Inverness Water and Wastewater Assessment

PRESENTATION FOR MUNICIPAL COUNCIL

APRIL 4TH, 2019

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Project Overview

Dillon was contracted to complete an assessment of existing water and wastewater (W&WW) infrastructure within the MOCI.

- **Project goal:**
  - Overview of W&WW infrastructure
  - Identify potential capital investments over the next 10 years
- **Project Focus:**
  - Linear Infrastructure → Piping
  - Complex Infrastructure
    - Treatment plants
    - Water storage tanks
    - Lift stations

Executive Summary

- MOCI owns an estimated **$186 Million** of W&WW assets currently.
- Estimated 10 Year Investment Cost - **$103,100,000**

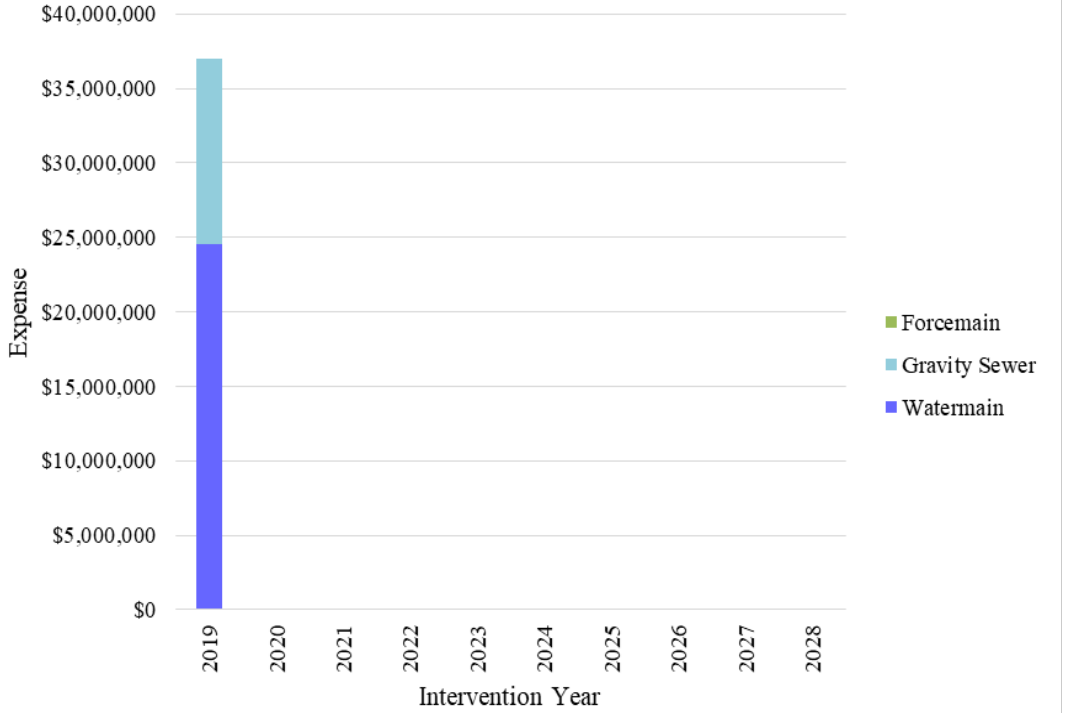


Figure 1 – Forecasted Investment for Linear Infrastructure

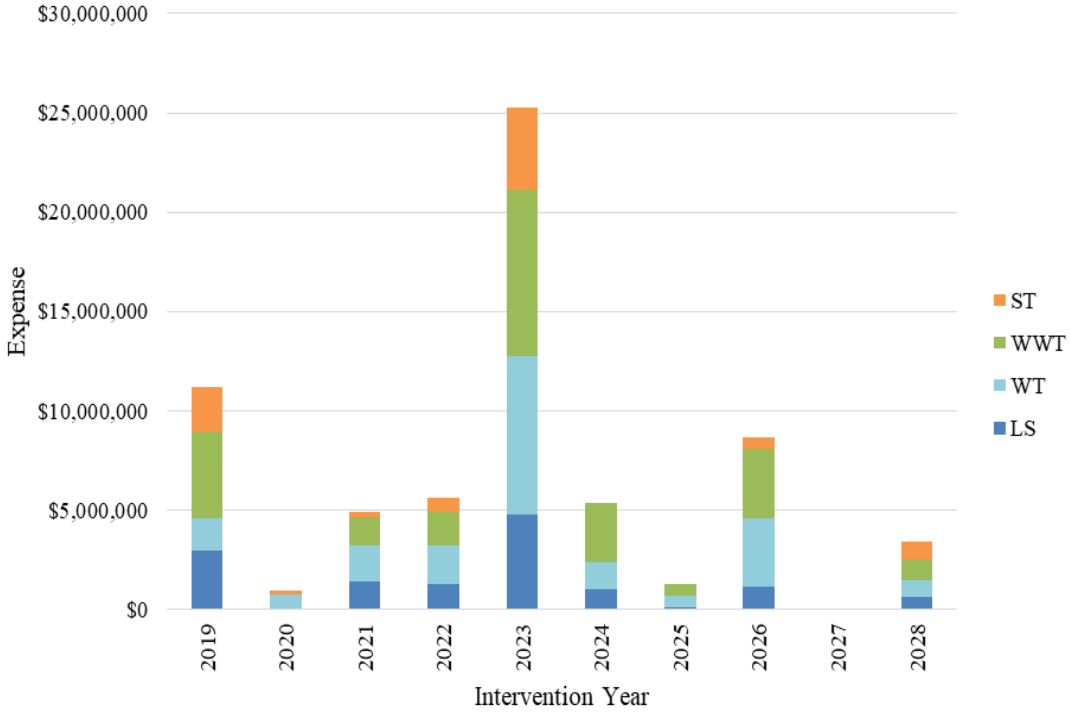


Figure 2 – Forecasted Investment for Complex Infrastructure

Executive Summary

General condition of MOCI W&WW infrastructure is **worse** than the national average.

Table 1 – Comparison to 2016 CIRC (Complex Assets)

Condition	2016 CIRC (Average across W&WW)	MOCI Condition Ratings
Very Good/Excellent (1)	45.5%	6%
Good (2)	37.5%	19%
Fair (3)	26.5%	60%
Poor (4)	7.0%	15%
Very Poor/Critical (5)	1.5%	0%

Executive Summary

- Recommended minimum **annual** capital investment:
  - **$10.3 Million per year** → 10 years
    - **5.56%** of the overall asset replacement value (approximately **$186 M**)
- In Comparison:
  - 2016 CIRC Minimum – **1.65%**
  - Industry Rule of Thumb – **2% to 3%**

Project Methodology

- **Project Goals and Objectives Workshop** - January 2019
- **Field Program** - January 7th to January 18th 2019
  - Site Visits to all lift stations, treatment plants and reservoirs
- **Condition assessments**
  - Canadian Infrastructure Report Card 1-5 rating scheme
- **Analysis**
  - Current asset condition, estimated remaining life and replacement costs
- **Draft Report** – February 22nd 2019
- **Final Report** – March 27th 2019

Asset Hierarchy

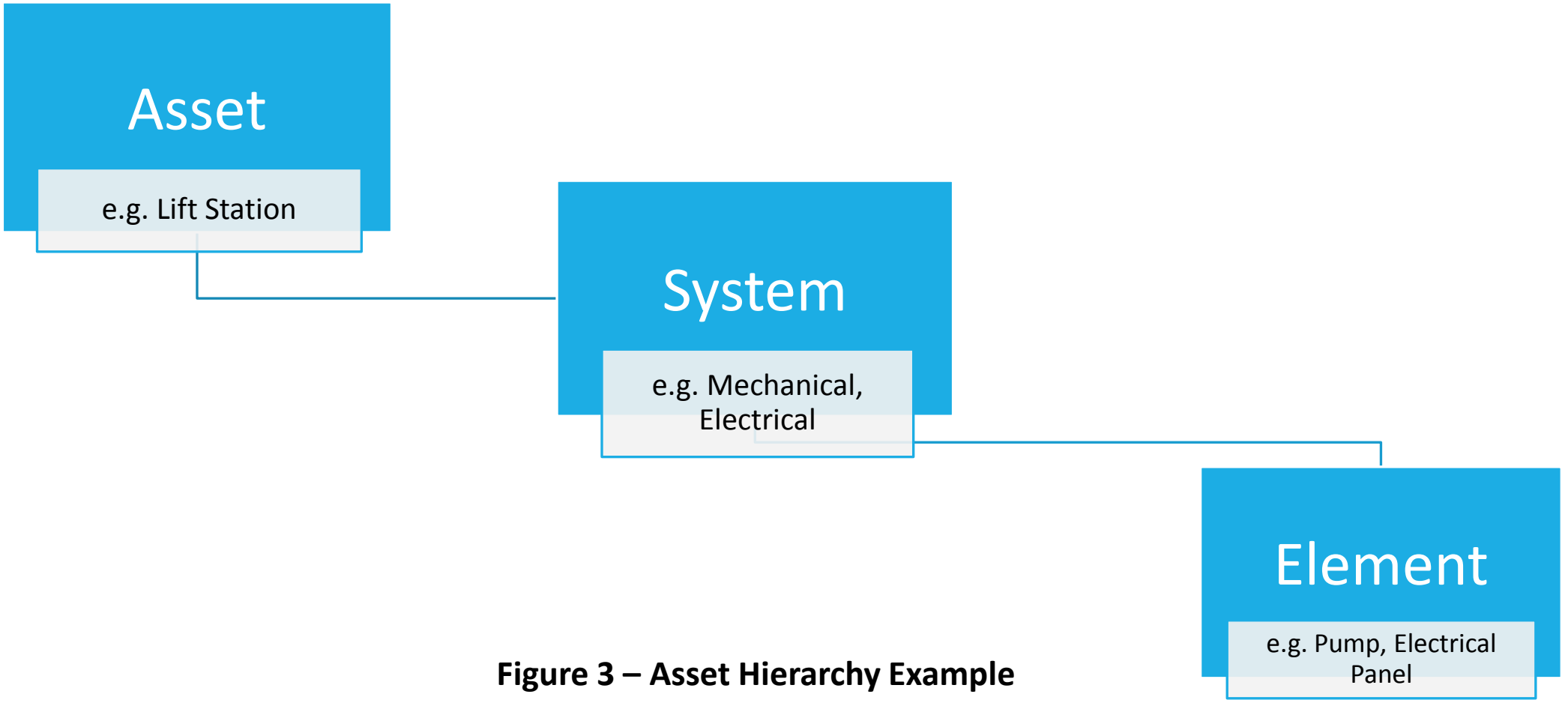


Figure 3 – Asset Hierarchy Example

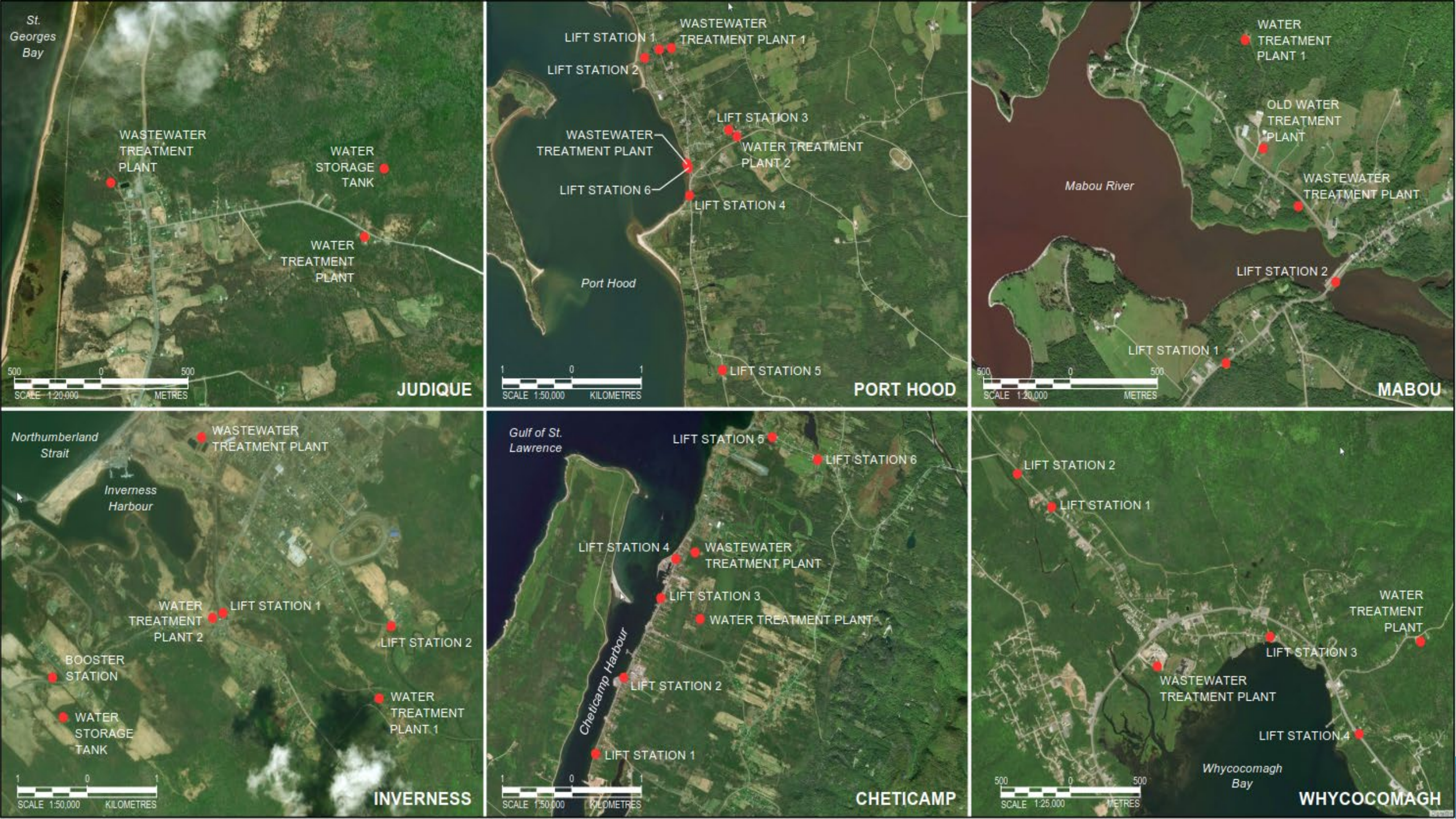
Inventory

MOCI Owns and Operates:

- **23** lift stations
- **2** water booster stations
- **7** WWTPs
- **9** WTPs (**2** inactive)
- **7** water reservoirs
- **45.7 km** of sanitary sewer
- **10.7 km** of wastewater forcemain
- **71.3 km** of watermains

General Breakdown of Assets (largest to smallest):

1. Inverness
2. Port Hood
3. Whycocomagh
4. Mabou
5. Cheticamp
6. Port Hastings
7. Judique


St. Georges Bay
WASTEWATER TREATMENT PLANT
WATER STORAGE TANK
WATER TREATMENT PLANT
500 0 500
SCALE 1:20,000 METRES
JUDIQUE
LIFT STATION 1
WASTEWATER TREATMENT PLANT 1
LIFT STATION 2
LIFT STATION 3
WASTEWATER TREATMENT PLANT
WATER TREATMENT PLANT 2
LIFT STATION 6
LIFT STATION 4
Port Hood
LIFT STATION 5
1 0 1
SCALE 1:50,000 KILOMETRES
PORT HOOD
WATER TREATMENT PLANT 1
OLD WATER TREATMENT PLANT
Mabou River
WASTEWATER TREATMENT PLANT
LIFT STATION 2
LIFT STATION 1
500 0 500
SCALE 1:20,000 METRES
MABOU
Northumberland Strait
WASTEWATER TREATMENT PLANT
Inverness Harbour
WATER TREATMENT PLANT 2
LIFT STATION 1
LIFT STATION 2
BOOSTER STATION
WATER TREATMENT PLANT 1
WATER STORAGE TANK
1 0 1
SCALE 1:50,000 KILOMETRES
INVERNESS
Gulf of St. Lawrence
LIFT STATION 5
LIFT STATION 6
LIFT STATION 4
WASTEWATER TREATMENT PLANT
LIFT STATION 3
WATER TREATMENT PLANT
Cheticamp Harbour
LIFT STATION 2
LIFT STATION 1
1 0 1
SCALE 1:50,000 KILOMETRES
CHETICAMP
LIFT STATION 2
LIFT STATION 1
WATER TREATMENT PLANT
LIFT STATION 3
WASTEWATER TREATMENT PLANT
LIFT STATION 4
Whycocomagh Bay
500 0 500
SCALE 1:25,000 METRES
WHYCOCOMAGH


PORT HASTINGS
LIFT STATION 1
LIFT STATION 2
CAPE BRETON ISLAND
BOOSTER STATION
LIFT STATION 3
WASTEWATER TREATMENT PLANT
Strait of Canso
PORT HAWKESBURY

System Connections

Approximately **14,000** residents served (2018), **2,900** + connections

Table 2 – Estimated System Connections (MOCI 2018)

Community	Estimated System Connections	Percentage of MOCI
Inverness	1,500	51.4%
Port Hood	300	10.2%
Whycocomagh	330	11.3%
Mabou	160	5.5%
Cheticamp	450	15.4%
Port Hastings	105	3.6%
Judique	75	2.6%
TOTAL	2,920	100%

Condition Rating Scale

Table 3 – Condition Ratings for Assets

Rating	Condition	Description
1	Very Good	Like new/physically sound and performing as intended.
2	Good	Minor superficial deterioration.
3	Fair	Showing deterioration and wear.
4	Poor	Major portion of the asset is deficient, functions but has major problems.
5	Very Poor	Physically unsound, unreliable and has reached or exceeded useful life.

How Does an Asset Change Over Time?

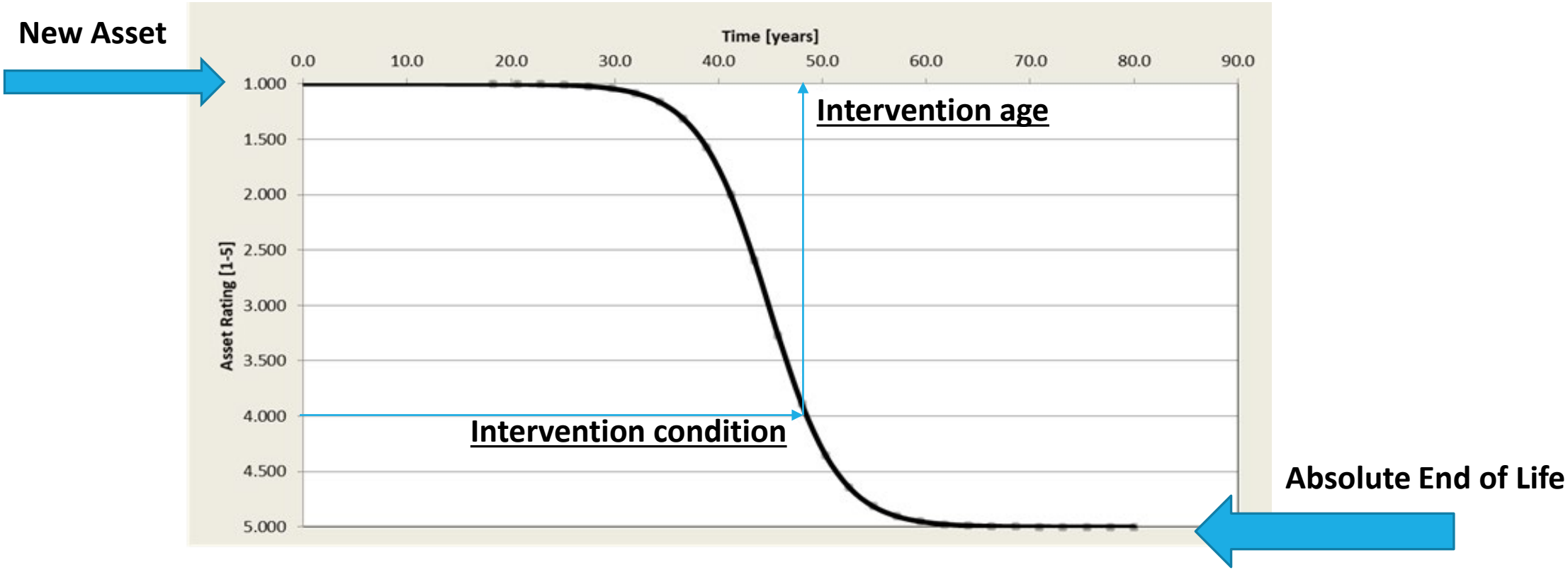


Figure 4 – Deterioration Curve for PVS/DPE Piping for W&WW Applications

Condition – Linear Infrastructure

- General condition of linear infrastructure is “fair” (middle scale)
  - Watermains generally in **Worse** condition
  - Forcemains generally **Fair** or **Very Good** condition

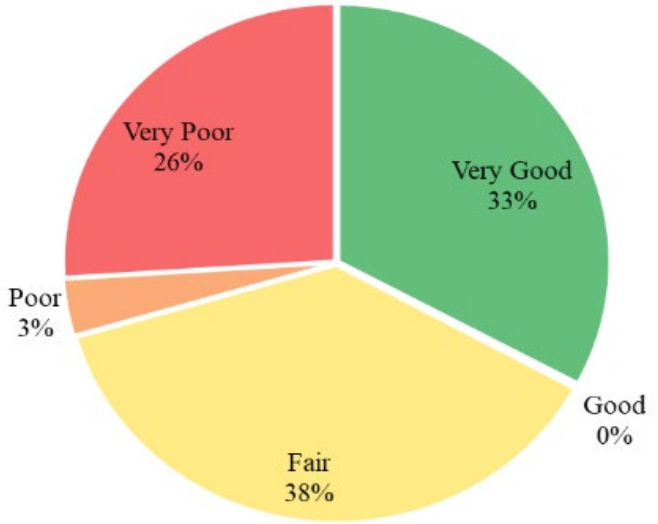


Figure 5 – All Communities, All Linear Assets

Condition – Linear Infrastructure

Table 4 - General Condition of Linear Infrastructure by Community

Community	Median Condition	Description
Cheticamp	**Fair**	Showing deterioration and wear.
Inverness	**Very Poor**	Physically unsound, unreliable and has reached or exceeded useful life.
Judique	**Poor**	Major portion of the asset is deficient, functions but has major problems
Mabou	**Fair**	Showing deterioration and wear.
Port Hastings	**Fair**	Showing deterioration and wear.
Port Hood	**Fair**	Showing deterioration and wear.
Whycocomagh*	**Very Good***	Like new/physically sound and performing as intended.

Condition – Complex Infrastructure

- General condition of complex infrastructure is **“fair”** (middle of scale)
  - WWTP’s generally **lowest** condition rating
  - WTP’s generally **Fair** or **Good**.

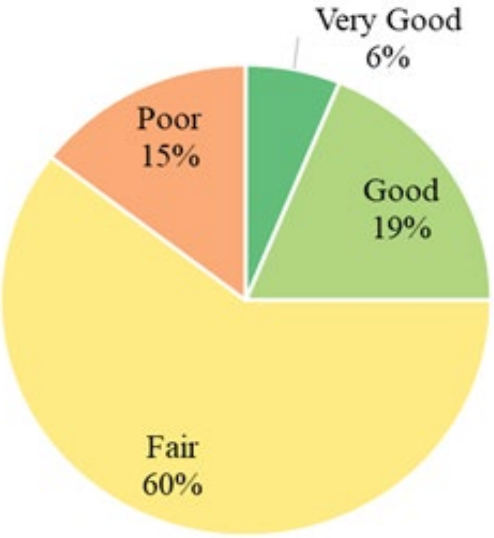


Figure 6 – Overall Complex Infrastructure Condition

Capital Investment Estimates

All assets require routine maintenance

- To meet the average level of service recommended
  - Budget minimum: **$10.3 Million Per Year for capital improvements**
  - Larger investments → Improvement of asset condition
    - Trend overall condition towards **Good**.
  - Smaller investments → Slow improvement
    - Trend towards a **poorer** overall condition.
- Approximately **37% for linear** infrastructure and **63% for complex**.
- Significantly higher than the National Average
  - Due to: Infrastructure age and condition

Capital Investment by Community

Table 5 – Estimated Breakdown by Community

Community	Estimated Asset Replacement Value	Estimated 10 year Investment Cost	% of Total 10 Year Estimated Investment
Cheticamp	$19.8 M	$16.0 M	15.5%
Inverness	$48.5 M	$42.6 M	41.3%
Judique	$12.0 M	$4.1 M	4.0%
Mabou	$28.0 M	$6.0 M	5.8%
Port Hood	$30.4 M	$16.4 M	15.9%
Whycocomagh	$28.0 M	$7.7 M	7.5%
Port Hastings	$19.2 M	$10.3 M	10.0%
Total	**$185.9 M**	**$103.1 M**	**100%**

Risk Management

Risk = Probability x Consequence

- **Probability** → Asset's current condition
- **Consequence** → "Triple Bottom Line" > Hazard
  - (i.e., Public Health, Environmental Damages and Financial Costs)

Assets may also be "high value" or "core"

- Failure → Significant disruptions to the community served
- **Example: Judique Water Treatment Plant, or a collector lift station**

Risk Management Cont'd

Risk = Probability x Consequence

- **"Points"** assigned for each triple bottom hazard
  - Additional point for high value/core assets
- **Risk** calculated and used to prioritize upgrades

Table 6 – High Priority Upgrades (Complex Infrastructure)

Asset	Recommended Upgrade	Estimated Cost
Judique WWTP	Replace plant	$2,900,400
Judique WTP	Complete detailed structural assessment of Judique dam	$57,500
Inverness WWTP	Replace plant	$4,700,000
Whycocomagh WWTP	Replace plant	$4,900,000
Cheticamp LS5	Replace one submersible pump	$18,000
Whycocomagh WTP	Identify and repair major leaks in distribution system	$70,800
Inverness WTP	Fix leaking storage tank	$60,000
Inverness WTP	Water exploration/well setup	$350,000
Judique WTP	Operational improvements to DAF	$60,000
Judique WTP	Program filters to automatically backwash	$12,000
Judique WTP	Install plant ventilation	$90,000
Judique WTP	Water exploration/well setup	$350,000
Cheticamp LS4	Replace 40 HP generator and diesel fuel tank	$97,750
Port Hood LS3	Replace one submersible pump	$17,250
Mabou WTP	Water exploration/well setup	$350,000
Port Hood	Water exploration/well setup	$350,000

Recommended Upgrades

Table 7 – High Priority Upgrades (Watermains)

Region	Estimated Cost
Inverness	$9,726,000
Judique	$1,135,000
Mabou	$50,000
Port Hood	$373,000

Recommended Upgrades

Table 8 – High Priority Upgrades (Gravity Sewer)

Region	Estimated Cost
Inverness	$7,185,000
Port Hastings	$20,000
Mabou	$710,000

Table 9 – Poor Performing Infrastructure

Region	Recommended Upgrade	Estimated Cost
Cheticamp	One or more pumps out of service (LS1-LS3, LS6)	$74,750
Whycocomagh	Identify and repair major leaks in distribution system	$75,000
Whycocomagh	Re-route wet well vents at LS 1, 2 and LS4	$4,500
Whycocomagh	Replace panel at LS4	$11,500
Whycocomagh	One or more pumps out of service (LS3)	$23,000
Judique	Possibly replace or rehabilitate dam	Requires further assessment
Mabou	Decommission old WTP	$200,000
Mabou	Install new station (LS1-LS2)	$230,000
Port Hastings	One or more pumps out of service (LS2)	$17,250
Port Hood	Expose and Heat Trace line to Pressure Transducer (Water Storage Tank)	$17,250
Port Hood	One or more pumps out of service (LS1, LS2, LS5, LS6)	$70,000
Port Hood	Replace station (LS4)	$230,000
All Communities	Fire Hydrant Replacement	$8,500/hydrant[1]

[1] *Assumes projects completed as standalone replacements (full mobilization/excavation)*

Table 10 - Recommended Further Investigations

Asset	Rationale
Judique Dam	• Dam is in poor condition • Major risk to the downstream environment and community's water supply • Completion of detailed structural and condition assessment
Inverness and Port Hastings water storage reservoirs	• Reservoirs appeared to have been leaking out of their seams • Significant risk (adjacent environment and the community's water supply) • Investigate and repair immediately
Cheticamp wellheads	• Inaccessible during field visit, should be investigated
Cheticamp water reservoir	• Reported that the roof on the tower experiences repetitive failures • Wind is assumed to be the cause of failure • Investigate to implement a permanent solution
Pre-purchased lift stations	• Reported that 2 purchased self-priming WW LS's are currently in storage (Truro, NS) • Current age and condition of these units is unknown • Investigate option of replacing certain lift stations

Going Forward

- Ongoing maintenance of asset management tool
- Annual capital investment/major maintenance programs
- Monitoring of long-term asset conditions
- Adjusting intervention points to reflect comfort with asset performance and level of service

Questions/Discussion