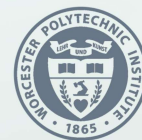


Increasing Awareness of Water Treatment Careers

May 4th, 2022

Supplemental Material



WPI

This report represents the work of WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see <http://www.wpi.edu/academics/ugradstudies/project-learning.html>

Increasing Awareness of Water Treatment Career

Supplemental Materials

Abstract

Water treatment operators ensure the quality of public drinking water and protect the environment by cleaning wastewater. The United States is currently facing a shortage of water treatment operators. Moreover, $\frac{1}{3}$ of current operators are eligible for retirement within the next 10 years. Facing such a serious shortage puts both public health and the environment at risk. For our project, we worked with the Massachusetts Department of Environmental Protection to identify the causes of the operator shortage and develop recommendations to increase awareness and recruitment for the water treatment field. To achieve this goal, we conducted 18 interviews with municipal officials and private corporations and collected 206 survey responses from vocational high school and community college students.

Team Members

Thuyen Nguyen, Matthew Wong, Yiyang Wu

Project Advisor

Dr. Corey Denenberg Dehner
Worcester Polytechnic Institute

Project Sponsor

Andrea Briggs, MassDEP Deputy Regional Director
John Murphy, Wastewater Engineer/Operator Certification and Training for MassDEP
Massachusetts Department of Environmental Protection (MassDEP)



This image was taken with permission at the Fairhaven Water Pollution Control Facility in Fairhaven, MA

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Appendix I	Matthew Wong	Edited By All
Appendix J	Yiyang Wu	Edited By All
Appendix K	Yiyang Wu	Edited By All
Appendix L	Yiyang Wu	Edited By All

Appendices:

Appendix A

Interview Questions for Our Sponsor John Murphy:

Q1. The NEWWA website currently shows that there are seven grades of water treatment operators in Massachusetts, however, only grade one to four has descriptions. Could you please provide some insights regarding the titles for all water treatment operators and their duties?

Q2. Which group of people do you think the regional governments are most interested in hiring as operators?

Q3. Which departments of these local governments are responsible for hiring operators? Are there anyone in these departments that would you recommend we reach out to?

Q4. What terms do you think are the most effective for water treatment operator job searching?

Q5. What do you think of the training results of the online courses?

Q6. As shown on the NEWWA website, a master degree in science is equivalent to 5 years of experience. Will an individual with such a degree be considered as a senior water treatment operator and are they required to complete the training program before the exam?

Q7. As shown on the NEWWA website, every 2 years, active operators are required to demonstrate 20 Training Contact Hours (TCH) for certification renewal. If an operator passes examinations for certification upgrades, they only need 10 TCHs. Are all operators required to upgrade certification after getting hired or are they allowed to stay in the same positions?
If not, would you suggest enforcing the certification upgrade requirement?

Q8. Besides Concord and Worcester, do you have any other specific region of Massachusetts that you would recommend us conduct our research on?

Q9. Is there anyone else that you recommend we reach out to?

Appendix B

Interview Questions for NEIWPC:

- Q1. Could you please tell us what you enjoy most working for the NEIWPC?
- Q2. What are your thoughts on the current water treatment operator shortage?
- Q3. The NEWWA website currently shows that there are seven grades of water treatment operators in Massachusetts, however, only grade one to four has descriptions. Could you please provide some insights regarding the titles for all water treatment operators and their duties?
- Q4. We were informed by Mr. John Murphy of the MassDEP that the NEIWPC does an excellent job in educating the public about the water industry. Could you please provide us some insights regarding the NEIWPC's current outreach methods? Who is the target audience? (Who implements these methods, ask for contact)
- Q5. In your experience with certification and renewal programs, is it common to see operators upgrade their certificates or stay in the same grade?
- Q6. How did you learn about this field and what motivated you to stay in this industry?
- Q7. It is shown on the website that you coordinate and host training classes, of which age group would you say most of the students belong to? How did they come to be involved in these training courses?
- Q8. Do you have any recommendations for increasing awareness and recruitment?
- Q9. Currently, we have some ideas on promoting awareness for water treatment plant positions to high school and vocational students. Would you like to provide your opinions on these ideas?
- Q10. Is there anyone else that you recommend we reach out to?
- Q11. If we have additional questions, is it alright if we contact you in the future? If so, how would you like us to reach out?

Appendix C

Interview Questions for Water Treatment Plant Superintendents

- Q1. Can you share some insights about your position?
- Q2. Can you share any insights on the benefits or challenges of working in the water treatment field?
- Q3. How did you come to be involved in this industry? What about the treatment operators you work with?
- Q4. What do you think are the challenges for hiring new operators?
- Q5. Can you share some insights regarding the salary range for operators?
- Q6. What methods do you use to measure treatment operator satisfaction? How often do you implement this method? What's the general result?
- Q7. What do you think are the main motivations for people to stay at the plant?
- Q8. Do you have any recommendations for increasing awareness and recruitment?
- Q9. Currently, we have some ideas on promoting awareness for water treatment plant positions to high school and vocational students. Would you like to provide your opinions on these ideas?
- Q10. Is there anyone else that you recommend we reach out to?
- Q11. If we have additional questions, is it alright if we contact you in the future? If so, how would you like us to reach out?

Appendix D

Preamble for interviews:

We are a group of students from Worcester Polytechnic Institute in Massachusetts, and we are working with the Massachusetts Department of Environmental Protection. We hope to gain an understanding of the current water treatment operator shortage, and explore ideas to increase awareness for the water industry.

The interview should take about 30-45 minutes.

Participation is completely voluntary, and you may withdraw at any time. Do you give us your permission to share your name/position and the information you provided in our final report? We will share those sections of the report with you prior to publication.

Your participation in this interview is greatly appreciated. You can reach out to our faculty advisor (cdehner@wpi.edu) if you have any additional questions.

If you would like, we can provide you with a copy to our final report at the end of the project. You will be able to opt in by sending us an additional email request

Preamble for survey:

We are a group of students from Worcester Polytechnic Institute partnering up with the Massachusetts Department of Environmental Protection to identify causes for the decrease in people entering the water treatment industry. Your responses will help us develop methods to increase public awareness and interest in the water treatment field. We offer some brief background on the issue below.

Please know that your participation in this survey is voluntary and you may withdraw at any time. Your identity will remain anonymous, and your names will not appear in any report or publication. There is no risk to your participation, and we are grateful for your assistance. If you have any questions, you may contact our faculty advisor, Corey Dehner, at cdehner@wpi.edu. Thank you!

Appendix E

Sample Survey Questions for Target Audiences

What is your plan after high school graduation?

- Attend University/College (4 years program)
- Attend University/College (2 years program)
- Secure a full-time job
- Secure a part-time job
- Enter the Military
- Not sure
- Other...

How likely are you to take a full-time job within the first year of completing your current education?

- Extremely unlikely
- Somewhat unlikely
- Neither likely nor unlikely
- Somewhat likely
- Extremely likely
- Not sure

If you have a specific field or career path that you are exploring, and are pursuing a full-time position, what is your expected salary? *

The average entry level salary in MA is \$15/hour and minimum wage in MA is currently \$14.25/hr... which equates to an annual salary of ~\$30,000/year.

- \$30,000-40,000
- \$41,000-50,000
- \$51,000-60,000
- \$61,000 +

Which of the following factors do you think will affect your choice of work the most? (Select your top three factors, with First Factor being the Most Important) *

	Job Sec...	Health ...	Retirem...	Flexibilit...	Working...	Length ...	Working...	Spendin...	Being P...
First Fa...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Second ...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Third Fa...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How much time do you spend on the following social media platforms daily? *

	0 hours	< 1 hour	1-3 hours	3-5 hours	> 5 hours	Not sure
Youtube	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tiktok	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instagram	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Snapchat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you answered 'Other' on the previous question with a choice other than '0 hours', what social media outlets might they be?

Short answer text

How much do you know about the drinking water source in your town? (Select all that apply)

- I know who to contact with questions about the quality of my drinking water
- I know the source of drinking water for my town
- I know where to look for information about drinking water in my town
- I know what methods my water department uses to treat my drinking water
- I don't know

Do you know where your home's wastewater goes? (Wastewater is any water that enters the drain from the kitchen sink, toilets and showers/tubs).

- Yes
- No
- Maybe

Did you know that the United States is currently facing a shortage of both drinking and wastewater treatment operators?

- Yes
- No
- Maybe

After learning about the water treatment field, how likely are you to consider a career in it.

- Extremely Likely
- Somewhat Likely
- Neither Likely nor Unlikely
- Somewhat Unlikely
- Extremely Unlikely

Appendix F

Parental Consent Form for Participants under 18 years of age.

Faculty Investigator: Corey Dehner

Student Investigators: Thuyen Nguyen, Matthew Wong, Yiyang Wu

Contact Information: gr-d22h2o_ops@wpi.edu

Title of Research Study: Increase Awareness for Water Treatment Positions

Sponsor: Massachusetts Department of Environmental Protection (MassDEP)

Introduction

Dear parent/guardian, we are students from Worcester Polytechnic Institute and are working with the Massachusetts Department of Environmental Protection (MassDEP) on a research project. We are researching why people go into different trade or water treatment professions and will develop recommendations for the MassDEP on how they can increase awareness of the water treatment field.

Procedures to be followed: All participants will remain anonymous. We will share a link to our research survey and ask their feedback on what they might look for in a career. We will not have access to survey participants' identity and will only share the data we collect in the aggregate. There are no risks to participants in this research. We hope the research will increase knowledge of the water treatment field careers.

For more information about this research or about the rights of research participants, contact:

Faculty Investigator: Corey Dehner, cdehner@wpi.edu

Student investigators: (Thuyen Nguyen, Matthew Wong, Yiyang Wu) gr-d22h2o_ops@wpi.edu WPI

Institutional Review Board Manager: Ruth McKeogh (Tel. 508 831- 6699, Email: irb@wpi.edu) WPI

Human Protection Administrator: Gabriel Johnson (Tel. 508-831-4989, Email: gjohnson@wpi.edu)

The student's participation in this research is voluntary.

Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits.

By signing below,

you acknowledge that you have been informed about and consent for your child (or dependent) to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

For Participants Under 18 Years Old

Guardian/Parent's

Signature _____ Date: _____

Guardian/Parent's

Name (Please print) _____ Date: _____

Appendix G

Project Timeline:

TASK	WEEK							
	PQP	1	2	3	4	5	6	7
01: Gain an understanding of the water treatment industry								
02: Determine target audiences and current advertising methods								
03: Explore target audiences' perceptions								
04: Develop recommendations to increase recruitment.								

Appendix H

Opt-In For Study Results Form:

To opt in for either or both a copy of the survey/interview results and access to the final report, please check the correct box in the next page and provide either your location address or email address in the blanks below. To opt out, just skip the section of the agreement in the next page.

- I would like to obtain a copy of the survey/interview results.
- I would like to get access to the final report.

Location Address:

Mailing Address Line 1: _____

Mailing Address Line 2: _____

City: _____ State / Province: _____

Zip Code: _____ Country: _____

Email Address: _____

Appendix I

List of Interviewees:

Municipal Water Treatment Facilities and Coalitions:

- Judy Brunjes, Superintendent, Maine DEP
- Guy Campinha, Director of Water Pollution, Town of Wareham
- Kristin Dee, Wastewater Treatment Supervisor with the Massachusetts Water Resources Authority
- Scott Firmin, Director of Wastewater Services, Portland Water District
- Vincent Furtado, Public Works Superintendent, Town of Fairhaven
- Michelle Jenkins, Information Officer , NEIWPCC
- Jeff Kalmes, Wastewater Superintendent, Billerica Water Resource Recovery Facility
- Evan Karsberg, Environmental Analyst (wastewater), NEIWPCC
- Jennifer Lichtensteiger, Environmental Analyst (wastewater), NEIWPCC
- Paula Lomas, Chief Operator, Worcester Water Filtration
- Jeff Murawski, Water-Sewer Superintendent of Concord
- Robert A. Pontau Jr., PE, Rob Pontau, General Manager, Brunswick Sewer District
- Robert Rak, Professor and Coordinator of the Environmental Technology Program at Bristol Community College
- Phyllis Arnold Rand, Water Quality Coordinator, Greater Augusta Utility District
- Arthur Simonian, Executive Director, The Mattabassett District
- Chris Welch, Wastewater Operations Supervisor, Uxbridge DPW
- (Anonymous), Wastewater treatment plant supervisor, small town in Maine

Private Water Treatment Facilities:

- Julie Carreiro, Recruiter, Weston & Sampson

Appendix J

Highlight Legend:

Green: Has worked/ currently working in wastewater treatment plant as an operator

Blue: Has worked/ currently working in drinking water treatment plant as an operator

Yellow: Work in other parts of the water treatment industry

Appendix J-1

Comparative Matrix about operator satisfaction and salary

Name - Position - Town	Operator Satisfaction	Salary
Chris Welch - Wastewater Operations Supervisor - Uxbridge, MA	Morning meeting every Monday (5 operators in total). Open-door policy, giving people an opportunity to share their experience. Most people are satisfied.	\$24
Evan Karsberg - Environmental Analyst NEIWPC - MA	People in the field are generally satisfied with their jobs	N/A
Michelle Jenkins - Information Officer & Wastewater Certification NEIWPC - MA	People love their jobs. They're proud of their jobs	N/A
Jennifer Lichtensteiger - Environmental Analyst NEIWPC - MA	Proud for providing clean water and protecting the environment	N/A
Judy Bruenjes - Sr. Env Engineer at Maine DEP - ME	Salary survey, association award, competition (sport-like events), social events, ski day Community college survey	
Jeff Murawski - Water-Sewer Superintendent of Concord - MA	Internal contact, conversation with your staff. HR don't provide survey to measure	
Vincent Furtado - Public Works Superintendent - Fairhaven MA		In the Municipal World, the original pay scales for any community were all predicated on the average home value for that specific community. Then, unions get involved and the pays are taken from there. In general, the lower licenses (1&2): \$25/hr, Grades 3&4: \$26-\$28, Grade 5's up: \$29 - \$50+

Name - Position - Town	Operator Satisfaction	Salary
Paula Lomas - Chief operator acting plant manager - Worcester MA	They're satisfied, some are burnt out, some are too old to be willing to work overtime (one is in 70s) to get things in plant done Personal communications (talk) – not many people here, talk through shifts, email when frustrated	salary range is changing
Phyllis Rand - Water Quality Coordinator - ME	Greater Augusta Utility District	53000 dollar a year without college degree (entry)
Rob Pontau - General Manager - Brunswick ME	Did employee satisfaction survey, overwhelmingly positive (50 questions, not excited to take it) Nobody unsatisfied, all satisfied or extremely satisfied. Also did face to face talking. Air grievances sometimes but get through	Salary will email: start with 0 experience 22-23/h, with exp 25/h, high level 27-30/h
Scott Firmin - Director of Wastewater Services - Portland, ME		Pay grade: pizza for 20/hr, Right now, Union Contract: pay operators by contract, \$22/hr. \$21-22 for most \$28 for high Next generation operator is a challenge In the 70s, we had environmental movements.
Jeff Kalms - Wastewater Superintendent - Billerica, MA	In person talking. See what goes wrong.	56000 a year for him, first 5 years 27/h up to 31/h. People may go to other towns, because other towns may pay more. The salary is controlled by the Union.
Guy Campinha - Director of Water Pollution Control - Wareham, MA		27 an hour grade 4-5, entry. Private is about 30/hour.
anonymous(Don't share name or city) - Environmental Compliance Manager - ME		Operations: entry level - \$19 Management: 90,000 She makes 79,000

Name - Position - Town	Operator Satisfaction	Salary
Arthur Simonian - Executive Director of the Mattabassett Sewer District - Mattabassett CT	Staff meeting, Merit award, allowing operators to voice their opinion and have ownership at the plant	Entry Level: \$37/hour Maintenance department: \$50-100k/year (avg. ~\$75k/year) Treatment Supervisor: \$105-120k/year. Lab work: \$105k/year Engineering: \$120k/year Manager: \$150-175k/year
Kristen Dee - Wastewater Treatment Operator (Grade 7 combined) - MWRA		(Previous data here: \$26) Entry level: \$55-56k /year Bio, Chem, or Engineering degree: \$80k+
Julie Carreiro (Weston & Sampson) - Recruiter - Boston, MA	N/A (doesn't know)	N/A (Can't tell, private company obligations)
Robert Rak- Wastewater Treatment Training - Bristol College, Fall River MA	N/A	20 entry level for most places, Depending on grade,giving bonuses for passing next grade. Midnight shift also gets a bonus. Superintendent most likely to receive 6 figure

Appendix J-2

Comparative Matrix about benefits and challenges of being an operator

Name - Position - Town	Benefits	Challenges for Operators
Chris Welch - Wastewater Operations Supervisor - Uxbridge, MA	Municipality, 7-3 everyday, job security. Essential workers, it's rewarding to see what they're able to do for the public/environment. health benefits.	Double edged sword, it's disgusting, salary (not the best). People don't understand the need for wastewater treatment and distribution of funds. Letting the public understand their job.
Evan Karsberg - Environmental Analyst NEIWPC - MA	Job Security, Serving/Protecting Public Health. Pension	Old Infrastructures, Broken Equipment
Michelle Jenkins - Information Officer & Wastewater Certification NEIWPC - MA	Job Security, Health Insurance.	8% of female operators.
Jennifer Lichtensteiger - Environmental Analyst NEIWPC - MA		Not much recognition
Jeff Murawski - Water-Sewer Superintendent of Concord - MA		Aging workforces

Name - Position - Town	Benefits	Challenges for Operators
<p>Vincent Furtado - Public Works Superintendent - Fairhaven MA</p>	<p>This all depends on the benefit package and/or union where one would work. Here, there is Blue Cross/Blue Shield Master Medical and Dental – with the Town paying 60% of the cost and the employee 40%.</p> <p>The retirement plan for either the State or a City/Town therein (in MA) is the best benefit we have. There is a formula based on your age and retirement and your number of years of service. Folks can max out at 80%. The greatest benefit is that you cannot outlive your \$\$ Once you are vested you will continue to receive retirement until you pass.</p> <p>Vacation time, sick time, personal time, holidays, union protection, satisfaction of cleaning the environment, being a public servant, working both indoors and out.</p>	<p>Trying to recruit folks at a young age: average age of people in courses are 35-40. Afraid of math: a lot of math for people out of school for so long.</p> <p>Math is considered as a part of the exam. Different levels of the exam, depending on the town, give some points value.</p> <p>8,9 years ago, people passed 4 or higher, but for now only grade 1 or 2. Some places even hire people with no license. Not common to have a license for now.</p> <p>In college or high school offering something to generate interest. It is useful to have a license, so you can have this job as back up.</p>
<p>Paula Lomas - Chief operator acting plant manager - Worcester MA</p>	<p>As an Environmental Engineering major, this job pays more than the lab.</p> <p>Other options are only to jump labs, with a limited number of EE majors already.</p> <p>Other jobs for EE need a lot of driving</p> <p>Water treatment has overtime shift pay and opportunities</p> <p>Can educate and benefit people, keep them safe</p> <p>Time to experience plant's environment since work schedule is 3 times a week</p> <p>At this point we have two insurance choices: Fallon and BCBS. Fallon is opting out of the insurance game so they are getting us an alternative. They also offer dental insurance, pet insurance, eyeglass insurance and car insurance.</p> <p>In the state of Massachusetts we do not pay into social security. Our pensions pay up to 80 percent of your highest three years if hired before 2012 and five years after 2012. It is a sliding scale to determine the percentage age and years served. we have set schedules so there isn't flexibility. We do have one floater shift that's flexible.</p> <p>It's a secure job no matter what the economy does. You need water. All through the pandemic we were working full time.</p>	<p>lack of staff and lack of pay, dealing with government</p> <p>Frustrated with vendors and government → needing to send work for bid on needs/costs greater than \$100K → follow nonoptimal contract vendors</p> <p>Lack of freedom to get work with vendors without waiting and government paying more to get work done through nonoptimal legal hoops (city 'red-tape')</p>

Name - Position - Town	Benefits	Challenges for Operators
Phyllis Rand - Water Quality Coordinator - ME	pay is good, stay in US, becoming more technical	not very well known, applicants unprepared
Rob Pontau - General Manager - Brunswick ME	job security (amidst financial decline and pandemic), 4-10 work week (holidays and weekends free) Half hour lunch break, work 9 hours pay for 10 hours. 100% health insurance for family and themselves. 12 holidays.	Not much knowledge to enter field (entry level) - straight from high school Aging workforce. (30-40 years)
Scott Firmin - Director of Wastewater Services - Portland, ME	important work, flexible hours, people are open for collaboration. Good networking people. medical , health benefit, more competitive the health benefit covers more. Good health plan. Compensation package is competitive Work is challenging. Benefits are changing, pension/health benefits are generous, Flexible hours. Mon-Fri 6-2:30 One person 6AM-6PM 2 days and have 3 days off Professional staff 8 -5 Systems crew - on call, flat pay, overtime on call 16 hours days limit, someone replaces afterwards - contract	
Jeff Kalmes - Wastewater Superintendent - Billerica, MA	80% pension, personal days trade money, vacation time up to 5 weeks after 16 years depending on the working years. 50% pay for health insurance(include family)	Understand the process, maintaining the equipment and sending data with good information. They are trying to create a biomass, they can not control everything. Union setting, whether people do well or poorly doesn't affect the salary.

Name - Position - Town	Benefits	Challenges for Operators
Guy Campinha - Director of Water Pollution Control - Wareham, MA	Pension, Retirement, Incredible for retirement 60 - 90% pay. Work Hours, level of flexibility Health insurance. Time off, sick time, vacation.	worry about differences of illness, public relation critical, expensive for wastewater - taxpayers. People don't understand what they do. Staffing – major issue. not sure if the pension is sustainable, not sure how long will it exist
anonymous(Don't share name or city) - Environmental Compliance Manager - ME	pride, her crew is proud of what they do. They're the last defense for pollution control. Good health benefits. Recession proof, transfer town-to-town, skills that you can use anywhere in the United States. Reciprocities (many states do)	Money, we sustain the plant via rate. We charge our community for sending their wastewater. No extra money. Breakdown, old infrastructures. Small plants require 5 license operators. Most people leave after a year. Environmental regulations are getting more difficult and costly.
Arthur Simonian - Executive Director of the Mattabassett Sewer District - Mattabassett CT	State pension plan, based on years of service. Lots of security. Not worrying about how many people they put into the project.	Losing people and their trade knowledge when they retire. Some trade knowledge is not documented. Workforce age: Highest :69 Lowest:25 Average workforce age: 53-55
Kristen Dee - Wastewater Treatment Operator (Grade 7 combined) - MWRA	Provide water for the community Clean up the environment. Protect wildlife Don't need college degree Union job: 80% of top 3 years (pension) - guarantee pay increase - Vacation up to a month	Convincing other people to enter this career
Julie Carreiro (Weston & Sampson) - Recruiter - Boston, MA	Unlimited sick time, vacation, 401k, all in-house safety training, education funds. Pump station tech first (entry, learn what to do), get additional money when they increase their license level (D1, D2...). Eventually reach lead operator status, can apply for managerial roles when open	N/A
Robert Rak- Wastewater Treatment Training - Bristol College, Fall River MA	Pension depends on who you are working for. Private may not provide pension. Protection from union, job security, medical benefits: dental, etc. Education benefits: free tuition. Boots, hats, PPE. Vacation time: he had 5 weeks of vacation.	outdoor sampling, the weather. React with problems. Depending on the size of the plant, small plants you need to jack of all trades, do lots of different work.

Appendix J-3

Comparative Matrix about hiring challenges and recommendation for increasing recruitment

Name - Position - Town	Hiring Challenges	Recommendations
Chris Welch - Wastewater Operations Supervisor - Uxbridge, MA	<p>Biggest challenge is finding qualified operators.</p> <p>Currently missing person for a position. 2 people left, but only one new person came</p> <p>People don't know the field exists. People he interviewed don't have a background in wastewater treatment. Uxbridge is competitive in the field. Boston and Deer Island operators get better salaries to convince people to join the field.</p> <p>Pay range is making things difficult. Minimum wage goes up</p>	<p>Start programs in elementary schools, arrange field trips once a year. High school seniors' projects focus on water treatment. Interactive programs at the plant, they have equipment to start classes at the plant. They want to start training classes and bring more students, people at other facilities to their plant.</p>
Evan Karsberg - Environmental Analyst NEIWPC - MA	<p>not much clarity, communicating issues. Find a new way to reach a new audience, and more audience</p>	<p>Shorten existing Youtube videos, Starting programs in high schools. Discord channels for people to communicate with operators</p>
Michelle Jenkins - Information Officer & Wastewater Certification NEIWPC - MA	<p>Not broadcasting</p>	<p>Tiktok videos, start micro learning concepts in High Schools, help students pass exams, target veterans</p>
Jennifer Lichtensteiger - Environmental Analyst NEIWPC - MA		<p>High school Programs. Young people in her programs were very committed. Need to attract teachers, parents for long-term impact.</p>
Judy Bruenjes - Sr. Env Engineer at Maine DEP - ME	<p>People who work these programs are also retiring</p>	<p>Internship, summer job programs → linking people from technical, vocational schools to get to work, learn about the plant → secure then a job there</p> <p>Connecting applicants to jobs > need suited staff to get them together</p>
Jeff Murawski - Water-Sewer Superintendent of Concord - MA	<p>low public awareness</p>	<p>Good relationship with minuteman technical high school: environmental program. Co-op jobs.</p>

Name - Position - Town	Hiring Challenges	Recommendations
Paula Lomas - Chief operator acting plant manager - Worcester MA	<p>Need people who specifically work in surface water treatment plants</p> <p>Need to meet diversity codes, jump hoops to get person cleared in codes</p> <p>Middle age white men mostly.</p> <p>Need people to move in desperately, but regulations and rules keep plant from matching to suitable applicants (vacation times, limited pay)</p> <p>Testing: standardized</p> <p>Always hard to pass</p> <p>Country standard is making it harder and excessive</p> <p>Forcing people to take courses that teach for the sake of test and nothing else</p> <p>No clear path in industry (getting a better path towards naturalizing into operator certifications and pay)</p>	<p>Education program</p> <p>College fair, make the path more clear.</p> <p>Getting operators more pay by pushing them up to senior positions, getting to board tomorrow city council meeting (look for, should be at 6)</p> <p>Have to educate city council and government bodies what water treatment is, complexities, and their due need for a greater pay (time and work requirement)</p> <p>People take for granted water treatment until Spencer situation occurs (hydrogen peroxide valve controls set to hand than auto and left on, no one certified in plant except 1, untrained and great responsibility)</p>
Phyllis Rand - Water Quality Coordinator - ME	<p>Many choices, lots of job open - competition</p>	<p>figuring out - don't know they're here since they don't know where water is going/coming from, advertising campaign locally - local colleges advertising facilities, on the internet</p>
Vincent Furtado - Public Works Superintendent - Fairhaven MA	<p>Is not marketed well. Generalized as disgusting. People don't know about it. In general he thinks people just don't know this job is provided.</p> <p>People have no idea where the water comes from, nobody thinks about it.</p>	<p>Start with high school, public school, vocational school aware of this position.</p> <p>Make it part of curriculum , get kids talking about it</p> <p>At least introductory level of knowledge.</p> <p>Prospect safeguard (backup career to think back to)</p>

Name - Position - Town	Hiring Challenges	Recommendations
<p>Rob Pontau - General Manager - Brunswick ME</p>	<p>Nobody wants to play swage, automatic and mechanical nowadays (mechanic), more technical positions now. Most parts are not dirty now, but it is hard to change people's opinions. People are not ready to go into the field, people take a couple years to train an operator. They are not directly ready to go. Hiring people ahead of time, because it takes time. Still competing with other jobs (higher pay, less experience). All industries lack workers.</p>	<p>TikTok might be the key. Abstract videos are eye-catching (watching dipping videos, want to see what happens) The key is to get organizations involved, like NEIWPCC, MAWEA,...letting people know about this job. They have social media accounts, never caught on. Not sure how they plan out for job fairs in highschool/college. Good reception, but not good results (no applicants). Competition with more eye catching job/careers (cars, bridges)</p>
<p>Scott Firmin - Director of Wastewater Services - Portland, ME</p>	<p>all other industry people are not aware they are here, not charge enough, hard to hire people with exp., underfunded after 70s with clean water act (90% funding)</p>	<p>Reaching out of high school and community college. Giving tours to those students. Engage with students, free pizza, etc. Telling people that they are there. Attend a career fair. A student took a tour and decided to work in the plant.</p>
<p>Jeff Kalmes - Wastewater Superintendent - Billerica, MA</p>	<p>People don't know this field. No school to produce operators, and no graduate program for operators. They came to this field by talking with people who are already in this field. Testing is difficult. You have to take classes before taking the exam(drinking water). licensing is a big thing. Now they have to hire people under license.</p>	<p>high school students don't have licenses, but they also don't have bad work hobbies. 18 year old kids don't have any working experience. Reaching out to public education, into school, makes students learn and understand. Positive PR</p>
<p>Guy Campinha - Director of Water Pollution Control - Wareham, MA</p>	<p>Operators should come out from high school, we should direct young people</p>	<p>Focus more on trade school, younger ages, get education earlier. Most people they hired were working in another industry, not many people from high school wanted to be an operator, which had to be vocational training, increasing awareness. More tour, explain to young kids what this is about. Need to let the public know they are here and what they are doing.</p>

Name - Position - Town	Hiring Challenges	Recommendations
<p>anonymous(Don't share name or city) - Environmental Compliance Manager - ME</p>	<p>We need to attack them young. We need to be in elementary , middle and high schools. We need it to be part of the curriculum, teaching kids about wastewater treatment.</p>	<p>Going to the schools. You have to invest in this early on. Internship, expose students with bachelor degrees. We should have programs within the vocational high schools. Tiktok, Snapchat, Instagram. Show them something, let them learn about the field. This industry is recession proof, covid proof. "People won't stop flushing"</p>
<p>Arthur Simonian - Executive Director of the Mattabassett Sewer District - Mattabassett CT</p>	<p>People are afraid to come into the industry. People don't want to deal with human waste. Competition with private companies is hard, and this is forcing them to raise salaries. Unless they attract more people, they don't want to increase the salary. Public side challenge is the funding. Private side challenge is just hiring more people, and training.</p> <p>Not enough people to review submitted resumes if they use online networking services. It is hard to attract people from different states.</p>	<p>Getting people from middle school or high school interested in this field. Once they get into the field, they can attract them. Need Guidance Counselors to educate students about the water treatment field.</p>
<p>Kristen Dee - Wastewater Treatment Operator (Grade 7 combined) - MWRA</p>	<p>Convincing people to enter this career: People don't know about the career, Most people came from plumbing, People don't want to deal with human waste.</p> <p>Not a lot of great public knowledge of the industry. High schools don't teach about the water industry. People don't know where water come from and where wastewater go Exam passing grade is low</p>	<p>Career fair. More high school water treatment programs (Minuteman High school has a wastewater treatment program.) More students need to be introduced to this industry.</p>

Name - Position - Town	Hiring Challenges	Recommendations
<p>Julie Carreiro (Weston & Sampson) - Recruiter - Boston, MA</p>	<p>Trying to promote their company to technical high schools' and colleges' students</p>	<p>Trying to get the word out for the younger generation, they have to sell it. She agrees that people don't go into this field because they don't know that companies provide this opportunity. It is really important to promote this job for those people. People don't really know what to do after graduation or what to do with the skills they have gained (i.e. treatment certifications).</p>
<p>Robert Rak- Wastewater Treatment Training - Bristol College, Fall River MA</p>	<p>N/A</p>	<p>Get young people to go into it. Try to get people, since most people are going to retire. Big retirement. Long time out of mind. Pipe is also a big issue, people spending lots of time on infrastructure. Try to replace all the old pipes. The awareness and directing people there are important. Making teachers understand this job is available so they can show this to students.</p> <p>How students are aware of this: middle school and high school programs, so people gain an understanding of the water field. Making them think it is easy to get this job. Showing the career pass for them.</p>

Appendix J-4

Comparative Matrix about Motivation for people to stay, current advertising method and How did operators come to be involved in the industry.

Name - Position - Town	Motivation for people to stay	Advertisement (current)	How did operators come to be involved in the industry
Chris Welch - Wastewater Operations Supervisor - Uxbridge, MA	They are having a tough time maintaining help, location and salary causing people to leave. Location is a key motivation, 3 operators live 5 minutes away from the plant. Getting young people in and allowing them to share their opinions.	Website, job hotline	learn from someone in the field
Evan Karsberg - Environmental Analyst NEIWPC - MA	Hands-on activities. Mechanically inclined, Protecting the Environment	Training classes, large training program, words to mouth	learned from someone in the field
Michelle Jenkins - Information Officer & Wastewater Certification NEIWPC - MA	People feel good and proud of what they do.	Information Pamphlets	
Jennifer Lichtensteiger - Environmental Analyst NEIWPC - MA		Internship, Field Trips, Website, Social Programs, Educational presentation. State Commision	
Judy Bruenjes - Sr. Env Engineer at Maine DEP - ME	People enjoy growing micro -organism to help the environment It is considered as a good job	Jobs posting: NEWWA postings, mentorship program at high schools Website	learned from someone in the field
Jeff Murawski - Water-Sewer Superintendent of Concord - MA	People who do this work believe in the importance of the service they provide. They consider this is a team that builds and supports each other, not for money or benefits. People enjoy the team environment.		Some of them know people in the field, some have family, some came over from construction. Some have a background in water treatment. Rare to have people come in with no background.

Name - Position - Town	Motivation for people to stay	Advertisement (current)	How did operator come to be involved in the industry
Vincent Furtado - Public Works Superintendent - Fairhaven MA	The money is good. Environmental rewarding. Nice field.		learned from someone in the field
Paula Lomas - Chief operator acting plant manager - Worcester MA	Pension, love of field, comfort More year work, more pay after retire These people are unwilling to immediately leave field (stay till 70s)		
Phyllis Rand - Water Quality Coordinator - ME	Challenging (exciting), pay well and live in community (local)		
Rob Pontau - General Manager - Brunswick ME	Greate pay scale, more exp the high money, more responsibility, as long as they did their job, nobody will come. Safety, people are comfortable with their work.		learned from someone in the field
Scott Firmin - Director of Wastewater Services - Portland, ME	People come in with no experience and support them to get their license. Offer people apartments.	Word to mouth Their association website, main water association, main utility association, new england water association Need to expand to find people indeed. Get a lot of people, but a small number are actually interested and acknowledge the field. 3-4 positions are open at all times.	Some people didn't know what they want to do Environmental, science degree, Plumbers, Retired from the military, mid 30s - second career doing something they want
Jeff Kalmes - Wastewater Superintendent - Billerica, MA	Benefits	Facebook page, haven't use online services for hiring	learned from someone in the field

Name - Position - Town	Motivation for people to stay	Advertisement (current)	How did operator come to be involved in the industry
Guy Campinha - Director of Water Pollution Control - Wareham, MA	People understand what they are doing, giving grandchildren a future. Some people think it is a good money range. Some people like professionals, having competitions, etc.		
anonymous(Don't share name or city) - Environmental Compliance Manager - ME	Benefits		good salary, word of mouth
Arthur Simonian - Executive Director of the Mattabassett Sewer District - Mattabassett CT	The benefit, job security, advancement. Their plant is very clean, cleanest plant in Connecticut; recognized by Connecticut DEP	Local news paper, on their website, or with NEWEA. Job posting site but too many applications and not enough people to review them (Monster) Word of mouth	Word to mouth, they learn from family and friends Lots of people at this firm has college degree, but college degree is not a requirement People who love environmental field
Kristen Dee - Wastewater Treatment Operator (Grade 7 combined) - MWRA	People are given the opportunity to feel loyal to their employer. They gained knowledge on the job and don't want to leave their employers		Working in a neighboring field and learning about the field(She has a CDL driver license, pipeline maintenance group). They provided the training for her to become a water operator
Julie Carreiro (Weston & Sampson) - Recruiter - Boston, MA		Do indeed, craigslist job on handshake, Monster, LinkedIn, website, diverse site, state agency site Craigslist and indeed are number one hits. NEWEA, technical high school outreach word of mouth from operators	Most of them have an environmental background for high school or college. Not engineering but the general environment.

Name - Position - Town	Motivation for people to stay	Advertisement (current)	How did operator come to be involved in the industry
Robert Rak- Wastewater Treatment Training - Bristol College, Fall River MA	Flexible schedules allow people to do other things. Motivated by being in charge then you can move on to become supervisor or manager. Some people are also allowed to move to different plants.		N/A

Appendix K

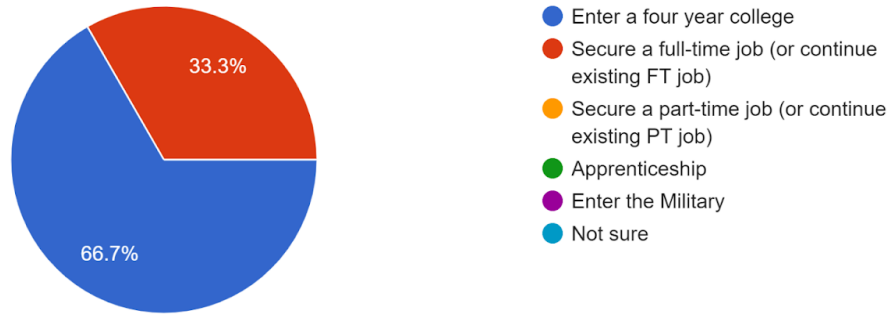
Survey Results:

Appendix K-1

Middlesex Community College Survey Results

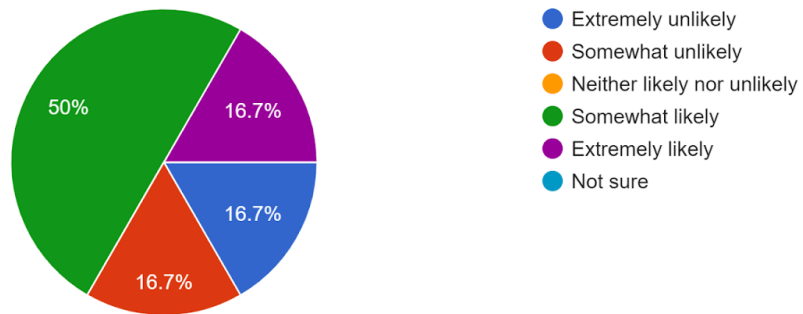
What is your plan after completing your courses at Middlesex Community College?

6 responses



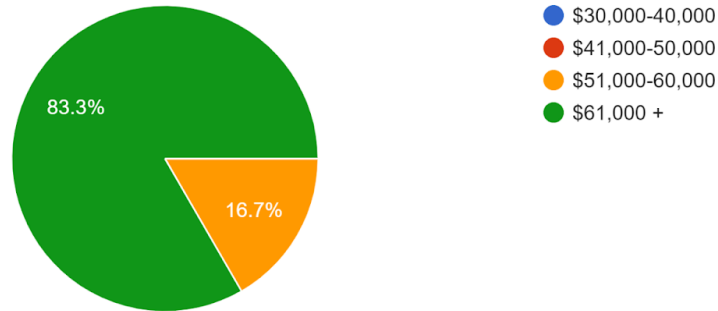
How likely are you to take a full-time job within the first year of completing your current education?

6 responses

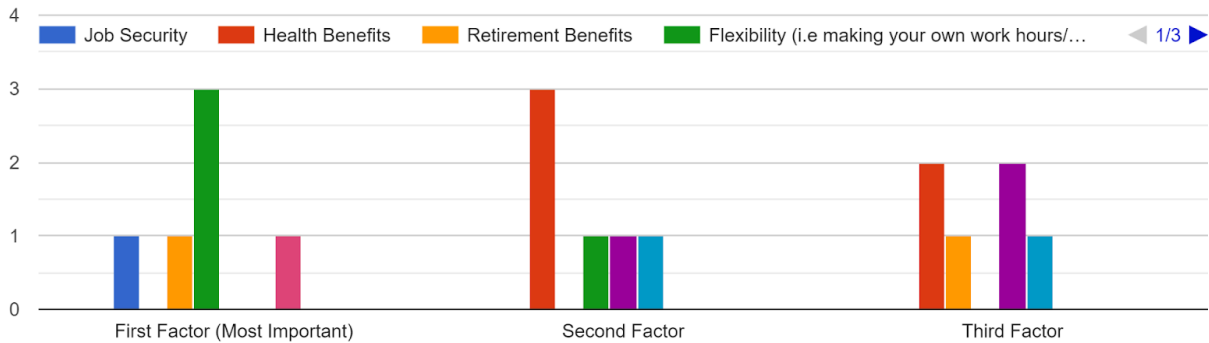


If you have a specific field or career path that you are exploring, and are pursuing a full-time position, what is your expected annual salary?

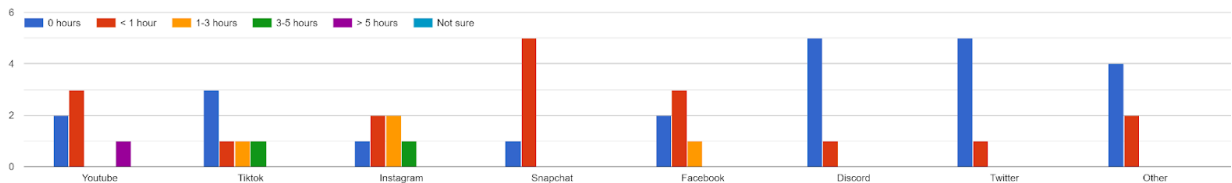
6 responses



Which of the following factors do you think will affect your choice of employment the most? (Select your top three factors, with the first factor being the most important)

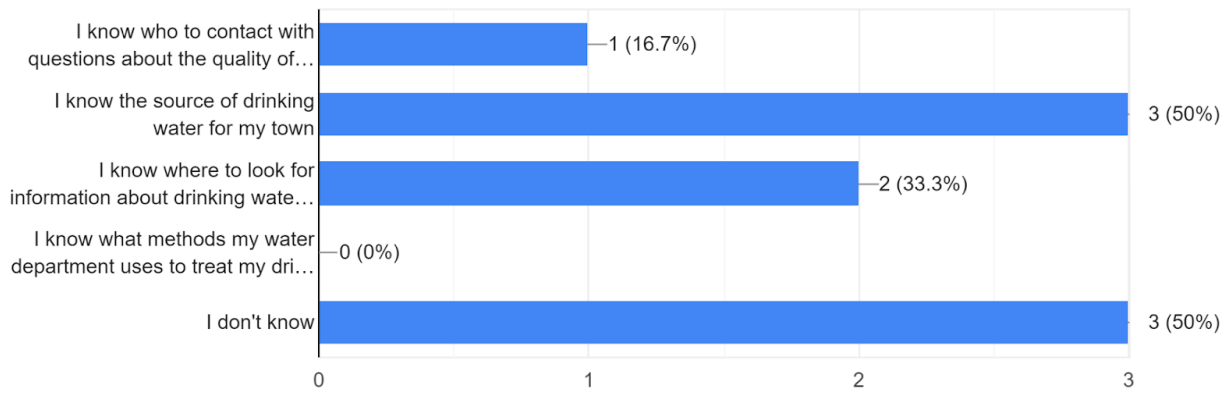


How much time do you spend on the following social media platforms daily?



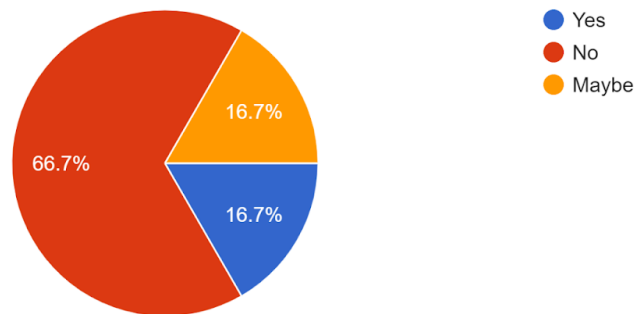
How much do you know about the drinking water source in your town? (Select all that apply)

6 responses



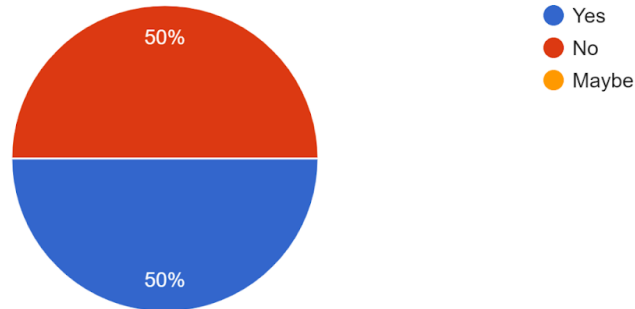
Do you know where your residential wastewater goes? (Wastewater is any water that enters the drain from the kitchen sink, toilets and showers/tubs).

6 responses



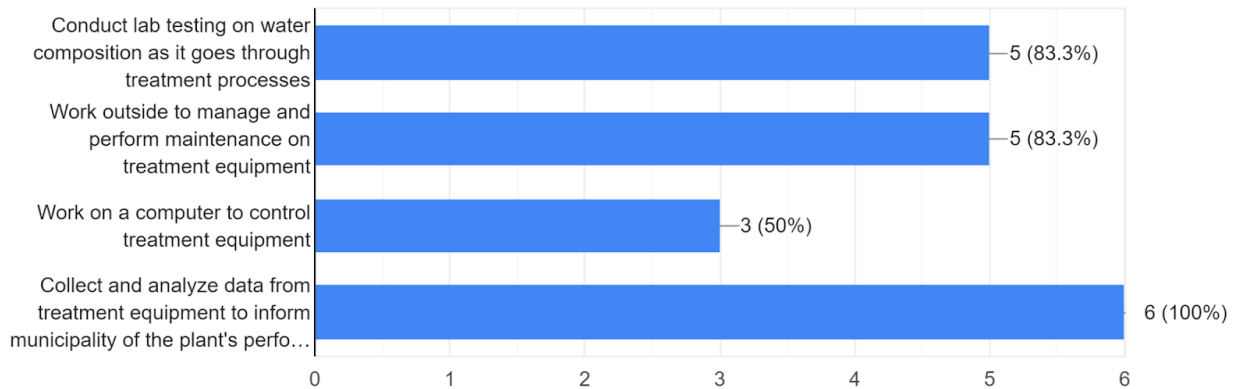
Did you know that the United States is currently facing a shortage of both drinking and wastewater treatment operators?

6 responses



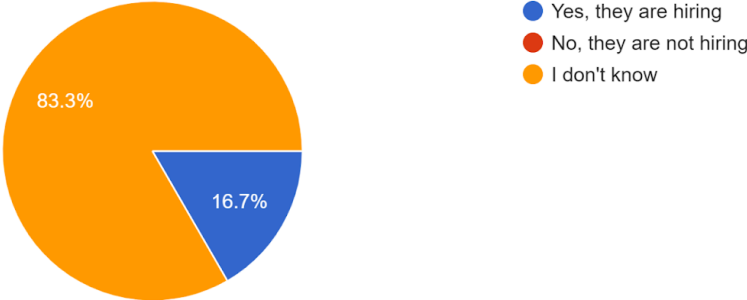
What responsibilities do you think drinking water and wastewater treatment operators entail?
(select all that apply)

6 responses



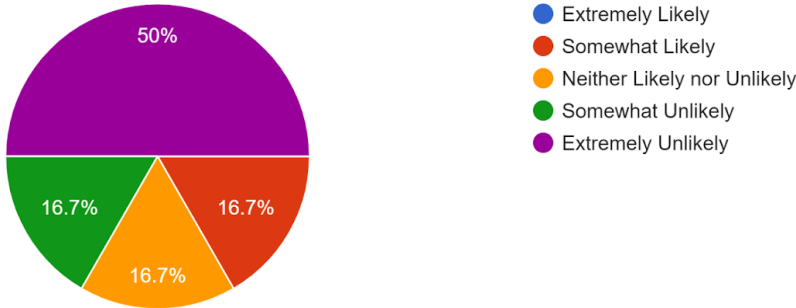
Do you know if your local drinking and wastewater treatment facilities are currently hiring water treatment operators?

6 responses



After learning about the water treatment field, how likely are you to consider a career in it.

6 responses

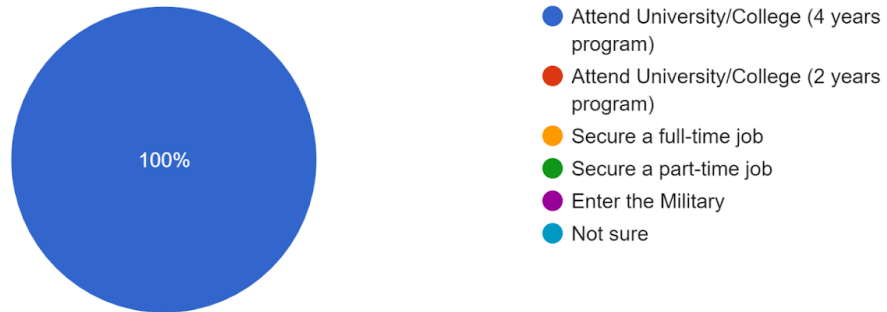


Appendix K-2

Worcester Technical High School Survey Results

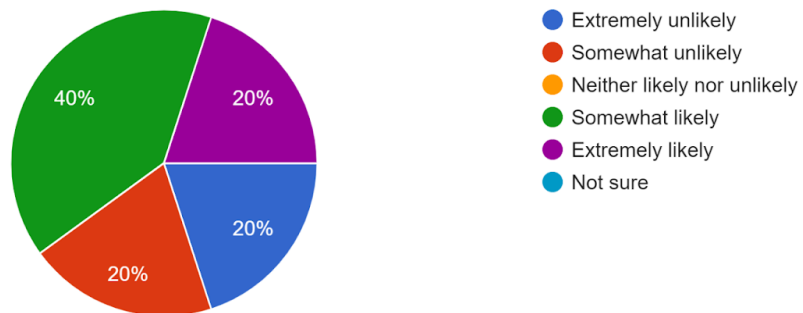
What is your plan after high school graduation?

5 responses



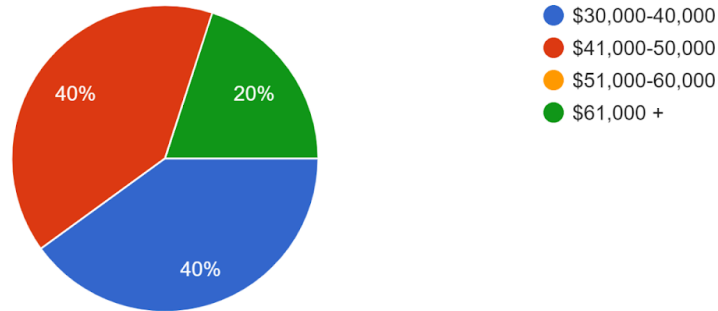
How likely are you to take a full-time job within the first year of completing your current education?

5 responses

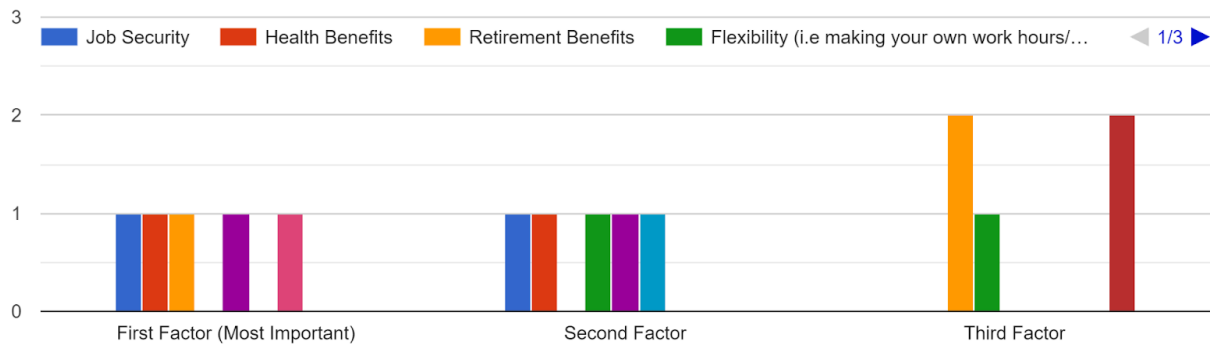


If you have a specific field or career path that you are exploring, and are pursuing a full-time position, what is your expected salary?

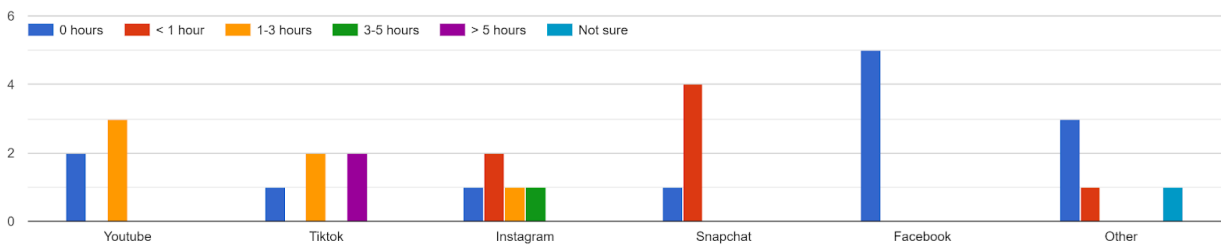
5 responses



Which of the following factors do you think will affect your choice of work the most? (Select your top three factors, with First Factor being the Most Important)

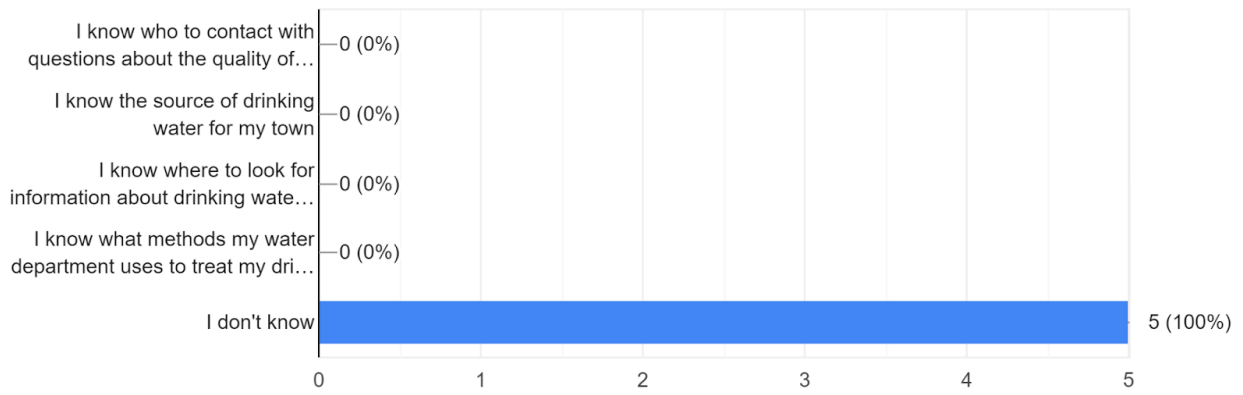


How much time do you spend on the following social media platforms daily?



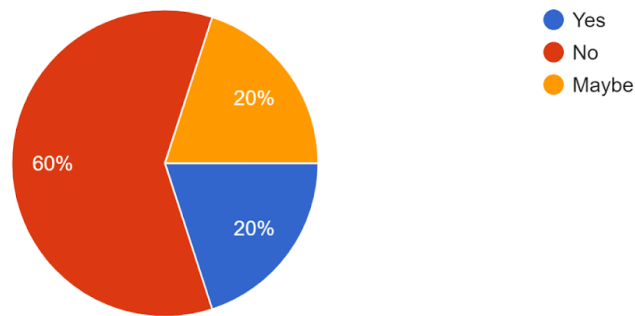
How much do you know about the drinking water source in your town? (Select all that apply)

5 responses



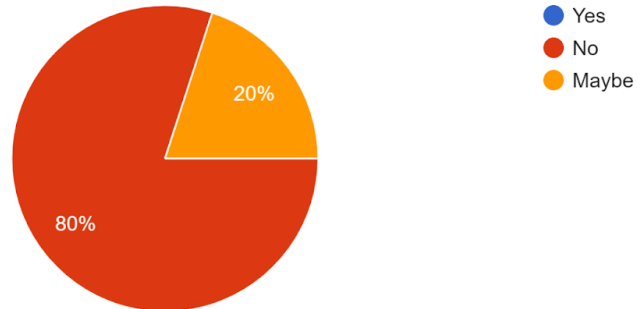
Do you know where your home's wastewater goes? (Wastewater is any water that enters the drain from the kitchen sink, toilets and showers/tubs).

5 responses



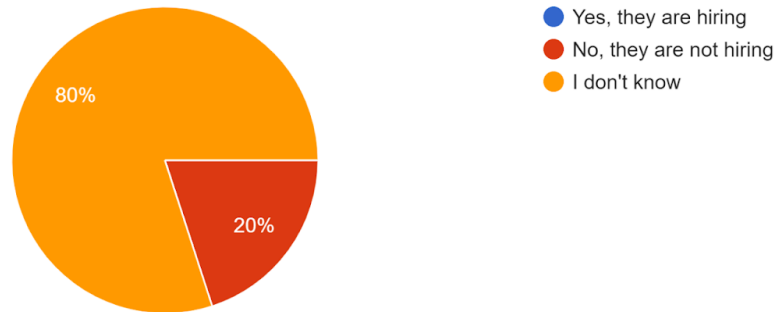
Did you know that the United States is currently facing a shortage of both drinking and wastewater treatment operators?

5 responses



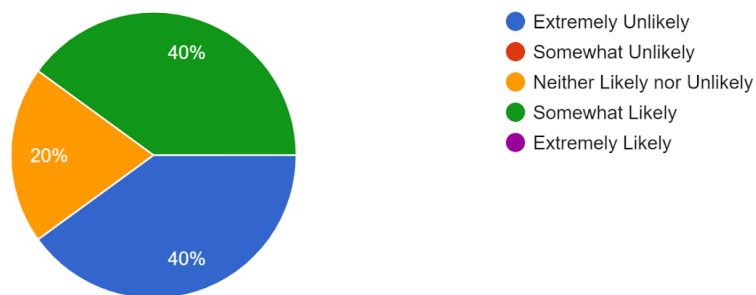
Do you know if your local drinking and wastewater treatment facilities are currently hiring water treatment operators?

5 responses



After learning about the water treatment field, how likely are you to consider a career in it.

5 responses

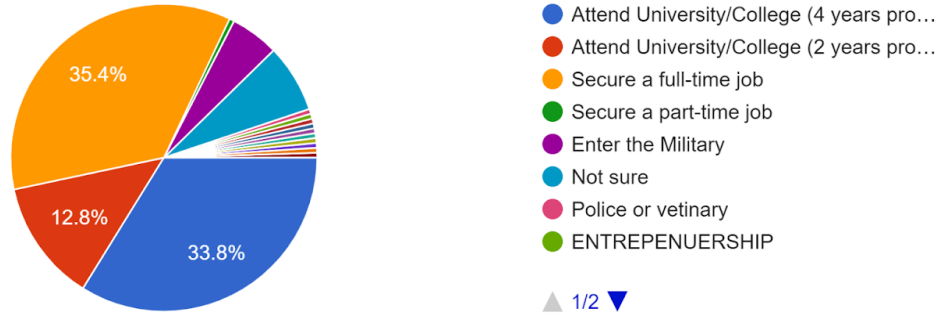


Appendix K-3

Bay Path Regional Vocational Technical High School Survey Results

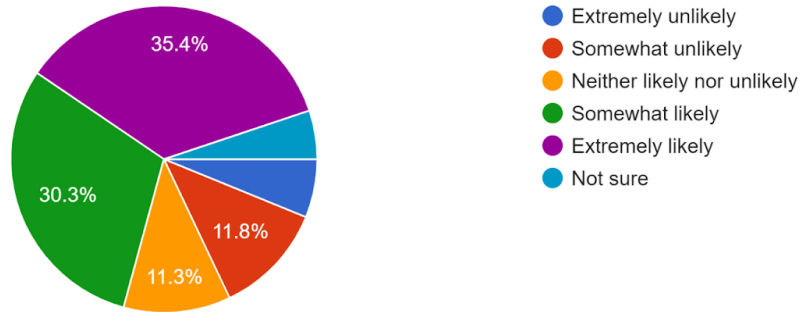
What is your plan after high school graduation?

195 responses



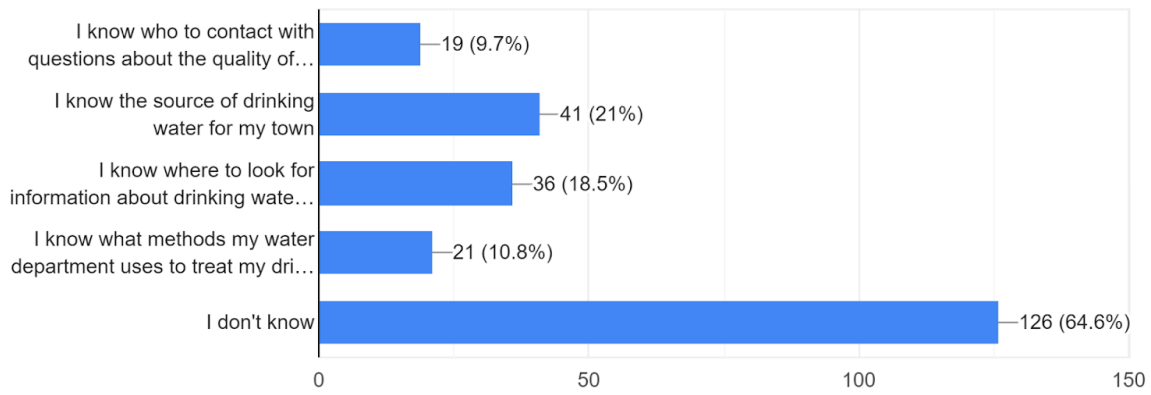
How likely are you to take a full-time job within the first year of completing your current education?

195 responses



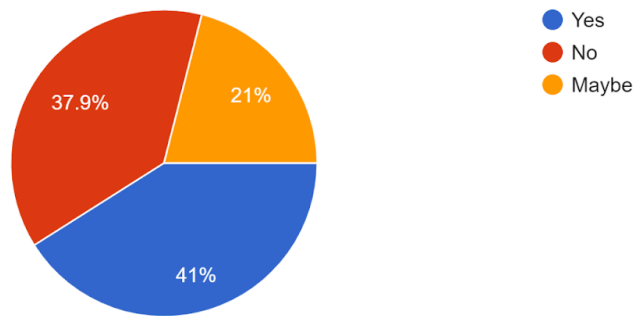
How much do you know about the drinking water source in your town? (Select all that apply)

195 responses



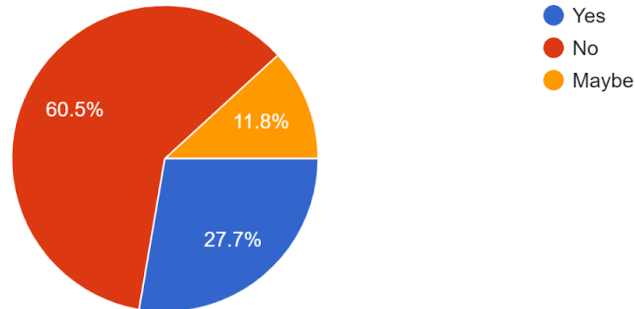
Do you know where your home's wastewater goes? (Wastewater is any water that enters the drain from the kitchen sink, toilets and showers/tubs).

195 responses



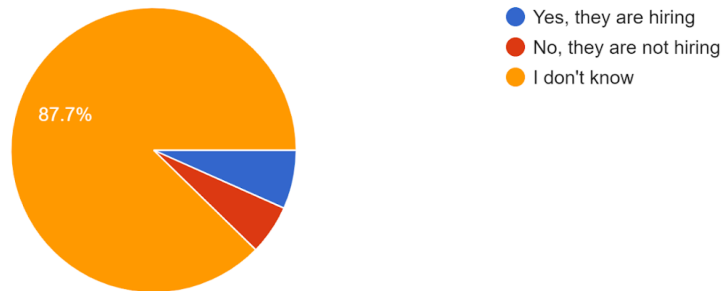
Did you know that the United States is currently facing a shortage of both drinking and wastewater treatment operators?

195 responses



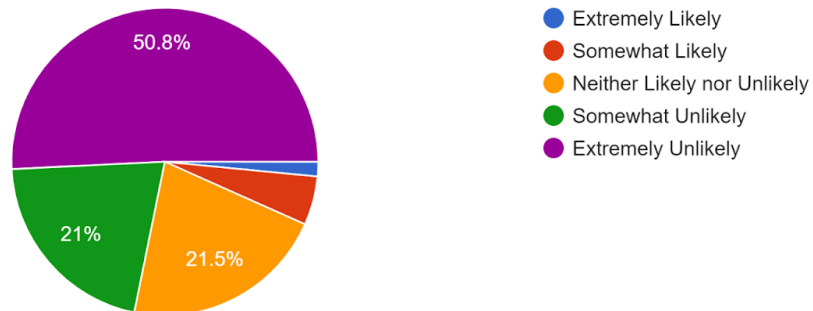
Do you know if your local drinking and wastewater treatment facilities are currently hiring water treatment operators?

195 responses



After learning about the water treatment field, how likely are you to consider a career in it.

195 responses



Appendix L

Link of our video: <https://www.youtube.com/watch?v=xNr1m5psyHI>

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