



Integrated Resource Plan

December 14, 2011



Technical Conference 3



Today's Meeting

- Introduction, Background and Purpose
- Resource Plan Components
- Open Discussion
- Break
- IRP Programs and Projects
- Building Resource Plans
- Resource Plan Evaluation
- Lunch
- Open Discussion
- Next Steps

Integrated Resource Plan (IRP) Overview

- An Integrated Resource Plan (IRP) is a comprehensive planning method that:
 - Uses a long-term planning horizon
 - Recognizes environmental constraints
 - Includes stakeholder participation
 - Assesses supply-side & demand-side management options
 - Uses scenario analysis
 - Conducts least cost financial analysis on scenarios that fulfill the performance requirements
 - Recommends a preferred plan

Integrated Resource Plan (IRP) Overview

- The purpose of the IRP is to create:
 - Method for evaluating alternative servicing scenarios
 - Long-term direction for Halifax Water
 - Comprehensive assessment of system & investment options
 - Framework for detailed capital investment analysis (more detailed will be done as capital needs are budgeted and approvals requested)
 - Risk management plans for issues & key uncertainties facing Halifax Water
 - Confidence in financial analysis in support of future rate applications to the NSUARB

IRP Scope

- IRP will address infrastructure within Halifax Water's mandate
 - Water system
 - Wastewater system
 - Stormwater system
- IRP scheduled for completion by June 2012

IRP Stakeholder Process

- **Technical Conferences**

- Terms of Reference March 24, 2011
- Assumptions & Plan Considerations October 4, 2011
- Resource Plans & Sensitivities December 14, 2011
- Resource Plan Analysis March 6, 2012*
- Present Draft IRP May 9, 2012*

- **One-on-One Stakeholder Meetings**

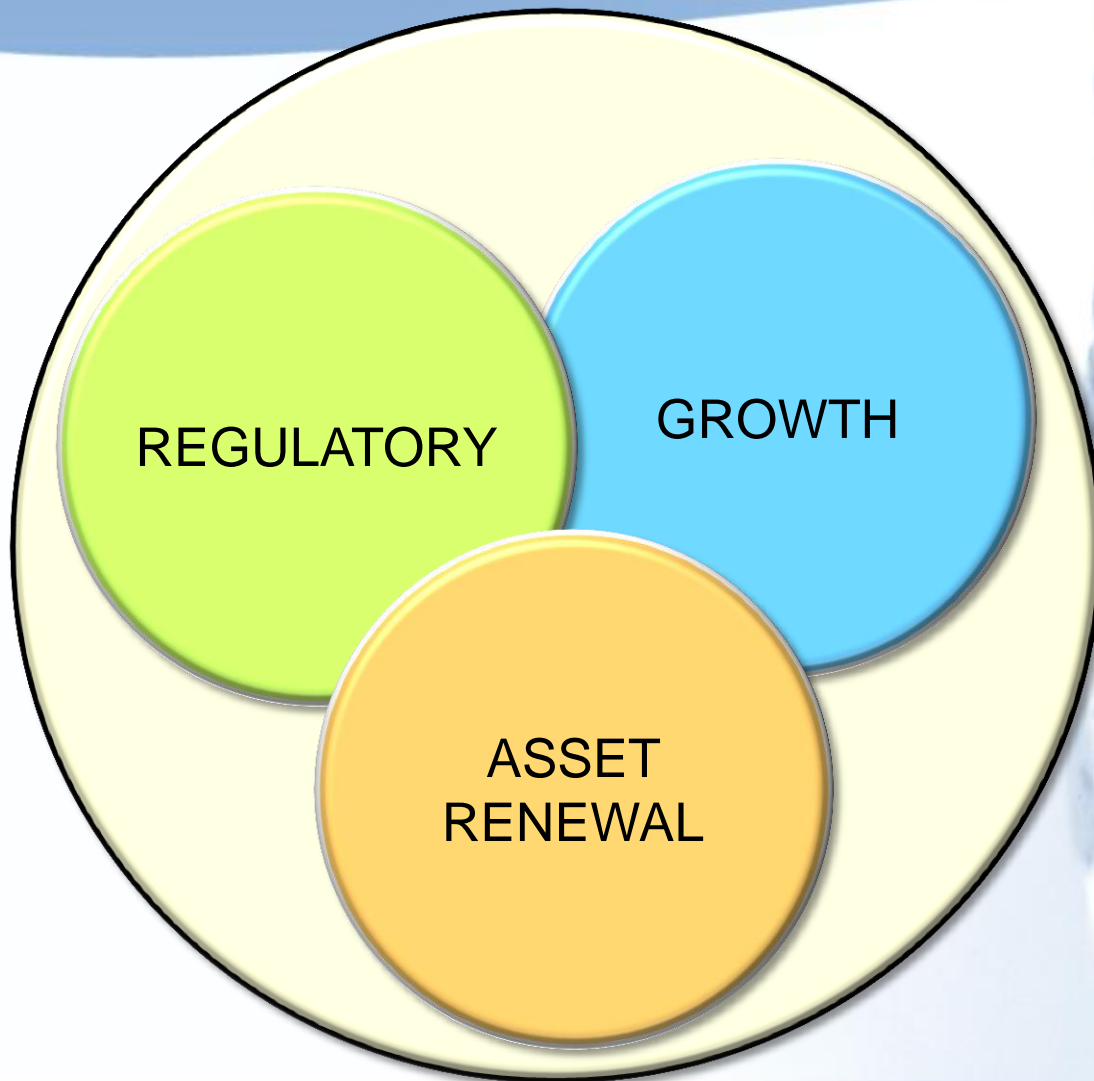
- Early identification of issues

* tentative

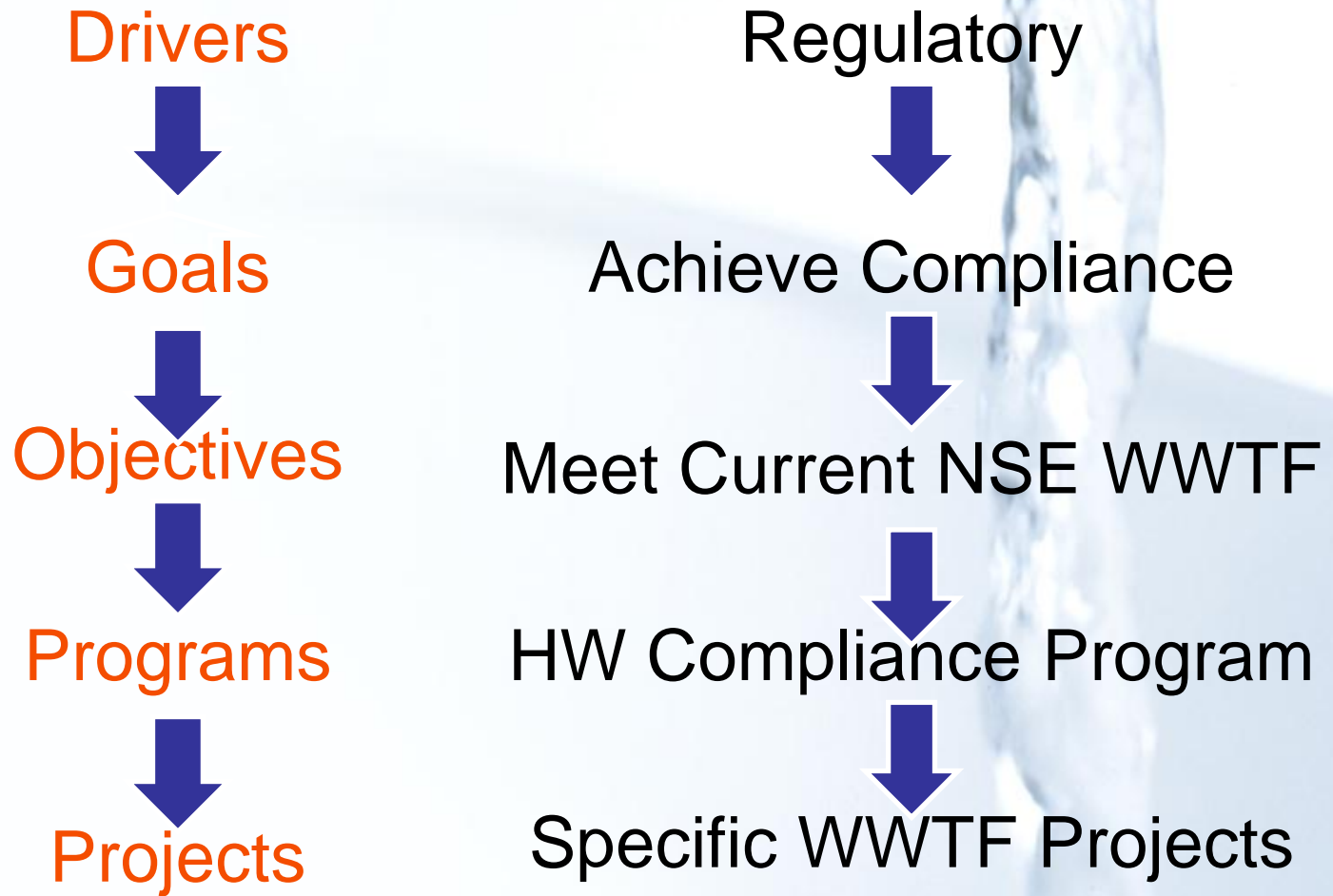


Resource Plan Components

▶ IRP Integrates Three Drivers



▶ Goals, Objectives, Programs and Projects



Program Metrics

- Program Metrics are the specific yardsticks used to track the success of programs and projects
- They include existing Halifax Water Level of Service statements.
- They also include measures that could be incorporated into future Levels of Service



Objective 1 - Meet Current NSE WWTF Permit To Operate Requirements

- Issues: A number of HW's WWTF are out of compliance with current NSE permits to operate. These represent an immediate priority for HW and are anticipated in HW's Wastewater Treatment Facility (WWTF) Compliance Plan.
- Variations: For purposes of the IRP, three time horizons are under consideration: short (3 years); medium (5 years); long (7 years)
- Metrics/LOS: Current Permit to Operate effluent requirements



Objective 2 - Meet Current NSE WSP Permit To Operate Requirements

- Issues: Presently, HW has no compliance concerns with the the WSPs. As a Level of Service, HW will continue to meet the current NSE WSP permit to operate requirements.
- Variations: For purposes of the IRP, only continued compliance is under consideration.
- Metrics/LOS: Current permit to operate finished/distributed water quality requirements



Objective 3 - Meet Current Overflow Compliance Requirements

- Issues: HW will develop programs based on current requirements for overflow compliance. HW will prioritize overflow abatement needs using a risk-based approach that recognizes risk to public health and sensitivity of the receiving water.
- Variations: For purposes of the IRP, three time horizons are under consideration: short (10 years); medium (20 years); long (30 years)



Objective 3 - Meet Current Overflow Compliance Requirements Cont'd

- Metrics/LOS:
 - Number of monitored active overflows
 - Number of screened active overflows
 - Number of sites with dry weather overflows
 - Frequency of overflows at active overflow sites
 - Overall wastewater facility capacity utilization



Objective 4 - Meet Future WWTF Effluent Requirements

- Issues: HW will need to respond to future WWTF effluent requirements.
 - CCME will require minimum secondary level treatment for all WWTFs.
 - Reduce nutrient and toxics discharges particularly to sensitive receiving water environments.
- Variations: Two time horizons are considered for CCME compliance: medium (20 years) and long (30 years).
- Nutrient management will likely be required earlier. For the IRP, three time horizons are considered: short (10 years), medium (20 years); and long (30 years).
- Toxics will be considered over long time line (30 years).



Objective 4 - Meet Future WWTF Effluent Requirements Cont'd

- Metrics/LOS:
 - Future effluent requirements for secondary treatment
 - Future effluent requirements for enhanced nutrient removal
 - Future effluent requirements for enhanced toxics removal



Objective 5 - Meet Future NSE/Health Canada Drinking Water Quality Rqmts

- Issues: HW has been monitoring and reporting the drinking water quality parameters: residual chlorine, trihalomethanes (THM), haloacetic acid (HAA), particle removal and corrosion control (lead).
- HW has a Water Quality Master Plan intended to ensure compliance with emerging water quality requirements. Most of the future requirements are already being met.
- Variations: Implementing the Water Quality Master Plan may be achieved under three time horizons: short (3 years), medium (5 years), or long (7 years).
- Metrics/LOS: Enhanced drinking water quality standards.



Objective 6 - Meet Future Overflow Regulations

- Issues: HW currently is required to monitor and report on combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and WWTF bypasses.
- HW will likely need to reduce the volume and frequency of CSOs and WWTF bypasses to marine waters and "virtually" eliminate SSOs (i.e. eliminate SSOs for a 1:5 year event) and WWTF bypasses made to fresh waters
- Disinfection of CSOs may be a future requirement.



Objective 6 - Meet Future Overflow Regulations Cont'd

- Variations: For purposes of the IRP:
- I/I program and virtually eliminating SSOs is expected to have a short (10 years), medium (20 years) or long (30 years) implementation horizon.
- Eliminating the WWTF by-passes would likely be implemented over the short (10 years) or medium (20 years) time frame depending on discharge location.
- Reducing CSOs is expected to have a minimum long term (30 years) implementation horizon (this recognizes that this may take a very long time i.e. > 50 years to achieve).



Objective 6 - Meet Future Overflow Regulations Cont'd

- Metrics/LOS:
 - CSO frequency e.g. events per year or season
 - WWTF bypass frequency in wet weather
 - SSO frequency e.g. frequency of occurrence based on 1:5 year design storm



Objective 7 - Meet Future Stormwater Quality Compliance Requirements

- Issues: HW anticipates new regulations will be forthcoming for stormwater quality.
- HW's responsibility for stormwater quality issues will need to be clarified.
- Variations: This will be a requirement of any alternative Integrated Resource Plan with an assumed implementation time line of 30 years.
- Metrics/LOS: Stormwater treatment requirements based on technology e.g. BMPs and/or water quality



Objective 8 - Establish Optimal Level Of Asset Reinvestment (All Asset Classes)

- Issues: HW has a history of underfunding for wastewater and stormwater assets.
- Water assets have seen reinvestment rates around 0.6% per year on average (wastewater and stormwater assets to a lesser degree).
- In order to ensure sustainable management of HW's assets, an optimal level of reinvestment must be established.
- Level of investment will differ depending on the asset class – not all assets have the same asset life.



Objective 8 – Implement Optimal Level Of Asset Reinvestment (All Asset Classes)

- Variations: Three levels of asset reinvestment per year are contemplated:
 - Minimum – Point assets: (assuming 20% extension of asset life and defined by $1 / 1.2 \times$ asset life); Network assets: (asset age will increase somewhat over time)
 - Moderate – Point assets: (assuming the asset life and defined by $1 / 1 \times$ asset life); Network assets: (age of assets will remain constant over time)
 - Aggressive – Point assets: (assuming accelerated replacement by 20% and defined by $1 / 0.8 \times$ asset life); Network assets: (age of assets will decrease over time)
- Metrics/LOS: Asset risk profile



Objective 9 – Enhance Reliability of Critical Assets

- Issues: HW has critical assets that provide services either to critical industries or to population at large.
- The loss of these assets in service can be catastrophic to the needs of the community as well as causing potential environmental impacts.
- Variations: For purposes of the IRP, three time horizons are under consideration: short (10 years); medium (15 years); and long (20 years).
- Metrics/LOS: Reduction in asset risk failure

▶ Objective 10 – Ensure Ex. Storm Systems Adequately Sized to Convey Minor Storm

- Issues: HW has inherited storm systems with unknown design parameters and historically, stormwater may not have been adequately controlled.
- There may be segments of the storm system that are not properly sized for their intended function.
- Variations: None. This will be a requirement of any alternative Resource Plan with an assumed implementation time line of 10 years.
 - Note this is for the identification of future capital projects for storm system capacity upgrades – these would be phased over the longer term & can be considered as a variable in future IRPs.
- Metrics/LOS: Number storm system capacity upgrade projects identified

Objective 11 – Adapt to Future Climate Change

- Issues: HW will need to ensure that its water, wastewater and stormwater infrastructure systems are sufficiently resilient to adapt to the impacts of climate change.
- Changes in climate may result in sea rise, extreme sea surge, modified precipitation as well as changes in temperature patterns.
- Variations: This will be a requirement of any alternative Resource Plan with an assumed implementation time line of 20 years.

Objective 11 – Adapt to Future Climate Change

- Variations: Subject to identification of storm system capacity constraints in Objective 10, there may be a future phasing requirement for projects and these variations can be considered in future IRPs.
- Metrics/LOS: System resilience measured by ability to mitigate future climate change impacts

Objective 12 - Reduce Energy Consumption, Operating Costs & Greenhouse Gases

- Issues: HW is facing significant increases in power costs due to rate increases, increasing costs of fuel sources, and more intensive treatment processes.
- Opportunities to reduce and offset energy/fuel consumption need to be explored.
- Variations: For the IRP, the energy efficiency implementation is planned under three time horizons: short (5 years), medium (7 years), or long (10 years).
- Metrics/LOS:
 - Number of pumping stations optimized, eliminated or consolidated.
 - Return on investment from energy savings.



Objective 13 - Provide Regional Infrastructure To Support Planned Growth

- Issues: Generally, growth will pay for itself.
- HW will respond to and comment on growth through the Regional Plan process and ongoing development applications.
- Where Regional infrastructure is needed to support planned growth, it will be prioritized in HW's capital program.
- Variations: This will be a requirement of any alternative Integrated Resource Plan.
- Metrics/LOS: Timely expansion to permit continued growth.



Objective 14 - Manage Flow Capacity Allocations

- Issues: HW will monitor and manage system flows to identify capacity constraint areas and required works to mitigate the constraints.
- Variations: This will be a requirement of any alternative Integrated Resource Plan.
- Metrics/LOS:
 - Reduction in required infrastructure capacity due to water conservation and I/I reduction programs
 - Timely flow management to permit continued approved growth.



Break



Resource Plan Programs and Projects

Regulatory Programs and Projects

- For purposes of the IRP the following regulatory programs and projects have been identified:
 - WSP future compliance – Implementation of Water Quality Master Plan upgrade projects
 - WWTF current compliance – Implementation of WWTF Compliance Plan projects
 - WWTF future requirements – Implementation of secondary treatment at Harbour Solutions WWTFs
 - Future nutrient requirements at WWTFs discharging to limited capacity receiving waters

Regulatory Programs and Projects

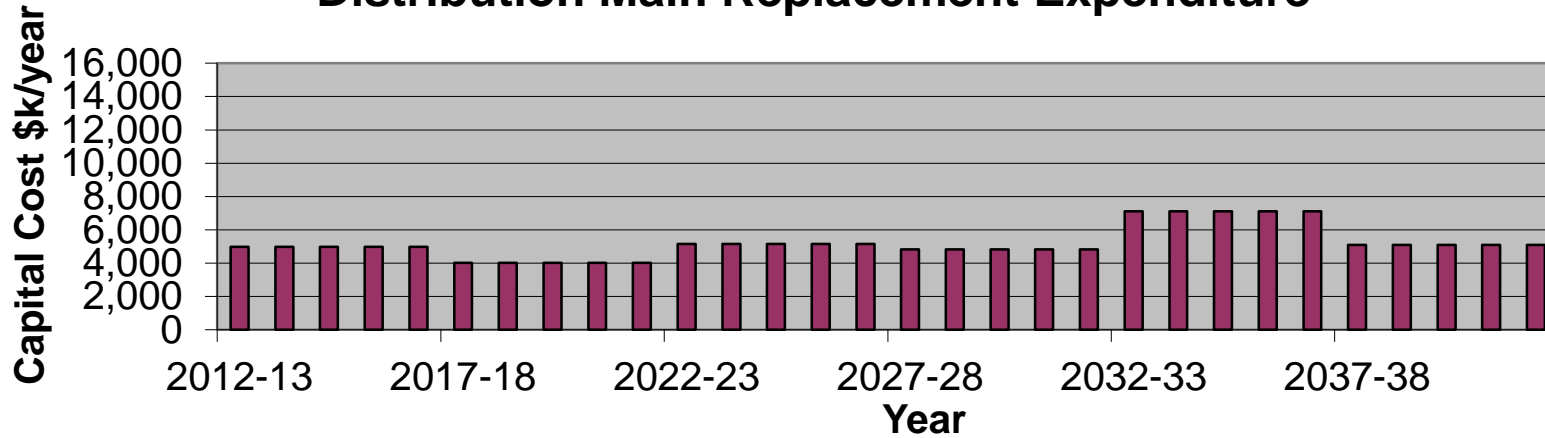
- For purposes of the IRP the following regulatory programs and projects have been identified:
 - Future toxics requirements at WWTFs discharging to limited capacity receiving waters
 - Future reduction of CSO discharges – Projects will be determined through Regional Wastewater Functional Plan (RWWFP)
 - Future reduction of SSO discharges – Projects will be determined through RWWFP
 - Future reduction of WWTF bypasses – Projects will be determined through RWWFP

Asset Renewal Programs and Projects

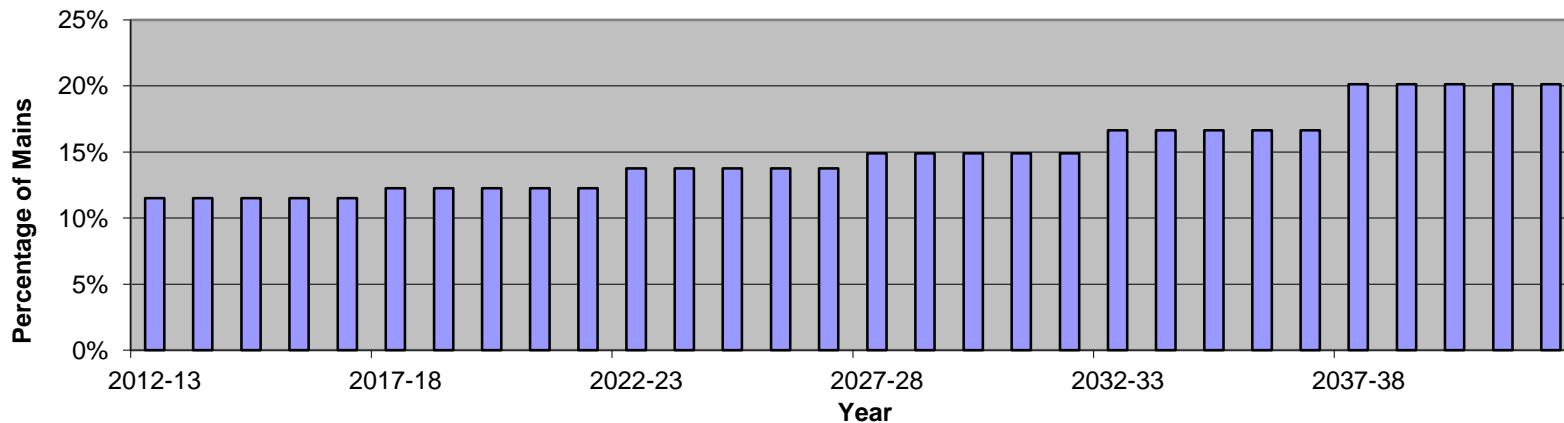
- HW has ongoing asset renewal program with specific expenditures (projects) identified 5 years or more
- Under the IRP, the existing asset renewal program will be incorporated into the total asset management program
- Forecast IRP expenditures will be a combination of specific project and program costs consistent with the overall asset renewal annual allocation
- Three rates of asset renewal have assumed: Aggressive, Moderate, Minimum

▶ Water Main Replacement – Minimum Rate

Distribution Main Replacement Expenditure

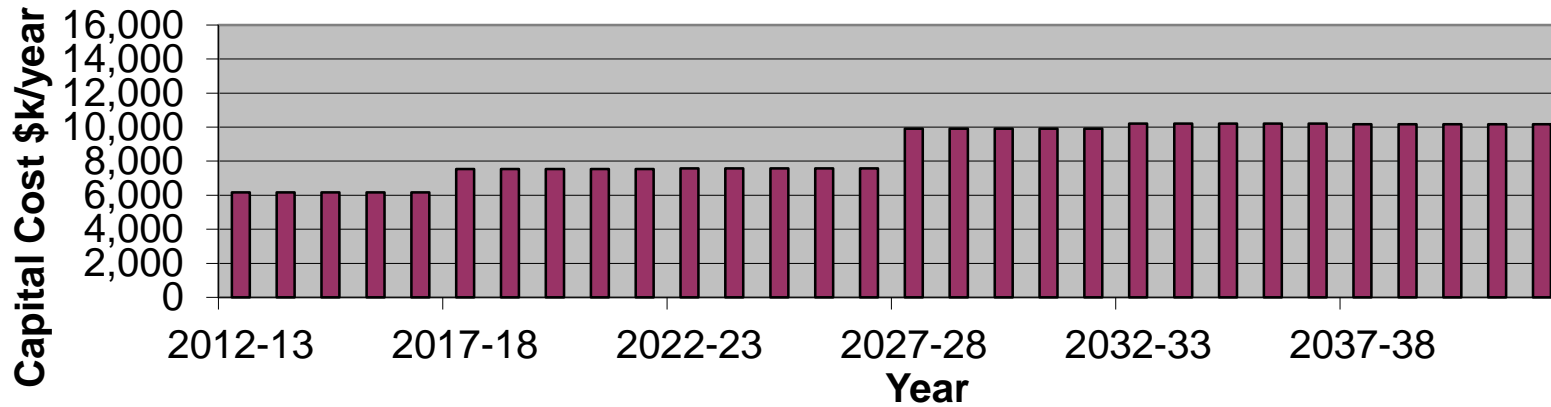


Mains Older than Useful Life

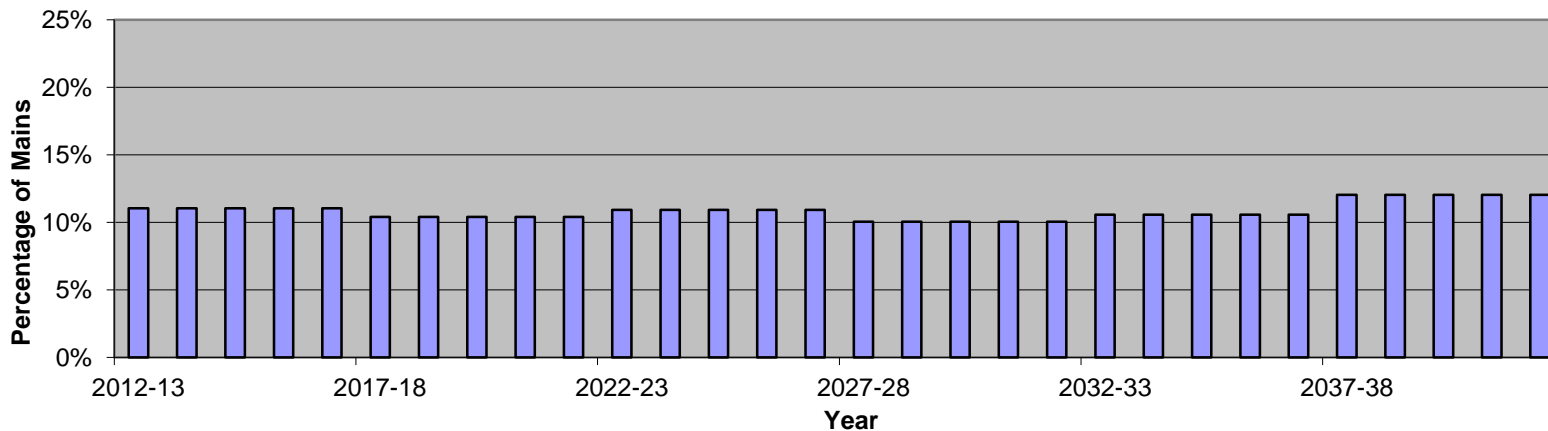


▶ Water Main Replacement – Moderate Rate

Distribution Main Replacement Expenditure

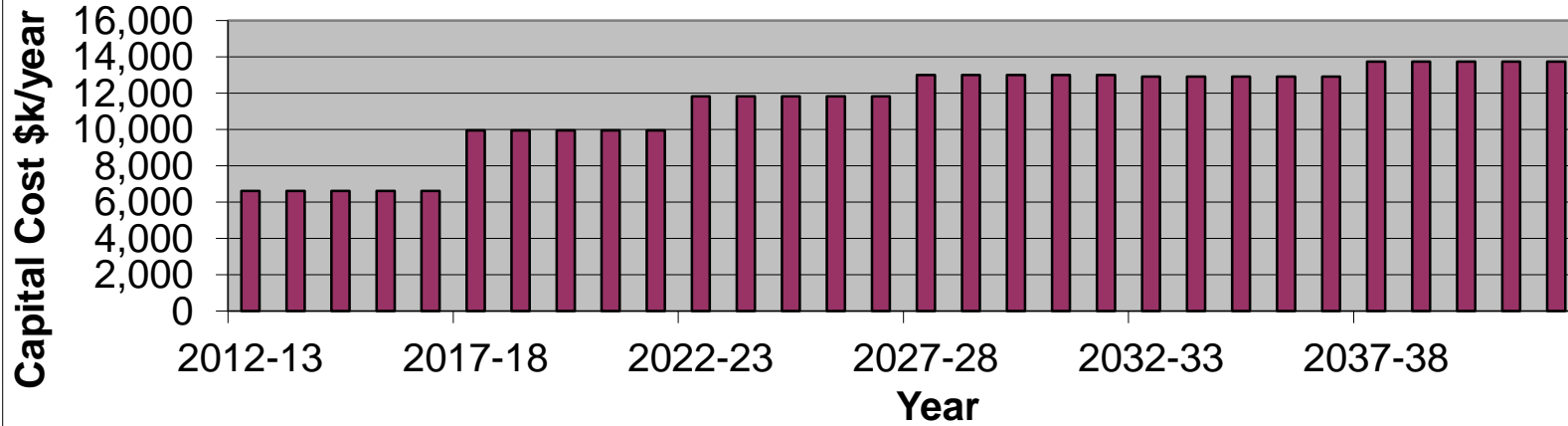


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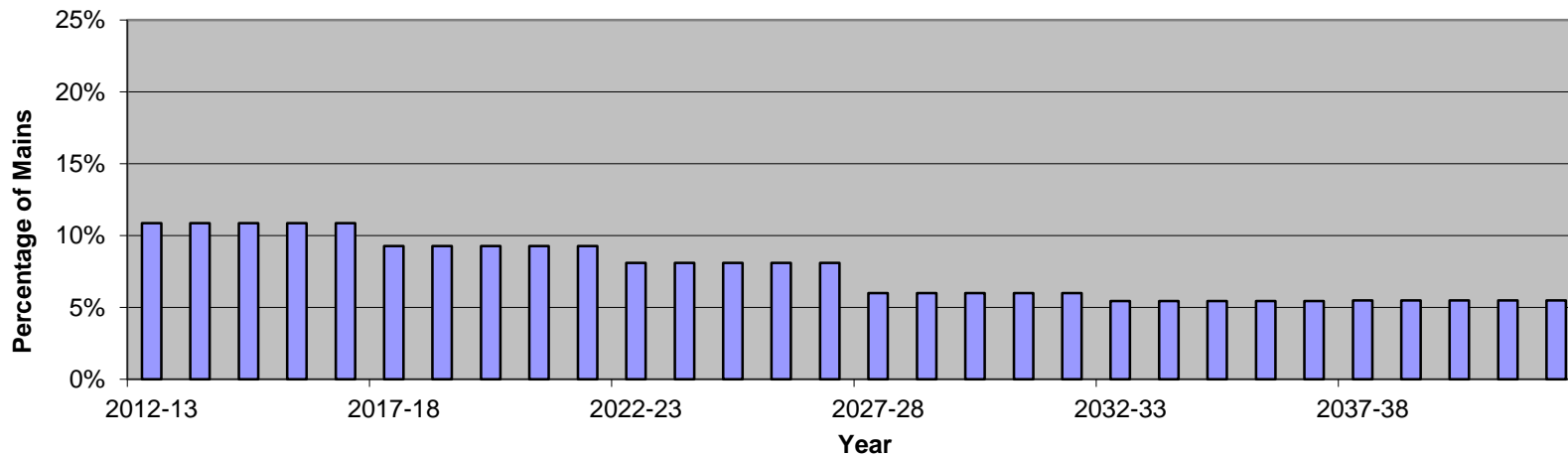


▶ Water Main Replacement – Aggressive Rate

Distribution Main Replacement Expenditure



Mains Older than Useful Life



Growth Related Programs and Projects

- For purposes of the IRP it has been assumed that Halifax will experience a baseline or medium growth rate over the 30 year planning period
- Growth related projects will be required to extend and expand infrastructure
- Sensitivity analysis will be used to assess the impact of low and high growth rates and demand reduction on growth related requirements
- An example of growth driven projects is the need to expand WWTFs

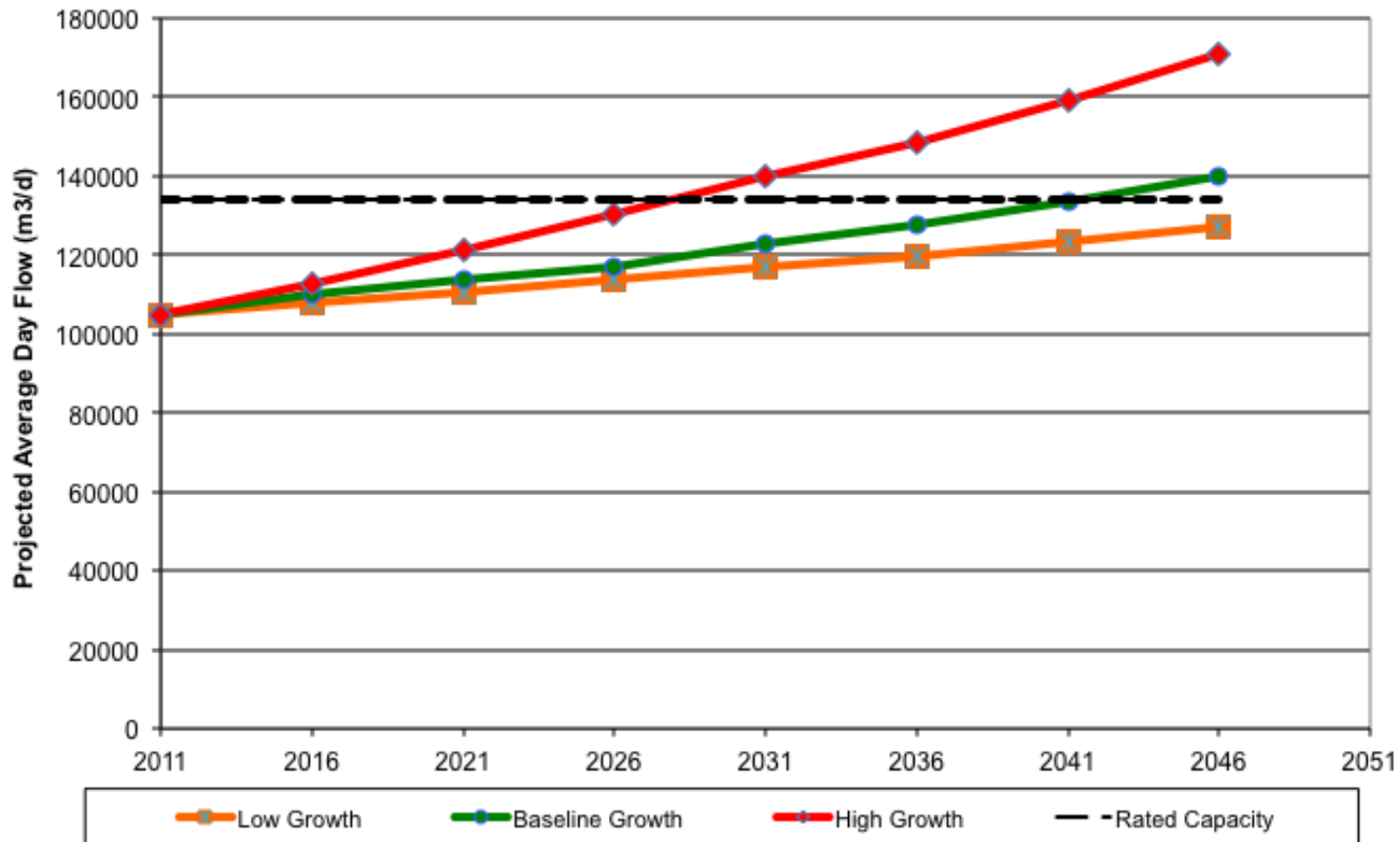
HRM Growth Outlook to 2041

Scenario	% Growth Residential	Increase Population	Increase Employment Area (ha)
Low	0.47	100,536	456
Baseline	0.81	137,760	597
High	1.14	210,792	759

Growth projections based on HRM Planning and Altus Group (2009)

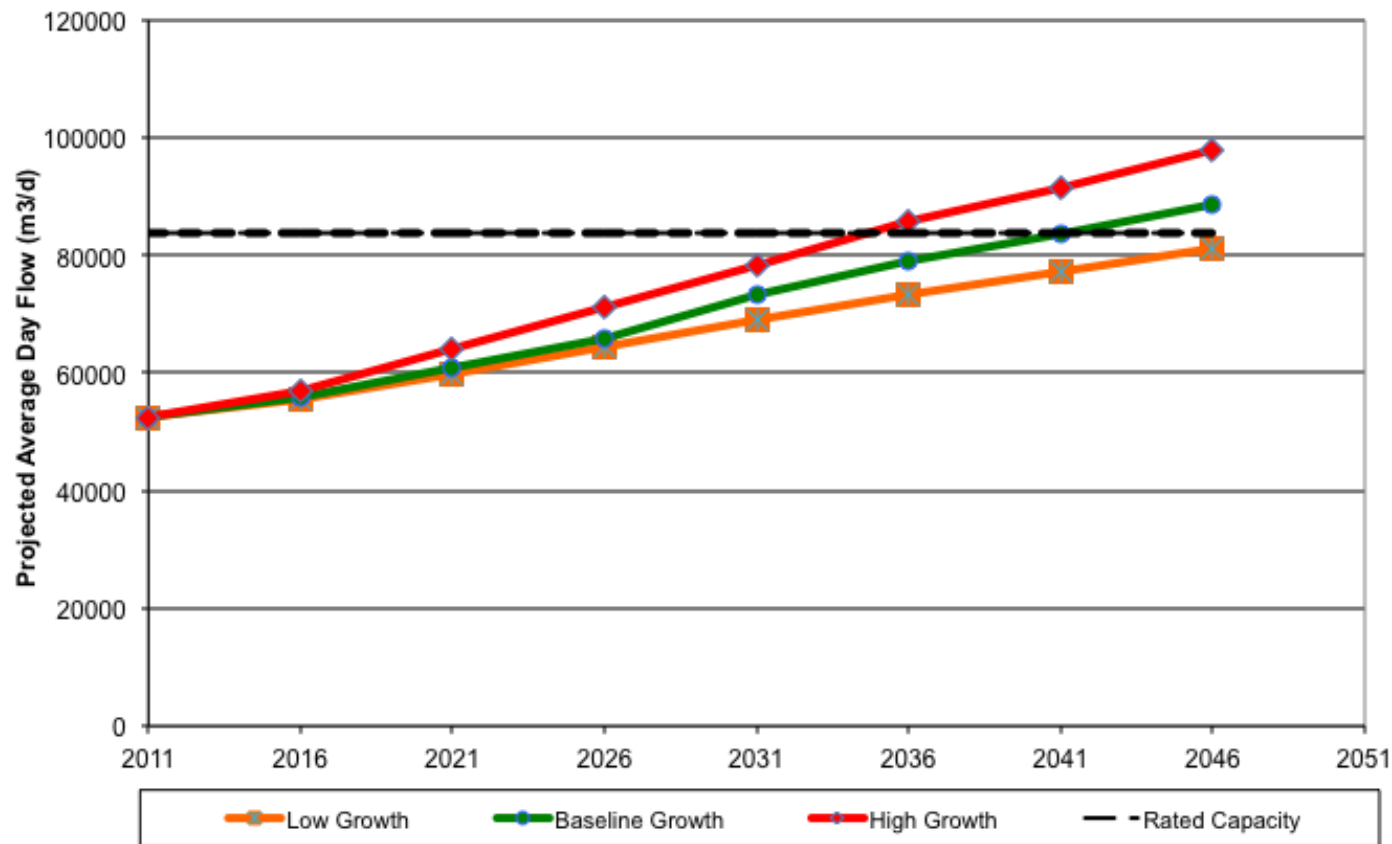


Influence of Growth on Halifax WWTF



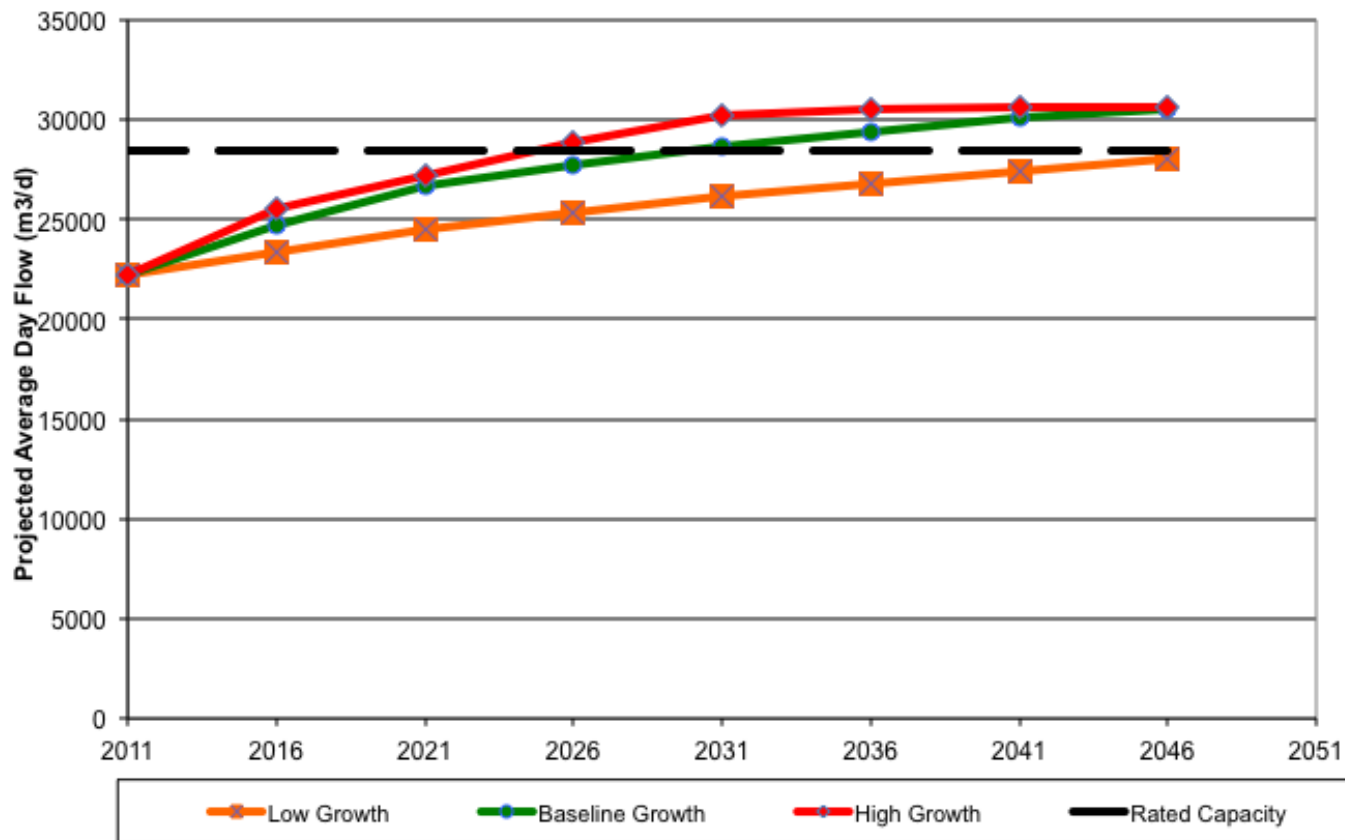


Influence of Growth on Dartmouth WWTF



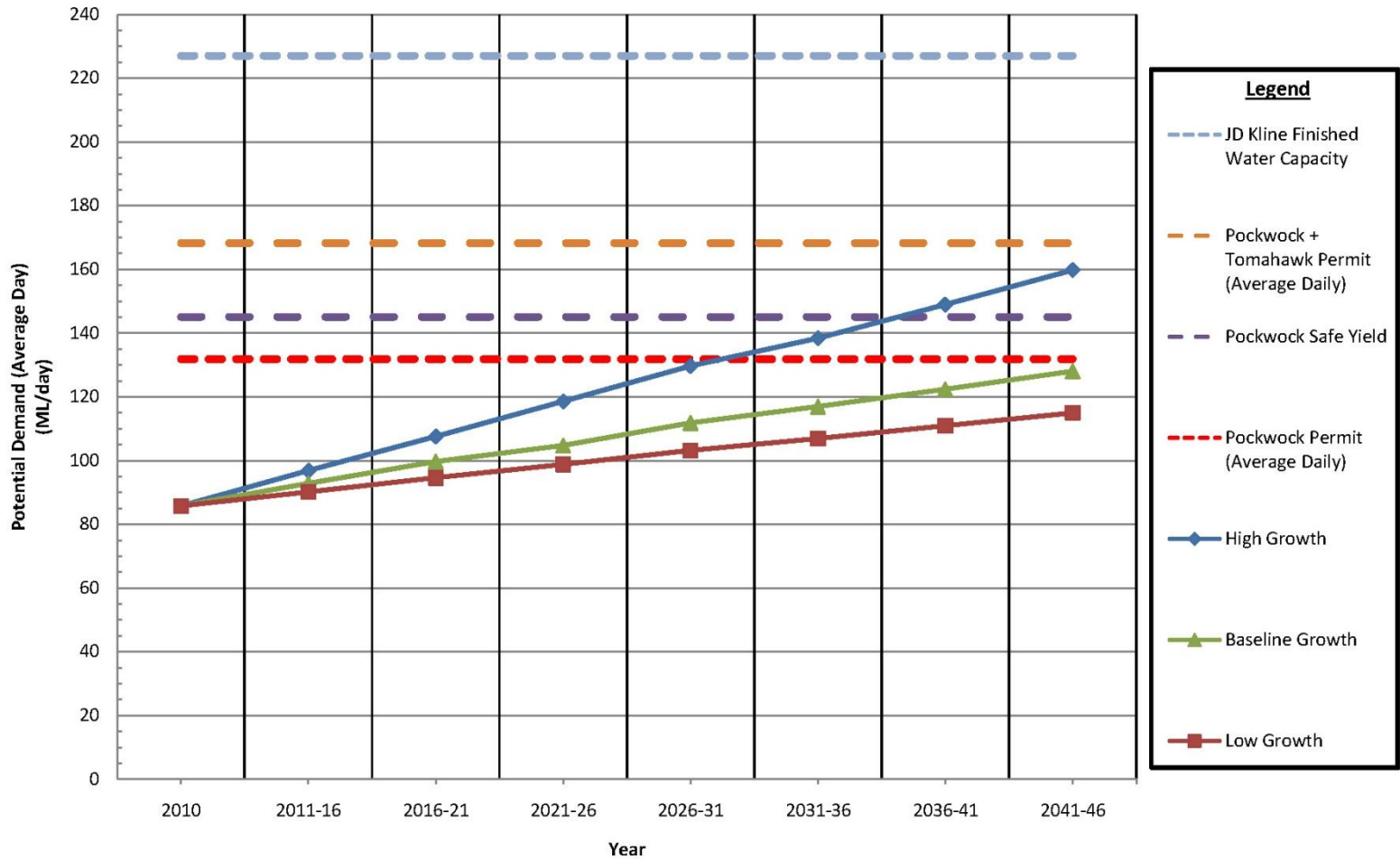


Influence of Growth on Mill Cove WWTF



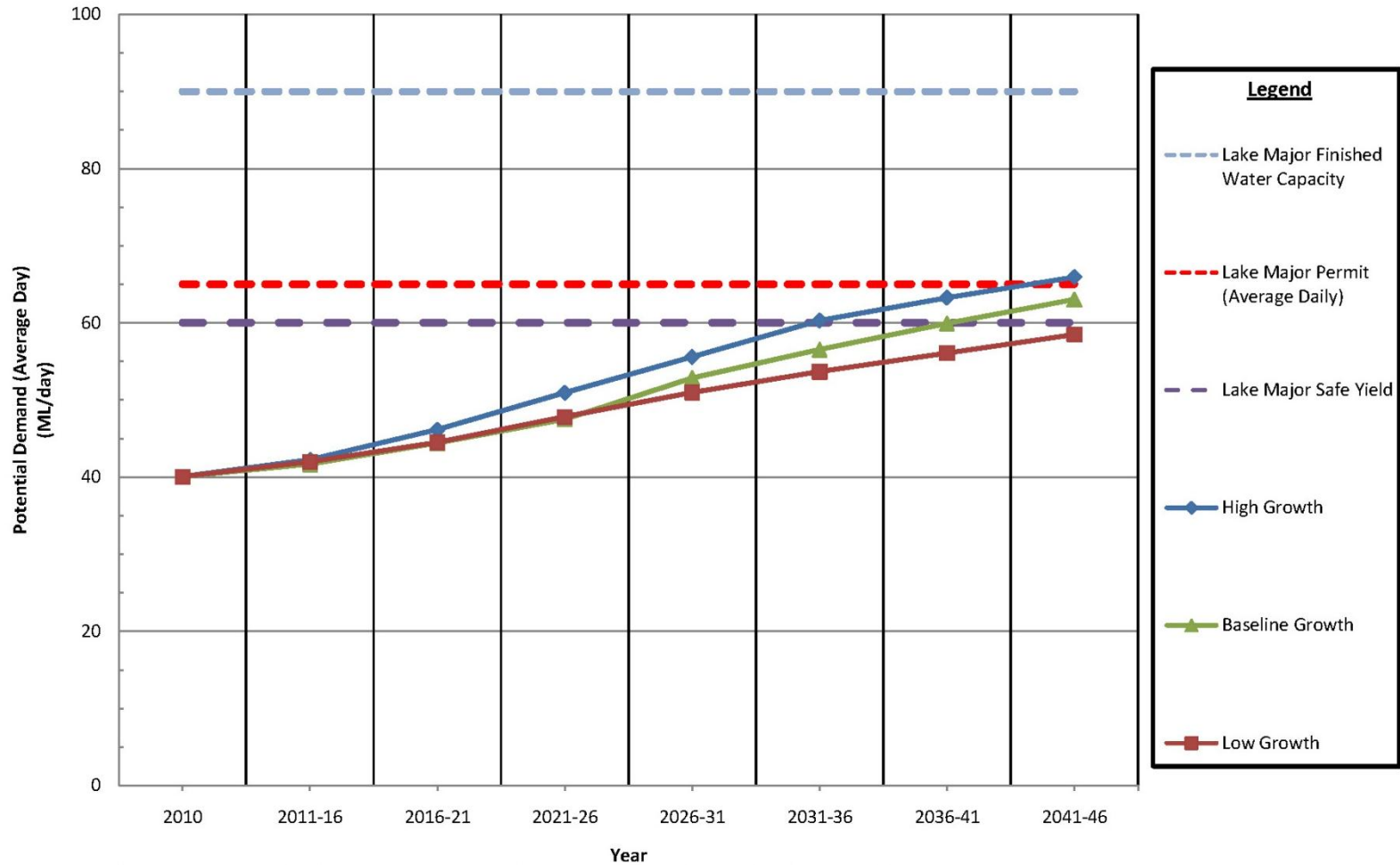


Influence of Growth on Pockwock WSP



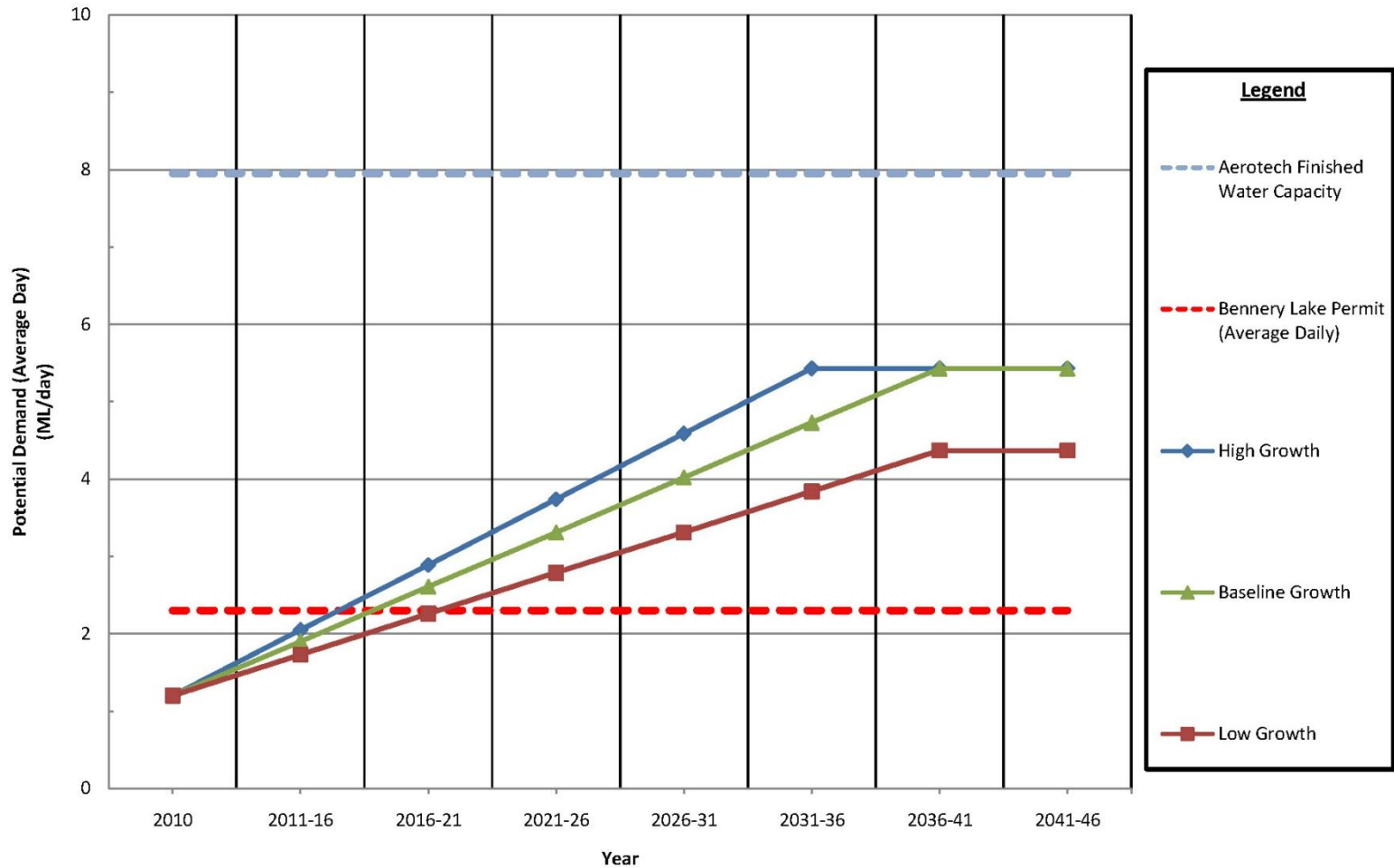


Influence of Growth on Lake Major WSP





Influence of Growth on Bennery Lake WSP





Building Resource Plans

Building Resource Plans

- Eight objectives have specified variations (e.g. Objective 1 – 1A – 3 years, 1B – 5 years, 1C - 7 years for implementation)
- Six objectives have a fixed value for all plans (e.g. Objective 2)
- Seven alternative Resource Plans are developed on the basis of combinations of the 8 objectives

▶ Resource Plan Variations

		Variations			
		A	B	C	
REGULATORY COMPLIANCE	1	Meet current Nova Scotia Environment (NSE) WWTF permit to operate requirements	3 years	5 years	7 years
	2	Meet current NSE WSP permit to operate requirements	ongoing		
	3	Meet current overflow compliance requirements	10 years	20 years	30 years
	4	Meet future WWTF effluent requirements	- nutrient management (10 years) - CCME WWTF effluent rqmts (20 years) - "toxics" mgmt (30 years)	- nutrient management (20 years) - CCME WWTF effluent rqmts (20 years) - "toxics" mgmt (30 years)	- nutrient management (30 years) - CCME WWTF effluent rqmts (30 years) - "toxics" mgmt (30 years)
	5	Meet future NSE/Health Canada drinking water quality requirements	3 years	5 years	7 years
	6	Meet future regulations for overflow volume and frequency	- eliminate WWTF by-passes (10 years) - I/I reduction & SSO elimination (10 years) - CSO reduction (30 years)	- eliminate WWTF by-passes (20 years) - I/I reduction & SSO elimination (20 years) - CSO reduction (30 years)	- eliminate WWTF by-passes (30 years) - I/I reduction & SSO elimination (30 years) - CSO reduction (30 years)
	7	Meet future stormwater quality compliance requirements	30 years		

▶ Resource Plan Variations

		Variations		
Objective		A	B	C
ASSET RENEWAL	8 Implement optimal level of asset reinvestment (all asset classes)	Aggressive point assets: 1 / 0.8 x asset life network assets: % investment per year (decreasing asset age over time)	Moderate point assets: 1 / 1 x asset life network assets: % investment per year (asset age constant over time)	Minimum point assets: 1 / 1.2 x asset life network assets: % investment per year (increasing asset age over time)
	9 Enhance reliability of critical assets	10 years	15 years	20 years
	10 Ensure existing storm system is adequately sized for minor storm conveyance	10 years		
	11 Adapt to future climate change	20 years		
	12 Reduce energy consumption, operating costs, and reduce greenhouse gas (GHG) contributions	5 years	7 years	10 years
GROWTH	13 Provide regional water, wastewater, and stormwater infrastructure needed to support planned growth	Meet medium growth requirement		
	14 Manage flow capacity allocations	Meet medium growth requirement		

Alternative Resource Plans

Preliminary plans developed including:

Plan 1 – Initial Plan

Plan 2 – Aggressive Compliance

Plan 3 – Aggressive Asset Renewal

Plan 4 – Aggressive Compliance and Asset Renewal

Plan 5 – Aggressive Current Compliance, Moderate Future Compliance and Moderate Asset Renewal

Alternative Building Resource Plans

Plan 6 – Moderate Current Compliance, Minimum Future Compliance and Minimum Asset Renewal

Plan 7 – Moderate Current WWTF Compliance, Aggressive Current Overflow Compliance, Moderate Future Wastewater Compliance, Aggressive Future Water Compliance, Moderate Asset Renewal and Aggressive Energy Management

▶ Alternative Resource Plans

Resource Plans		1	2	3	4	5	6	7
		INITIAL PLAN	AGGRESSIVE COMPLIANCE FOCUS	AGGRESSIVE ASSET RENEWAL	AGGRESSIVE COMPLIANCE & AGGRESSIVE ASSET RENEWAL	AGGRESSIVE CURRENT COMPL. MODERATE FUTURE COMPLIANCE MODERATE ASSET RENEWAL	MODERATE CURRENT COMPL. MINIMUM FUTURE COMPLIANCE MINIMUM ASSET RENEWAL	MOD CURRENT WWTF COMPL. AGG CURRENT O/F COMPL. MODERATE FUTURE WW COMPL. AGG FUTURE WATER COMPL. MODERATE ASSET RENEWAL AGGRESSIVE ENERGY MGMT
REGULATORY COMPLIANCE	1 Meet current Nova Scotia Environment (NSE) WWTF permit to operate requirements	1C	1A	1C	1A	1A	1B	1B
	2 Meet current NSE WSP permit to operate requirements	X	X	X	X	X	X	X
	3 Meet current overflow compliance requirements	3C	3A	3C	3A	3A	3B	3A
	4 Meet future WWTF effluent requirements	4C	4A	4C	4A	4B	4C	4B
	5 Meet future NSE/Health Canada drinking water quality requirements	5C	5A	5C	5A	5B	5C	5A
	6 Meet future regulations for overflow volume and frequency	6C	6A	6C	6A	6B	6C	6B
	7 Meet future stormwater quality compliance requirements	X	X	X	X	X	X	X

▶ Alternative Resource Plans

Resource Plans		1	2	3	4	5	6	7	
		INITIAL PLAN	AGGRESSIVE COMPLIANCE FOCUS	AGGRESSIVE ASSET RENEWAL	AGGRESSIVE COMPLIANCE & AGGRESSIVE ASSET RENEWAL	AGGRESSIVE CURRENT COMPL. MODERATE FUTURE COMPLIANCE MODERATE ASSET RENEWAL	MODERATE CURRENT COMPL. MINIMUM FUTURE COMPLIANCE MINIMUM ASSET RENEWAL	MOD CURRENT WWTF COMPL. AGG CURRENT O/F COMPL. MODERATE FUTURE WW COMPL. AGG FUTURE WATER COMPL. MODERATE ASSET RENEWAL AGGRESSIVE ENERGY MGMT	
ASSET RENEWAL	8	Implement optimal level of asset reinvestment (all asset classes)	8C	8C	8A	8A	8B	8C	8B
	9	Enhance reliability of critical assets	9C	9C	9A	9A	9B	9C	9B
	10	Ensure existing storm system is adequately sized for minor storm conveyance	X	X	X	X	X	X	X
	11	Adapt to future climate change	X	X	X	X	X	X	X
	12	Reduce energy consumption, operating costs, and reduce greenhouse gas (GHG) contributions	12C	12C	12A	12A	12B	12C	12A
GROWTH	13	Provide regional water, wastewater, and stormwater infrastructure needed to support planned growth	X	X	X	X	X	X	X
	14	Manage flow capacity allocations	X	X	X	X	X	X	X

▶ Resource Plan Refinement

Build Alternative Resource Plans



Evaluate Plan Costs and Performance



Refine Alternative Resource Plans



Undertake Sensitivity Analysis



Evaluate Refined Plan Costs and Performance

Resource Plan Sensitivity Analysis

- Systematically examine impact of key assumptions on plan costs and performance
- Variables that will be considered:
 - Rate of population growth
 - Technology for control and treatment
 - Level of control required
 - Impact of demand reduction measures
 - Inflation



Evaluation of Resource Plans

▶ Evaluation of Resource Plans - Criteria

- Net present value e.g.
 - \$1 @ 30 years and 5% requires \$0.23 today
- Annual cash flow distribution
 - Ideally even distribution
- Plan implementability e.g.
 - Institutional capacity to manage programs/projects
 - Public acceptance e.g. mandated on-lot measures
 - Additional property requirements

▶ Evaluation of Resource Plans – Criteria

- Risk and reliability e.g.
 - Enhanced redundancy and back-up systems
 - Reduced asset failure risk through timely rehabilitation/replacement
- Receiving water benefits:
 - CSO reduction
 - SSO reduction
 - WWTF bypass reduction
 - Stormwater loading reduction
 - WWTF treated effluent loading reduction

Evaluation of Resource Plans

- NPV will be presented as total \$ value for each resource plan
- A qualitative benefit description has been included in the resource plan summary table
- The four non-monetary criteria and the description of benefits will be used along with the NPV to assess and evaluate the alternative resource plans and select the preferred plan



Lunch



Round Table Discussion



Next Steps

Next Steps

- Consider comments received in relation to Technical Conference #3 (request comments submitted today or by deadline of December 23, 2011, 4:00 PM)
- Issue summary of meeting actions and key points
- Begin resource plans modelling and analysis
- Prepare for Technical Conference #4 (date to be confirmed) and issue information package



**Questions or
Comments?**