

BC WATER & WASTEWATER SECTOR WORKFORCE PROFILE

December 2015

Prepared for: BC Water & Waste Association and Environmental Operators Certification Program

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Executive Summary

At any moment of the day in British Columbia, clean water flows from our taps and wastewater disappears seamlessly from our drains and toilets. We give little thought to the complex system of treatment, distribution and collection that make this possible, nor to the people who are responsible for these critical systems. Yet, the water and wastewater workforce plays a key role in safeguarding public health and the environment by taking care of our water and wastewater and making sure that our systems are always available and safe to use.

To carry out this critical role, employees require formal training and hands-on work experience to gain the knowledge and certification required to work in this sector. While there is a strong need to address aging infrastructure and the required investment in equipment upgrades, it is equally important to understand the people behind the pipes and pumps, including trends in the current workforce and the future demand for skilled workers. The sector needs to understand:

- How large is the water and wastewater workforce in British Columbia and who are the people that are employed in the sector today?
- Do water and wastewater employees have the right knowledge and skills to continue to protect public health and the environment? Does their training adequately prepare them for the current and future demands of their role?
- How many employees will retire and when? Are there enough qualified and experienced people to replace them?
- What are the current skill gaps and barriers facing the water and wastewater industry and are there additional challenges that need to be addressed in the next five to ten years?

With funding provided through the Canada-British Columbia Labour Market Development Agreement, the BC Water & Waste Association (BCWWA) and the Environment Operators Certification Program (EOCP) commissioned research to develop a comprehensive profile of BC's water and wastewater sector workforce. Advice and support was provided by a project advisory committee, which included the BC Ministry of Health, the BC Ministry of Jobs, Tourism and Skills Training, employers, and private and public education providers.

This report identifies three conclusions about the sustainability of the water sector workforce:

1. There is currently a shortage of skilled workers in the water and wastewater sector and demand for new workers will grow significantly in the next five to ten years.
2. There is a lack of education opportunities available to maintain technical skills, meet certification requirements and satisfy the evolving industry needs.
3. Resources are required to define the competencies associated with the priority occupational groups and to create accessible pathways for new individuals to enter the various roles within the sector to fill the growing workforce gaps.



The goal of this study was to develop a comprehensive profile of BC's water and wastewater sector operations workforce for the present and extending over the next five to ten years.



Summary of Key Findings

Workforce Demographics

Estimates based on survey results show that the water and wastewater sector workforce is comprised of 6,247 total employees. Of the total sector workforce, the majority of employees are employed as operators (55.4%) or technical support staff (21.7%). The workforce is nearly evenly distributed between water (53.1%) and wastewater (46.9%) facilities.

Workforce demographic findings indicate that the sector is predominantly comprised of men who are 35 years of age and older. The majority of the water sector workforce works in the Mainland/Southwest (61.9%) region of the province, followed by Vancouver Island/Coast (16.3%), the Interior (13.0%), and Northern BC (8.8%).

EOCP certified employees account for 3,305 members (53%) of the sector's workforce and employees without EOCP certification account for 2,972 members (47%) of the sector's workforce. Approximately one-third (34.2%) of employers reported that they provide additional compensation or a higher job rate maximum for positions that require either an EOCP designation or dual EOCP designation.

Hiring Needs

Projections show that the BC water and wastewater sector will see a turnover rate estimated at 29.7% of the workforce between 2015 and 2025. New hires for the water sector are anticipated to amount to a cumulative total of 3,319 by 2025 or about 53.1% of the estimated current total workforce. Operators will comprise the majority of new hires followed by technical support staff, supervisors, and management staff.

While employers might not fully understand the magnitude and impacts of upcoming retirements and turnover in water sector over the next five years, they report that they are in various stages of preparing for this change through succession planning and workforce development of junior staff.

Over one-quarter (27.5%) of survey contributors identified recruitment/retention challenges or staffing issues as the largest water sector workforce barrier that their organization will be facing over the next five years. In order to meet the demand for skilled water and wastewater sector employees, new pools of workers will need to be recruited and trained to meet hiring demands due to retirements, turnover and economic growth.

Education Needs

Skills, education, certification levels, experience, and competencies currently need improvement and will assume great importance to meet workforce demand and supply over the next five years. Identified training needs include both technical skills and essential skills (e.g., communications, literacy, mathematics).

Key informant interviews revealed that much of the water and wastewater sector workforce is not up-to-speed on the "mobile computing era," and educators interviewed explained the need to embrace these technological changes because the water sector is implementing mobile technologies that require training. Some employers discussed the importance over the next five years for staff to have communication and collaboration skills, as much of water sector work involves dealing with contractors; for example, water sector staff direct positions and work, deal with contractors and residents, and need to resolve conflicts or issues that arise in the projects on which they are working.

“New hires for the water and wastewater sector are anticipated to amount to a cumulative total of 3,319 by 2025 or about **53.1%** of the estimated current total workforce.”

Summary of Conclusions

Vacancies due to retirement

Qualified, experienced workers are in short supply and on the verge of retirement. About one-third (36.3%) of the water and wastewater sector workforce is 50 years of age and over. Over one-third (43.9%) of upcoming retirements will be for operator positions and another one-third (34.9%) of retirements will be for management and supervisor positions. Furthermore, employers observed that most new hires are in response to retirement-related vacancies and new hires tend to be young, inexperienced and uncertified workers.

There is a need for succession planning at the sector level that includes knowledge transfer. Despite concerns expressed about impending retirements and the associated knowledge loss, only 27.4% of employers surveyed have established career development programs, and only 18.4% of employers have instituted succession planning for senior management positions.

Labour supply

Opportunities for new entrants to the sector can be prohibitive. Several employers, educators, and regulators reported issues with high turnover rates among inexperienced staff and difficulty filling vacant positions because of difficulty progressing between operator levels. Barriers include lack of adequate entry-level training and resources for mentorship.

The water sector's demand for new employees today and into the future requires that new employees enter the workforce. There is a continued need to bring new workers into the water sector workforce and water sector related training programs. However, public awareness about careers in the water sector is low. Each role in the workforce is different, so each will require a unique public outreach approach and training program to ensure that individuals are matched with the most appropriate position.

Women are underrepresented in the water sector. Women accounted for only 12.9% of the water sector workforce and the numbers are even lower for operator and supervisor positions. It is unknown as to why women represent such a small proportion of the workforce, and research to identify the barriers to the industry and particular positions is required.

Education & Certification

The competencies required for the occupations in the water and wastewater sector workforce are not defined and this limits the quality and consistency of education programs offered. There are no required courses that ensure operators, supervisors and managers have the knowledge, skills and abilities to carry out their role and responsibilities, resulting in knowledge and skill gaps.

Existing education is insufficient to maintain skills and certification. Employers commented that there are many knowledge and skill gaps in the sector related to water quality and safety, technology and regulatory changes, and environmental impacts. New training should be developed and continuously updated to reflect these changes and ensure that each of the occupations in the water sector workforce is informed and prepared to properly implement these changes in their workplace.

Training opportunities are not available locally for many employers and their staff. More flexibility in terms of training models and training delivery are desired by water and wastewater sector employers. Some of the current barriers facing many employers include the cost to develop in-house training; travel and loss of work costs to send their staff to external courses; and the limited location of schools and instructors teaching continuing education units.

There are limited pathways for new operators to successfully enter the workforce, and additional education options are required to train under-employed individuals with related degrees and diplomas. Certification is required to progress in water and wastewater sector careers and prerequisites include relevant work experience; however, relevant work experience is difficult to obtain without having the required certification for sector positions. One-half of participants identified a trades-type training model as a priority for human resource development for the sector.

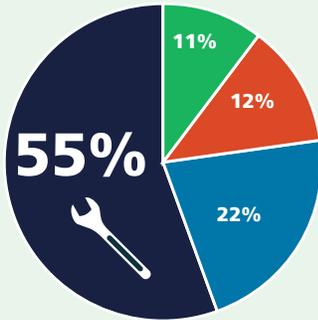
Employers have identified the need for additional training including hands-on practical components as well as leadership, communication, and computer skills. All stakeholders interviewed noted that managers, supervisors, operators, and technicians need to have a transferrable set of skills that could be used sector-wide. Suggested skills gaps include mobile technology, communication and collaboration, leadership, and public engagement; these topics could be included in entry-level education programs as well as professional development programs for more seasoned staff.



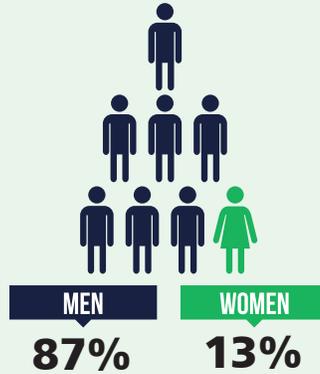
2015 BC WATER & WASTEWATER SECTOR WORKFORCE DEMOGRAPHICS

Labour Supply ~6,250 total employees

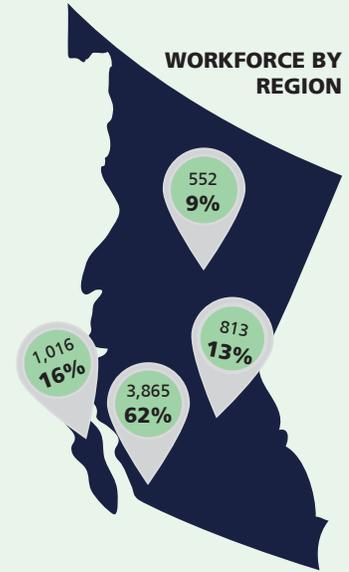
OCCUPATION TYPE WATER & WASTEWATER FACILITIES



- Management
- Supervisor
- Technical Support
- Operator



WORKFORCE BY FACILITY TYPE

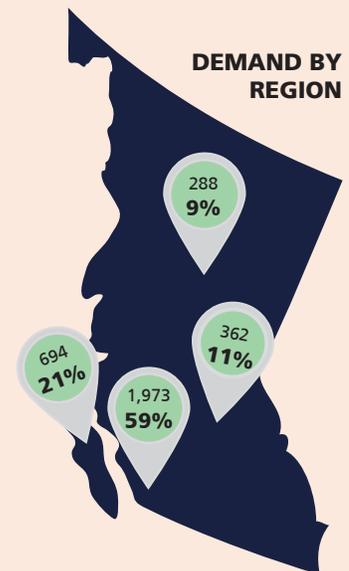
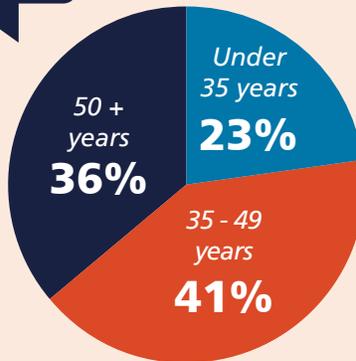


Labour Demand ~3,320 new hires needed

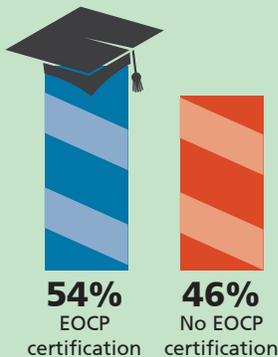
1,149

Current employees retiring within the next 10 years

WORKFORCE BY AGE



EOCP CERTIFICATION



Acknowledgments

The BC Water & Waste Association (BCWWA) is a not-for-profit association representing more than 4,600 water professionals who are responsible for ensuring safe, sustainable and secure water, sewer, and stormwater systems in British Columbia and the Yukon. The BCWWA's members include facility operators, utility managers, engineers, consultants, suppliers, government policy and enforcement staff, and researchers from across the BC and Yukon region.

The Environmental Operators Certification Program (EOCP) is a member-based certification organization responsible for classifying water and wastewater systems and administering the certification process for operators in BC.

The BCWWA and EOCP have worked together to lead the development of this water sector workforce profile.

The project partners gratefully acknowledge the funding provided for this project through the Canada-British Columbia Labour Market Development Agreement.

The BCWWA and EOCP also wish to extend a sincere thank you to all individuals and organizations who provided valuable input for this important work, through participation in interviews and providing survey data. We appreciate the significant investment of time and effort.

And finally, our thanks to the project Advisory Committee:

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Cover image courtesy of Metro Vancouver



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1. Introduction

Workers in water and wastewater occupations carry out functions that are critical to protecting human health and the environment. Despite the importance of this sector, there has been a lack of reliable, BC-specific data to document and understand the dynamics of this workforce.

In order to examine labour market supply and demand of the BC water sector, which includes both water and wastewater operations, the BC Water & Waste Association (BCWWA) and Environmental Operators Certification Program (EOCP) commissioned the *Water & Wastewater Sector Workforce Profile* study. R.A. Malatest & Associates Ltd. (Malatest), an independent research firm, was contracted to conduct this study on behalf of the BCWWA and the EOCP. Funding for this project was generously provided through the Canada-British Columbia Labour Market Development Agreement.

The goal of this study was to develop a comprehensive profile of BC’s water and wastewater sector operations workforce (supply and demand) for the present and extending over the next five to ten years. Results will inform plans for recruitment, training and certification of water sector operators, identifying crucial program changes that may be needed over the next five years to address shifting market conditions. The study confirmed and quantified the anticipated demand for certified operators and provided data about the magnitude of the human resources gaps in the various regions of the province. This information will ultimately support the development of strategies to build a sustainable and competent water sector workforce that is capable of protecting public health and the environment into the future.

For the purposes of this study, the water sector workforce was defined as those workers involved in the day-to-day operations and maintenance of water and wastewater collections, treatment, and distribution; construction and capital projects are not included. Information was collected about employees who devote at least one-half of their workday to such activities.

“ This information will ultimately support the development of strategies to build a water sector workforce that is capable of protecting public health and the environment into the future. ”





2. Background

The BC water and wastewater sector is important to the province both economically and in terms of public health and safety. As the sector is not currently documented in official reports such as the *Labour Force Survey* or special industry profiles developed by Statistics Canada, this research provides an important overview of key workforce issues affecting BC's water sector in order to plan more effectively. The research provides a comprehensive summary of the sector size and breadth, as well as key human resource issues, including workforce attrition, retention, and training requirements, that could affect sector sustainability.

2.1. Critical Issues

2.1.1. Critical Nature of Work

Understanding the workforce dynamics of BC's water sector workforce is important because workers in water and wastewater occupations carry out functions that are critical in protecting human health and the environment. Without adequate treatment and safety precautions, communities are exposed to waterborne disease. Such illnesses can be particularly dangerous to vulnerable populations, such as infants, the elderly, and those with compromised immune systems. Properly treating drinking water can prevent thousands of cases of illness per year and also prevent very costly and dangerous outbreaks.

2.1.2. Comprehensive Labour Review

As a regulated industry, the water and wastewater sector requires trained and certified personnel (e.g., water treatment plant and wastewater treatment plant operators). Previous national research by ECO Canada shows that the sector is experiencing workforce change due to retirements, competition with other sectors, changing technology, and evolving regulation. This study builds on previous work to provide BC-specific data about succession planning, employee recruitment, training, and retention issues.

2.1.3. Succession Planning

According to ECO Canada's *Municipal Water and Waste Management: Labour Market Study* (2010), 42% of managers for Canadian public water/wastewater treatment facilities are over 50 years of age and the industry is experiencing difficulties recruiting operators at intermediate levels, as well as operators-in-training (OITs)¹. To the extent that this situation is reflected in BC, a succession plan is needed to fill the gap in trained and experienced employees. R.A. Malatest and Associates Ltd.'s work in BC suggests that employees in trade/technical positions are increasingly being recruited to work in the expanding resource sectors, including oil and gas, mining, and pulp and paper.



Image courtesy of Clearbrook Waterworks District

2.1.4. Training and Employee Turnover

Similarly, the ECO Canada report concluded that public water and wastewater facility operators found it very challenging to recruit and retain candidates for critical positions, such as intermediate operators or OITs. The report found that one-third of the public facilities surveyed experienced difficulties retaining workers at the intermediate experience level. The issue of recruitment and retention is heightened for level III and IV facilities (requiring a higher certification level) and for facilities in small, remote communities; smaller municipalities also tend to lose talent to larger municipalities that offer greater career growth and better pay.

To fill the training gap, the research suggests that there is an urgent need and opportunity to promote training in the sector by either encouraging the expansion of such training in education institutions or the development of new programs to meet the gap in training needs. The research also suggests the importance of a review of conditions that might be contributing to employee turnover, as the ECO Canada study found that turnover was higher in public water and wastewater treatment facilities than in the public waste management facilities.

1. Environmental Labour Market Research. (2010). *Municipal water and waste management: Labour market study*.

The ECO Canada study also found that the surveyed municipal employers felt that available training resources were insufficient for workers to maintain skills and certifications; that there is a lack of appropriate training courses to satisfy the professional development needs of practitioners; and that many practitioners were lacking training in leadership, communication, and computer skills to enable them to advance in the workforce.

Before considering BC-specific strategies to address training and retention issues, it is important to determine if these national findings are reflected in BC. The *BC Water & Wastewater Sector Workforce Profile* built on this and other research to date in order to develop BC-specific labour market data that addresses the project objectives and research questions.



2.2. Project Goals

The *BC Water and Wastewater Sector Workforce Profile* quantifies the size and composition of workers responsible for the day-to-day operations and maintenance of water and wastewater treatment, distribution, and collections systems in the public and private sectors. Results of the research support the BCWWA and EOCP's core activities, recommending needs in operator training and certification for the five-year period. The research also provides defensible data about sector needs that will facilitate BCWWA's advocacy role in communicating these needs to government, industry partners, and the public. Specifically, results inform plans for recruitment, training, and certification of water sector operators, thereby identifying crucial program changes that may be needed over the next five years to address changing market conditions. In support of the EOCP's mandate, results confirm and quantify the anticipated shortage of certified operators and provide data about the magnitude of the human resource gap in the various regions of the province. Most importantly for both

organizations and their members, the results will help support strategies to ensure there is a sustainable, competent water and wastewater sector workforce to protect public health and the environment into the future.

“ This research provides an important overview of key workforce issues affecting BC's water and wastewater sector in order to plan more effectively. ”



Image courtesy of Metro Vancouver



3. Methodology

This project encompassed three main stages:

- 1. Background research** that included a review of existing labour market information, including a 2010 study carried out by ECO Canada, and *Labour Force Survey* data from Statistics Canada.
- 2. Primary research** to collect original data for British Columbia, based on interviews and surveys of employers, training organizations, regulators, and accreditation institutions. This research included four components:
 - » A review of secondary data (e.g., sourced from Statistics Canada, BC Stats);
 - » A survey of employers (n = 205);
 - » Key informant interviews (n = 17) with education, training, and certification institutions (n = 5); regulator, labour, and industry representatives (n = 5); and major employers (n = 7); and
 - » A focus group with employers (n = 6).
- 3. Analysis and synthesis** of data to outline trends and forecasts.

3.1. Key Research Issues

The *BC Water and Wastewater Sector Workforce Profile* study had several objectives (Appendix A). Key research issues examined in the project included the following:

- 1. Establishment of the size and composition of BC's water and wastewater sector workforce.** As there is little data available from the 2011 Census of Population or from on-going labour market studies (i.e., Statistics Canada *Labour Force Survey*), a key objective of the study was to document the size and composition of the water sector workforce, including estimates of the number of workers by subsector

(water, wastewater), by market orientation (private sector, public sector), and across key occupations. The study was also intended to provide insight as to the age structure in the sector, turnover rates, and hiring requirements among employers over the next five to ten years.

- 2. Determining the economic outlook for the water sector.** Another key objective of the study was to identify those trends and market forces that will be impacting the water sector over the next five years. This includes identifying market, regulation and policy changes that are projected to impact the size of the sector in BC.
- 3. Analysis of compensation data.** Another objective was to establish the nature of compensation within the sector. Compensation data was collected and analysed by region, utility size and type, and subsector. Comparisons were also made with industries that compete within the same labour pools.
- 4. Identifying the necessary competencies and skills to grow and sustain the water sector.** Critical skills, knowledge, and competencies were identified, as well as routes to attaining such attributes. Gaps in skills and training programs were analysed, both regionally and by level of certification. Barriers to entering the sector, advancing in the workforce, and obtaining certification were investigated.
- 5. Analysis of market sustainability.** Research included the identification of new entrants to the workforce and the difference between them and established workers. The adaptability or readiness of various stakeholder organizations to adapt to changes in labour supply and demand was also gauged.

3.2. Key Occupational Groups

The BCWWA and EOCP defined four priority occupational groups of interest for the study, including example job titles. Table 3.1 maps these occupational groups and job titles to National Occupation Classification (NOC) codes.

It is important to note that the technical support occupational group does not neatly map to a single NOC code, but rather spans multiple categories. Also noteworthy is that NOC differentiates between operators and maintenance workers, which are combined into a single occupational group (i.e., operator) for the purposes of this study. Occupational groups not listed here (e.g., labourer) are classified elsewhere in the NOC system.

3.3. Employer Survey

RA Malatest & Associates Ltd. developed the employer survey with input and feedback from the BCWWA and EOCP. The survey explored labour demand issues and human resource practices through questions that complemented the knowledge acquired through the secondary data review and expanded on questions specific to employers, as detailed below:

- The current number of positions in the water and wastewater sector workforce by occupational group, EOCP designation, union affiliation, development region, and facility type;
- The current number of vacancies and annual attrition rate in the water sector workforce by occupational group;
- Anticipated workforce changes in the next five to ten years;
- Water sector workforce position compensation levels and qualifications;
- Current workforce characteristics by age and gender;
- Organizational information on water sector training budgets, employee benefits, career development, skills training, and diversity strategies; and
- Overall recommendations on barriers and opportunities to secure a sustainable water sector workforce.

Table 3.1: Priority Occupational Groups and Corresponding NOC Codes

Occupational Group	Example Job Titles	Corresponding NOC code(s)
Manager	Operations Manager, Public Works Manager, Superintendent, Waterworks/Sewer Director, Utility Manager	0912 – Utilities managers
Supervisor	Senior Operator, Foreman, Chief Operator, Lead Hand, Utility Supervisor	9212 – Supervisors in petroleum, gas, and chemical processing and utilities
Operator	Operator, Operator-in-Training, Maintenance Worker, Public Works Employee, Operations Worker, Construction Inspector	9243 – Water and waste treatment plant operators 7442 – Waterworks maintenance workers
Technical support	Engineer, Water Technician, Cross Connection Control Coordinator, Laboratory Technician, Water Conservation Coordinator, Spill Response Technician, SCADA Technician	2131 – Civil engineers 2243 – Industrial instrument technicians and mechanics 2211 – Civil engineering technologists and technicians

Source: Government of Canada. (n.d.). Welcome to the National Occupational Classification 2011. Retrieved May 29, 2015, from <<http://www5.hrsdc.gc.ca/NOC/English/NOC/2011/Welcome.aspx>>

3.3.1. Sample Development

EOCP provided a list of water system employers (excluding small systems that serve a population under 500 people), including key contacts and other administrative data, such as the facility classification and population served. As the EOCP database does not differentiate between private versus public sector facilities, matching and cross-referencing of external information was necessary to identify the private or public sector employers prior to the survey going into the field. In consultation with the BCWWA and EOCP, the sample for the employer survey was stratified by BC development region² instead of by regional health authority. The reasons for this stratification include better alignment with secondary labour market data, as health authority boundaries are only applicable to water but not wastewater management regulation, and better delineation of municipal water facilities (e.g., Metro Vancouver).

The initial sample distribution by facility type and number of facilities operated is detailed in Table 3.2. Over one-half (56.8%) of the sample was comprised of facilities devoted to either water distribution or water treatment, just of one-third (34.4%) were wastewater collection system facilities, and 8.9% consisted of wastewater treatment systems. Nearly two-thirds (65.4%) of the contributors in the sample operated either one or two facilities, and an additional one-quarter (26.2%) operated either three or four facilities.

While Table 3.2 depicts the initial sample, it is important to note that this sample was not static throughout the administration of the survey. As contributors reported that their water sector occupations were being managed by contractors, additional cases were added to permit surveying these contractors as separate entities. A contributor also informed Malatest of additional facilities operated by his organization that were not included in the sample and to which he could not speak; additional cases were also added to account for these facilities. The final sample consisted of n = 435 cases.

Table 3.2: Initial Sample Distribution

Facility Type	#	%
Wastewater collection system	143	34.4%
Water distribution system	118	28.4%
Water treatment system	118	28.4%
Wastewater treatment system	37	8.9%
Number of Facilities Operated	#	%
1	169	40.6%
2	103	24.8%
3	63	15.1%
4	46	11.1%
5	13	3.1%
6	3	0.7%
7	5	1.2%
8	2	0.5%
9	1	0.2%
10	1	0.2%
11	2	0.5%
13	2	0.5%
14	3	0.7%
17	1	0.2%
20	1	0.2%
25	1	0.2%
Total	416	100.0%

Source: EOCP facility classification data

2. BC Stats. (n.d.). Reference maps. Retrieved May 29, 2015, from <<http://www.bcstats.gov.bc.ca/StatisticsBySubject/Geography/ReferenceMaps/DRs.aspx>>.

3.3.2. Survey Administration

Introduction letters were prepared and emailed to contributors prior to commencement of the survey; for those contributors without email address information on file, a paper copy was mailed. These letters included information about the survey, as well as contact information to complete the survey by telephone or online (toll-free telephone number, URL, and unique access code). A communications plan was developed to publicize the survey to its target audience through such forums as the BCWWA and EOCP websites. One week following the distribution of the emails, telephone surveyors started contacting those employers who had not yet participated in the survey. In addition, email reminders were sent to individuals who had yet to participate in the survey on a biweekly basis.

Prior to survey administration, the survey instrument was programmed into CallWeb-Computer Assisted Telephone Interface (CATI) and underwent thorough interdepartmental review. In addition, the programming withstood rigorous testing to ensure that it was an accurate representation of the approved survey instrument. The sample was reviewed and prepared, as were communication materials.

The survey was field tested between Tuesday, March 31 and Friday, April 3, 2015. Emails were sent to all owners with an email address (n = 239), and all owners of single facilities without an email address were phoned for the field test (n = 99). Follow-up calls with owners who received an email to verify contact information were also made as a component of the field test.

An experienced team of surveyors was assembled to perform this field test. Extensive surveyor training was conducted to ensure their understanding of the nature of the research and the survey instrument, including key concepts and definitions. Questions or clarifications were addressed during and after the training session. Regular survey house activities included making calls to organizations in the sample to:

- Remind contributors about the survey;
- Schedule appointments to complete the survey;
- Answer questions about the survey; and
- Send email invitations to complete the survey (if preferred by the contributor).

Active dialing continued through Tuesday, June 2, 2015. The online survey form remained open until July 29, 2015 to allow time for survey completion by contributors who were experiencing busy periods during the active dialling window.

Approximately 250 employers were called during the field test, comprising approximately 60% of employers in the sample. A total of nine (9) survey completions were obtained during the field test: five (5) online completions and four (4) telephone completions. The contact information in the sample file was reasonably valid with 19% of the emails resulting in bounces and 7% of telephone numbers resulting in not in service (NIS) responses.

The majority of telephone survey work was dedicated to identifying appropriate contributors. In a few cases (n = 10), a “dead end” was reached; that is, the survey house supervisors exhausted all possible leads without reaching the correct employer. EOCP was contacted regarding these cases and provided updated contact information where available.

3.3.3. Survey Response Breakdown

To ascertain the perspective of BC water and wastewater sector employers, 368 organizations were contacted via telephone and email, resulting in 228 completions and a valid completion rate of 62.0%. Some employers (7.8% of the 436 total cases) were disqualified for such reasons as not operating in BC or operating a small water system, while others reported that their water needs were met by contractors. Only 4.4% of contributors contacted indicated that they did not wish to complete the survey. Table 3.3 details final survey result breakdown.

Survey completions were obtained from water and wastewater facility owners. Contributors reported on a total of 516 facilities, 172 of which were single facility owners. Multiple facility owners reported on a total of 344 facilities ranging from 2 to 30 facilities operated by given employer. Two-thirds (66.7%) contributors reported on publicly owned facilities and one-third (33.3%) reported on privately owned facilities.

3.4. Key Informant Interviews

Key informant interviews (KIIs) help to improve understanding of the context for interpreting statistical information and to provide in-depth feedback to supplement information from other sources. The interviews gathered information on recruitment, retention, and occupational training issues in the sector. Discussions were substantive and focused on identifying current challenges, big picture themes, and developing strategies to address these issues. All interviews were conducted via telephone and were 30 to 60 minutes in duration.

To respect the privacy and anonymity of interviewees, the perspectives of all key informants were summarized by Malatest. Responses and comments are presented so that they cannot be attributed to any individual.

Malatest developed semi-structured interview guides for the study, tailored to each of the stakeholder groups identified. The BCWWA and EOCP provided a list of representatives to contact for KIIs and provided them with a letter of introduction. Malatest then scheduled and conducted interviews with the stakeholders. Interviews were recorded and summarised, and subsequently analysed and coded by theme. Table 3.4 illustrates the primary issues explored with each stakeholder group.

3.5. Focus Group

A 90-minute focus group was conducted on Friday, May 29, 2015 at the BCWWA Conference in Kelowna, BC. Focus group participants (n = 6) were recruited from major employers in the BC water sector by the BCWWA and EOCP. The purpose of the focus group was to elaborate on preliminary findings collected as part of the employer survey and KIIs, as well as to gather other relevant information not captured via these data collection tools regarding barriers to water sector recruitment, retention, attraction, training, employee advancement, and/or certification. Malatest prepared the focus group guide, which was submitted to the BCWWA and EOCP for feedback and approval, and conducted the focus group. Focus group participants engaged in discussions, completed worksheets, and carried out a dotmocracy³ activity. Data collected from facilitator notes and participant worksheets were subsequently analysed for inclusion in the report.

Table 3.3: Final Survey Sample Breakdown

Call Results	Total (#)	Total (%)
Completion	206	47.2%
Partial Completion	22	5.0%
Total Completions	228	52.3%
Respondent Wants to Do Online	37	8.5%
Answering Machine – Message Left	36	8.3%
Non-Qualifier	34	7.8%
Answering Machine – No Message Left	29	8.3%
Respondent Refusal	19	4.4%
Referred to Contractor	16	3.7%
Multiple Case – Not a Duplicate	15	3.4%
Call Answered – Call Again	12	2.8%
No Answer	4	0.9%
Wrong Number/Business vs. Household	2	0.5%
Soft Appointment	1	0.2%
No Phone Number/Incomplete Number	1	0.2%
Not in Service	1	0.2%
Incomplete Survey – Won't Continue	1	0.2%
Total Cases	436	100.0%
Total Valid Sample	368	
Valid Response Rate	62.0%	

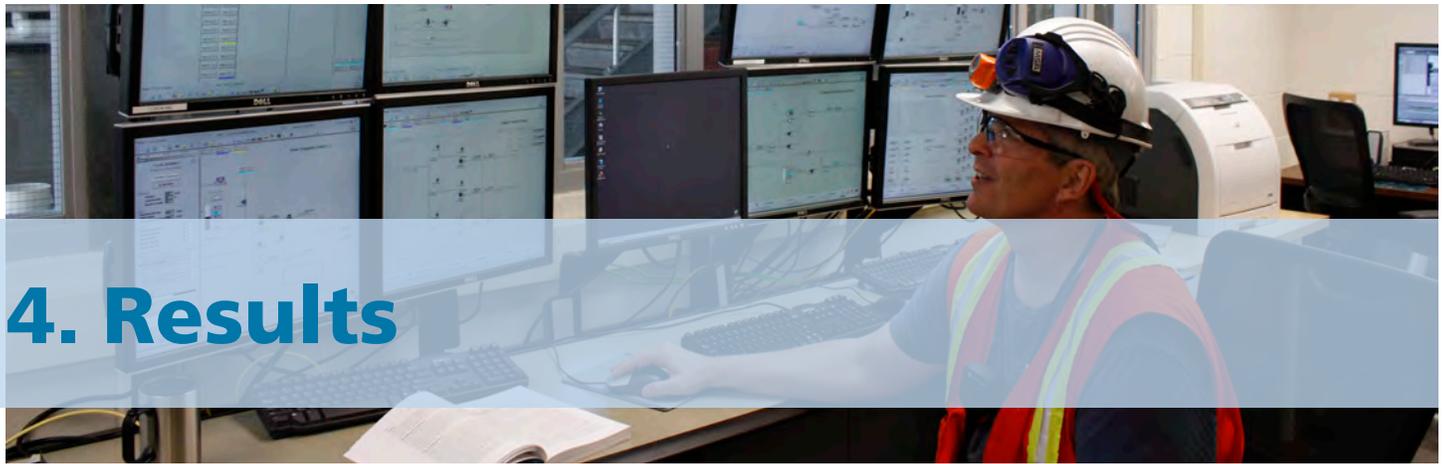
Source: 2015 BC Water Sector Workforce Profile Employer Survey

Table 3.4: Primary Issues by Stakeholder Group

Stakeholder Group	# of Interviews Conducted	Key Issues Under Discussion
Major education, training, and certification organizations in BC	5	<ul style="list-style-type: none"> Anticipated supply of workers by key occupation Current gaps in training and certification structure and processes, such as those that inhibit the timely training and/or recruitment of core occupations or occupations for which there is expected shortage (e.g., OITs/intermediate operators) Opportunities for collaborative training programs between public/private training facilities and industry employers
BC regulator, labour, employee, and industry association representatives	5	<ul style="list-style-type: none"> Projected industry growth over the next five years Shifts in technology use and regulatory changes and its impact on the labour force (either replacing workers or requiring more training) Issues surrounding worker recruitment and retention
Major BC employers	7	<ul style="list-style-type: none"> Projected industry growth over the next five years Programs/funding that would assist employment efforts in the industry (especially public sector) Existing procedures/programs that facilitate or hinder recruitment, training, and retention in the industry Issues surrounding worker recruitment and retention Identification of the current gaps between the supply and demand of labour Competition between other industries for skilled trades

3. Diceman, J. (n.d.). Idea rating sheets: A simple tool to help large groups find agreement. Retrieved June 10, 2015, from <<http://www.idearatingsheets.org/>>.





4. Results

This section presents the results obtained from the four primary lines of research. Results obtained during the field test of the employer survey are included.

4.1. Market Size and Composition

4.1.1. Estimated Size of the Workforce

In order to estimate the size of the BC water and wastewater sector workforce, it was necessary to extrapolate from the survey data to encompass all employers, including those who did not complete the survey. Possible estimation approaches that could be utilized are discussed below.

1. Extrapolation based on population served.

One possible approach to estimate the provincial water sector workforce would be to extrapolate the size of the workforce per 1,000 population served (for regions that reported data) and extrapolate the data to select workers in regions in which employers did not provide data. This approach would yield reasonably good data for water distribution, but would be problematic for the wastewater workforce. This sector had higher proportion of contracted service providers who serviced multiple regions.

2. Extrapolation based on EOCP certification.

A more valid approach to measuring water workforce employment would be to develop ratios of EOCP-certified workers and other water sector workers to develop an estimate of the likely size of the BC water sector workforce. In this context, if employers who responded to the survey accounted for 60%

of EOCP-certified workers, we could assume that the ratio of water sector workers to EOCP certified staff would remain constant, and here we could extrapolate to compute the number of workers associated with the 40% of EOCP-certified workers who were not reflected in the study.

Extrapolation factors for this study were based on population coverage (i.e., the number of people served by water facilities) and proportions of EOCP certified employees relative to population coverage. Extrapolation results were then adjusted to match the known number of EOCP certified water sector employees prior to estimating the total number of non-EOCP certified water sector employees.

Results show that the water sector workforce is estimated to be comprised of 6,247 total employees. EOCP-certified employees account for 3,305 members of the sector's workforce, and those without EOCP certification account for 2,942 members of the sector's workforce. Over three-quarters (87.2%) of the workforce are male and most employees are 35 to 49 years of age (40.4%) or 50 years of age and over (36.3%). A little less than two-thirds (61.9%) of the workforce are employed in the Mainland/Southwest region of the province. Over one-half (55.4%) of the workforce is employed in the operator occupation family. Further profiling of the water sector workforce is provided in the tables in the remainder of this section.

Figure 4.1: Workforce by Age

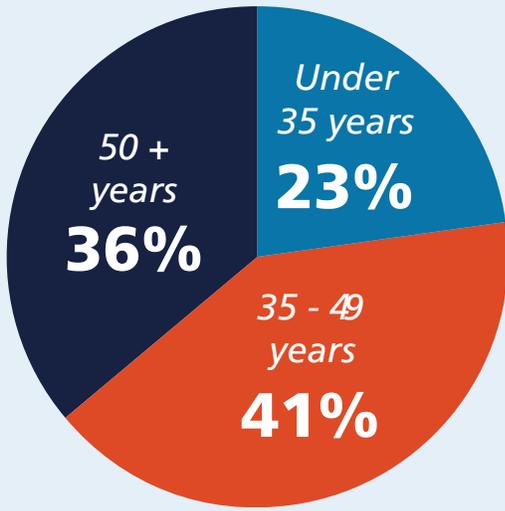


Figure 4.2: Workforce by EOCP Certification

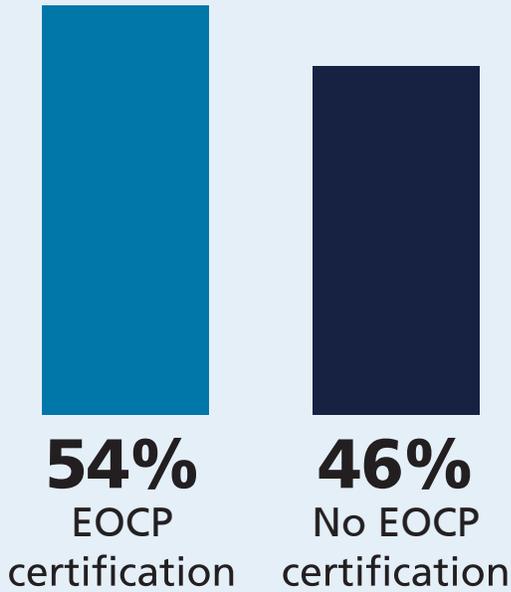
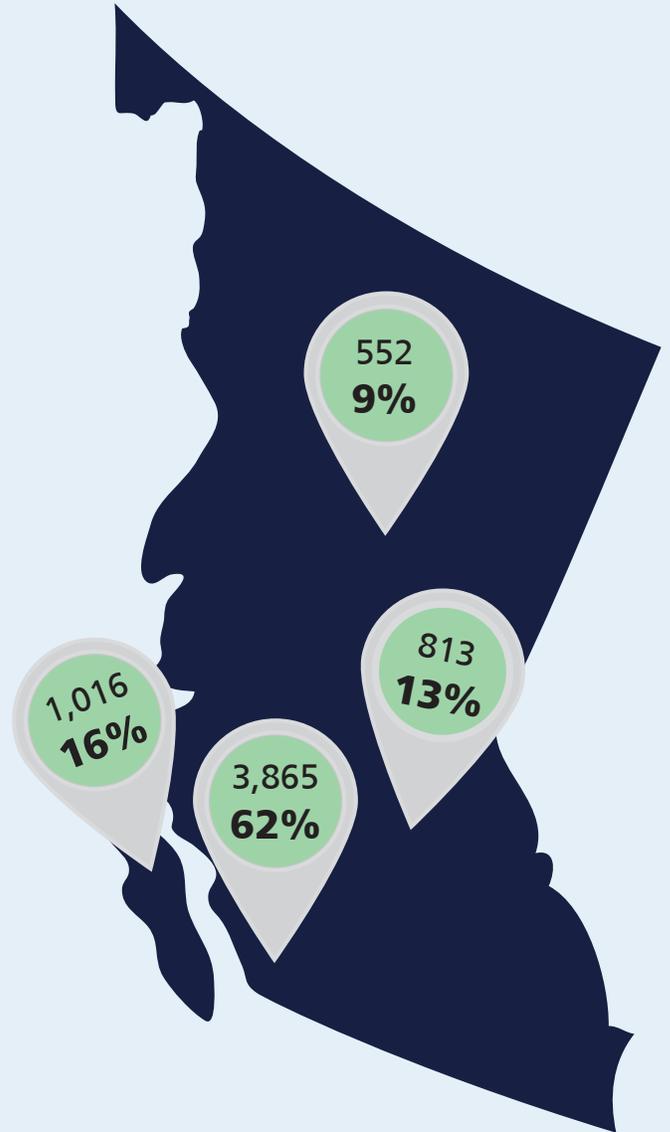


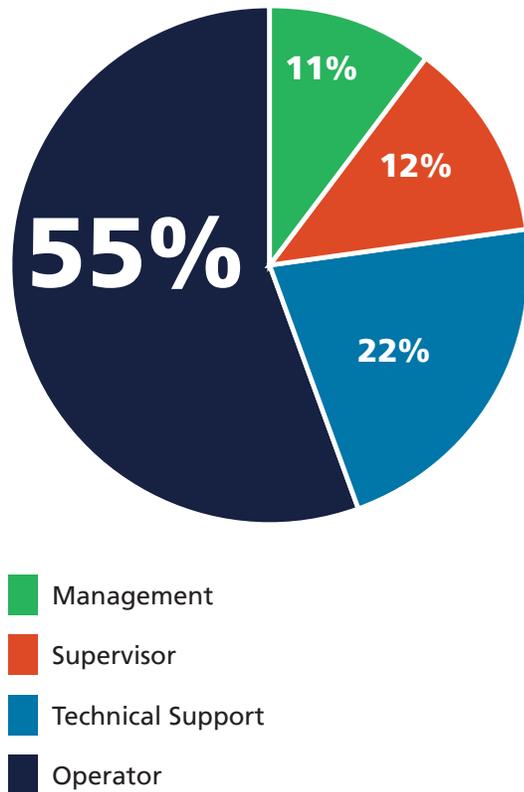
Figure 4.3: Workforce by Region



4.1.2. Workforce Demographics

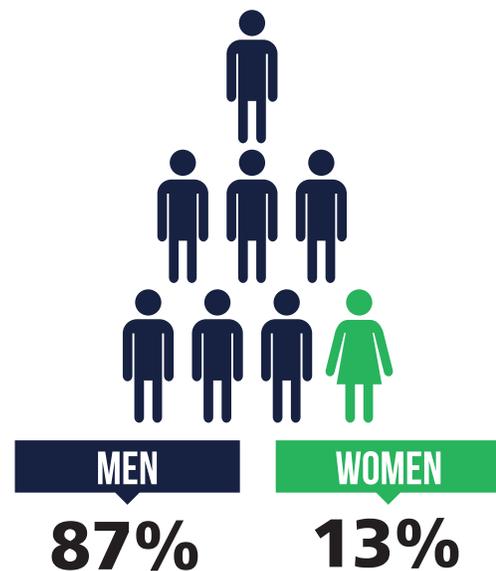
Of the total water sector workforce, the majority of employees are employed as operators (55.4%) or technical support staff (21.7%). As shown in Figure 4.4, smaller proportions of the workforce are employed as supervisors (12.4%) or as management (10.5%).

Figure 4.4: Workforce by Occupation Type (water and wastewater facilities)



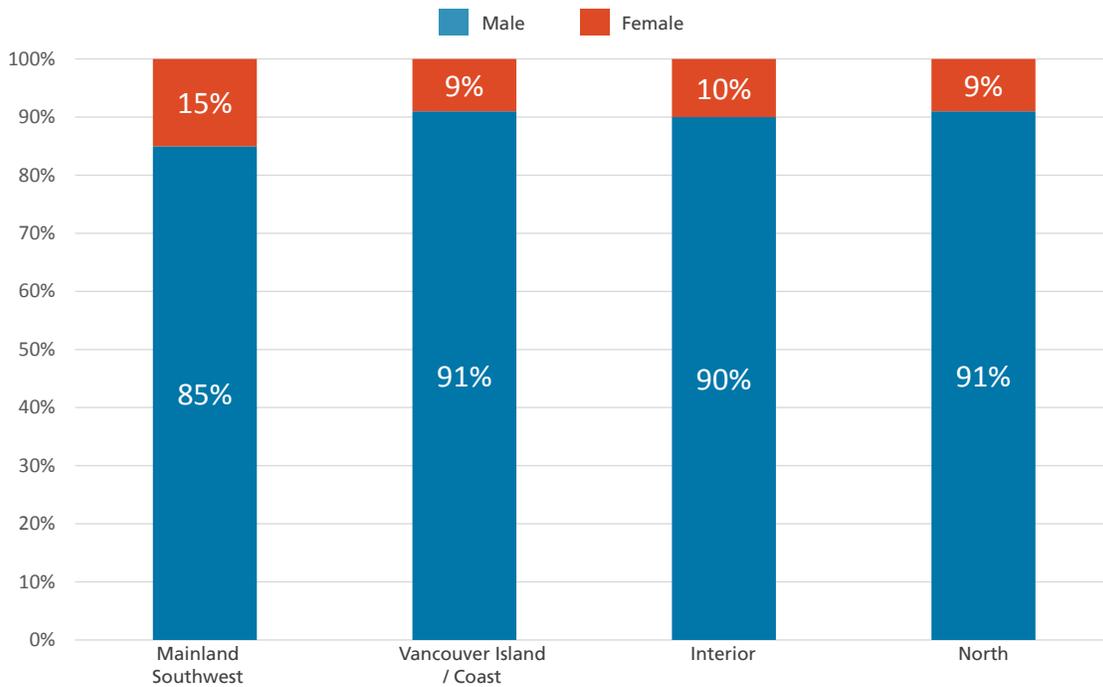
The water sector workforce is characterised by a significant male population (87.2%), while females account for one-eighth (12.9%) of the workforce (see Figure 4.5). Furthermore, the majority of female employees (9.3%) in the sector are employed in the Mainland/Southwest region. This region also employs almost two-thirds (61.9%) of the employees in the sector, followed by Vancouver Island/Coast (16.3%), Interior BC (13.0%), and Northern BC (8.8%).

Figure 4.5: Industry Gender Composition



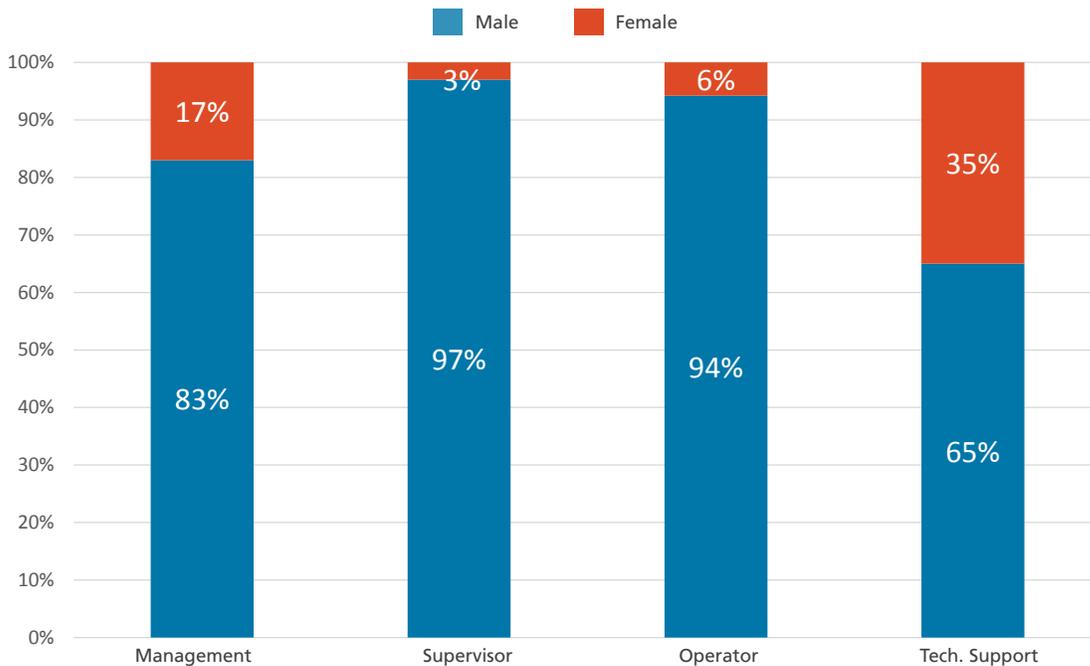
The workforce is nearly evenly distributed between water (53.1%) and wastewater (46.9%) facilities. Survey contributors' responsibilities extended beyond the four types of facilities identified in this study. A few contributors reported that their organization also had septic systems, lagoons, or chlorination/disinfection within its purview.

Figure 4.6: Gender, by Region



The proportion of women employed in the broader field of utilities has varied over the past 15 years, and has never exceeded 37.1%⁴. It should be emphasized, however, that this data refers to employment in all utilities (electricity, water, gas, etc.) and may not be applicable to BC's water sector profile.

Figure 4.7: Gender, by Occupation



4. Statistics Canada. (2015, May). Labour Force Survey CANSIM. <Retrieved from <http://www5.statcan.gc.ca/cansim/a01?lang=eng>>.

Female employees have higher representation in technical support (7.4% of 21.7% or 34.1% of the occupation) and management occupations (1.8% of 10.5% or 17.1% of the occupation) where there are higher proportions of female water sector employees relative to the proportion of employees in that occupation (see Figure 4.7).

Survey results confirmed that operator and supervisor positions were mostly held by men and managerial employees were older than staff in other positions. The BC water and wastewater sector workforce is primarily comprised of men (87.2%). The majority of managers were male (83.9%) and most were 50 years of age or older (56.0%). Most supervisors in the sector were 35 years of age or older (93.3%) and nearly all were male (97.1%). In comparison, less than three-quarters (68.9%) of operators were 35 years of age or older and nearly all were male (94.4%). Over three-quarters of technical support employees were 35 years of age or older (80.4%) and about two-thirds were male (65.7%).

Moreover, union membership and EOCP certification also varied by occupational group. A little over one-half (53.8%) of the workforce is EOCP certified (see Table 4.4). Publicly owned facilities are nearly evenly operated by EOCP certified employees (51.5%) and non-EOCP certified employees (48.5%), while about two-thirds (62.8%) of privately owned facilities are operated by EOCP certified employees. The workforce of publicly owned facilities is predominately unionized (80.0%), while about one-third (36.5%) of privately owned facilities have a unionized workforce. Most technical support staff (92.7%) and the majority of managers (65.1%) did not have EOCP certification, in contrast with the 69.4% of operators and 74.6% of supervisors who did. Most operators (89.9%), supervisors (71.6%), and technical support workers (63.8%) belonged to a labour union.

Figure 4.8: EOCP Certification, by Facility Type

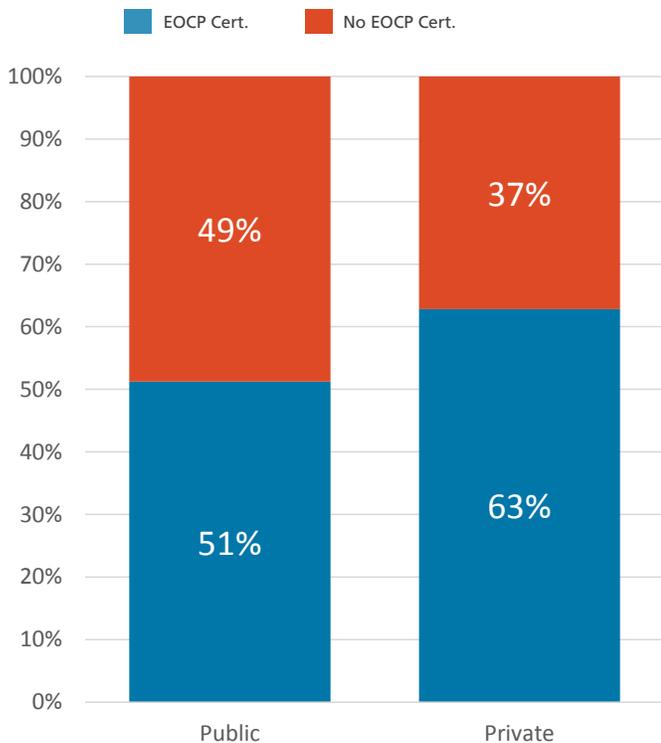


Figure 4.9: EOCP Certification, by Occupation Type

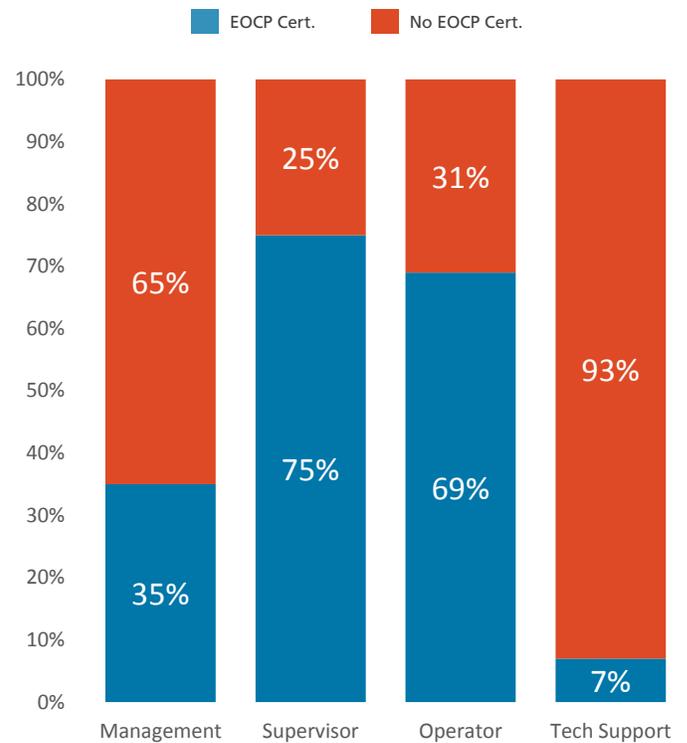




Image courtesy of Metro Vancouver

Table 4.1: Estimated Total Current Workforce by Facility Type and Occupation Family

Occupation Family	Water Facility Workforce		Wastewater Facility Workforce		Total	
	#	%	#	%	#	%
Management	357	5.7%	299	4.8%	656	10.5%
Supervisor	403	6.5%	371	6.0%	775	12.4%
Operator	1,864	29.8%	1,594	25.6%	3,458	55.4%
Technical Support	695	11.1%	663	10.6%	1,358	21.7%
Total	3,319	53.1%	2,928	46.9%	6,247	100.0%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 228.

Table 4.2: Estimated Total Current Workforce by Gender and Region

Workforce by Region	Female		Male		Total	% of Total
	#	%	#	%		
Mainland/Southwest	581	9.3%	3280	52.5%	3,865	61.9%
Vancouver Island/Coast	94	1.5%	925	14.8%	1,016	16.3%
Interior BC	81	1.3%	731	11.7%	813	13.0%
Northern BC	50	0.8%	506	8.1%	552	8.8%
Total	806	12.9%	5441	87.1%	6,247	100.0%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 223. Estimates may not sum up or match exactly across tables due to rounding.

Table 4.3: Proportion of Current Workforce by Gender and Occupation Family

Occupation Family	Female		Male		Total	% of Total
	#	%	#	%		
Management	112	1.8%	556	8.9%	656	10.5%
Supervisor	25	0.4%	743	11.9%	775	12.4%
Operator	200	3.2%	3292	52.7%	3,458	55.4%
Technical Support	462	7.4%	862	13.8%	1,358	21.7%
Total	793	12.7%	5447	87.2%	6,247	100.0%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 223. Estimates may not sum up or match exactly across tables due to rounding.

Table 4.4: EOCP Certified and Non-EOCP Certified Water Sector Workforce by Region and Occupation

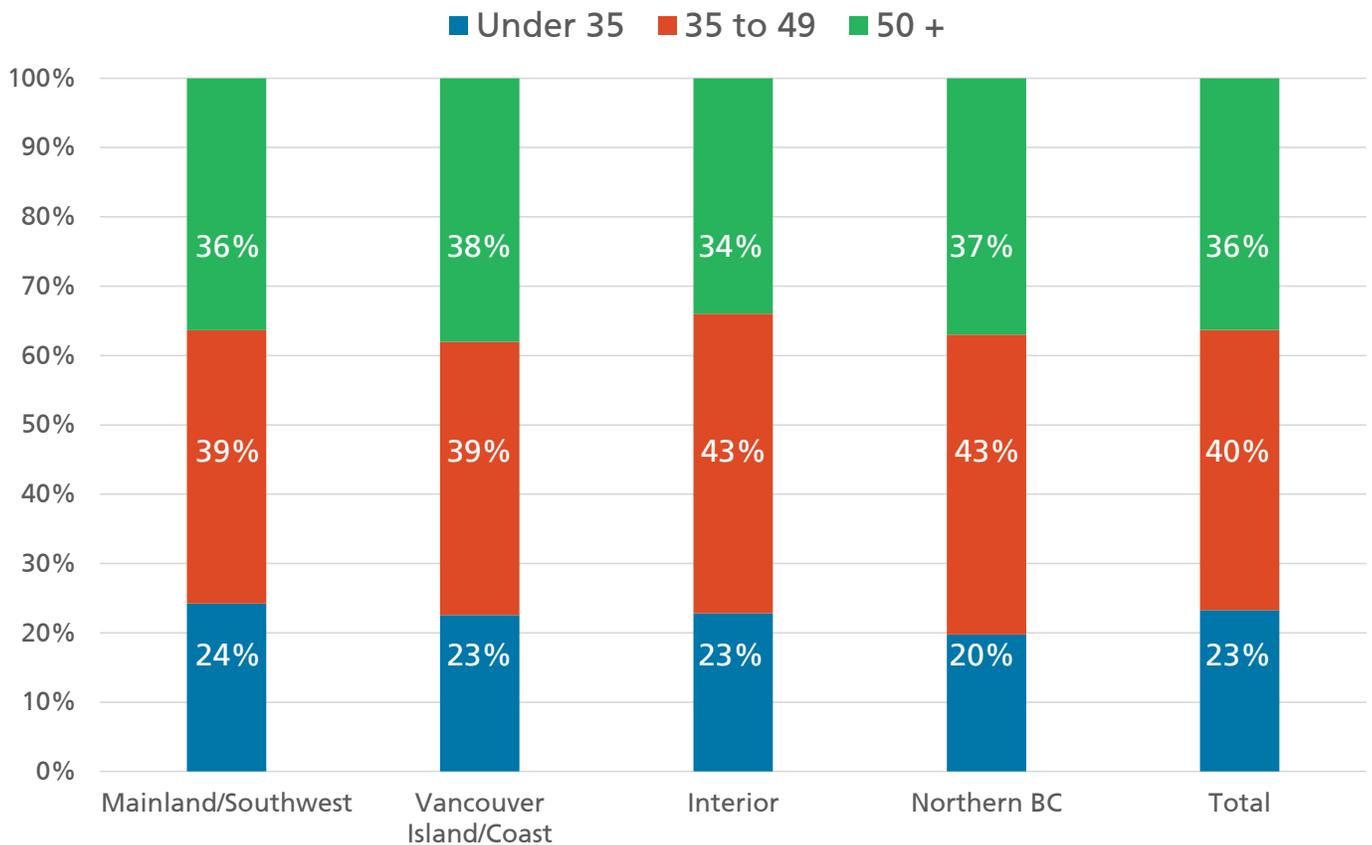
Region/Occupation	EOCP		No EOCP Certification	
	#	% of Workforce	#	% of Workforce
Management	231	3.7%	431	6.9%
Supervisor	581	9.3%	200	3.2%
Operator	2455	39.3%	1081	17.3%
Technical Support	94	1.5%	1174	18.8%
Total*	3361	53.8%	2886	46.2%
Mainland/Southwest	1374	22.0%	2155	34.5%
Vancouver Island/Coast	781	12.5%	337	5.4%
Interior BC	818	13.1%	181	2.9%
Northern BC	437	7.0%	169	2.7%
Total*	3411	54.6%	2836	45.4%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 218. *Estimates may not sum up or match exactly across tables due to rounding.

The water and wastewater sector has a mature workforce with a little over 36.3% in the 50 years of age and over age range and 40.4% in the 35 to 49 years of age category. Age category distributions of water sector employees are nearly even across regions, as depicted in Figure 4.10. This suggests that retirement and training considerations related to the sector's age profile will remain the same for water and wastewater facility owners across the province. More information on retirement and training for the sector is provided in Section 4.1.3 and 4.4.2 of this report.

The water and wastewater sector has a mature workforce with a little over 36.3% in the 50 years of age and over age range and 40.4% in the 35 to 49 years of age category.

Figure 4.10: Proportion of Current Workforce by Age Group and Region



Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 227.

4.1.3. Retirement

The lack of young employees was also noted by interviewees, with multiple individuals remarking on the “aging workforce” as well as knowledge loss due to retirements. However, for focus group participants, retirement was not perceived as a primary workforce issue for the water sector. Indeed, key informants reported that plans to address anticipated retirements and associated knowledge loss had already been established. Major employers in the water sector explained:

“We have succession planning in place, but ... human resources is developing a self-development program where each worker puts forward a plan where they see themselves going. Implementation is planned and discussed with human resources and the staff member’s direct manager.”

“We are expecting quite a few retirements, which provides room for younger employees to move up or get into the industry. We are not worried about retirements too much; succession planning is in place for some higher up roles.”

Future retirements in the water sector were estimated based on current reported retirements and the age profile of the workforce. As employees in the 50 years of age and over category move toward retirement, it can be inferred that 1,148 current employees will be retiring within the next ten years. Table 4.5 shows projected retirements for the sector from 2015 to 2025 for each occupation family.

4.1.4. Recruitment and Retention

Most of the KII (i.e., employers, educators and regulators) participants indicated that hiring practices and new hires were relevant indicators to consider when looking at the water sector workforce and its composition, competencies and skills, labour supply and demand, market sustainability, and the economic outlook of the industry in the next five years in terms of growth/decline. Most of the employers interviewed described the main characteristics of their newly hired staff as being young, inexperienced, uncertified, upwardly mobile, enthusiastic, and male.

A substantial number of interviewees stated the need to downgrade positions and hire staff into entry-level positions (i.e., labourer) because they lacked the experience and training to be hired as certified operators, and this was the only way to get them on board and obtain the required one year of experience working on a water system. Many employers also mentioned that, due to labour agreements, it is challenging to hire workers into roles above labourer. Many trainers and educators interviewed spoke of the risk and burden associated with an employer bringing in operators without certification and training.

“It is very difficult for newcomers to get into the sector. They need to find an employer willing to hire them without certification or experience and then train them on the job to the point that they can write the exam for certification.”
- Water Sector Employer

Table 4.5: Actual Current and Projected Retirements by Occupational Family (not extrapolated*)

Current Retirement	2015	2020	2025	Cumulative Total
Management	13	62	123	198
Supervisor	16	62	125	203
Operator	31	158	316	505
Technical Support	4	79	159	242
Overall Retirement	64	361	723	1,148
Cumulative Retirement	64	425	1,148	--

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 211.

*These projections are based solely on actual reported retirements and the age profile of the workforce for survey contributors. They have not been extrapolated to the entire workforce. Turnover and new hire projections in Section 4.5 include extrapolated retirement projections for the entire workforce.

Over one-quarter (27.5%) of survey contributors identified recruitment and retention challenges or staffing issues as the largest water sector workforce barrier that their organization will be facing over the next five years. This was followed by an identified need for more qualified or certified staff (22.5%) and a need for more funding or investment (20.3%). KII and focus group participants alike advocated promoting the water sector to youth and in schools as one facet of a recruitment strategy. General promotion of the sector to increase recruitment was the most frequently identified priority for human resource strategies by focus group participants.

Most of the new hires are in response to positions created by current and upcoming retirements. However, most employers and trainers expect that the number of water sector jobs will remain static over the next five to 10 years. All stakeholders interviewed stated the need over the next 10 years to close the existing skills and knowledge gap associated with senior water staff retirements; it was deemed essential to have training plans in place to transfer that knowledge to the new junior staff. This was especially important for water and wastewater operators. Stakeholders also explained that there are challenges associated with hiring “new” employees into unionized positions, making it difficult to train and transition employees from the bottom up.

4.2. Employment Outlook

Human resource representatives were asked to estimate their current (2015) workforce and expected workforce in 2020. Results from the survey show that water and wastewater facility owners anticipate a 6.0% increase in the workforce between 2015 and 2020. During key informant interviews, employers confirmed that they expected low levels of labour force growth regardless of operational expansion due to new technology creating efficiencies in work processes. Tables 4.6 and 4.7 show workforce estimates based on employer survey responses for 2015, 2016, 2020, and 2025. Estimates are provided for occupation type and region.

Some regulators indicated that the water sector workforce is relatively stable but anticipated a slight growth due to increased regulation, as well as an increase in demand for expertise. However, one regulator interviewed suggested that this is limited due to economic pressures, which echoed interviews with employers and educators, especially in the public sector, who discussed hiring limitations due to shrinking/stagnant budgets. A number of stakeholders interviewed expected a slight growth in maintenance staff due to aging infrastructure.

Some educators noted that there are enough people trained to meet the demand for water and wastewater sector employees today; however, they expected that in the next few year years the sector will need more people due to retirement. Focus group participants identified aging infrastructure as a factor that may impact recruitment, as more work will need to be conducted and more breakdowns will be anticipated.

All stakeholders, when discussing strengths the water sector has in its ability to recruit and retain workers, mentioned the diversity of the work involved; municipal employment; competitive compensation; challenging environment; job stability and recession-proof work; pension, health care, and other benefits; impactful, community-driven, and significant work; and opportunities for training and advancement. In many interviews, the location/geography of where the water or wastewater facility was situated served as an incentive.

Additionally, for best hiring practices, employers indicated that monitoring the job market and advertising job stability as ways to assure the hiring of a competent and stable workforce into the future.



Figure 4.11: Workforce Projections by Occupation

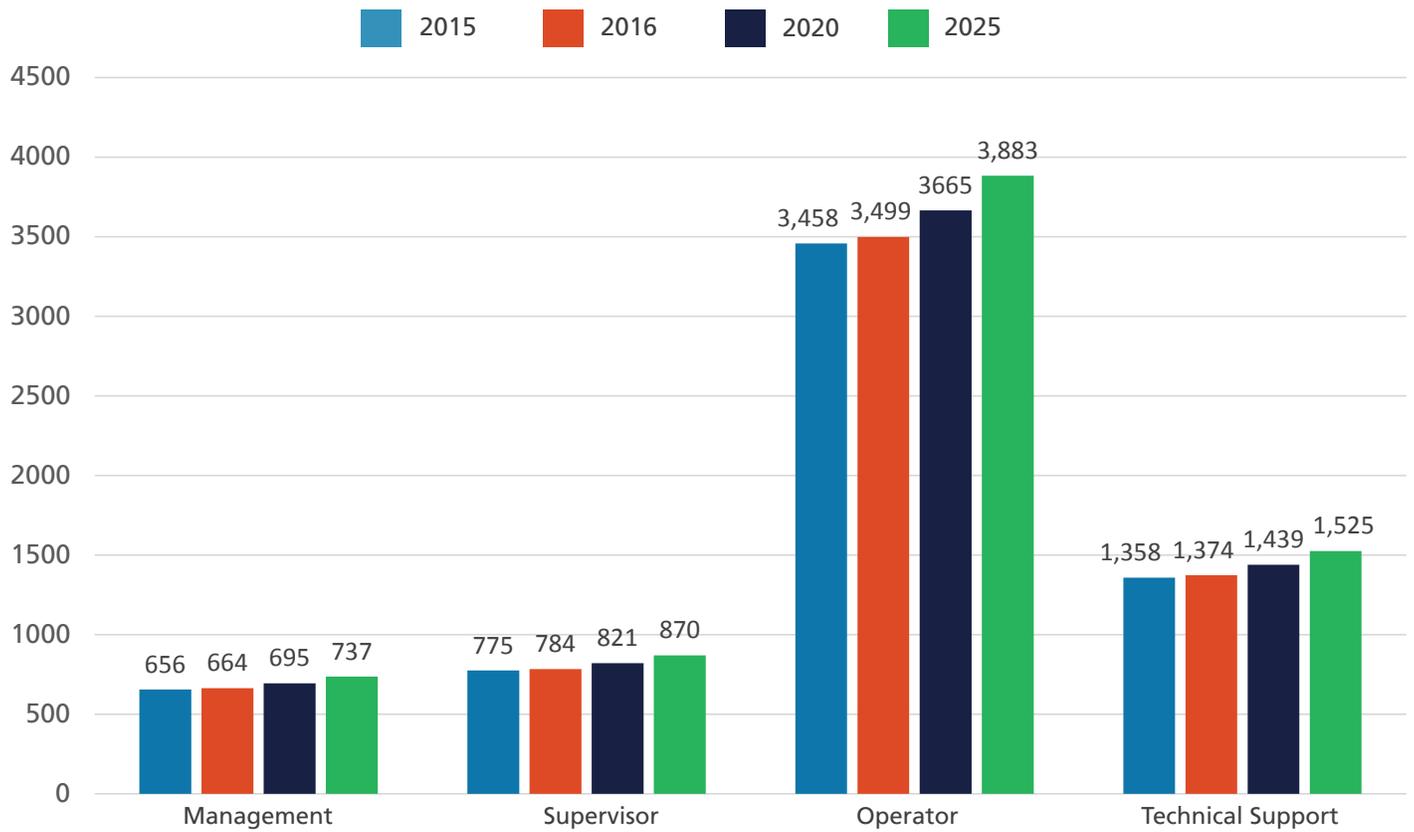




Table 4.6: Workforce Projections by Occupation Family

Occupation	2015	2016	2020	2025
Management	656	664	695	737
Supervisor	775	784	821	870
Operator	3,458	3,499	3,665	3,883
Technical Support	1,358	1,374	1,439	1,525
Total Workforce	6,247	6,321	6,620	7,015*
Percent Change from 2015	--	1.2%	6.0%	12.3%
Total size of the workforce relative to 2015 levels	--	+74	+299*	+395*

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 228. *Estimates may change by one due to rounding.

Table 4.7: Workforce Projections by Region

Region	2015	2016	2020	2025	10 year change
Mainland/Southwest	3,866	3,916	4,116	4,382	+13%
Vancouver Island/Coast	1,016	1,026	1,068	1,123	+10%
Interior BC	813	820	846	881	+8%
Northern BC	552	560	590	630	+14%
Total Workforce	6,247	6,322	6,620	7,016*	
Percent Change from 2015	--	1.2%	6.0%	12.3%	
Total size of the workforce relative to 2015 levels	--	+75	+298*	+396*	

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 228. *Estimates may change by one due to rounding.



“Youth are less concerned with pensions, so we will have to consider other benefits.”

- Water Sector Employer

4.3. Compensation

According to the 2011 National Household Survey (NHS), employees in the priority occupational groups earn at least \$40,000 annually, ranging up to \$130,000. Figure 4.9 compares average employment incomes for the NOC codes identified in section 3.2. One noteworthy point is the nearly \$12,000 difference in average salary between water and wastewater plant operators and chemical technologists and technicians, especially as chemical technologists and technicians typically require completion of college or university.

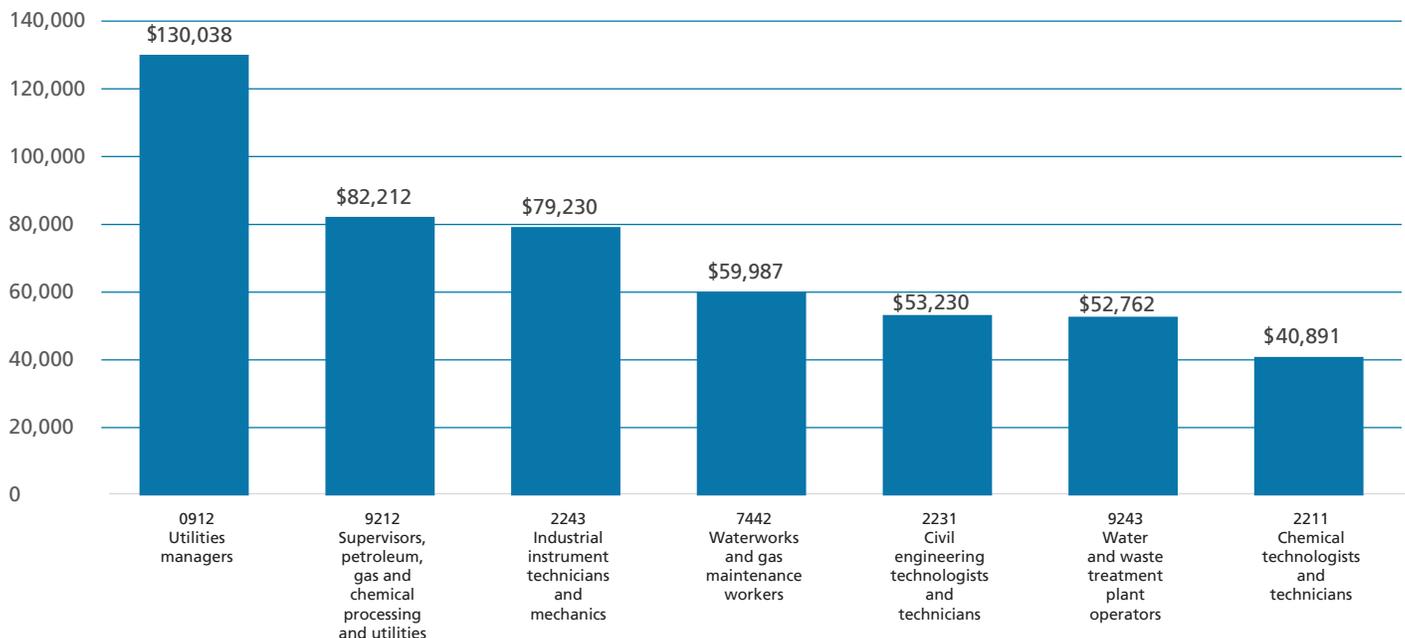
This salary information can be compared with that collected through the survey of employers. Average salaries were reviewed by publicly and privately owned facilities and employer size (small/medium versus large). Average reported by public sector employers ranged from as high as \$89,000 (for operations manager positions) to as low as \$46,000 (for entry-level operations worker positions). Private sector employers reported average salaries ranging from \$67,000 (for operations manager positions) to \$31,000 (for entry-level operations worker positions). The average public sector salary (\$63,000) is \$16,000 above the average private sector salary (\$47,000), a difference of 34%. The smallest average salary difference between public and private sector employers was for \$4,000 for SCADA/Instrumentation Technician position and the highest difference was \$21,000 for operations manager positions.

Employer size (i.e., number of employees) showed less difference in average salaries. Large employers (employers with 11 or more employees) paid an average salary of \$68,000, which was \$13,000 higher (+24%) than the average salary for small employers (employers with 10 or fewer employees) of \$55,000.

Municipal employers provided average salaries similar to the overall group of public sector employers. Municipal employers reported an average salary of \$64,000 ranging from \$92,000 (for operations manager positions) to \$48,000 (for entry-level operations worker positions). While the average municipal salary is higher than the national average (\$53,000) for Water and Waste Plant Operators, it is very near to the average Water and Waste Plant Operator salary (\$63,000) reported for Alberta⁵, and it is the same as the municipal average salaries for water/wastewater operators exclusively.

Approximately one-third (34.2%) of employers reported that they paid a premium or a higher job rate maximum for positions that require either an EOCP designation or dual EOCP designation. Many water sector employers also offered a benefits package to complement the salaries provided to their workforce. The most frequently offered benefit was Medical Services Plan (53.2%), followed by extended health coverage and dental coverage, both at 44.4%. Table 4.8 details the benefits employers offered to water sector employees.

Figure 4.12: Average 2010 Salary by NOC Code



Source: Statistics Canada. (2015, May). National Household Survey. Retrieved from <<http://www12.statcan.gc.ca/nhs-enm/index-eng.cfm>>.

5. Source: Alberta Government Alberta Learning Information Service. (2013) Alberta Wage and Salary Survey. Retrieved from <<http://occinfo.alis.alberta.ca/occinfopreview/info/browse-wages.html>>.

Figure 4.13: Average Minimum and Maximum Wages by Region - all occupations

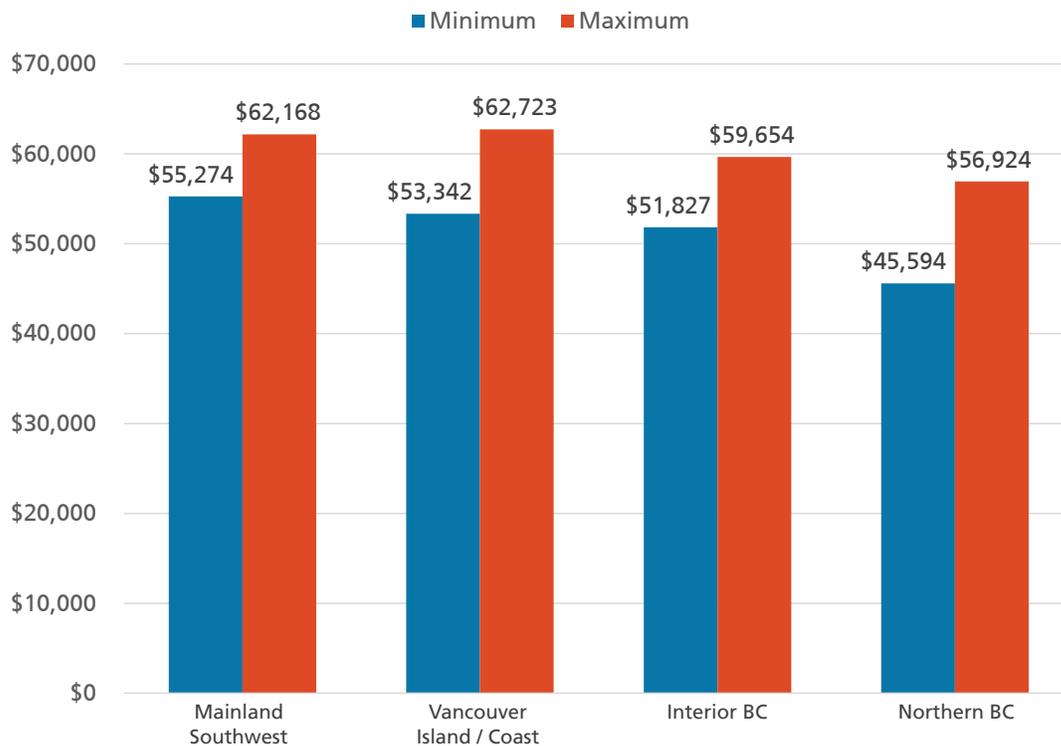
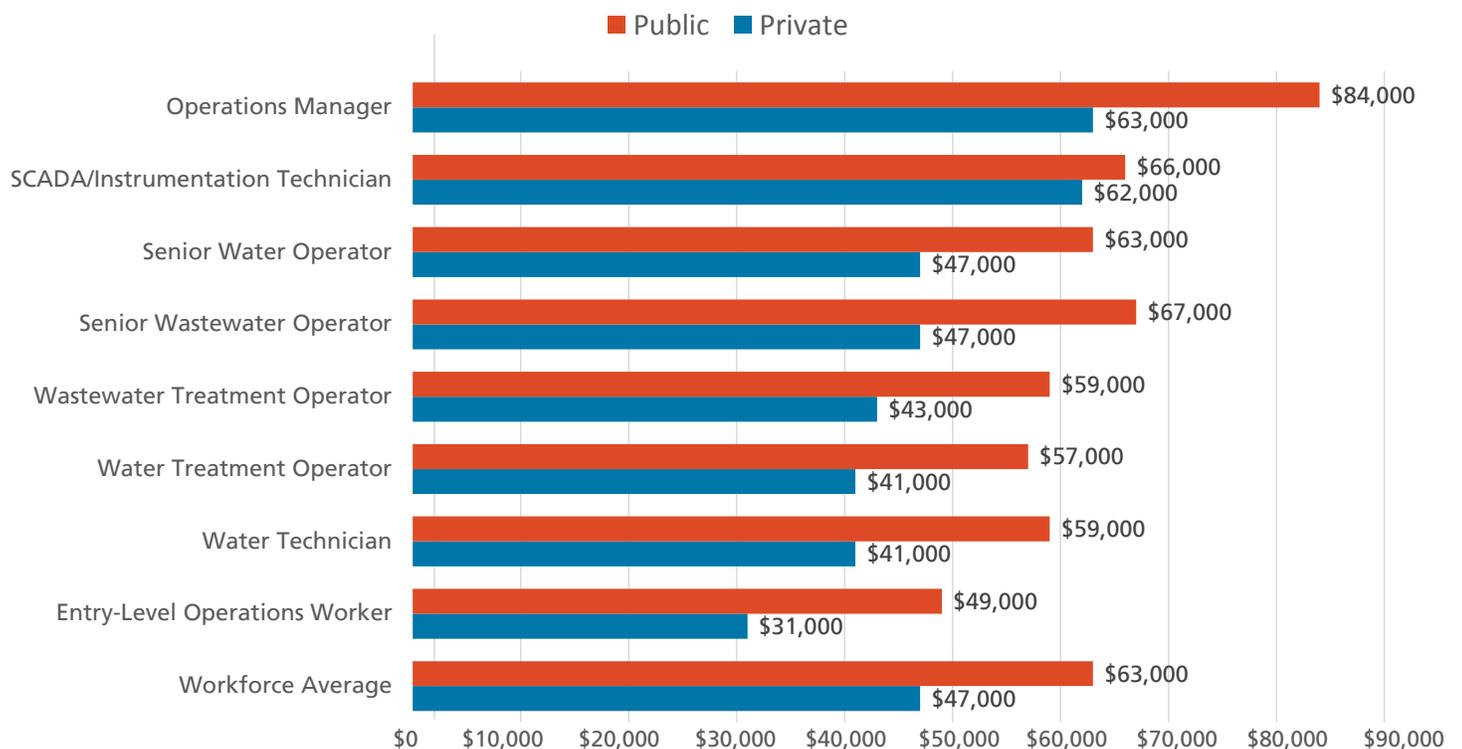


Figure 4.14: Average Water Sector Salaries by Occupation for Public and Private Sector Employers



Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 199.

Table 4.8: Benefits Offered to Water Sector Employees*

Benefit	Employer Paid		Cost-Shared		Not Offered	
	#	%	#	%	#	%
Medical Services Plan (MSP)	112	52.8%	54	25.5%	46	21.7%
Extended health coverage	92	43.2%	82	38.5%	39	18.3%
Dental coverage	92	43.2%	82	38.5%	39	18.3%
Vision care	91	42.7%	74	34.7%	48	22.5%
Employee/dependent life/accidental death or dismemberment insurance	85	40.1%	80	37.7%	47	22.2%
Short-term disability	79	37.3%	59	27.8%	74	34.9%
Long-term disability	71	33.5%	81	38.2%	60	28.3%
Parental leave in excess of government requirement	41	19.3%	23	10.8%	148	69.8%
Registered pension plan (defined benefit plan)	35	16.5%	86	40.6%	91	42.9%
Registered pension plan (defined contribution plan)	27	12.7%	86	40.6%	99	46.7%
Health spending account	21	9.9%	23	10.8%	168	79.2%
Group RRSP to which employer contributes	9	4.2%	28	13.2%	175	82.5%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 212 to 213

*Responses of "Don't know" and "No response" not depicted.



Image courtesy of Clearbrook Waterworks District

4.4. Competencies and Skills

In *Waterproof 3: Canada's Drinking Water Report Card*, BC merited a C+ grade for water source and other drinking water protection⁶. Among the suggestions for improvement were proper operator training and certification. Moreover, the updated federal Wastewater Systems Effluent Regulation requires stringent recordkeeping and reporting, as well as new standards for residual chlorine. New training should be developed to reflect these changes and ensure that the water sector workforce is informed and prepared to properly implement these changes in their workplace.

4.4.1. Skills in Demand

Most of the employers and educators, and some of the regulators, interviewed conveyed similar qualification needs for the water sector. The majority of participants interviewed stated that skills, education, certification levels, experience, and competencies are currently needed and will continue to be needed to meet labour demand and supply over the next five to ten years. Most of the stakeholders discussed skill and experience gaps as well as the impact that current training programs are having on the sector.

All stakeholders interviewed noted that managers, supervisors, operators, and technicians need to have, at minimum, some post-secondary education (i.e., degree, certificate, or diploma), level I EOCP certification, and a transferrable set of skills that could be used sector-wide. Other qualifications stakeholders noted included the following:

- Experience in public engagement and stakeholder relations;
- Experience with equipment and tools;
- Interpersonal and communication skills, collaboration, and teamwork;
- Mechanical, technical, and hands-on/practical skills;
- Leadership skills (of particular importance for managers and supervisors);
- Technical and IT skills (for those working on technical aspects of the water systems);
- Applied mathematics and scientific literacy;
- Project management (primarily for managers, supervisors, and senior technicians);
- Knowledge of environmental issues and law (e.g., water quality, water shortages, climate change, regulations, policies); and
- A keen interest in the field.

Important to note is the plurality of employers interviewed who stated that the need for managers and supervisors to have leadership skills and the ability to earn respect from their staff. Furthermore, it was deemed important for operators to have both hands-on experience and theoretical knowledge of water and wastewater systems. Some employers discussed the importance for staff over the next five years to have communication and collaboration skills, as much of water sector work involves dealing with contractors and residents as well as resolving project conflicts or issues. Finally, a considerable proportion of the current workforce is not up-to-speed on the “mobile computing era” and educators interviewed explained the pressing need to update skills sets as the water sector implements these mobile technologies.

Focus group participants concurred with insights provided by key informants. All participants reported that they would like to see training modules covering management and supervisory skills, as well as technical skills. An additional two-thirds of participants reported a preference for training modules on essential skills (e.g., communications, literacy, mathematics). Online training was identified as a possibility, with a few caveats: limited response from instructor, difficulty of fully engaging in the course, lack of comfort with the format. Focus group participants emphasized that online courses could not serve as the primary training method, but rather as supplemental material. As far as brokered training, BCWWA was perceived to be well positioned to take on such a function.

The demand by water users (i.e., taxpayers) for transparency was mentioned by most of the stakeholders as an important factor in the water and wastewater sector (in terms of public engagement, social media, financial cutbacks, communication skills, etc.) associated with public opposition to taxes and the importance of work. Knowledge gaps in areas such as water quality and skill gaps in areas such as leadership and public engagement are, according to stakeholders, due to inadequate training and certification programs.

“Operators do not know enough about the most critical things: water quality and environmental impacts.”

- Water Sector Regulator

6. Christensen, R. (2011, November). *Waterproof 3: Canada's drinking water report card*.

4.4.2. Training Program Needs

Most of the stakeholders interviewed for this project reported similar concerns, barriers, gaps, and successes around the current training and certification programs, and on-the-job learning available to the water and wastewater sector workforce.

Some stakeholders suggested that the current training and certification programs are less than helpful for jobs in the sector because there are no defined competencies associated with the training programs (particularly for the operator program), and instead a “need-to-know” document is used. Additionally, gaps in knowledge and skills such as water quality, calculations, health, regulations, and environmental impacts are attributed to insufficient/inadequate training and certification programs. Consequently, there was consensus among employers, regulators, and educators that existing training is not adequately serving the needs of the sector. The most pertinent barriers identified by stakeholders in providing relevant, useful, and appropriate training include the following:

- **Cost:** including the costs for an organization to design or update a course and the full cost (i.e., accommodation, travel, loss of work hours) an employer must bear to send their staff to courses, training, and certification.
- **Scheduling:** this relates to when a given course is offered; employers and staff were not interested in weekend or evening courses.
- **Course relevance:** some stakeholders noted that some of the course content was not particularly relevant to jobs in the water and wastewater sector. Most indicated the desire to see BCIT offer training specific to the sector.
- **Location:** schools and instructors teaching continuing education units (CEUs) were situated in areas not accessible to all students/candidates/operators; most of the stakeholders interviewed highlighted the need for satellite campuses and on-site training and other forms of training delivery available throughout the entire province.
- **Instruction:** a shortage of qualified senior instructors was reported.
- **Vendor-provided training:** some training was specific to new technology and offered only by vendors in certain locations.
- **Regulatory changes:** new regulations and policies mean additional training is needed.
- **Duration:** the requirement of having one year of experience in order to obtain EOCP certification can be a barrier for workers in roles that have multiple

functions where earning experience hours can take a long time, as can obtaining certification as a multi-utility operator.

- **Technological changes:** new systems and technology require more training.
- **Classroom and coursework:** operators need to acquire CEUs to maintain certification and the school/classroom environment is a challenging setting for some. Some stakeholders stated that CEUs need to become more attainable and relevant, as tests may not reflect the ability in the field. Instead, they may create barriers to certifying operators who should be considered competent and create barriers to advancement.

When asked about what strategies the water and wastewater sector should adopt to meet current and future workforce needs, contributors’ survey responses focused on training. Nearly one-third (31.3%) of contributors identified training needs, including in-house training, as a priority. An additional one-quarter (27.5%) proposed creating a more formal apprenticeship or college program to train sector workers, while one-fifth (21.3%) advocated for modifying the certification requirements to make it a Red Seal trade or require more education. Focus group participants agreed: one-half of participants identified development of a trades-type training model as a priority for human resource strategy for the sector.

Some educators noted that training programs are becoming more hands-on and are adapting to changing workforce needs and changes in labour supply and demand. For example, one educator stated that their school is beginning to shift the nature of their course design so that it is more student/worker/employer focused and consists of more practical work. However, while theoretical training is necessary, educators asserted that opportunities to apply the theory are important for retention (i.e., co-op placements and on-site tours with a “show and tell” component).

Some employers, regulators, and educators reported that it is important for organizations and schools to offer different course options, including: online, in school, on an ad hoc basis (usually only when there is sufficient demand in an area), and contract-based training where the course is delivered on-site. Having the course on-site is noted as being cost-effective for the employer and allows for more practical/hands-on training on the water systems. Stakeholders stated that most of the training and certification programs offered by BC schools/programs have been successful in training people for acquiring certification and skills, yet assert that these bodies should be evaluated and reviewed for enhancement.

Most stakeholders interviewed mentioned the difficulty of providing on-the-job training because many employers do not have the resources (i.e., financial, human, time). However, a few employers noted that training is adequate at present and is meeting the needs of their workforce because they have currently invested in staff training due to either a new requirement in regulation, new infrastructure/ technology, certification maintenance, or advancement in operator levels. Nevertheless, most stakeholders argued that, even if training programs currently meet the needs of the water sector, they require continual quality assurance: vetting materials and methodologies to ensure that they are relevant and current. Furthermore, it is essential that training keeps pace with improving infrastructure; one stakeholder noted that currently investment is not being made in training, which was attributed to inadequate resources, tax cuts, and the reluctance to use new technology that does not have a proven track record. Some stakeholders interviewed reported that peer-to-peer training was one of the most effective training strategies for the water sector workforce.

4.5. Market Sustainability

WorkBC estimated demand for workers by selected NOC codes in 2015 and forecasted job openings for 2012 to 2022⁷. The greatest areas of demand were for utilities managers and waterworks and gas maintenance workers, which is consistent with perspectives provided by key informant interviewees. Indeed, WorkBC ranked the utilities industry number 10 out of 18 trending industries in BC as determined by growth rate⁸. The total size of the utilities industry is anticipated to increase by 1,500 employees between 2012 and 2022 with annual employment growth of 0.9%⁹. Demand for chemical technologists and technicians will increase by the smallest amount, slightly less than civil engineering technologists and technicians.

Nevertheless, these jobs are not anticipated to be evenly distributed across the province. For example utilities manager and supervisor positions are anticipated to

be concentrated in the Mainland/Southwest region: 1.6%¹⁰ and 1.3%¹¹ annual growth rate, respectively. Meanwhile, waterworks and gas maintenance workers will be located primarily in the Northeast (2.1% annual growth rate). The average annual growth rate for chemical technicians and technologists, civil engineering technologists and technicians, and water and waste treatment plant operators is estimated to be highest in the North Coast and Nechako region at 2.3%¹³, 1.7%¹⁴, and 2.0%¹⁵, respectively.

These data can be compared to projections calculated from the survey of water sector employers. Taken together, employers anticipated that their total workforce (in terms of numbers of workers) would remain the same in 2020 as in 2015. (Note, it was assumed that employers who did not provide a response regarding their projected workforce in 2020 would require the same number of employees in 2020 as in 2015.) This result was mirrored by key informants who anticipated little growth in the sector. However, with the 2014 retirement and separation rate estimated at 7.1%, the water sector will need to fill positions equivalent to approximately 46.9% of its workforce over the next ten years from retirements and non-retirement separations alone.

Water and wastewater facility owners reported a total of 207 current actual vacancies in the sector (see Table 4.9). The sector is experiencing vacancies for approximately 7.3% of its workforce. The majority of vacancies are for operator positions (113 vacancies), 54% of total, followed by technical support positions (52 vacancies), 25% of total, supervisor positions (24 vacancies), 12% of total, and management positions (19 vacancies), 9% of total.

Of the positions reported by employers as challenging to fill, over one-half (55.1%) were operator positions. Consistent with this finding, operation job duties were the most frequently required, closely followed by maintenance duties. Focus group participants identified several barriers to recruitment, including: labour agreements that preclude hiring external staff into junior-level positions, lack of resources for mentoring, and an insufficient number of graduates from BC college programs.

7. WorkBC. (2015). Labour market navigator. Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator>>.

8. WorkBC. (n.d.). Trending industries in British Columbia. Retrieved May 29, 2015, from <<http://www.workbc.ca/Navigator/TrendingIndustries#>>.

9. Ibid.

10. WorkBC. (2015). Utilities managers (NOC 0912). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/0912>>.

11. WorkBC. (2015). Supervisors, petroleum, gas and chemical processing and utilities (NOC 9212). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/9212>>.

12. WorkBC. (2015). Waterworks and gas maintenance workers (NOC7442). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/7442>>.

13. WorkBC. (2015). Chemical technologists and technicians (NOC 2211). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/2211>>.

14. WorkBC. (2015). Civil engineering technologists and technicians (NOC 2231). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/2231>>.

15. WorkBC. (2015). Water and waste treatment plant operators (NOC 9243). Retrieved May 29, 2015, from <<https://www.workbc.ca/Navigator/occupations/9243>>.

Figure 4.15: Actual Current Vacancies by Region and Occupational Family (not extrapolated)

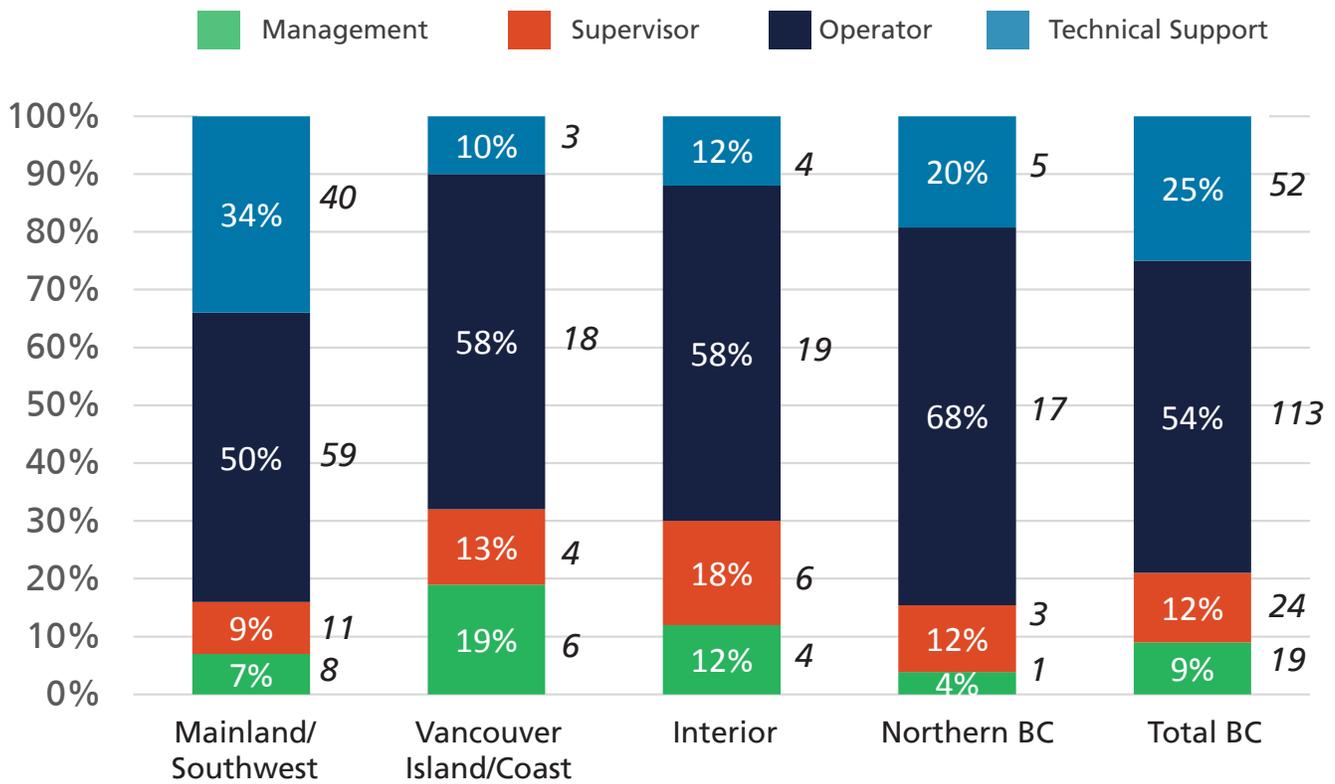
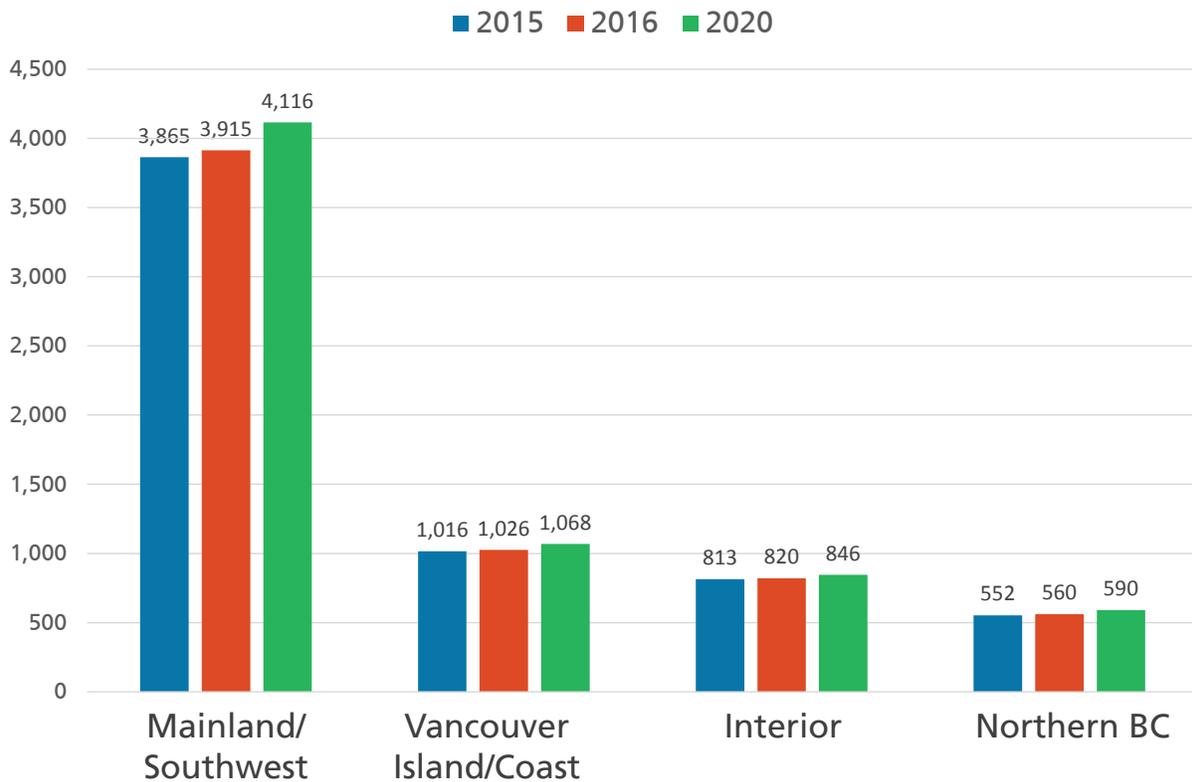


Figure 4.16: Workforce Projections by Region



Furthermore, several employers, educators, and regulators reported issues with high turnover rates among inexperienced staff and difficulty filling vacant positions because of the difficulty progressing between operator levels; lack of certification at the appropriate levels; working in an unionized environment (i.e., seniority vs. ability); competition within the sector among private firms; competition with other municipal departments and regions; and competition with other industries and sectors, including oil, gas, pulp and paper, energy, construction, and other trades (e.g., plumbing, electrical, etc.). The main reasons provided for these industries' competitive advantage is that they provided more financial incentives, they make it easier for interested candidates to get apprenticeships and job placements and move quickly into supervisory positions, and educational requirements are lower.

Employers, regulators, and educators interviewed showed a preference for more/higher education for new hires (i.e., college diploma). However, it was deemed difficult to find qualified Level III and IV operators in both the water and wastewater subsectors, especially in rural, northern, economically disadvantaged and First Nations communities because of the shortage of qualified operators and accessibility to training and education programs.

The current turnover rate for the sector is estimated at 9.3%. Turnover rates are highest for management (12.7%) and supervisor (11.5%) positions (see Table 4.10). While the turnover rate for operators (8.8%) is less than the overall sector turnover rate, the largest volume of employees to replace is in the operator occupation family (141 replacements needed in 2015) due to the higher proportion of operators in the sector. It should be noted that individual employers may have higher turnover rates as the sector turnover rate assumes that one-half of non-retirement separations will remain in the sector (i.e., moving from one water sector employer to another employer in the same sector).

Regional turnover projections show that the Mainland/Southwest region is expected to have the highest turnover, with a cumulative turnover of 1,065 employees over the next 10 years (see Table 4.11). Projections show that the BC water and wastewater sector will see a turnover rate estimated at 29.7% of the current total workforce.

Table 4.9: Actual Current Vacancies by Region and Occupational Family (not extrapolated)

Current Vacancies	Management	Supervisor	Operator	Technical Support	Total	% of Workforce
Mainland/Southwest	8	11	59	40	118	7.2%
Vancouver Island/Coast	6	4	18	3	31	6.1%
Interior	4	6	19	4	33	7.4%
Northern BC	1	3	17	5	25	9.7%
British Columbia	19	24	113	52	207	7.3%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 216.

Table 4.10: Current Turnover Rate and Turnover Replacement Needs by Occupation Family

Turnover Rate	2015 Turnover Rate	Employees to Replace	% of Total
Management	12.7%	83	14%
Supervisor	11.5%	89	15%
Operator	8.8%	304	52%
Technical Support	7.8%	106	18%
Total Turnover	9.3%	582	100%

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 216. *Assumes approximately one-half of non-retirement separations remain in the sector.

Table 4.11: Workforce Turnover Projections by Region

Projected Turnover	2015		2020		2025		Cumulative Total	
	#	% WF	#	% WF	#	% WF	#	% WF
Mainland /Southwest Turnover by Year	333	5.3%	355	5.7%	378	6.0%	1,065	17.0%
M/SW Cumulative Turnover	333	5.3%	687	11.0%	1,065	17.0%	1,065	17.0%
Vancouver Island/Coast Turnover by year	144	2.3%	151	2.4%	159	2.5%	454	7.3%
VI/Coastal Cumulative Turnover	144	2.3%	295	4.7%	454	7.3%	454	7.3%
Interior Turnover by Year	55	0.9%	57	0.9%	59	1.0%	171	2.7%
Interior Cumulative Turnover	55	0.9%	112	1.8%	171	2.7%	171	2.7%
Northern BC Turnover by Year	50	0.8%	53	0.8%	57	0.9%	159	2.5%
Northern BC Cumulative Turnover	50	0.8%	103	1.6%	159	2.5%	159	2.5%
British Columbia Turnover by Year	583	9.3%	619	9.9%	656	10.5%	1,857	29.7%
British Columbia Cumulative Turnover	583		1,202		1,857			

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 216. Totals may not sum due to rounding.

Table 4.12: New Hire Projections by Occupation Family

Projected New Hires	2015		2016-2020		2021-2025		Total for 2015-2025	
	#	% of workforce (% WF)	#	% WF	#	% WF	#	Cumulative %
Management	83	1.3%	145	2.3%	191	3.1%	419	6.7%
Supervisor	89	1.4%	161	2.6%	215	3.4%	465	7.4%
Operator	304	4.9%	621	9.9%	855	13.7%	1,780	28.5%
Technical Support	106	1.7%	229	3.7%	320	5.1%	655	10.5%
Total Hires	582	9.3%	1,156	18.5%	1,581	25.3%	3,319	53.1%
Cumulative Hires	582		1,737		3,319			

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 216. Totals may not sum due to rounding.

Table 4.13: New Hire Projections by Region

Projected New Hires	2015		2016-2020		2021-2025		Total for 2015-2025		
	#	% of workforce (% WF)	#	% WF	#	% WF	#	% of Total	Cumulative %
Mainland / Southwest	333	5.3%	688	11.0%	952	15.2%	1,973	59%	31.6%
Vancouver Island / Coast	144	2.3%	239	3.8%	310	5.0%	694	21%	11.1%
Interior	55	0.9%	127	2.0%	180	2.9%	362	11%	5.8%
Northern BC	50	0.8%	100	1.6%	138	2.2%	288	9%	4.6%
Total Hires	584	9.3%	1,155	18.5%	1,581	25.3%	3,320	100%	53.1%
Cumulative Hires	584		1,739		3,320				

Source: 2015 BC Water Sector Workforce Profile Employer Survey; n = 216. Totals may not sum due to rounding.

The water and wastewater sector's turnover rate of 9.9% from 2015 to 2020 is generally lower than that of workforce turnover in various regions of the province and in other sectors. The BC oil and gas sector estimates workforce turnover rate of 12.0%¹⁶. The BC mining sector reported an 8.3% turnover rate in 2010 for trades and undesignated occupations¹⁷. The water sector's turnover rate in the Interior region (0.9%) can be compared with workforce turnover for the Okanagan (2.3%)¹⁸ and for the Thompson-Nicola region (6.2%)¹⁹ to show that the water sector's turnover is considerably lower than average workforce turnover.

New hires for the water and wastewater sector are anticipated to amount to a cumulative total of 3,319 by 2025. This is approximately 53.1% of the current total workforce (see Tables 4.12 and 4.13). Operators will comprise the majority of new hires followed by technical support staff, supervisors, and management staff.

Despite concerns expressed about impending retirements and the associated knowledge loss, only 27.4% of employers surveyed have established career development programs, and only 18.4% of employers have instituted succession planning for senior management positions. Consistent with this finding, key informants reported hiring more younger/junior staff to act as a hedge against retirements. Some employers are habituated to dealing with attrition related to retirements; for example, succession plans have been established to prepare junior employees to take on the roles of exiting workers. Development of recruitment and retention plans was, however, limited; 15.1% of employers have employee recruitment plans in place and similar plans for employee retention. In contrast, well over one-third (42.5%) of employers have

established plans to address skills and training needs. In support of these plans, employers reported an average annual water sector training budget of \$11,326.60 (min: \$0.00; max: \$120,000.00).

Table 4.14 depicts employers' support for such human resource initiatives. Employer support was highest (69.1%) for enhancing the broader education and training opportunities to ensure that new workers have the skills required.

One key theme identified from the interviews is the developmental capacity of the three stakeholder groups in the water and wastewater sector. Some stakeholders discussed challenges and benefits associated with further developing the training programs and courses, the current workforce, and those directly involved in the development of policy that impacts the sector. CEUs and on-site training are opportunities in which particular skills can be developed that contribute to water sector employees' professional development and work advancement. Completion of CEUs is also necessary to maintain EOCP certification.

Most of the stakeholders interviewed stated that infrastructure renewal, regulatory change, major projects (e.g., liquefied natural gas), population growth, and environmental change will require more non-traditional workers and traditional workers that are well-rounded professionals. In addition, some employers and regulators mentioned the need to have quality assurance checks for training and certification programs because current certification courses outlined the nature of information around "need-to-know" items, but the "need-to-know" criteria do not correspond to the skill set necessary.

Table 4.14: Employer Support for Human Resource Strategies

Strategy	n	1 - not at all supportive - to 2	3	4 to 5 - very supportive
		%	%	%
Enhancing the broader education and training opportunities to ensure new workers have the appropriate skills	201	12.5%	18.4%	69.1%
Development of a succession plan to fill senior level positions with competent staff	194	23.2%	23.2%	53.6%
Development of resources to help employers retain existing workers (e.g., professional develop plans, employee mentoring)	189	25.9%	26.5%	47.7%
Development of a sector-specific strategy to attract new workers	163	41.1%	28.8%	30.1%

Source: 2015 BC Water Sector Workforce Profile Employer Survey.

16. Source: BC Oil and Gas Commission. (2014). 2014/15 – 2016/17 Service Plan. Retrieved from < <https://www.bcogc.ca/node/11169/download>>.
17. Source: Mining Industry Human Resources Council. (2010). Canadian Mining Industry Employment and Hiring Forecasts. < http://www.mihr.ca/en/resources/MiHR_Canadian_Mining_Employment_Forecasts_July2010.pdf>.
18. Source: Central Okanagan Economic Development Commission. (June, 2014). Growing in the Okanagan: Labour Market Outlook. < http://www.investkelowna.com/sites/default/files/uploads/growingintheokanagan_labourmarket2020.pdf>.
19. Source: Venture Kamloops. (September, 2015). 2015 Labour Market Study. < http://venturekamloops.com/wp-content/uploads/2015/11/VK_LMP-Report-November-4-2015.pdf>.

It is important that operators and other water sector employees develop professionally in order to advance in their careers. Furthermore, stakeholders assert that a stronger vision of the continuum of employment opportunities and advancements would be valuable because some workers leave due to the vertical entry structure (i.e., staff are hired as labourers or in another entry-level position regardless of their level of education).

Smaller, more remote, and less economically advantaged areas have more challenges with recruitment and retention of water and wastewater sector employees.





5. Conclusions

The water sector must prepare for the future by increasing the pool of eligible and trained applicants from which employers can hire. While the sector is not expanding rapidly, current and future hiring needs due to retirement and other attrition demand increasing numbers of skilled, trained workers.

Most of the stakeholders interviewed indicated a need to raise awareness and develop recruitment strategies. Some employers and educators recommended that the water sector imitate the trades' (e.g., plumbing, carpentry) recruitment strategies for women and Aboriginal workers, as they have had success in attracting such employees. Indeed, hiring non-traditional workers was identified as a best practice by interviewees.

More flexibility in terms of training models and training delivery are also desired by water and wastewater sector employers. Training offerings need to take into consideration cost to employers and accessibility for both students and employers. Furthermore training offerings should be designed to address knowledge and skill gaps in the sector.

The following conclusions can be drawn from the findings of this study:

Education & Certification

- **The competencies and education required to work in the water and wastewater sector must be updated to align with current industry needs.** There is no defined education program that covers current competencies required at each level of certification, resulting in knowledge and skill gaps. Furthermore, some stakeholders suggested that competencies associated with many positions have yet to be defined.

- **The current education model is insufficient to maintain skills and certification.** Employers indicated that knowledge and skill gaps exist in the sector related to water quality and safety, technology and regulatory changes, and environmental impacts. New training should be developed and continuously updated to reflect these changes and ensure that the water sector workforce is informed and prepared to properly implement these changes in their workplace.
- **Water and wastewater sector employers are seeking more flexible education models and delivery methods to better meet changing sector needs and training budgets.** Some of the current barriers facing many employers include the cost to develop in-house training; travel and loss of work costs to send their staff to external courses; and the location of schools and instructors teaching continuing education units.
- **To fill vacancies, a new pathway is required to train under-employed individuals with related degrees and diplomas.** Certification is required to progress in the water sector careers and prerequisites include relevant work experience, however relevant work experience is difficult to obtain without having required certification for water sector positions. One-half of participants identified a trades-type training model as a priority for human resource development for the sector.
- **Educational programs must expand beyond technical training to include hands-on practical components as well as leadership, communication, and computer skills.** All stakeholders interviewed noted that managers, supervisors, operators, and technicians need to have

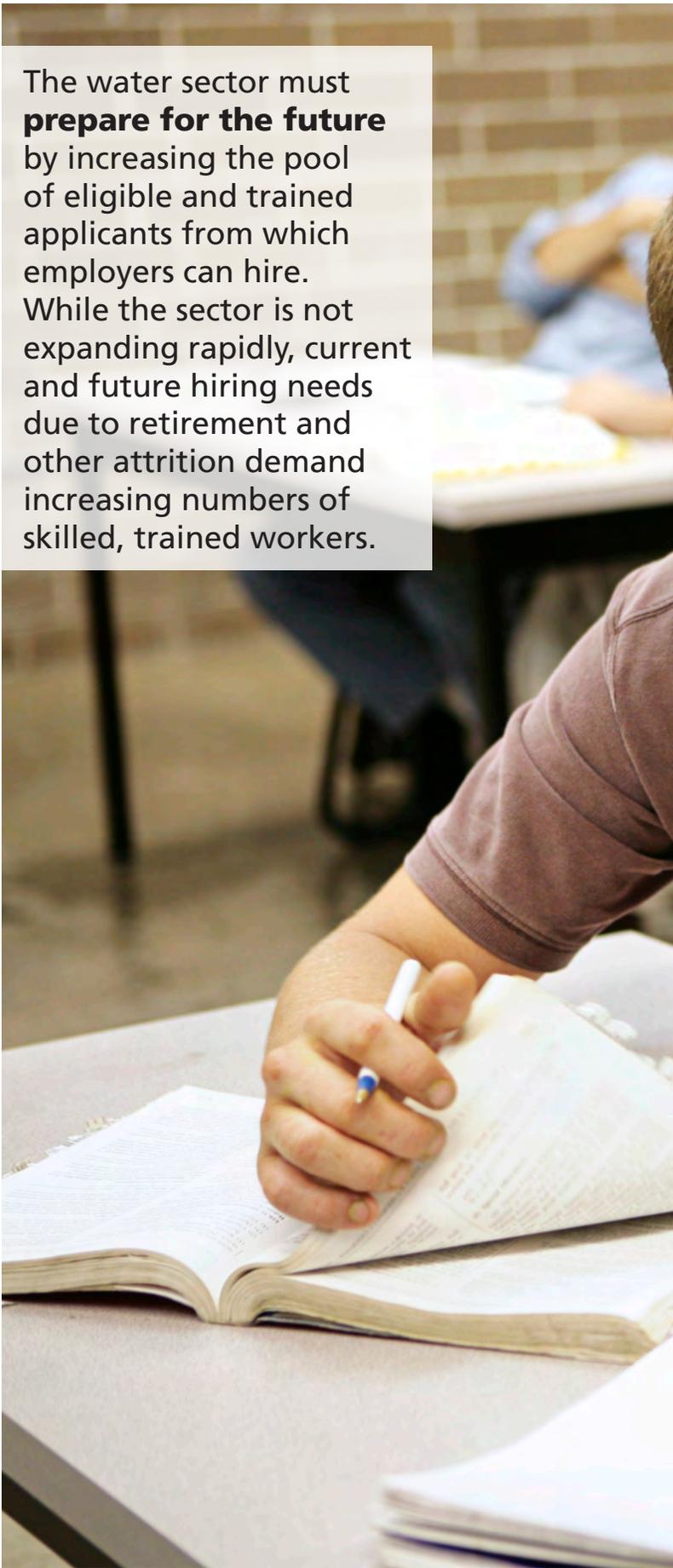
a transferrable set of skills that could be used sector-wide. Suggested skills include mobile technology, communication and collaboration, leadership, and public engagement and could be included in entry-level education programs as well as professional development for more seasoned professionals.

Vacancies due to retirement

- **Looming retirements are driving significant workforce vacancies and potential knowledge-loss.** One-third (36.3%) of the water and wastewater sector workforce is 50 years of age and over. Employers observed that most new hires are in response to retirement-related vacancies and new hires tend to be young, inexperienced, uncertified workers.
- **There is a need for succession planning at the sector level that includes knowledge transfer.** Despite concerns expressed about impending retirements and the associated knowledge loss, only 27.4% of employers surveyed have established career development programs, and only 18.4% of employers have instituted succession planning for senior management positions.

Labour supply

- **Opportunities for new entrants to the sector can be prohibitive.** Several employers, educators, and regulators reported issues with high turnover rates among inexperienced staff and difficulty filling vacant positions because of difficulty progressing between operator levels. Barriers include lack of adequate training and resources for mentorship.
- **The water and wastewater sector's demand for new employees today and into the future requires that new employees enter the workforce.** There is a continued need to raise awareness about career opportunities in the sector, and to bring new workers into the workforce and water sector related training programs.
- **Women are underrepresented in the water sector as in many utilities.** It is unknown as to why women represent such a small proportion of the workforce, and research to identify the barriers to women is required.

A photograph showing a person's hands writing in a notebook on a desk. The person is wearing a brown long-sleeved shirt. The notebook is open, and the person is holding a white marker. In the background, another person is sitting at a desk, and the setting appears to be a classroom or a study area with brick walls.

The water sector must **prepare for the future** by increasing the pool of eligible and trained applicants from which employers can hire. While the sector is not expanding rapidly, current and future hiring needs due to retirement and other attrition demand increasing numbers of skilled, trained workers.



Appendices



Appendix A: Research Question Matrix

Research Objectives	Proposed Research Method/Line of Evidence			
	Secondary Data Review	Survey of Employers	Key Informant Interviews	Focus Group
Market Size and Composition				
Quantify size and composition of the water sector workforce today and workforce needs five years from now, plus expected turn-over rate	✓	✓		
Determine demographics of today's water sector workforce (e.g., age, educational background, accreditation, geographical representation)	✓	✓	✓	
Understand the industry outlook, including economic trends and market forces impacting the water industry for next five years	✓		✓	✓
Understand how the labour market for water sector operators is expected to change over the next five years and analyze labour supply and demand implications for employers, training and accreditation institutions*	✓	✓	✓	✓
Identify where water sector workers are employed (e.g., public sector vs. private sector, municipal/utility vs. other industries) and competition with other provinces and industries for workers with similar skills or competencies	✓	limited	✓	
Economic Outlook				
Identify trends and market forces impacting the industry over the next five years, indicators for determining growth/decline in water industry, and government policies or market changes that will affect the industry's size and robustness*	✓		✓	✓
Compensation				
Identify compensation levels and trends for water sector workers	✓	✓	✓	
Determine variance by region, utility type/size, and industry sector	✓	limited		
Compare compensation in the municipal/water sector utility market with compensation in industries that compete for the same labour market	✓			
Competencies and Skills				
Determine what skills, knowledge, competencies, and experience will be needed by water sector workers five years from now and any gaps			✓	✓
Determine how well existing training is serving the sector and regional differences in training accessibility	✓		✓	✓
Identify barriers to entry into the sector			✓	✓
Identify barriers to advancement and/or certification	✓		✓	✓
Market Sustainability				
Identify sources of new entrants to the market and differences from current workers	✓		✓	✓
Assess the readiness of employers, training institutions and accreditation organizations to adapt to changing workforce needs and to changes in labour supply and demand	✓	limited	✓	✓
Overall Recommendations				
Provide comprehensive recommendations regarding next steps to bring together stakeholders and facilitate appropriate planning for workforce recruitment, retention, training, and credentialing	✓	✓	✓	✓

Appendix B: Water Sector Position Titles

Benchmark Occupations	Organizational Titles (summarized)	% of Employers Using this Title
Water Treatment Operator	Operator (general or specific)	49.4%
	Environmental, Field, Maintenance, or Utilities Technician/Worker/Repair	27.2%
	Public Works Operator/Foreman/Manager	7.4%
	Operations Manager/Maintenance	4.9%
	Other	11.1%
Wastewater Treatment Operator	Operator (general or specific)	59.0%
	Environmental, Field, Maintenance, or Utilities Technician/Worker/Repair	25.6%
	Public Works Operator/Foreman/Manager	3.8%
	Operations Manager/Maintenance	3.8%
	Other	7.7%
Senior Water Operator	Environmental, Field, Maintenance, or Utilities Technician/Worker/Foreman	25.0%
	Operator (general or specific)	19.3%
	Chief/Certified/Senior Operator or Maintenance Person	17.0%
	Supervisor/Superintendent	13.6%
	Public Works Operator/Foreman/Manager	9.1%
	Lead Hand	8.0%
	Assistant Operator/Manager/Shift Engineer	3.4%
	Other	4.5%
Senior Wastewater Operator	Chief/Certified/Senior Operator or Maintenance Person	32.8%
	Environmental, Field, Maintenance, or Utilities Technician/Worker/Foreman	18.0%
	Supervisor/Superintendent	16.4%
	Operator	13.1%
	Public Works Operator/Foreman/Manager	9.8%
	Lead Hand	3.3%
	Other	6.6%
Entry-Level Operations Worker	Operator/Utility/Labourer/Pipelayer/Maintenance 1 or 2	26.9%
	Operator-in-training/Junior Operator	23.1%
	Labourer/Operator (general)	21.8%
	Trades, Maintenance Technician	10.3%
	Utility Worker (general)	6.4%
	Other	6.4%
	Pipefitter/Pipelayer (general)	2.6%
	Other	6.4%

Benchmark Occupations	Organizational Titles (summarized)	% of Employers Using this Title
Operations Manager	Manager	46.7%
	Supervisor/Superintendent	23.9%
	Director	12.0%
	Chief Operator/Works/Maintenance	4.3%
	Operator (Water and Sewer or Utility Maintenance)	2.2%
	Foreman	1.1%
	Lead Hand	1.1%
	Other	8.7%
SCADA / Instrumentation Technician	Electrician/Instrumentation Technician	34.6%
	Operator/Foreman/Manager	19.2%
	SCADA Technician	15.4%
	Electronics Technologist/Digital Control Software Specialist	11.5%
	Engineering Assistant/Technician	7.7%
	Other	11.5%
Water Technician	Operator/Utility Worker	40.0%
	Technician/Technologist (general)	24.4%
	Engineering Technician/Technologist	15.6%
	Lab/Maintenance Assistant/Worker	6.7%
	Manager/Supervisor/Technician (general)	6.7%
	Other	6.7%

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