



INTEGRATED RESOURCE PLAN UPDATE

Executive Summary
November 2019



EXECUTIVE SUMMARY

1.1 INTRODUCTION

Halifax Water is a publicly owned and regulated water, wastewater and stormwater utility. With a long history dating back to 1945, Halifax Water is the municipal water, wastewater and stormwater utility servicing residents of the Halifax Regional Municipality (HRM).

As part of its mandate and services, Halifax Water continuously undertakes initiatives and programs to maintain, operate and expand its systems while striving to provide world class service to its customers and environment. These initiatives and programs require integration into a single capital program that identifies the long-term resource needs and financial expenditures.

The long-term program is consolidated into a comprehensive document: The Integrated Resource Plan (IRP) for Halifax Water. As part of the IRP approach, it is intended to complete IRP updates at regular intervals to ensure the consolidated long-term program is current. This IRP update is a critical project that brings together projects, initiatives and programs from separate studies, into a singular integrated capital plan. This study applies the considerations of compliance, asset renewal and growth, to ensure the integrated recommendations achieve the desired service delivery goals, as well as identify any additional gaps and programs required in the long-term plan.

The IRP approach is a key component of Halifax Water’s iterative planning process. The process was initiated in 2012 with the first IRP and continued with further understanding of the infrastructure systems and development of studies and frameworks, capital delivery and financial planning. The 2019 IRP Update is built on the foundation of the 2012 IRP and provides Halifax Water with the required programs and resources for a 30-year period covering each of the three drivers: Compliance, Asset Renewal and Growth.

The 2019 IRP Update will feed directly into Halifax Water’s Business Plans, Capital and Operating Budgets and future rate applications. However, the 2019 IRP Update is it not intended to provide analysis of capital program impacts on the operating budget, debt, depreciation, rates and affordability as part of the development of the long-term capital program and implementation. Figure 1 shows graphically how the various key individual studies and plans feed into the Integrated Resource Plan process and output Halifax Water business planning and Regional Development Charge deliverables.

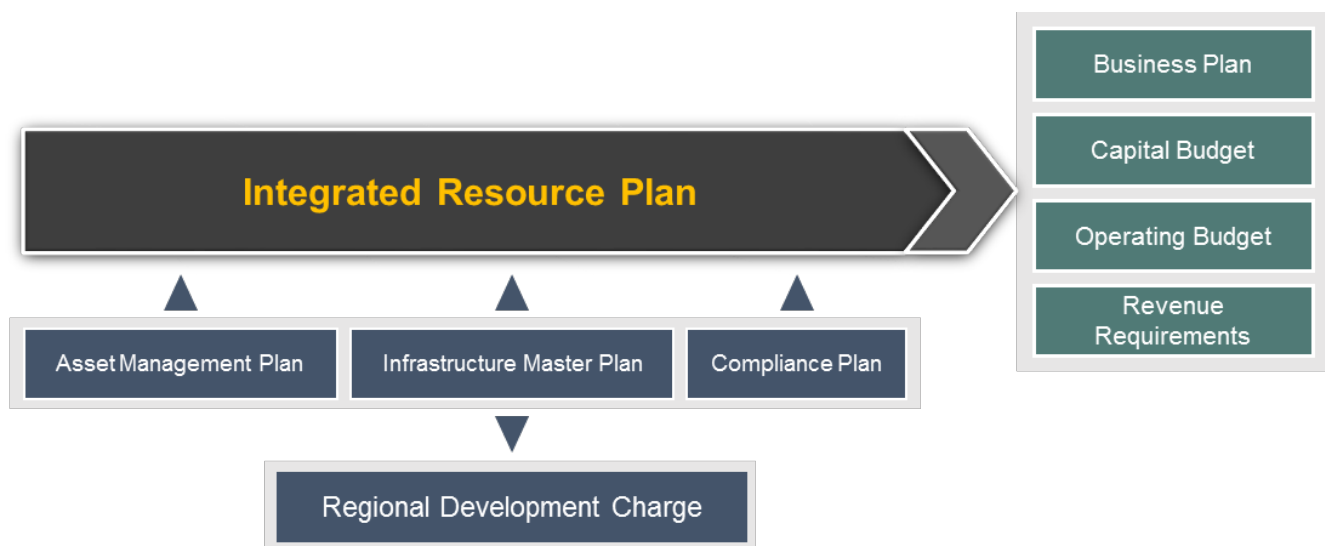


Figure 1 – Relationship of the Integrated Resource Plan to other initiatives

1.2 GOALS AND OBJECTIVES

The 2019 IRP Update is a critical component of Halifax Water’s financial and resource planning. The primary goal of the 2019 IRP Update is to combine the outputs from the foundational studies and programs (Infrastructure Master Plan, Compliance Plan, Asset Management Plan) to create one holistic project and study program that will inform Halifax Water activities for the next 5 years and provide a guide for the next 30 years.

In order to achieve this goal, the following key objectives were completed:

- Complete a baseline understanding from previous studies
- Complete detailed review of Supply Side Management (SSM) and Demand Side Management (DSM) options
- Coordinate and align needs identified in the Infrastructure Master Plan, Compliance Plan and Asset Management Plans
- Identify the projects and splits that meet the three drivers of Compliance, Asset Renewal and Growth.
- Provide the preliminary preferred long-term capital infrastructure program as an input into financial models
- Provide recommendations for future initiatives and improvements
- Create a foundation for ongoing capital budgeting processes

1.3 GOVERNANCE

Halifax Water is an autonomous, self-financed utility owned by HRM. Halifax Water owns, operates and maintains the water and wastewater systems within HRM, as well as the stormwater infrastructure located within the road right-of-way or easements owned by the utility. Halifax Water builds and maintains infrastructure to treat, deliver and move water across the region while servicing over 109,000 customers and employing approximately 500 people.

Two provincial bodies have responsibility for oversight of Halifax Water: Nova Scotia Utility and Review Board (NSUARB) and Nova Scotia Environment (NSE).

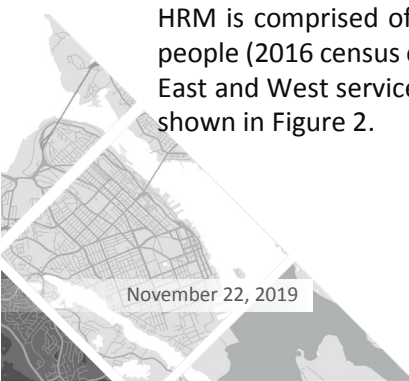
The NSUARB is an independent body with both regulatory and adjudicative jurisdiction. The NSUARB provides general supervision over all public water utilities within the Province, including involvement in rate setting, approval of large capital expenditure projects and reviewing complaints. The Board ensures projects meet the requirements of the public utilities act. When approving capital expenditures, the Board assesses, among other things, the need for the proposed project, the reasonableness of the expenditure, and the financial impact on the Utility and its customers.

NSE is the provincial government department that acts as environmental regulator ensuring public health and environmental quality. NSE oversees wastewater and water supply standards, issues approvals and audits compliance with standards. NSE specifically regulates drinking water quality as well as municipal and industrial discharges from wastewater treatment plants and other sources such as overflows.

In addition to the NSUARB and NSE, federal departments including Department of Fisheries and Oceans (DFO), Environment Canada (EC) and Health Canada (HC) may also play an oversight role for specific projects and activities.

1.4 HALIFAX WATER INFRASTRUCTURE

HRM is comprised of 18 community planning areas, spanning 5,500 km², with a total population of 411,014 people (2016 census estimate). The boundary of the 2019 IRP Update includes the existing and planned Central, East and West service areas for water and wastewater in HRM, as well as the stormwater service boundary as shown in Figure 2.



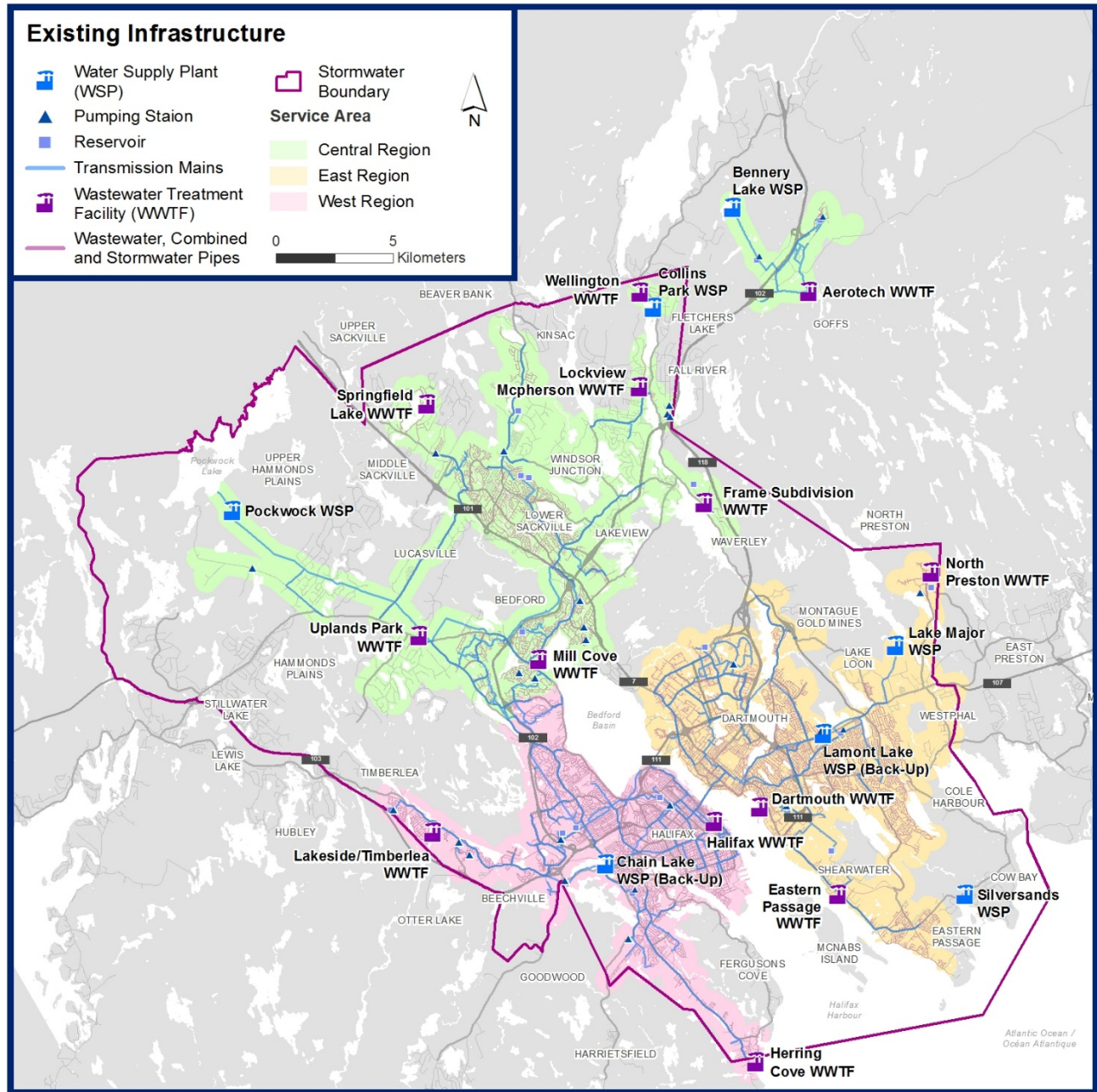


Figure 2 – Study Area and Halifax Water Systems Overview

Water System

Halifax Water provides drinking water and fire protection services to approximately 370,000 people. The water distribution system is made up of 1,558 km of watermains (including transmission and distribution mains), eight water supply plants (WSP), two back-up water supplies, six water supply dams, 21 booster stations and 143 chambers.

Wastewater System

The wastewater collection system is made up of 1,424 km of sewers (including forcemains and gravity sewers), 14 treatment plants, one biosolids processing facility and 166 pumping stations.

Stormwater System

The stormwater collection system is made up of 878 km of storm sewers, 2,337 cross culverts, approximately 16,000 driveway culverts, and 40 stormwater management structures. The stormwater system is multi-jurisdictional, with the provincial and municipal governments, Halifax Water and private owners having distinct roles and responsibilities within the stormwater cycle. Table 1 presents the inventory of Halifax Water’s infrastructure and the associated replacement cost.

Table 1 – Infrastructure Inventory and Replacement Costs

Asset Group	Asset*	Number/Length	Replacement Costs (\$ 2019 Millions)
Water	Water Distribution Mains	1235 km	\$1,384
	Water Transmission Mains	323 km	\$690
	Water Pumping Stations	21	\$17
	Chambers and PRV	143	\$50
	Water Reservoirs	16	\$95
	Dams	6	\$44
	Water Supply Plants	10**	\$306
	Water System Sub-Total		\$2,586
Wastewater	Sewers	1296 km	\$1,714
	Force mains	129 km	\$275
	Pumping Stations	166	\$561
	Holding Tanks	5	\$12
	Treatment Facilities	14	\$652
	Wastewater System Sub-Total		\$3,214
Stormwater	Pipes	878 km	\$1,369
	Cross Culverts	2,337	\$268
	Driveway Culverts	16,000	\$56
	Structures	40***	\$3
	Stormwater System Sub-Total		\$1,696
All Systems Total		\$7,496	

* There are other categories of assets funded through the capital program that are not represented in Table 1 (e.g. Information systems and other corporate programs)

** Includes back up supply plants

*** Excludes Sullivans Pond and Ellenvale Run

1.5 2019 IRP DEVELOPMENT

The Integrated Resource Plan was a multi-step and iterative process. The key tasks and activities are represented graphically in Figure 3. The main approach to the development of the plan included the completion of the following tasks:

- Build on the foundation of the 2012 IRP and the projects, studies and work completed through its recommendations.
- Complete a baseline understanding from previous studies
 - Review opportunities and constraints for the water, wastewater and stormwater systems
 - Review underlying assumptions related to project triggers and servicing requirements
 - Identify data gaps
 - Consolidate recommendations from previous studies and identify potential conflicts and uncertainties
- Complete detailed review of Supply Side Management (SSM) and Demand Side Management (DSM) options
 - Review completed and ongoing initiatives
 - Review opportunities and constraints related to implementing public and private-side initiatives
 - Develop a range of short and long term potential initiatives
- Coordinate and align needs identified in the Infrastructure Master Plan, Compliance Plan and Asset Management Plans
 - Consolidate full range of recommendations
 - Identify opportunities for alignment and integration
 - Identify opportunities for merging projects or programs
- Utilize data and tools to help close gaps through data linkage and apply spatial allocation, prioritization and decision-making tools to review project integration opportunities.
- Identify the projects and splits that meet the three drivers of Compliance, Asset Renewal and Growth
 - Complete a project-by-project analysis of the project triggers and objectives
- Provide the preliminary preferred long-term capital infrastructure program as an input into financial models
 - Work iteratively and collaboratively with Halifax Water team to support the development of a long-term capital infrastructure plan based on the capital investment requirements for the three drivers
- Recommend a forward-looking long-term infrastructure plan that is traceable, defensible and implementable.
- Provide recommendations for future initiatives and improvements
 - Recognizing the process for future updates, identify opportunities for additional work, data and other updates that would benefit and enhance value for the future IRP Update
- Create a foundation for ongoing capital budgeting processes
 - Provide the deliverables in a format to be easily leveraged into Halifax Water processes and other analyses for capital delivery including budgeting
- Prepare a report that documents the development of the IRP Update.

HALIFAX WATER INTEGRATED RESOURCE PLAN UPDATE PROCESS FLOW DIAGRAM

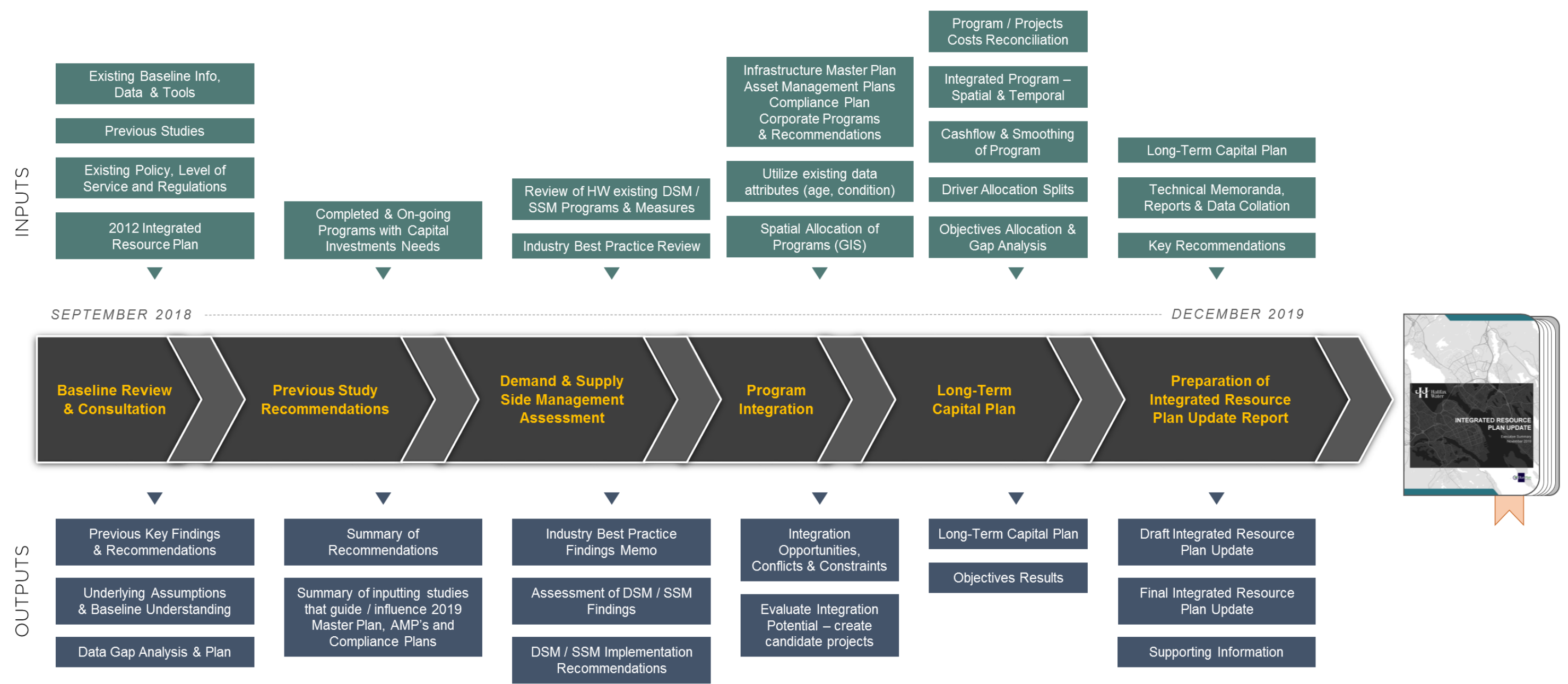


Figure 3 – 2019 Integrated Resource Plan Development – Process Flow Chart

1.5.1 Drivers and Objectives

The 2019 IRP Update focuses on the three drivers:

Compliance

Asset Renewal

Growth

In support of the three drivers, fourteen objectives based on Halifax Water’s level of service, compliance requirements (existing and future), asset renewal requirements, as well as other important considerations such as adaptation to climate change, system reliability and servicing growth were further identified. The IRP Update does not focus on Enterprise Risk Management (ERM) as a specific objective, however the risk lens is applied through consideration of objectives such as adaptation to climate change and system reliability. The IRP Update commenced prior to Halifax Water implementing formalized ERM. The outcomes of the ERM will be considered for future updates to the IRP and in the implementation of the IRP capital program.

Compliance

For the 2019 IRP Update the compliance driver has been divided into two main categories: Regulatory Compliance and Level of Service Compliance. Regulatory compliance is based on Halifax Water’s goal to ensure, through their efforts, that appropriate measures are taken to be in conformity with current policies and regulations. The level of service component of compliance is based on Halifax Water aspiring to provide customers with high quality water, wastewater and stormwater services, in accordance with the Halifax Water vision.

Asset Renewal

Asset renewal encompasses the replacement or rehabilitation of an existing asset with the new asset capable of delivering the same or improved level of service. Asset renewal was the major strategic driver identified in the 2012 IRP and will continue as the main driver for the foreseeable future, all with the intention to elevate the level of service to customers and protect the environment.

Growth

Projected growth within greenfield and intensification areas is a fundamental component for the long-term infrastructure planning of the water, wastewater and stormwater systems. The 2012 IRP utilized high level growth estimates that were generated by HRM in collaboration with Halifax Water during the Regional Wastewater Functional Plan (RWWFP). The planning numbers were a key input into the creation of the infrastructure requirements in the RWWFP, but they were not subject to additional analysis during the development of the 2012 IRP.

Since the 2012 IRP, the Halifax Water project teams including HRM staff collaborated to define the planning projections dataset required to complete the Infrastructure Master Plan. Planning data and growth projections formed the baseline and growth demands on the systems, spanning the period from 2016-2046 (a 30-year planning horizon). Table 2 summarizes the HRM planning estimates as developed in the Infrastructure Master Plan.

Table 2 – Halifax Regional Municipality Planning Estimates

Sub-boundary	Employment Growth (2016-2046)	Population Growth (2016-2046)	Total Growth (2016-2046)
Regional Centre	42,123	53,507	95,630
Suburban	36,963	77,706	114,669
Rural	6,877	17,000	23,877
Total	85,963	148,213	234,176
Service Area*	79,086	131,213	210,299

*Excludes rural planning projections.

IRP Objectives

The fourteen objectives developed under the 2012 IRP were further reviewed under this update process. The objectives reflect a greater level of granularity and specific criteria related to the current and anticipated compliance requirements for the three infrastructure systems, optimal asset renewal requirements and growth. Through the development of the 2019 IRP Update, the fourteen 2012 IRP objectives were reviewed, refined and updated. Many of the 2012 objectives remain valid and have not changed with others requiring context update or change in main driver to better reflect the current and planned Halifax Water planning and delivery program. The 2019 IRP Update objectives are summarized in Table 3. Changes between the 2012 and 2019 objectives are highlighted in blue.

Table 3 – IRP Drivers and Objectives

Driver		Infrastructure System	Objective
Compliance	Regulatory	Wastewater	1. Meet or exceed current Nova Scotia Environment WWTF Permit to Operate Requirements
		Water	2. Meet or exceed current Nova Scotia Environment WSP Permit to Operate
		Wastewater Stormwater	3. Meet Current Overflow Compliance (Monitor and Report)
		Wastewater	4. Meet or exceed Future WWTF Compliance
		Water	5. Meet or exceed future drinking water compliance
	Level of Service	Wastewater Stormwater	6. Meet future overflow compliance
		Water Wastewater Stormwater	7. Endeavour to provide existing systems that are adequately sized to meet Halifax Water Level of Service
		Stormwater	8. Meet Future Stormwater Quality Compliance
		Water Wastewater Stormwater	9. Ensure planning and sizing of infrastructure considers the impact of climate change
Asset Renewal	Water Wastewater Stormwater	10. Implement optimal level of asset re-investment	
	Water Wastewater Stormwater	11. Enhance the reliability, redundancy and security of the water, wastewater and stormwater systems with attention to high risk and critical areas	
	Water Wastewater	12. Reduce energy consumption, operating costs and GHG contributions	
Growth	Water Wastewater Stormwater	13. Provide regional water, wastewater and stormwater infrastructure needed to support planned growth	
	Water Wastewater	14. Manage flow and demand to maximize capacity for growth and minimize the need for new hard infrastructure	

1.5.2 Study Inputs

There are three major plans that served as the main inputs for the 2019 IRP Update: The Infrastructure Master Plan, Compliance Plan (CP) and Asset Management Plans (AMPs).

1.5.2.1 Infrastructure Master Plan

The Infrastructure Master Plan focuses on the servicing strategies and management of infrastructure in the Halifax Region, to produce an optimal servicing strategy for the wastewater collection and water supply networks to meet growth. The Infrastructure Master Plan is built off previous completed studies such as the West Region Wastewater Infrastructure Plan (WRWIP) and Regional Centre Local Wastewater Servicing Capacity Analysis (LoWSCA). The Infrastructure Master Plan incorporates the WRWIP and provides servicing strategies for the rest of the wastewater system servicing the Central and East Regions. The Infrastructure Master Plan then follows a similar approach for the water network, by formalizing the foundational policies of regional infrastructure planning in water infrastructure and forming a servicing strategy that covers the regional water network for Halifax Water.

The Infrastructure Master Plan is a key component of long-term planning, providing project costing and phasing. It included development/update of wastewater and water hydraulic models, conceptual designs for priority projects, and forms a work plan for adapting to climate change.

The Infrastructure Master Plan provided the following key inputs to the 2019 IRP Update:

- Planning projections and growth areas.
- Water and wastewater capital projects to 2046 including timing, cost estimates and spatial allocation.
- Wet Weather Management Study – priority areas, best areas with potential for sewer separation, Rainfall derived inflow and infiltration (RDII) reduction, low impact development (LID) and CSO discharge reduction.
- Climate Change Vulnerability Assessment Framework

Major projects from the Infrastructure Master Plan include:

Wastewater

- Mill Cove WWTF Capacity Upgrade
- Dartmouth WWTF Capacity Upgrade and Flow Diversion to Eastern Passage
- Halifax WWTF Capacity Upgrade
- WRWIP: Fairview Cove Tunnel
- WRWIP: BLT Diversion to Halifax Peninsula
- Eastern Passage new Gravity Pressure Sewer upgrade
- Rainfall derived inflow and infiltration (RDII) reduction program across all regions
- Sewer Separation in Halifax and Dartmouth Areas

Water

- Pockwock Transmission Twinning (60in) & (54in)
- Bedford – Burnside Lake Major and Pockwock system interconnection
- Water system extension to Bennery Lake
- Robie Transmission Main

Figure 4 presents the total program and percentage split of water, wastewater and stormwater projects from the Infrastructure Master Plan as an input into the 2019 IRP Update.

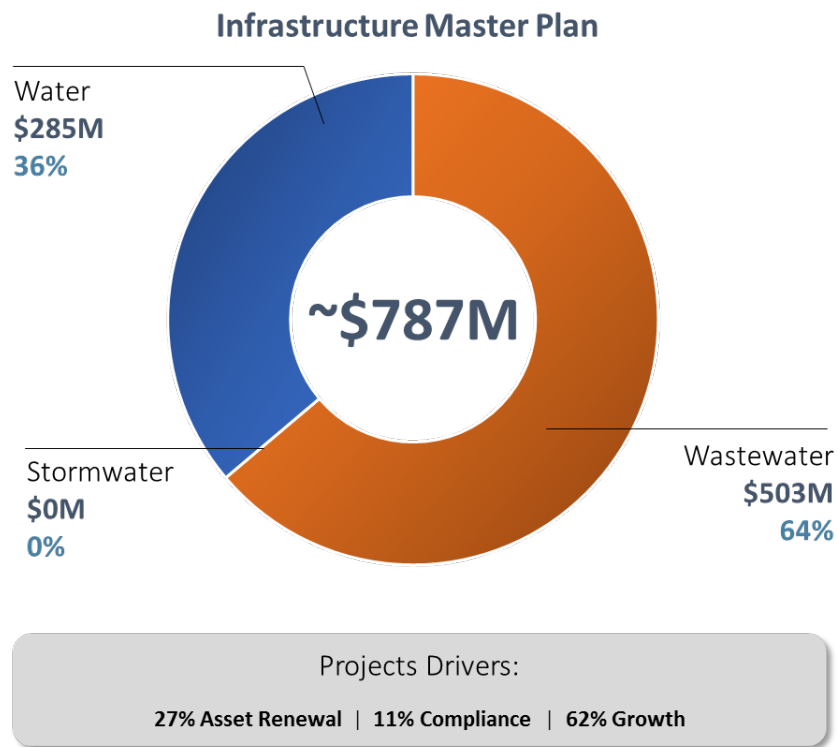


Figure 4 – Infrastructure Master Plan

1.5.2.2 Compliance Plan

The Compliance Plan provides a review of the current state of compliance of Halifax Water’s infrastructure with federal, provincial and municipal level compliance requirements. The main goal of the compliance plan is to document the long term (30 years) infrastructure needs related to compliance and to ensure continued compliance requirements are met for wastewater, water and stormwater systems. The plan discusses and examines wastewater treatment facilities, wastewater collection systems, sanitary and combined sewer overflows, water supply plants, and water distribution systems including water storage reservoirs.

The Compliance Plan provides the following key inputs to the 2019 IRP Update:

- Current and future regulatory compliance requirements.
- Detailed treatment compliance assessment for WWTFs and WSPs.
- Capital program including timing, cost estimates and location.

Major projects from the Compliance Plan include:

- Halifax WWTF Upgrade to meet Wastewater Systems Effluent Regulations
- Dartmouth WWTF Upgrade to meet Wastewater Systems Effluent Regulations
- Herring Cove WWTF Upgrade to meet Wastewater Systems Effluent Regulations
- Corporate Flow Monitoring Program and Overflow Monitoring Program
- Wet Weather Management Program
- Lake Major and J.D. Kline WSP upgrades

Figure 5 presents the total program and percentage split of water, wastewater and stormwater projects from the Compliance Plan as an input into the 2019 IRP Update.

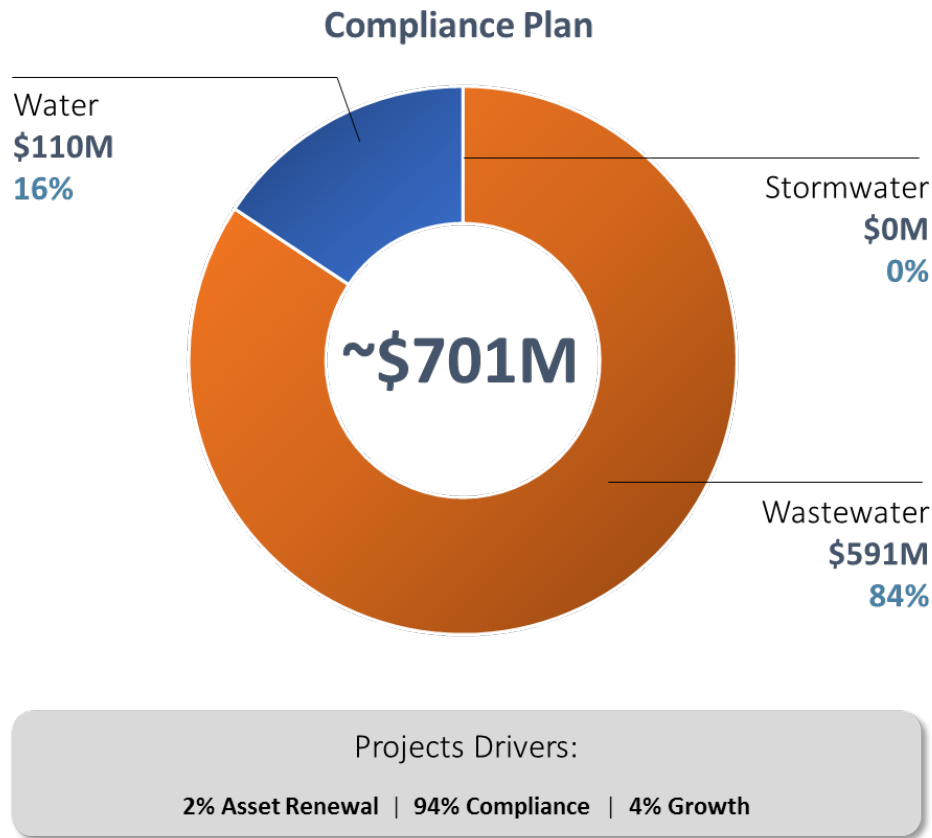


Figure 5 – Compliance Plan

1.5.2.3 Asset Management Plans

The Asset Management Plans (AMPs) provide a summary of asset inventory and state of Halifax Water’s infrastructure, level of service the assets provide to the customers, infrastructure replacement and maintenance strategies, and associated costs and expenditures. Halifax Water currently updates the AMPs on an annual basis. The 2019 IRP Update focuses on the 2018/2019 AMPs which are expected to be published in Spring of 2020.

The AMPs main document structure consists of an “Overall Main Sections” component followed by individual AMPs covering 14 different asset class as follows:

Water

- Supply Plants
- Supply Dams
- Chambers & Booster Stations
- Transmission Mains
- Distribution Mains
- Service Reservoirs

Wastewater

- Treatment Facilities
- Pumping Stations
- Gravity Sewers
- Forcemains

Stormwater

- Management Structures
- Gravity Sewers
- Cross Culverts
- Driveway Culverts and Ditches

The AMPs provide the following key inputs to the 2019 IRP Update:

- Asset inventory and replacement costs for each asset class.
- Asset condition based on age/estimated service life, conditions assessments, site inspections, staff knowledge and discussions, depending on the available information for each asset class.
- Recommended 5-year detailed capital expenditures and a 30+ year average forecast for most asset classes.

Figure 6 presents the total program and percentage split of water, wastewater and stormwater projects from the Asset Management Plans as an input into the 2019 IRP Update.



Figure 6 – Asset Management Plans

1.6 LONG-TERM CAPITAL PLAN

The Long-Term Capital Plan (LTCP) was developed based on a six-step approach for program integration.

The first step was the development of the **Baseline Program** by compiling all individual projects from the study inputs into one comprehensive table including project specific information such as cost, year, drivers, driver splits, objectives.

The second step was to **Categorize Infrastructure Master Plan Projects** based on critically and timing to identify which projects could be advanced, delayed or have a fixed timing.

The third step was to identify **Candidates for Integration**. At this stage the objective was to identify projects that were happening at the same time and could be coordinated/bundled together, have critical timing, could align with state of good repair program, and/or require coordination with external influences.

The fourth step was the **Program Integration**. This step involved workshops with Halifax Water project team to review candidate projects for integration, provide an update on the process and confirm the integration program and approach.

The fifth step was the **Smoothing of the Program**. Once the program was reviewed and integration opportunities were confirmed, a smoothing process was completed to bring a realistic aspect to the program for implementation. This process consisted of flattening the cost expenditure peaks in the program by adding projects splits for multiple year expenditures to account for projects phases such as preliminary design, detailed design and construction over two years. This process by applied to projects greater than \$1 million dollars that were not already smoothed or programmed for multiple years.

The last step of the program integration process was the development of the **Final Program** and recommendations. The final program was provided to Halifax Water for inclusion in their financial model for debt, rate structure and affordability analysis.

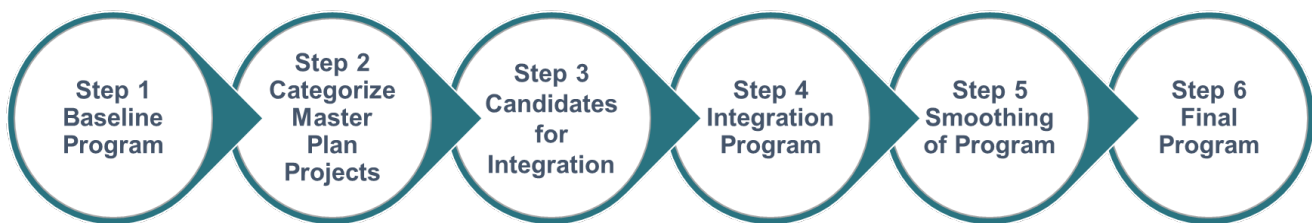


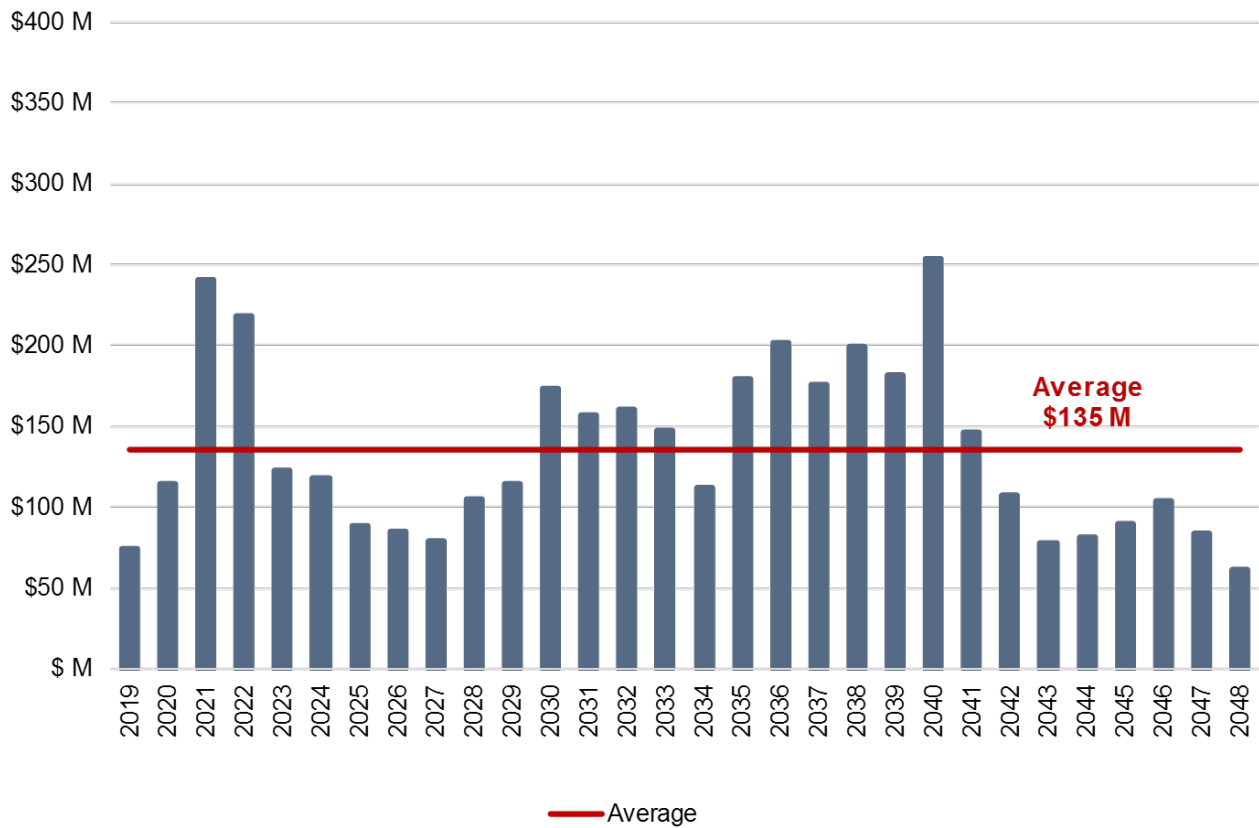
Figure 7 – LTCP - Program Integration Approach

1.6.1 LTCP Expenditure Summary

The total 30-year program recommended in the LTCP inclusive of capital and \$4,054 million. This represents a net present value (NPV) of \$2,691 million and a yearly average of approximately \$135 million for the next 30 years.

The timing of projected expenditures (in \$2019 dollars) is presented in Figure 8 which shows significant expenditures above the yearly average at key points in the next 30 years related to the following projects:

- Mill Cove Wastewater Treatment Plant Capacity Upgrade (2020-2022)
- Lake Major and J.D. Kline WSP upgrades (2020-2030)
- Pockwock Transmission Twinning – 60in (2028-2031)
- Future Enhanced Overflow Program (2033-2042)
- Dartmouth WWTF Upgrade to meet Wastewater Systems Effluent Regulations (2035-2038)
- Herring Cove WWTF Upgrade to meet Wastewater Systems Effluent Regulations (2036-2039)
- Halifax WWTF Upgrade to meet Wastewater Systems Effluent Regulations (2037-2040)



Note: 2019 projects are ongoing

Figure 8 – 2019 IRP Recommended Expenditure by year

The projected expenditures by driver and system are shown in Figure 9 . Approximately 68% of the projected expenditures are associated with asset renewal and the remainder split between 14% for growth and 18% for compliance. 55% of the projected expenditures are associated with the wastewater system, while 36% are associated with the water system and 9% with the stormwater system.

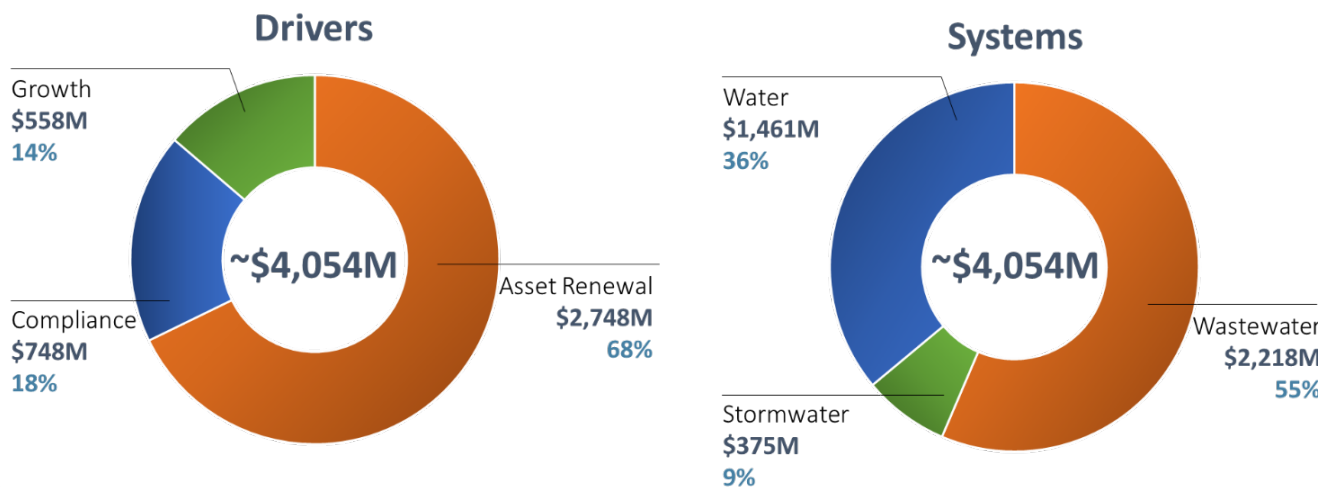


Figure 9 – 2019 IRP Recommended Expenditure by driver

The timing of projected expenditures by driver (in \$2019 dollars) is presented in Figure 10 which shows the fluctuation of asset renewal requirements across the 30-year period. Growth projects are more concentrated in the first 4 years mainly related to Infrastructure Master Plan projects including the Eastern Passage new gravity pressure sewer, Mill Cove WWTF capacity upgrade and WRWIP projects. Compliance projects are mostly concentrated between 2035 and 2040, mainly related to the WWTF upgrades to meet WSER requirements and the Enhanced Overflow Program.

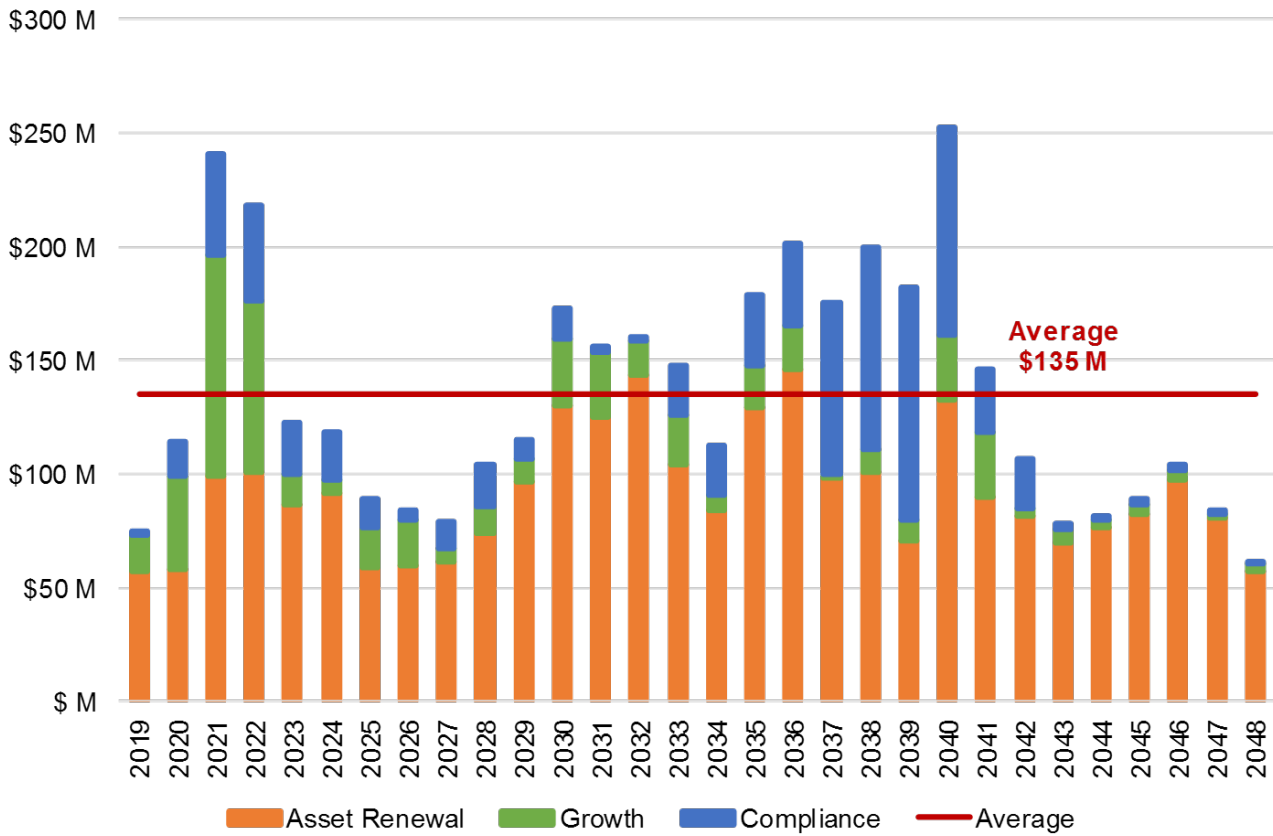


Figure 10 – 2019 IRP Recommended Expenditure by driver (cash flow)



1.6.2 2019 IRP Comparison with the 2012 IRP

Figure 11 and Figure 12 present a comparison of the 2012 and 2019 Update Integrated Resource Plans.

2012 Integrated Resource Plan

Total Program ~\$3,920M (2012\$)

30-year Net Present Value ~\$2,579M

30-year Average ~\$131M

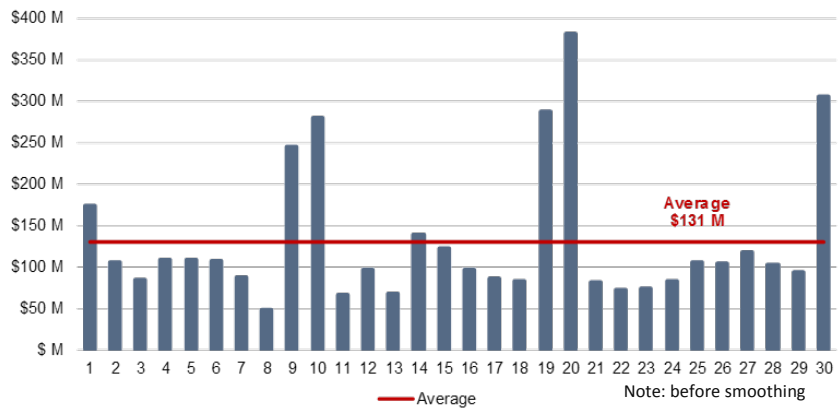
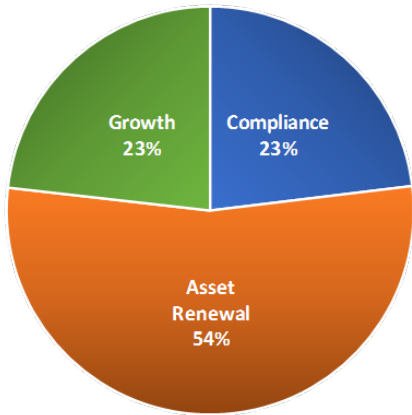


Figure 11 – 2012 Integrated Resource Plan

2019 Integrated Resource Plan

Total Program ~\$4,054M (2019\$)

30-year Net Present Value ~\$2,691M

30-year Average ~\$135M

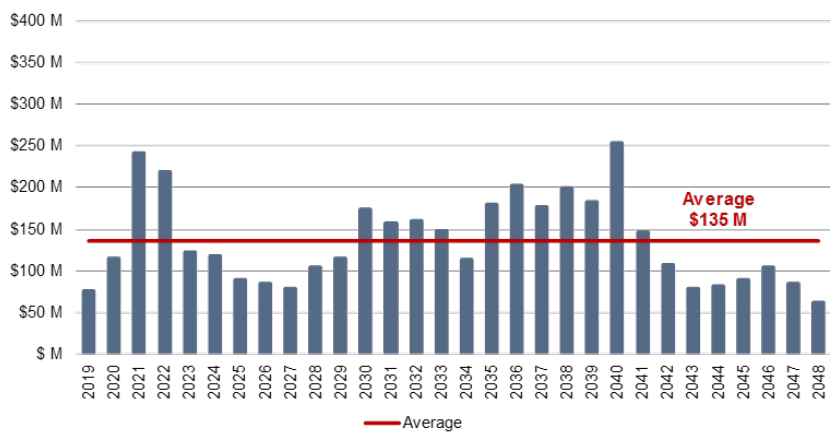
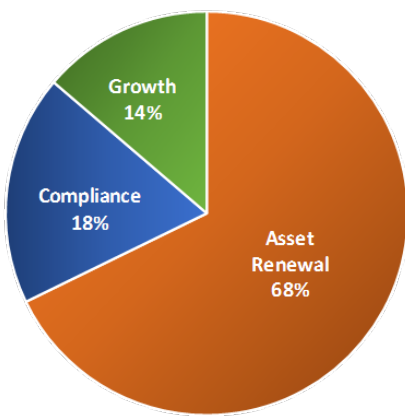


Figure 12 – 2019 Integrated Resource Plan



The main differentiators between the two programs are:

- The 2019 IRP Update program represents an increase of approximately \$220 million, in current year dollars, for the total cost of the program and represents an increase of the 30-year average by approximately \$8 million, in current year dollars.
- The projected asset renewal expenditures increased from 54% of the program in the 2012 IRP to 68% of the 2019 IRP Update program. This can be attributed to the significant effort Halifax Water has allocated to the development of formal asset management plans that are updated annually. This includes complete inventory of all assets, improved attribution of age, material and size, and initiation of condition assessments for some asset classes. In addition, the preparation of the 2019 Infrastructure Master Plan identified increased asset renewal requirements for water infrastructure. This works has enabled an update of the 2019 IRP driver allocation.
- The 2012 IRP program has significant peaks in expenditure related to WWTF upgrades to meet WSER and enhanced overflow program, among other projects. While the 2019 IRP Update program contains the same projects, the program has been smoothed to provide more realistic timing that accounts for project implementation phases such as preliminary design, detailed design and construction.

1.6.3 2019 IRP Update Timeline of Key Projects and Programs

Figure 13 and Figure 14 present a timeline to provide an overview of the total IRP program and highlights the key water, wastewater and stormwater infrastructure projects, studies and programs that are recommended for the next 30 years.



**FIGURE 13 - WATER INFRASTRUCTURE
INTEGRATED RESOURCE PLAN TIMELINE 2019-2048**

**Total Water Infrastructure
Expenditure: \$1.5B**

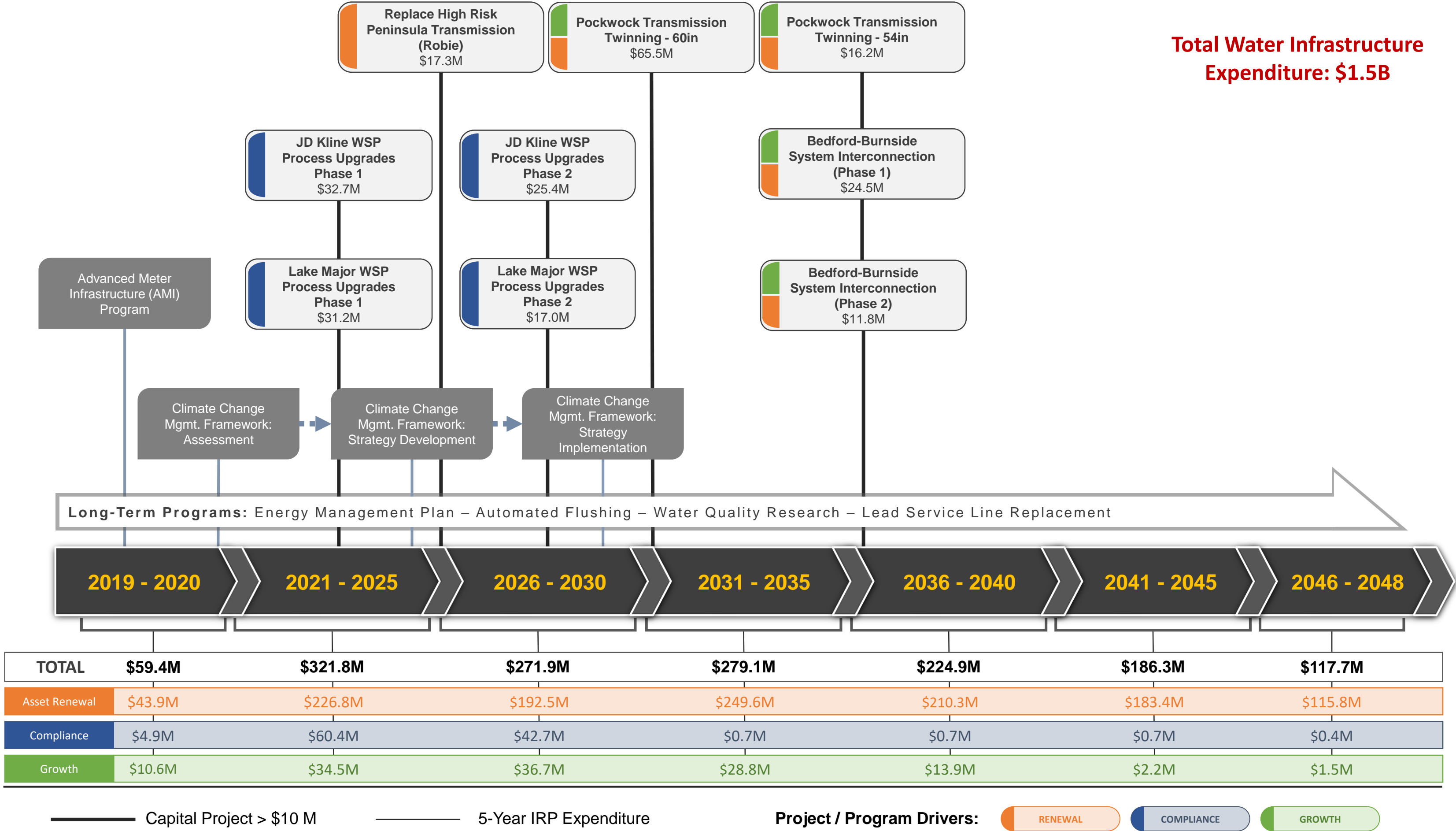
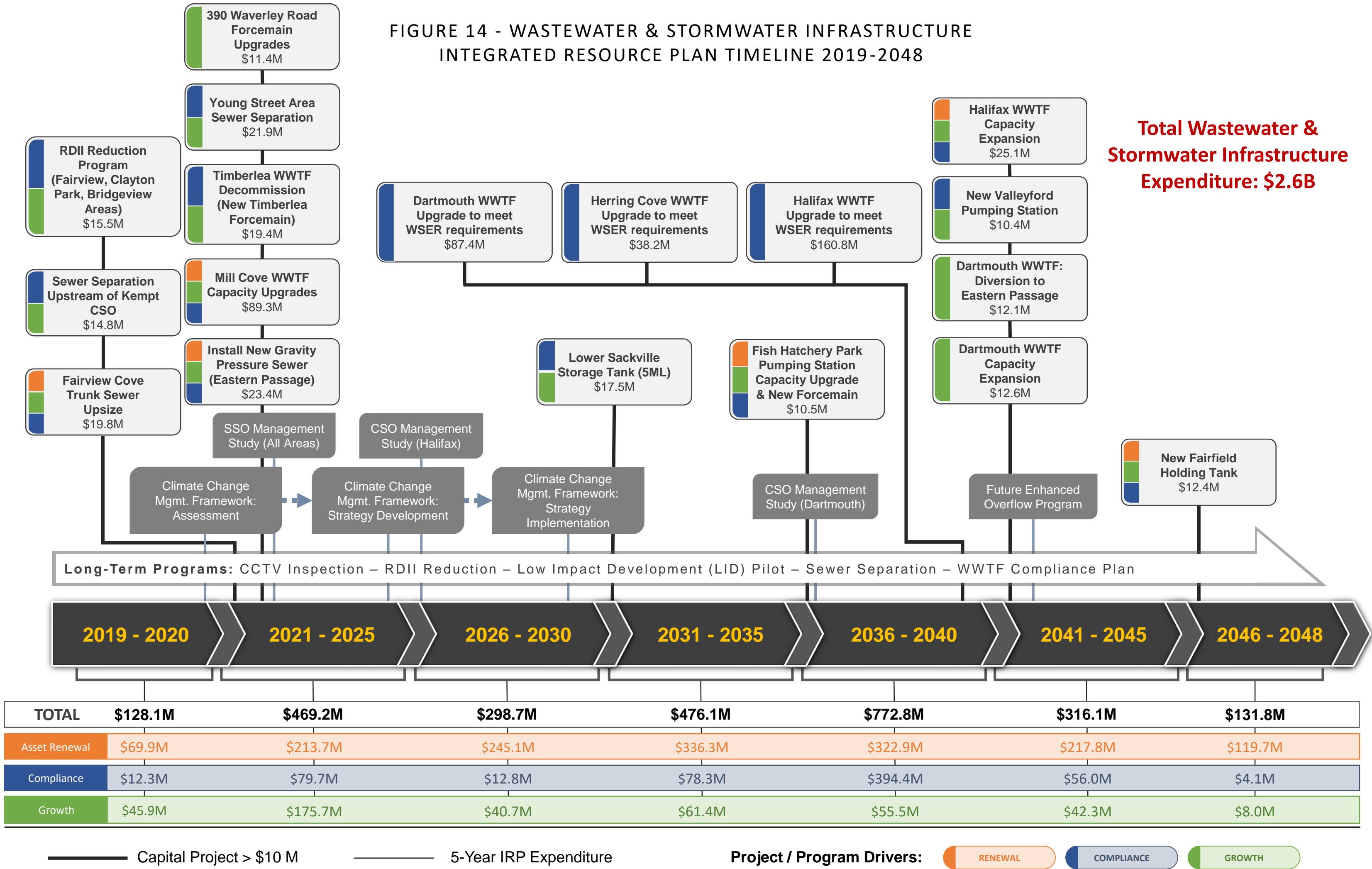


FIGURE 14 - WASTEWATER & STORMWATER INFRASTRUCTURE
INTEGRATED RESOURCE PLAN TIMELINE 2019-2048

Total Wastewater & Stormwater Infrastructure Expenditure: \$2.6B



1.6.4 2019 IRP Long-Term Capital Plan Tables

The 2019 IRP Long-Term Capital Plan is presented in detail attached to the end of the Executive Summary. The LTCP contains project descriptions, estimated total cost, proposed year in service, source of project/program, drivers, drivers split allocation and objectives.

1.6.5 Integrated Resource Plan Strategy to Achieve Objectives

The projects and studies that form the Integrated Resource Plan program evidence the intent of Halifax Water to achieve each of the 14 Integrated Resource Plan objectives (Section 1.5.1).

Every project and study contained in the Integrated Resource Plan program table has been assessed to identify which Objective(s) the project or study helps to achieve. Where a project addresses multiple objectives, the association was ranked to identify the primary, secondary and tertiary objective to which the project applies.

The analysis was completed to support the identification of strengths and weaknesses in the program, helping to identify additional recommendations to achieve progress towards the objectives. The ring chart below (Figure 15) shows graphically the projects that address each objective. The colours show which objective group (compliance, renewal, growth) the specific objectives belong to.



Figure 15 – Ring Chart showing the relative number of projects and studies that address the Integrated Resource Plan objectives.



The results of the analysis can be summarized as follows:

- The three drivers of Growth, Renewal and Compliance are all adequately addressed by the Integrated Resource Plan Program.
- Objectives 5, 8, 9 and 12 have minimal projects aimed at addressing them:
 - Objective 5 Meet future drinking water compliance: recommend that scope be included in the next iteration of the Compliance Plan to assess potential future scenarios and level of preparedness.
 - Objective 8 Meet future stormwater quality compliance: a study review is recommended to identify future possible scenarios.
 - Objective 9 Ensure planning and sizing of infrastructure considers the impact of climate change: an implementation plan is recommended (see Section 1.6.5.1) to ensure attainment this objective.
 - Objective 12 Reduce energy consumption, operating costs and GHG contributions: Associated with the Climate Change implementation plan it is recommended that an assessment be completed to assess GHG contributions and potential for reduction. The current Energy Management Strategy is recommended to be updated.

Table 4 outlines the approach to meet each of the 14 objectives, highlighting only the key actions required.

Table 4 – Integrated Resource Plan Key Actions to Achieve Objectives

Objective	Key Integrated Resource Plan Components
1. Meet or exceed current Nova Scotia Environment WWTF Permit to Operate Requirements	Implement Compliance Plan and Infrastructure Master Plan Project recommendations.
2. Meet or exceed current Nova Scotia Environment WSP Permit to Operate	Fully compliant. Continue review through the Compliance Plan, Water Quality Master Plan and Infrastructure Master Plan updates.
3. Meet Current Overflow Compliance (Monitor and Report)	Fully compliant with current requirements. Maintain up to date hydraulic model with 5 year Infrastructure Master Plan updates. Implement CSO flow monitoring program.
4. Meet or exceed Future WWTF Compliance	Implement Infrastructure Master Plan WWTF expansion projects (Dartmouth, Halifax and Mill Cove). Implement compliance plan projects to ensure compliance with future WSER requirements.
5. Meet or exceed future drinking water compliance	Implement Infrastructure Master Plan and Compliance Plan projects. Complete review of future scenarios.
6. Meet future overflow compliance	Complete Infrastructure Master Plan CSO and SSO Management Plan studies and Identify discharge frequency and volume targets for CSO's. Implement Infrastructure Master Plan I/I reduction projects considering pre and post CSO discharge impact assessment.
7. Endeavour to provide existing systems that are adequately sized to meet Halifax Water Level of Service	Update water hydraulic model in 2020 and update/recalibrate water and wastewater models every 5 years. Complete Stormwater Capacity Evaluation.
8. Meet future stormwater quality compliance	Complete study to review potential future regulatory scenarios.

Objective	Key Integrated Resource Plan Components
9. Ensure planning and sizing of infrastructure considers the impact of climate change	Implement Climate Change framework.
10. Implement optimal level of asset re-investment	Complete condition assessment of water mains, sewers, and vertical facilities to enable condition-based renewal planning.
11. Enhance the reliability, redundancy and security of the water, wastewater and stormwater systems with attention to high risk and critical areas	Implement Water Infrastructure Master Plan preferred strategy, specifically transmission twinning, system interconnections, safe yield and back up supply studies.
12. Reduce energy consumption, operating costs and GHG contributions	Update Energy Management Strategy including the assessment of current GHG generation and establish targets for reduction.
13. Provide regional water, wastewater and stormwater infrastructure needed to support planned growth	Implement Infrastructure Master Plan preferred servicing strategy. Ensure 5-year updates to re-align strategy with updated planning and development information.
14. Manage flow and demand to maximize capacity for growth and minimize the need for new hard infrastructure	Implement I/I and Sewer Separation projects from Infrastructure Master Plan preferred servicing strategy Enhance public education campaigns on water usage and savings.

1.6.5.1 Climate Change

Climate change is a prominent consideration for Halifax Water. Through the Infrastructure Master Plan, a Climate Change Assessment Framework was developed to provide a consistent approach of assessing the threats of climate change on water, wastewater and stormwater infrastructure.

The Infrastructure Master Plan considered climate change throughout the development of the projects and studies that form the preferred servicing alternative. Every infrastructure project was assessed using a design rainfall event that makes an allowance for the predicted increased rainfall intensities.

It is important for Halifax Water to build on these initiatives and begin implementing the framework. The following provides an outline of the recommended implementation plan.

- Climate Change Infrastructure Assessments on Asset Groups – 2020-2023 (4 years)
 1. Water Supply Plants and Dams (AMP A1 and A2)
 2. Wastewater Treatment Facilities (AMP B1), Wastewater Pumping Stations (AMP B2) and Water Chambers and Booster Stations (AMP A3).
 3. Water Reservoirs (AMP A6) and Stormwater Management Structures (AMP C1)
 4. Water Transmission Mains (AMP A4), Distribution Mains (AMP A5), Wastewater Gravity Mains (AMP B3), Wastewater Forcemains (AMP B4), Stormwater Gravity Sewers (AMP C2), Stormwater Cross Culverts (AMP C3)
- Develop Climate Change Action Plans following sequence above – 2024-2027 (4 years)
- Implement Action Plan on Priority Basis – 2028+

It is important to note that Halifax Water takes climate change into consideration on a project by project basis. For instance, projects submitted for funding consideration under the current Investing in Canada Infrastructure Federal Provincial Program require a formal audited review under the “Climate Lens” for Climate change adaptation and mitigation.



1.7 IRP IMPLEMENTATION

The 2019 IRP Update has established a 30-year capital program. It has been identified that an average of \$135M per year is required to address all asset renewal, compliance and growth needs.

The capital program requirement not only requires financial capacity but also resource capacity from the Halifax Water staff, consulting engineering firms, and construction firms.

Halifax Water needs to significantly increase project delivery capacity through both staff increases and project delivery method improvements.

Successful implementation of the 2019 IRP Update recommendations will require the following key steps:

- Elevate critical projects to ensure priorities across all 3 drivers are addressed
- Utilize the 2019 IRP Update capital program as the foundation for yearly capital and operating budgets for Halifax Water
- Undertake additional cash flow analysis for projects to ensure costs and effort are apportioned across the appropriate time period
- Continually increase capital project delivery year over year while at the same time continually increase the Halifax Water project team resources including staff and project management/delivery tools
- Engage the consulting and construction industry in order to support the level of construction needed to meet the infrastructure needs
- Review procurement and project delivery models to ensure allocation of resources is not delayed

1.7.1 Long-Term Planning Study Schedule

In order to ensure future updates of the Integrated Resource Plan continue in an efficient manner it is recommended that the various supporting studies be planned and coordinated so that outputs can be integrated together. Figure 16 provides a study schedule that identifies the critical studies and outlines timing of each to ensure continuity, efficient and timely delivery of outputs. Key components that direct the timing of the studies are as follows:

- Halifax Water commitment to update the Regional Development Charge every 5 years if not triggered earlier due to a 15% variance on the program
- Commitment to RDC stakeholders that project need, costing, design criteria impact are periodically reviewed
- Infrastructure Master Plan Update is required to drive the Regional Development Charge update
- Population planning estimates are required to feed into hydraulic models
- Hydraulic models used in Infrastructure Master Plan updates
- Infrastructure Master Plan updates required to capture/recalibrate starting point and projections and review project need, triggers and phasing
- Key supporting studies are needed to inform the core studies
- Infrastructure planning is not static but dynamic with changing variables and requires iterative updates
- Studies provide exceptional value when they are a tool to better inform how, when and where to spend billions of dollars

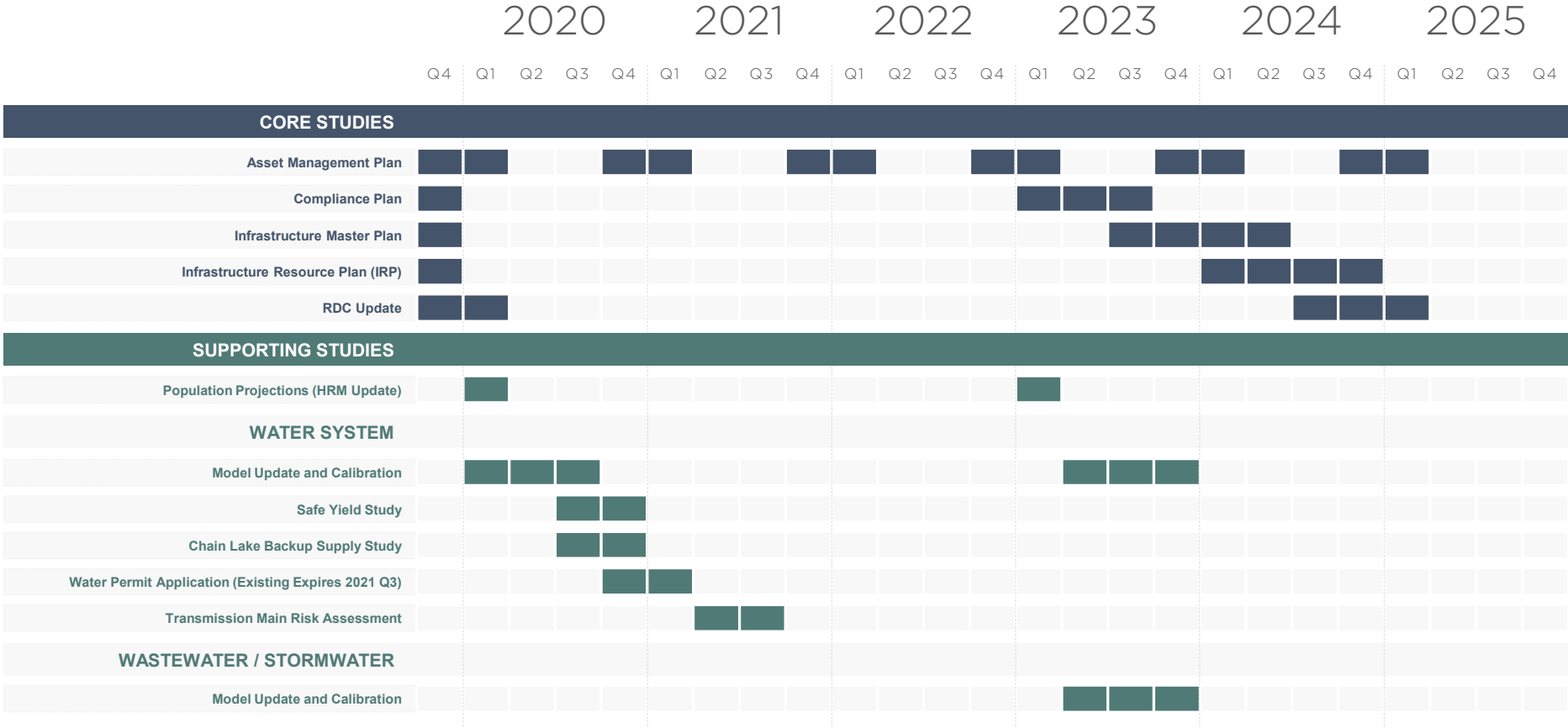


Figure 16 – 5-year Studies Schedule



1.8 IRP RECOMMENDATIONS


Based on the analysis carried out during the development of the 2019 IRP, the following recommendations are presented:

Table 5 – 2019 IRP Recommendations

Stakeholder Outreach and Education	
1.	Continue and enhance public outreach with stakeholders and public to market Halifax Water’s objectives, educate customers and target efficiencies related to water, wastewater and stormwater servicing
2.	Enhanced communication with NSE to ensure current compliance and appropriate future planning of regulatory issues
Implement Programs	
3.	Implement IRP Capital Program - (Water and Wastewater Infrastructure Master Plan, Asset Management Plans and Compliance Plan)
4.	Utilize IRP program and undertake financial modelling, select preferred program and implement
5.	Implement Wet weather management program
6.	Integrate private-side I & I with wet weather management program starting 2020
Data Collection & Tools	
7.	Undertake on-going GIS system build out and data management
8.	Improve asset knowledge base and accuracy through asset management condition assessments and performance <ul style="list-style-type: none"> - Expand pumping station performance assessments for the top 50 largest facilities - Use CCTV information to support the development of a sewer predicted condition model - Use condition and break history to support the development of a watermain predicted condition model
9.	Maintain and update 2019 IRP integrated GIS program tool
10.	Maintain and update water and wastewater hydraulic model development, calibration and build-out <ul style="list-style-type: none"> - 2020 - Water model calibration - 2023 – Water and Wastewater model update
11.	Continue flow monitoring program and analysis <ul style="list-style-type: none"> - 2022 - Implement CSO flow monitoring
12.	Use established Level of Service and asset performance to prioritize data collection
Studies	
13.	Continue wet weather management in coordination with I & I reduction pilots and programs
14.	Complete Water and Wastewater Master Plan Update within 5 years
15.	Complete Asset Management Plan Updates annually <ul style="list-style-type: none"> - Establish renewal program based on condition and performance data rather than age - Prepare project specific AMP’s for large vertical infrastructure e.g. WWTF’s
16.	Complete Compliance Plan Update within 5 years
17.	Complete study of potential future regulatory scenarios for water, wastewater and stormwater
18.	Update the Energy Management Strategy including the assessment of current GHG generation and establish targets for reduction
19.	Update Institutional Capacity Study to align with preferred 2019 IRP program
Cost Estimation	
20.	Undertake an annual review of all unit rates (linear and vertical)

21.	Enhance cost estimating approach for vertical facilities (e.g. pumping stations, storage facilities, treatment plants)
22.	Develop a more detailed approach for complex facilities that include unit rates for subcomponents
23.	Continue benchmarking construction projects
Enhanced HW and HRM Coordination	
24.	Coordinated periodic planning projection updates to establish “best planning estimates” for use in studies to support timing, phasing and allocation decisions for water, wastewater and stormwater infrastructure
25.	Establish predictable timetable to update projections to enable coordinated timing of studies and tool updates
26.	Enhanced sharing of data and planned project information to enable updating, building and use of the GIS integration tool
27.	Enhanced coordinated capital project planning improve ability to align projects
28.	Joint study to explore required steps, viability and impact of enhanced private side I/I reduction and Low Impact Development (LID)
29.	Enhance joint educational/marketing to target efficiencies related to water, wastewater and stormwater servicing
Scheduling/Timing	
30.	Ensure scheduled alignment of integrated studies to better inform and enable review of integrated planning opportunities (e.g. AMP prepared in advance of Master Plans)
31.	Ensure Population projections, hydraulic models, Infrastructure Master Plan and Compliance are updated by 2025
32.	Ensure AMPs are updated Annually





2019 IRP UPDATE
LONG-TERM CAPITAL INFRASTRUCTURE PLAN TABLES



No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
1	Install new twinned gravity pressure sewer (825mm and 450mm)	East	Wastewater - Trunk Sewers	\$23,372,000	2022	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,13,14
2	Connect Beaver Crescent PS and Caldwell PS forcemains to new 450mm gravity pressure sewer	East	Wastewater - Forcemains	\$78,000	2026	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,13,14
3	Install four (4) new pump out stations along gravity pressure sewer	East	Wastewater - Structures	\$1,676,000	2023	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,13,14
4	Install gate valves at surge tank between Bissett Lake Pumping Station and gravity pressure sewer	East	Wastewater - Structures	\$420,000	2026	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,13,14
5	Decommission existing 450mm gravity pressure sewer	East	Wastewater - Trunk Sewers	\$559,000	2043	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,13,14
6	Upgrade Quigley's Corner Pumping Station	East	Wastewater - Structures	\$2,875,000	2022	Master Plan	Asset Renewal - Compliance - Growth	47.5:47.5:5	6,7,9,10,13
7	Optimize operation of Quigley's Corner Pumping Station	East	Wastewater - Structures	\$336,000	2021	Master Plan	Asset Renewal - Compliance - Growth	47.5:47.5:5	7,11,14
8	Upgrade Memorial Drive Pumping Station	East	Wastewater - Structures	\$2,633,000	2031	Master Plan	Asset Renewal - Compliance	50:50	7,9,11
9	Upgrade Beaver Crescent Pumping Station	East	Wastewater - Structures	\$168,000	2036	Master Plan	Asset Renewal - Compliance	50:50	7,9,11
10	Upgrade Bissett Lake Pumping Station	East	Wastewater - Structures	\$2,934,000	2041	Master Plan	Asset Renewal - Compliance - Growth	25:25:50	6,7,9,10,13
11	Upgrade Caldwell Road Pumping Station	East	Wastewater - Structures	\$631,000	2039	Master Plan	Asset Renewal - Growth	25:75	6,7,9,10,13
12	RDII Reduction Program (FMZ23)	East	Wastewater - Collection Sanitary	\$3,204,580	2031	Master Plan	Compliance - Growth	5:95	6,7,9,14
13	RDII Reduction Program (FMZ24)	East	Wastewater - Collection Sanitary	\$1,570,040	2022	Master Plan	Compliance - Growth	5:95	6,7,9,14
14	RDII Reduction Program (FMZ37)	East	Wastewater - Collection Sanitary	\$2,479,704	2022	Master Plan	Compliance - Growth	5:95	6,7,9,14
15	Local network upgrades on Caldwell Road	East	Wastewater - Collection Sanitary	\$607,000	2036	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
16	Local network upgrades on Colby Drive	East	Wastewater - Collection Sanitary	\$1,176,000	2031	Master Plan	Asset Renewal - Compliance	50:50	7,9,10
17	Local network upgrades on Forest Hill Parkway	East	Wastewater - Collection Sanitary	\$4,275,000	2041	Master Plan	Compliance	100	7,9,10
18	Eastern Passage SSO Management Study	East	Wastewater - Collection System	\$484,000	2023	Master Plan	Compliance	100	3,6,9
19	LoWSCA: Canal Street Separation	East	Wastewater - Collection System	\$1,842,000	2022	Master Plan	Compliance - Growth	25:75	7,8,9,13
20	LoWSCA: Wyse Road Separation (Phase 1)	East	Wastewater - Collection System	\$3,860,000	2022	Master Plan	Compliance - Growth	25:75	7,8,9,13
21	LoWSCA: Wyse Road Separation (Phase 2)	East	Wastewater - Collection System	\$2,802,000	2022	Master Plan	Compliance - Growth	75:25	7,8,9,13
22	Additional Sewer Separation on Wyse Street	East	Wastewater - Collection System	\$1,912,000	2031	Master Plan	Compliance - Growth	25:75	6,7,8,9,13
23	Albro Lake Watershed Separation	East	Wastewater - Collection System	\$8,111,000	2022	Master Plan	Compliance - Growth	5:95	6,7,8,9,13
24	Maynard Lake and Clement Street Wetland Separation (Phase 1)	East	Wastewater - Collection System	\$642,000	2025	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,7,8,9,13
25	Maynard Lake and Clement Street Wetland Separation (Phase 2)	East	Wastewater - Collection System	\$4,540,000	2028	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,7,8,9,13
26	Maynard Lake and Clement Street Wetland Separation (Phase 3)	East	Wastewater - Collection System	\$1,155,000	2028	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,7,8,9,13
27	Maynard Lake and Clement Street Wetland Separation (Phase 4)	East	Wastewater - Collection System	\$453,000	2028	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,7,8,9,13
28	New Valleyford Pumping Station	East	Wastewater - Structures	\$10,446,000	2041	Master Plan	Compliance - Growth	75:25	6,7,9,10,13
29	390 Waverley Road Forcemain Upgrades	East	Wastewater - Collection System	\$11,361,000	2022	Master Plan	Growth	100	6,7,9,13,14
30	Anderson Pumping Station Upgrades	East	Wastewater - Structures	\$340,000	2031	Master Plan	Asset Renewal - Compliance	50:50	6,7,9,10
31	Upgrades to Dartmouth WWTF	East	Wastewater - Treatment Facilities	\$12,572,000	2041	Master Plan	Growth	100	4,7,9,10,13
32	RDII Reduction Program (FMZ27)	East	Wastewater - Collection Sanitary	\$5,941,076	2022	Master Plan	Compliance - Growth	25:75	6,7,9,14

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
33	RDII Reduction Program (FMZ45)	East	Wastewater - Collection Sanitary	\$1,120,232	2031	Master Plan	Compliance - Growth	5:95	6,7,9,14
34	Additional flow monitoring	East	Wastewater - Collection Sanitary	\$252,000	2021	Master Plan	Compliance - Growth	90:10	3,9
35	Dartmouth CSO Flow Management Plan	East	Wastewater - Collection System	\$675,000	2036	Master Plan	Compliance - Growth	90:10	3,6,9
36	Green St. Sewer Upsize	East	Wastewater - Collection Sanitary	\$513,000	2041	Master Plan	Asset Renewal - Compliance	50:50	7,9,10
37	Pinecrest Dr. Sewer Upgrade	East	Wastewater - Collection Sanitary	\$1,013,000	2034	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
38	Peddars Way Sewer Upgrade	East	Wastewater - Collection Sanitary	\$555,000	2031	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
39	Atlantic Street Sewer Upgrade	East	Wastewater - Collection Sanitary	\$3,831,000	2026	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	7,9,10,13
40	Akerley Blvd and Railway Alignment Sewer Upgrade	East	Wastewater - Collection Sanitary	\$4,814,000	2041	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
41	Pleasant Street Sewer Upgrade	East	Wastewater - Collection Sanitary	\$767,000	2021	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
42	Princess Margaret Blvd. Sewer Upgrade	East	Wastewater - Collection Sanitary	\$3,106,000	2031	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	7,9,10,13
43	Anderson Lake Development Connection	East	Wastewater - Collection Sanitary	\$7,609,000	2036	Master Plan	Growth	100	9,13
44	Marvin Street Connection to Cuisack CSO	East	Wastewater - Collection Sanitary	\$1,380,000	2026	Master Plan	Compliance - Growth	47.5:47.5:5	6,7,9,14
45	King Street Diversion	East	Wastewater - Collection Sanitary	\$78,000	2026	Master Plan	Compliance - Growth	47.5:47.5:5	6,7,9,14
46	Diversion to Eastern Passage	East	Wastewater - Collection Sanitary	\$12,113,000	2041	Master Plan	Growth	100	6,9,13,14
47	Dartmouth SSO Flow Management Plan	East	Wastewater - Collection Sanitary	\$555,000	2023	Master Plan	Compliance	100	3,6,9
48	Sackville Trunk Sewer Upgrades (1200mm diameter)	Central	Wastewater - Trunk Sewers	\$5,101,000	2041	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
49	Sackville Trunk Sewer Upgrades (1050mm diameter)	Central	Wastewater - Trunk Sewers	\$8,246,000	2041	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	7,9,10,13
50	Sackville Trunk Sewer Upgrades (1500mm diameter)	Central	Wastewater - Trunk Sewers	\$144,000	2041	Master Plan	Asset Renewal - Compliance - Growth	25:25:50	7,9,10,13
51	New 5ML storage tank in Lower Sackville (GoodLife Fitness Sackville Downsview Plaza)	Central	Wastewater - Structures	\$17,469,000	2031	Master Plan	Compliance - Growth	5:95	9,10,13,14
52	Fish Hatchery Park Pumping Station Upgrade	Central	Wastewater - Structures	\$10,529,000	2036	Master Plan	Asset Renewal - Compliance - Growth	25:25:50	6,9,10,13
53	Pumping Station (Beaver Bank #3 PS and Majestic Avenue PS)	Central	Wastewater - Structures	\$1,090,000	2036	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,9,10,13
54	Mill Cove Wastewater Treatment Plant Capacity Upgrade	Central	Wastewater - Treatment Facilities	\$89,256,000	2022	Master Plan	Asset Renewal - Compliance - Growth	25:25:50	1,4,6,9,10,13
55	RDII Reduction Program (FMZ07, FMZ10, & FMZ40)	Central	Wastewater - Collection Sanitary	\$9,288,248	2022	Master Plan	Compliance - Growth	5:95	6,7,9,14
56	RDII Reduction Program (FMZ02 & FMZ03)	Central	Wastewater - Collection Sanitary	\$8,023,065	2031	Master Plan	Compliance - Growth	5:95	6,7,9,14
57	Local network upgrades on Beaver Bank Rd. North on Glendale Dr.	Central	Wastewater - Collection Sanitary	\$2,086,000	2022	Master Plan	Compliance - Growth	75:25	7,9,10
58	Local network upgrades on Beaver Bank Rd. at Galloway Dr.	Central	Wastewater - Collection Sanitary	\$1,490,000	2022	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	7,9,10,13
59	Local network upgrades on Beaver Bank Rd by Windgate Drive	Central	Wastewater - Collection Sanitary	\$1,667,000	2022	Master Plan	Asset Renewal - Compliance - Growth	37.5:37.5:25	7,9,10
60	Local network upgrades on Old Sackville Road south of Harvest Hwy	Central	Wastewater - Collection Sanitary	\$845,000	2036	Master Plan	Asset Renewal - Compliance	50:50	1,7,9,10
61	Local network upgrades on Hallmark Ave.	Central	Wastewater - Collection Sanitary	\$437,000	2036	Master Plan	Asset Renewal - Compliance	50:50	7,9,10
62	Local sewer upgrades on Waterfront Drive	Central	Wastewater - Collection Sanitary	\$500,000	2036	Master Plan	Asset Renewal - Compliance	50:50	7,9,10
63	Springfield Lake Connection to Sackville	Central	Wastewater - Collection Sanitary	\$6,226,000	2043	Master Plan	Compliance - Growth	50:50	1,7,9,13
64	Central Region SSO Management Study	Central	Wastewater - Collection Sanitary	\$1,086,000	2024	Master Plan	Compliance	100	3,6,9

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
65	WRWIP: Spring Garden Area Sewer Separation	West	Wastewater - Collection System	\$7,281,000	2021	Master Plan	Compliance - Growth	50:50	7,8,9,13
66	WRWIP: Young Street Area Sewer Separation	West	Wastewater - Collection System	\$21,879,000	2022	Master Plan	Compliance - Growth	25:75	7,8,9,13
67	WRWIP: Sewer Separation Upstream of Kempt CSO	West	Wastewater - Collection System	\$14,752,000	2021	Master Plan	Compliance - Growth	5:95	7,8,9,13
68	WRWIP: Linear Upsize - Gottingen & Cogswell Area	West	Wastewater - Collection System	\$221,000	2019	Master Plan	Compliance - Growth	5:95	7,9,10,13
69	WRWIP: Young Pumping Station Upgrade	West	Wastewater - Structures	\$2,169,000	2027	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	6,7,9,10,13
70	WRWIP: New Fairfield Holding Tank	West	Wastewater - Structures	\$12,403,000	2046	Master Plan	Asset Renewal - Compliance - Growth	25:25:50	6,7,9,13
71	WRWIP: Replace Armdale Pumping Station Forcemains	West	Wastewater - Forcemains	\$3,850,000	2022	Master Plan	Asset Renewal - Growth	50:50	3,7,9,10,13
72	WRWIP: BLT WWTF Decommission - New Timberlea PS	West	Wastewater - Structures	\$5,928,000	2022	Master Plan	Compliance - Growth	5:95	1,9,13
73	WRWIP: BLT WWTF Decommission - New Timberlea Forcemain	West	Wastewater - Forcemains	\$19,436,000	2022	Master Plan	Compliance - Growth	5:95	1,9,13
74	WRWIP: BLT WWTF Decommission	West	Wastewater - Treatment Facilities	\$500,000	2020	Master Plan	Compliance - Growth	5:95	1,9,13
75	WRWIP: RDII Reduction Program in Fairview, Clayton Park, and Bridgeview areas	West	Wastewater - Collection Sanitary	\$15,491,589	2021	Master Plan	Compliance - Growth	5:95	6,7,9,14
76	WRWIP: BLT Flow Diversion to Herring Cove - New Crown Drive Pumping Station	West	Wastewater - Structures	\$8,063,000	2033	Master Plan	Compliance - Growth	5:95	1,11,13
77	WRWIP: BLT Flow Diversion to Herring Cove - New Crown Drive Forcemain	West	Wastewater - Forcemains	\$9,026,000	2033	Master Plan	Compliance - Growth	5:95	1,11,13
78	WRWIP: BLT Flow Diversion to Herring Cove - New Gravity Sewer	West	Wastewater - Collection Sanitary	\$4,319,000	2033	Master Plan	Compliance - Growth	5:95	1,10,13
79	WRWIP: BLT Flow Diversion to Herring Cove - New Gravity Sewer	West	Wastewater - Collection Sanitary	\$3,266,000	2033	Master Plan	Compliance - Growth	5:95	1,10,13
80	WRWIP: Herring Cove Road - Gravity Sewer Upsize	West	Wastewater - Collection Sanitary	\$7,439,000	2033	Master Plan	Compliance - Growth	5:95	1,7,9,10,13
81	WRWIP: Fairview Cove Linear Upsize	West	Wastewater - Collection Sanitary	\$19,781,000	2021	Master Plan	Asset Renewal - Compliance - Growth	12.5:12.5:75	6,7,9,10,13
82	WRWIP: Halifax Treatment Plant Capacity Upgrade	West	Wastewater - Treatment Facilities	\$25,142,000	2041	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	1,10,13
83	WRWIP: Linear Upgrades within the Kearney Lake Road Area	West	Wastewater - Collection Sanitary	\$2,997,000	2033	Master Plan	Asset Renewal - Compliance - Growth	2.5:2.5:95	7,9,10,13
84	Infrastructure Master Plan: West Region CSO Management Study	West	Wastewater - Collection Sanitary	\$965,000	2026	Master Plan	Compliance - Growth	90:10	3,6,9
85	Infrastructure Master Plan: West Region SSO Management Study	West	Wastewater - Collection Sanitary	\$415,000	2023	Master Plan	Compliance	100	3,6,9
86	Chain Control Transmission - Existing Peninsula Low Upsize	West	Water - Transmission	\$3,841,000	2022	Master Plan	Asset Renewal - Growth	25:75	10,13
87	Chain Control Transmission - Existing Peninsula Intermediate Upsize	West	Water - Transmission	\$2,650,000	2022	Master Plan	Asset Renewal - Growth	25:75	1,10,13
88	Pepperell Transmission Upsize	West	Water - Distribution	\$2,702,000	2036	Master Plan	Asset Renewal - Growth	25:75	10,13
89	Chain Control Transmission - Existing Peninsula Low Lining	West	Water - Transmission	\$2,916,000	2036	Master Plan	Asset Renewal - Growth	25:75	10,13
90	Chain Control Transmission - Valve Chambers	West	Water - Structures	\$1,258,000	2036	Master Plan	Asset Renewal - Growth	25:75	10,13
91	Replace High Risk Peninsula Transmission (Robie)	West	Water - Transmission	\$17,312,000	2026	Master Plan	Asset Renewal	100	11
92	Peninsula Intermediate Looping - Quinpool Rd to Young St	West	Water - Distribution	\$4,319,000	2022	Master Plan	Asset Renewal - Growth	25:75	10,13
93	Young St. Watermain Upsize	West	Water - Distribution	\$1,315,000	2026	Master Plan	Asset Renewal - Growth	25:75	10,13
94	Robie St. Watermain Upsize	West	Water - Distribution	\$956,000	2026	Master Plan	Asset Renewal - Growth	25:75	10,13
95	Almon St. Watermain Upsize	West	Water - Distribution	\$1,168,000	2026	Master Plan	Asset Renewal - Growth	25:75	10,13
96	Windsor St. Watermain Upsize	West	Water - Distribution	\$1,004,000	2026	Master Plan	Asset Renewal - Growth	25:75	10,13

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
97	Geizer 158 to Lakeside High Watermain Looping	West	Water - Distribution	\$2,249,000	2028	Master Plan	Asset Renewal	100	11
98	Gravity Supply to Brunello	West	Water - Distribution	\$2,328,000	2041	Master Plan	Asset Renewal	100	10,12
99	Dominion Cres. Watermain Upsize	West	Water - Distribution	\$447,000	2041	Master Plan	Asset Renewal	100	10
100	Brunello Booster Pump Upgrades	West	Water - Structures	\$236,000	2021	Master Plan	Asset Renewal	100	10
101	Geizer 158 Looping - Lacewood Dr	West	Water - Distribution	\$2,002,000	2041	Master Plan	Asset Renewal	100	10
102	Geizer Hill Booster Pump Upgrades	West	Water - Structures	\$277,000	2021	Master Plan	Asset Renewal	100	10
103	Leiblin Booster Fire Pump	West	Water - Structures	\$395,000	2019	Master Plan	Asset Renewal	100	10
104	Herring Cove Rd. Watermain Twinning	West	Water - Distribution	\$3,585,000	2022	Master Plan	Asset Renewal	100	11
105	St. Michaels Ave. Watermain Upsize	West	Water - Distribution	\$502,000	2041	Master Plan	Asset Renewal	100	11
106	Herring Cove Rd. Watermain Looping - McIntosh St	West	Water - Distribution	\$2,272,000	2022	Master Plan	Asset Renewal	100	11
107	Lucasville Rd. Twinning (Phase 1)	Central	Water - Distribution	\$8,117,000	2019	Master Plan	Growth	100	13
108	Lucasville Rd. Twinning (Phase 2)	Central	Water - Distribution	\$8,956,000	2026	Master Plan	Growth	100	13
109	New Primary Feed to Sackville High	Central	Water - Distribution	\$4,953,000	2026	Master Plan	Growth	100	13
110	New Sackville Beaver Bank Valve Chamber	Central	Water - Structures	\$839,000	2026	Master Plan	Growth	100	13
111	Reconfiguration of Beaver Bank Booster	Central	Water - Structures	\$100,000	2041	Master Plan	Asset Renewal	100	10,12
112	New Sackville High PRV	Central	Water - Structures	\$420,000	2036	Master Plan	Growth	100	13
113	Cobequid High Looping	Central	Water - Distribution	\$2,233,000	2026	Master Plan	Asset Renewal - Growth	25:75	11,13
114	Windgate Dr. Watermain Upsize	Central	Water - Distribution	\$882,000	2026	Master Plan	Asset Renewal - Growth	25:75	11,13
115	Lively Booster Pump Upgrades	Central	Water - Structures	\$38,000	2036	Master Plan	Asset Renewal	100	10
116	New Hemlock Elevated Tank	West	Water - Structures	\$6,209,000	2022	Master Plan	Asset Renewal - Growth	59:41	10,13
117	Pockwock Transmission Loop through Bedford	Central	Water - Distribution	\$5,069,000	2025	Master Plan	Asset Renewal	100	11
118	Second Geizer 158 Feed	West	Water - Distribution	\$9,612,000	2041	Master Plan	Asset Renewal	100	11
119	New Main Street to Caledonia Road Connection	East	Water - Distribution	\$3,072,000	2022	Master Plan	Asset Renewal	100	11
120	Caledonia Rd. Watermain Twinning	East	Water - Distribution	\$3,429,000	2022	Master Plan	Asset Renewal	100	11
121	New Breeze Dr. Watermain	East	Water - Distribution	\$5,801,000	2022	Master Plan	Asset Renewal	100	11
122	Highway 118 Crossing - Shubie Park to Dartmouth Crossing	East	Water - Distribution	\$6,063,000	2025	Master Plan	Asset Renewal	100	11
123	Windmill Rd. Watermain Upsize	East	Water - Distribution	\$6,104,000	2030	Master Plan	Asset Renewal - Growth	25:75	10,13
124	New Woodside Industrial Park Feed	East	Water - Distribution	\$1,649,000	2025	Master Plan	Asset Renewal	100	10
125	Willowdale to Eastern Passage Connection	East	Water - Distribution	\$6,290,000	2036	Master Plan	Asset Renewal	100	11
126	Tacoma PRV Chamber	East	Water - Structures	\$420,000	2020	Master Plan	Asset Renewal	100	10
127	Pockwock Transmission Twinning - 60in	West	Water - Transmission	\$65,516,000	2031	Master Plan	Asset Renewal - Growth	63:37	11
128	Pockwock Transmission Twinning - 54in	West	Water - Transmission	\$16,228,000	2036	Master Plan	Asset Renewal - Growth	63:37	11

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
129	Extension to Springfield Lake	Central	Water - Distribution	\$3,043,000	2043	Master Plan	Asset Renewal	100	7,10,13
130	Bedford-Burnside System Interconnection (Phase 1)	All	Water - Distribution	\$24,499,000	2036	Master Plan	Asset Renewal - Growth	53:47	9,11,13
131	Bedford-Burnside System Interconnection (Phase 2)	All	Water - Distribution	\$11,779,000	2036	Master Plan	Asset Renewal - Growth	53:47	9,11,13
132	Lyle Emergency Booster Upgrade	East	Water - Structures	\$1,045,000	2026	Master Plan	Asset Renewal - Growth	53:47	11
133	Valving for Central Intermediate Boundary Change	East	Water - Structures	\$629,000	2026	Master Plan	Asset Renewal - Growth	53:47	11
134	Extension of Fall River to Bennery Lake (Phase 1)	East	Water - Distribution	\$8,067,000	2026	Master Plan	Asset Renewal - Growth	26:74	9,11,13
135	Extension of Fall River to Bennery Lake (Phase 2)	East	Water - Distribution	\$9,156,000	2026	Master Plan	Asset Renewal - Growth	26:74	9,11,13
136	Extension of Fall River to Bennery Lake (PS)	East	Water - Structures	\$1,310,000	2026	Master Plan	Asset Renewal - Growth	26:74	9,11,13
137	Decommission Miller Lake WTP - Linear	East	Water - Distribution	\$628,000	2019	Master Plan	Asset Renewal	100	10,12
138	Decommission Miller Lake WTP	East	Water - Treatment Facilities	\$61,000	2019	Master Plan	Asset Renewal	100	10,12
139	Decommission Collins Park WTP - Linear	East	Water - Distribution	\$1,086,000	2041	Master Plan	Asset Renewal	100	10,12
140	Decommission Collins Park WTP	East	Water - Treatment Facilities	\$168,000	2041	Master Plan	Asset Renewal	100	10,12
141	Decommission Silversands WTP - Linear	East	Water - Distribution	\$1,931,000	2041	Master Plan	Asset Renewal	100	10,12
142	Decommission Silversands WTP	East	Water - Treatment Facilities	\$168,000	2041	Master Plan	Asset Renewal	100	10,12
143	Chain Lake Backup Supply Study	West	Water - Transmission	\$50,000	2020	Master Plan	Asset Renewal - Growth	50:50	2,5,11,13
144	Mt. Edward Booster Fire Pump Study	East	Water - Structures	\$50,000	2019	Master Plan	Asset Renewal - Growth	50:50	10,13
145	New Orchard Control Chamber Study	West	Water - Structures	\$50,000	2021	Master Plan	Asset Renewal - Growth	50:50	10,13
146	Robie Emergency Booster Study	West	Water - Structures	\$50,000	2041	Master Plan	Asset Renewal - Growth	50:50	10,13
147	Safe Yield Study	All	Water - Treatment Facilities	\$100,000	2020	Master Plan	Compliance - Growth	50:50	2,5,13
148	New Hydraulic Water Model (InfoWater)	All	Water - Corporate Projects	\$200,000	2020	Master Plan	Asset Renewal - Growth	50:50	9,10,12,13
149	Comprehensive PRV Study	All	Water - Structures	\$50,000	2019	Master Plan	Asset Renewal - Growth	50:50	10,12,13
150	Transmission Main Risk Assessment and Prioritization Framework	All	Water - Transmission	\$50,000	2020	Master Plan	Asset Renewal - Growth	50:50	10,13
151	Tomahawk Lake Supply Study	Central	Water - Treatment Facilities	\$50,000	2036	Master Plan	Compliance - Growth	50:50	2,5,7,9,13
152	Aerotech Storage	Central	Water - Structures	\$4,752,000	2022	Master Plan	Asset Renewal - Growth	20:80	2,10,13
153	Water Supply Plants (A1) - Asset Renewal	All	Water - Treatment Facilities	\$230,428,000	2019-2048	AMPs	Asset Renewal	100	2,10
154	Water Supply Dams (A2) - Asset Renewal	All	Water - Structures	\$8,345,000	2019-2048	AMPs	Asset Renewal	100	2,10
155	Water Chambers and Booster Stations (A3) - Asset Renewal	All	Water - Structures	\$25,164,682	2019-2048	AMPs	Asset Renewal	100	10
156	Water Transmission Mains (A4) - Asset Renewal	All	Water - Transmission	\$269,144,527	2019-2048	AMPs	Asset Renewal	100	10
157	Water Distribution Mains (A5) - Asset Renewal	All	Water - Distribution	\$301,734,210	2019-2048	AMPs	Asset Renewal	100	10
158	Water Reservoirs (A6) - Asset Renewal	All	Water - Structures	\$32,249,015	2019-2048	AMPs	Asset Renewal	100	10,11
159	Wastewater Treatment Facilities (B1) - Asset Renewal	All	Wastewater - Treatment Facilities	\$373,129,278	2019-2048	AMPs	Asset Renewal	100	10
160	Wastewater Pumping Stations (B2) - Asset Renewal	All	Wastewater - Structures	\$337,852,112	2019-2048	AMPs	Asset Renewal	100	10

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
161	Wastewater Gravity Sewers (B3) - Asset Renewal	All	Wastewater - Collection System	\$248,764,304	2019-2048	AMPs	Asset Renewal	100	10
162	Forcemains (B4) - Asset Renewal	All	Wastewater - Forcemains	\$48,139,079	2019-2048	AMPs	Asset Renewal	100	10
163	Stormwater Management Structures (C1) - Asset Renewal	All	Stormwater - Structures	\$10,538,402	2019-2048	AMPs	Asset Renewal	100	10
164	Stormwater Gravity Sewers (C2) - Asset Renewal	All	Stormwater - Pipes	\$162,116,838	2019-2048	AMPs	Asset Renewal	100	7,10
165	Stormwater Cross Culverts (C3) - Asset Renewal	All	Stormwater - Culverts/Ditches	\$65,229,942	2019-2048	AMPs	Asset Renewal	100	7,10
166	Driveway Culvert (C4) - Asset Renewal	All	Stormwater - Culverts/Ditches	\$25,500,000	2019-2048	AMPs	Asset Renewal	100	7,10
167	JD Kline WSP - Process Upgrades - PH 1	West	Water - Treatment Facilities	\$32,660,000	2020-2025	Compliance Plan	Compliance	100	2
168	JD Kline WSP - Process Upgrades - PH 2	West	Water - Treatment Facilities	\$25,440,000	2025-2028	Compliance Plan	Compliance	100	2
169	Lake Major WSP - Process Upgrades - PH 1	East	Water - Treatment Facilities	\$31,163,000	2020-2024	Compliance Plan	Compliance	100	2
170	Lake Major WSP - Process Upgrades - PH 2	East	Water - Treatment Facilities	\$16,960,000	2027-2030	Compliance Plan	Compliance	100	2
171	Halifax WWTF - Preliminary Treatment	West	Wastewater - Treatment Facilities	\$1,950,000	2022	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
172	Halifax WWTF - Coagulant Dosing System	West	Wastewater - Treatment Facilities	\$135,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
173	Halifax WWTF - Polymer Dosing System	West	Wastewater - Treatment Facilities	\$39,500	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
174	Halifax WWTF - Hydraulic Balancing Improvements	West	Wastewater - Treatment Facilities	\$395,000	2019	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
175	Halifax WWTF - Disinfection Upgrades	West	Wastewater - Treatment Facilities	\$850,000	2023	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
176	Halifax WWTF - UV System Level Controls	West	Wastewater - Treatment Facilities	\$385,000	2023	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
177	Halifax WWTF - Solids Handling	West	Wastewater - Treatment Facilities	\$935,000	2021	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
178	Halifax WWTF - Odour Control - Activated Carbon Reactors	West	Wastewater - Treatment Facilities	\$275,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
179	Halifax WWTF - Ballasted Flocculation Upgrades	West	Wastewater - Treatment Facilities	\$4,070,000	2029	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
180	Halifax WWTF - Upgrade to secondary treatment / optimize advance primary treatment	West	Wastewater - Treatment Facilities	\$160,750,000	2040	Compliance Plan	Compliance	100	1,4
181	Dartmouth WWTF - Preliminary Treatment	East	Wastewater - Treatment Facilities	\$1,785,000	2022	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
182	Dartmouth WWTF - Coagulant Dosing System	East	Wastewater - Treatment Facilities	\$120,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
183	Dartmouth WWTF - Polymer Dosing System	East	Wastewater - Treatment Facilities	\$25,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
184	Dartmouth WWTF - Hydraulic Balancing Improvements	East	Wastewater - Treatment Facilities	\$335,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
185	Dartmouth WWTF - Disinfection Upgrades	East	Wastewater - Treatment Facilities	\$775,000	2021	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
186	Dartmouth WWTF - UV System Level Controls	East	Wastewater - Treatment Facilities	\$325,000	2023	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
187	Dartmouth WWTF - Solids Handling	East	Wastewater - Treatment Facilities	\$735,000	2023	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
188	Dartmouth WWTF - Ballasted Flocculation Upgrades	East	Wastewater - Treatment Facilities	\$3,800,000	2029	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
189	Dartmouth WWTF - Upgrade to secondary treatment / optimize advance primary treatment	East	Wastewater - Treatment Facilities	\$87,400,000	2038	Compliance Plan	Compliance	100	1,4
190	Herring Cove - Preliminary Treatment	West	Wastewater - Treatment Facilities	\$1,020,000	2022	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
191	Herring Cove - UV System Level Controls	West	Wastewater - Treatment Facilities	\$300,000	2023	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
192	Herring Cove - Odour Control - Activated Carbon Reactors	West	Wastewater - Treatment Facilities	\$165,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
193	Herring Cove - Ballasted Flocculation Upgrades	West	Wastewater - Treatment Facilities	\$3,265,000	2025	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
194	Herring Cove - Upgrade to secondary treatment / optimize advance primary treatment	West	Wastewater - Treatment Facilities	\$38,200,000	2039	Compliance Plan	Compliance	100	1,4
195	Lakeside-Timberlea WWTF - Improve Plant Hydraulics	West	Wastewater - Treatment Facilities	\$25,000	2020	Compliance Plan	Asset Renewal - Compliance	50:50	1,10
196	Wet Weather Management Program	All	Wastewater - Corporate Projects	\$7,250,000	2020-2048	Compliance Plan	Asset Renewal - Compliance - Growth	33:33:33	3,6,9,10,14
197	Armdale CSO Screening	West	Wastewater - Collection System	\$3,000,000	2025	Compliance Plan	Compliance	100	6,7
198	Quinpool Road CSO Screening	East	Wastewater - Collection System	\$3,000,000	2025	Compliance Plan	Compliance	100	6,7
199	Coburg Road CSO Screening	West	Wastewater - Collection System	\$3,000,000	2025	Compliance Plan	Compliance	100	6,7
200	South Street CSO Screening	West	Wastewater - Collection System	\$3,000,000	2025	Compliance Plan	Compliance	100	6,7
201	Beaufort CSO Screening	West	Wastewater - Collection System	\$3,000,000	2025	Compliance Plan	Compliance	100	6,7
202	Automated Flushing Program	All	Water - Distribution	\$580,000	2020-2048	Compliance Plan	Compliance	100	3
203	Corporate Flow Monitoring Program	All	Wastewater - Corporate Projects	\$51,060,000	2019-2048	Compliance Plan	Compliance - Growth	50:50	3,6,13
204	I&I Reduction (SIR) Program Flow Meters and Related Equipment	All	Wastewater - Equipment	\$750,000	2019-2048	Compliance Plan	Compliance	100	3,6,14
205	Watershed Land Acquisition	All	Water - Land	\$3,000,000	2019-2048	Compliance Plan	Compliance	100	5
206	Future Overflow Compliance Program (Enhanced Overflow Program - 10 overflows per year at B&C receiving waters)	All	Wastewater - Collection System	\$198,889,474	2042	Compliance Plan	Compliance	100	6,9
207	Bio-Solids Facility Upgrades	All	Wastewater - Treatment Facilities	\$10,000,000	2023	Compliance Plan	Compliance	100	1,4
208	Regional Development Charge Studies W	All	Water - Corporate Projects	\$425,000	2019,+5...,2048	Corporate Projects	Growth	100	13,14
209	Regional Development Charge Studies WW	All	Wastewater - Corporate Projects	\$425,000	2019,+5...,2048	Corporate Projects	Growth	100	13,14
210	Water System Master Plan Update	All	Water - Corporate Projects	\$4,500,000	2023,+5...,2048	Corporate Projects	Growth	100	7,8,10,13,14
211	Wastewater System Master Plan Update	All	Wastewater - Corporate Projects	\$4,500,000	2023,+5...,2048	Corporate Projects	Growth	100	7,8,10,13,14
212	IT Projects - Water	All	Water - Corporate Projects	\$102,767,500	2019-2048	Corporate Projects	Asset Renewal	100	10
213	IT Projects - Wastewater	All	Wastewater - Corporate Projects	\$82,214,000	2019-2048	Corporate Projects	Asset Renewal	100	10
214	IT Projects - Stormwater	All	Stormwater - Corporate Projects	\$20,778,500	2019-2048	Corporate Projects	Asset Renewal	100	10
215	GIS Projects - Water	All	Water - Corporate Projects	\$10,050,000	2019-2048	Corporate Projects	Asset Renewal	100	10,11
216	GIS Projects - Wastewater	All	Wastewater - Corporate Projects	\$8,215,000	2019-2048	Corporate Projects	Asset Renewal	100	10,11
217	GIS Projects - Stormwater	All	Stormwater - Corporate Projects	\$2,385,000	2019-2048	Corporate Projects	Asset Renewal	100	10,11
218	Asset Management Projects - Water	All	Water - Corporate Projects	\$3,275,000	2019-2048	Corporate Projects	Asset Renewal	100	10,11
219	Asset Management Projects - Wastewater	All	Wastewater - Corporate Projects	\$9,552,500	2019-2048	Corporate Projects	Asset Renewal	100	10,11
220	Asset Management Projects - Stormwater	All	Stormwater - Corporate Projects	\$5,382,500	2019-2048	Corporate Projects	Asset Renewal	100	10,11
221	Facility Projects - Water	All	Water - Corporate Projects	\$20,750,000	2019-2048	Corporate Projects	Asset Renewal	100	10
222	Facility Projects - Wastewater	All	Wastewater - Corporate Projects	\$16,600,000	2019-2048	Corporate Projects	Asset Renewal	100	10
223	Facility Projects - Stormwater	All	Stormwater - Corporate Projects	\$4,150,000	2019-2048	Corporate Projects	Asset Renewal	100	10
224	SCADA & Other Equipment - Water	All	Water - Corporate Projects	\$10,283,500	2019-2048	Corporate Projects	Asset Renewal	100	10

No.	Project Name	Region	Asset Group	Total Cost (\$2019)	Year in Service	Source of Program/Project	Driver	Driver Allocation (%)	Objectives
225	SCADA & Other Equipment - Wastewater	All	Wastewater - Corporate Projects	\$10,016,800	2019-2048	Corporate Projects	Asset Renewal	100	10
226	SCADA & Other Equipment - Stormwater	All	Stormwater - Corporate Projects	\$79,200	2019-2048	Corporate Projects	Asset Renewal	100	10
227	Fleet Upgrade Program - Water	All	Water - Corporate Projects	\$14,091,000	2019-2048	Corporate Projects	Asset Renewal - Growth	50:50	10
228	Fleet Upgrade Program - Wastewater	All	Wastewater - Corporate Projects	\$30,972,000	2019-2048	Corporate Projects	Asset Renewal - Growth	50:50	10
229	Fleet Upgrade Program - Stormwater	All	Stormwater - Corporate Projects	\$8,993,000	2019-2023	Corporate Projects	Asset Renewal - Growth	50:50	10
230	Integrated Resource Plan W	All	Water - Corporate Projects	\$1,250,000	2024,+5...,2048	Corporate Projects	Asset Renewal - Compliance - Growth	33:33:33	2,5,7,9,10,11,12,13,14
231	Integrated Resource Plan WW	All	Wastewater - Corporate Projects	\$1,000,000	2024,+5...,2048	Corporate Projects	Asset Renewal - Compliance - Growth	33:33:33	1,3,4,6,7,9,10,11,12,13,14
232	Integrated Resource Plan SW	All	Stormwater - Corporate Projects	\$250,000	2024,+5...,2048	Corporate Projects	Asset Renewal - Compliance - Growth	33:33:33	7,8,9,10,11,13,14
233	Climate Change Adaptation - Water	All	Water - Corporate Projects	\$250,000	2020-2026	Corporate Projects	Asset Renewal - Compliance	20:80	9,12
234	Climate Change Adaptation - Wastewater	All	Wastewater - Corporate Projects	\$240,000	2020-2026	Corporate Projects	Asset Renewal - Compliance	20:80	9,12
235	Climate Change Adaptation - Stormwater	All	Stormwater - Corporate Projects	\$210,000	2020-2026	Corporate Projects	Asset Renewal - Compliance	20:80	9,12
236	Energy Management Capital Program (Water)	All	Water - Energy	\$1,200,000	2021-2023	Corporate Projects	Asset Renewal	100	9,12
237	Energy Management Capital Program (Wastewater)	All	Wastewater - Energy	\$14,500,000	2020-2048	Corporate Projects	Asset Renewal	100	9,12
238	Lead Service Line Replacement Program	All	Water - Distribution	\$30,000,000	2019-2048	Corporate Projects	Asset Renewal - Compliance	100	5,10
239	CCC Various - Water	All	Water - Distribution	\$555,000	2019-2023	Corporate Projects	Growth	100	13
240	CCC Various - Wastewater	All	Wastewater - Collection System	\$7,305,000	2019-2020, 2022-2023	Corporate Projects	Growth	100	13
Total Cost (\$2019)				\$4,053,662,397					