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Porters Lake Watershed / Servicing Study

Presentation to:

Harbour East-Marine Drive Community Council

3 April 2014

Agenda

- Purpose of the Study
- Assessment of Assimilative Capacity of Porters Lake
- What Should be Done for Existing Issues
- Growth Scenarios
- Objectives for Future Development
- Servicing for Future Development
- Questions and Comments

Purpose of the Study

The purpose of this study is to:

- Define existing environments, including existing lake water quality;
- Identify existing constraints and assessing the cause(s).

Recommend changes to address:

- existing issues; and
- further development without making existing problems worse.

The study looked at terrestrial and aquatic environments within the Study Area.

The **study area** is in the lower reaches of two watersheds.

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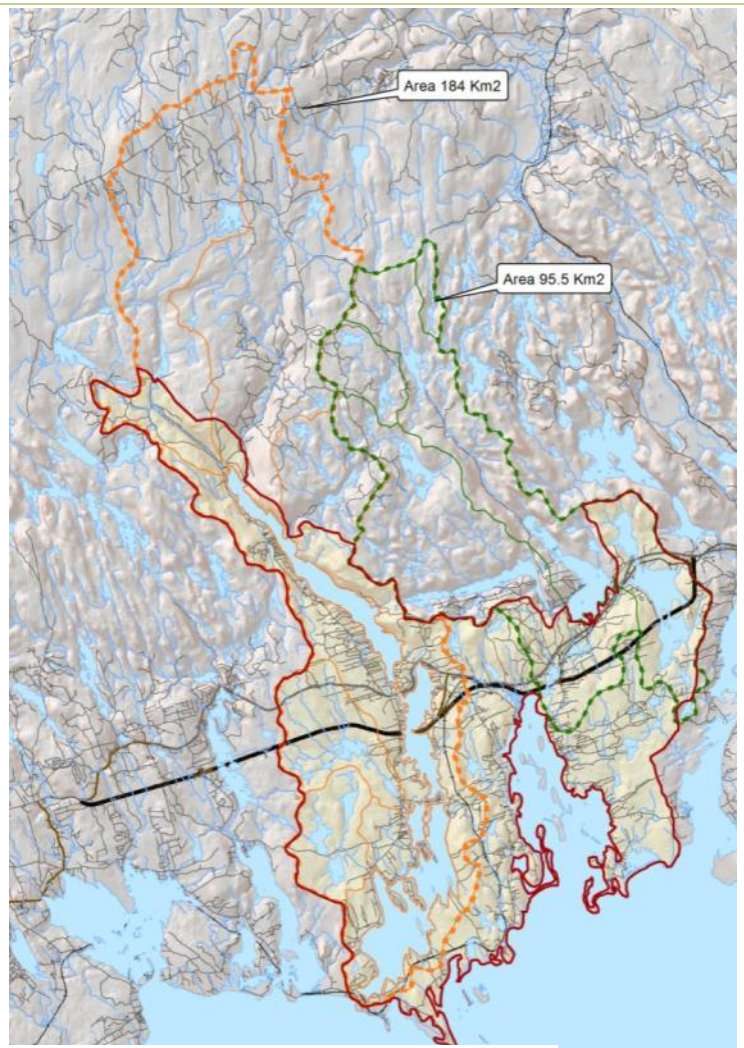
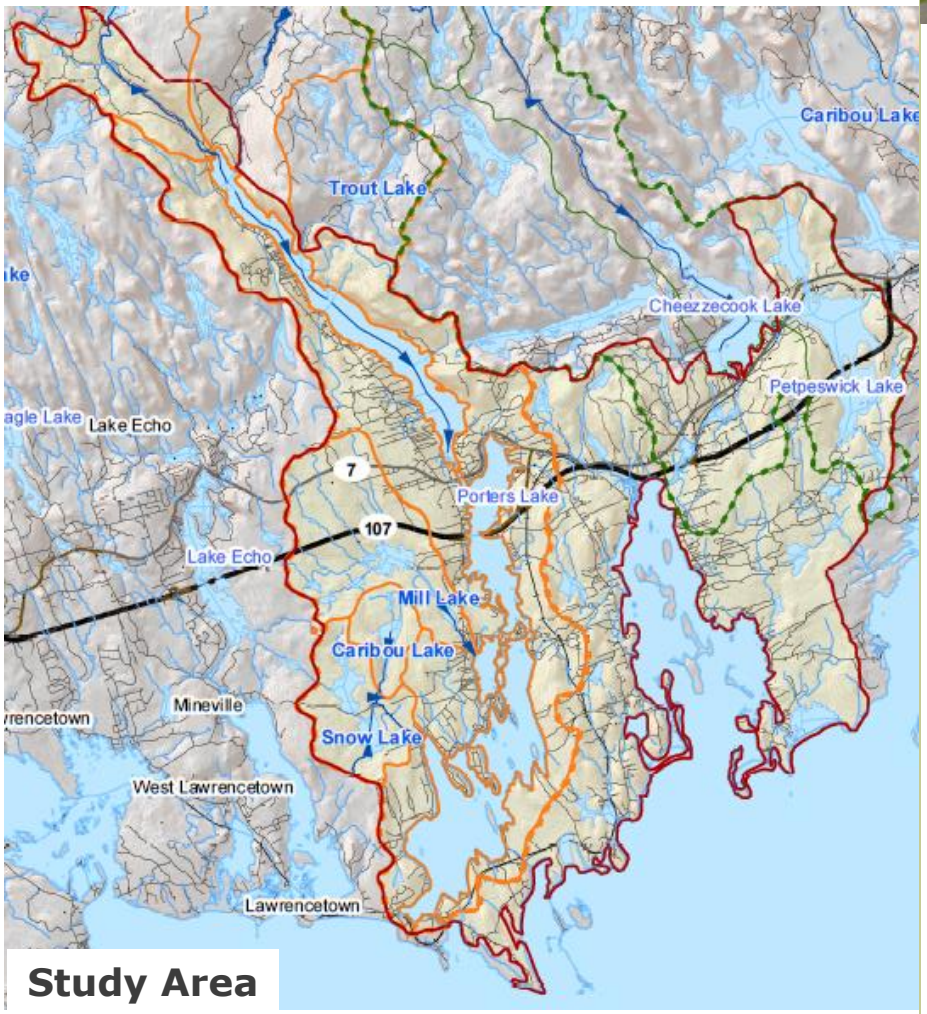
Porters Lake Study Area



Porters Lake Watershed



Study Area

Focus of this Presentation

Lake Water Quality and Assimilative Capacity:

- Desired **water uses**;
- **Water quality required** for desired water uses;
- **Measured water quality** in Porters Lake;
- **Comparison** of water quality objectives to measured water quality:
  - Assimilative capacity available where measured less than required

Water Use Objectives

Minimum water use objectives provided in the HRM Regional MPS include:

- All water bodies should be **suitable for swimming**;
- All lakes should be **oligotrophic or mesotrophic;**
- Development should **not change the trophic status of lakes**.

Respondents (**197**) to an online survey indicated that the water in Porters Lake (and other waterbodies) should be of the highest quality - (35%) or able to provide **habitat for fish and wildlife** (53%) suitable for human consumption. Only 12% considered suitable for swimming a reasonable objective for the lakes and Chezzetcook Inlet.

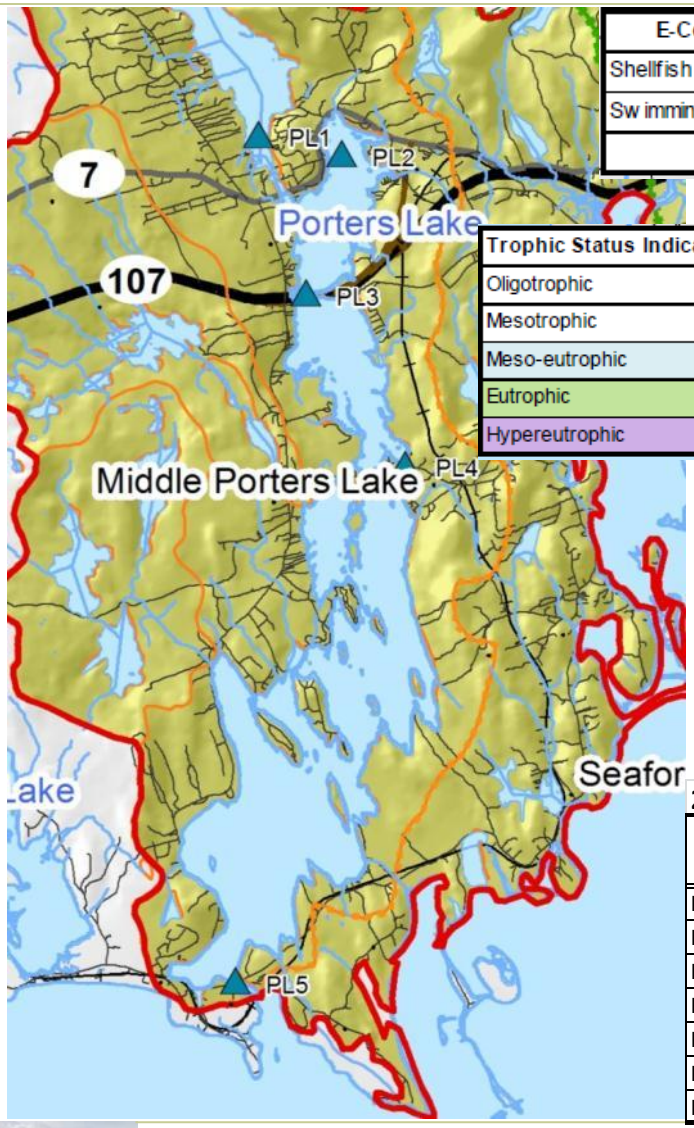
Water Quality Objectives

Guidelines and standards were used to develop specific objectives for water quality parameters typically used to define the suitability of water for swimming, habitat suitable for consumption of fish, and trophic status.

Recommended water quality objectives for lakes in the Study Area:

- **E coli** concentration less than 200 counts/100 mL for swimming, less than 14 counts/100 mL to support fish and wildlife habitat.
- **Total phosphorous** concentrations less than 10 micrograms/ L for oligotrophic, 20 micrograms/ L for mesotrophic;
- **pH** > 5.4 - DFO characterizes as acute toxicity for Atlantic Salmon waters with pH 5.0 to 5.4.

Measured Water Quality 2010



E-Coli thresholds CFU/100ml	
Shellfish harvesting	14
Swimming	200
	400

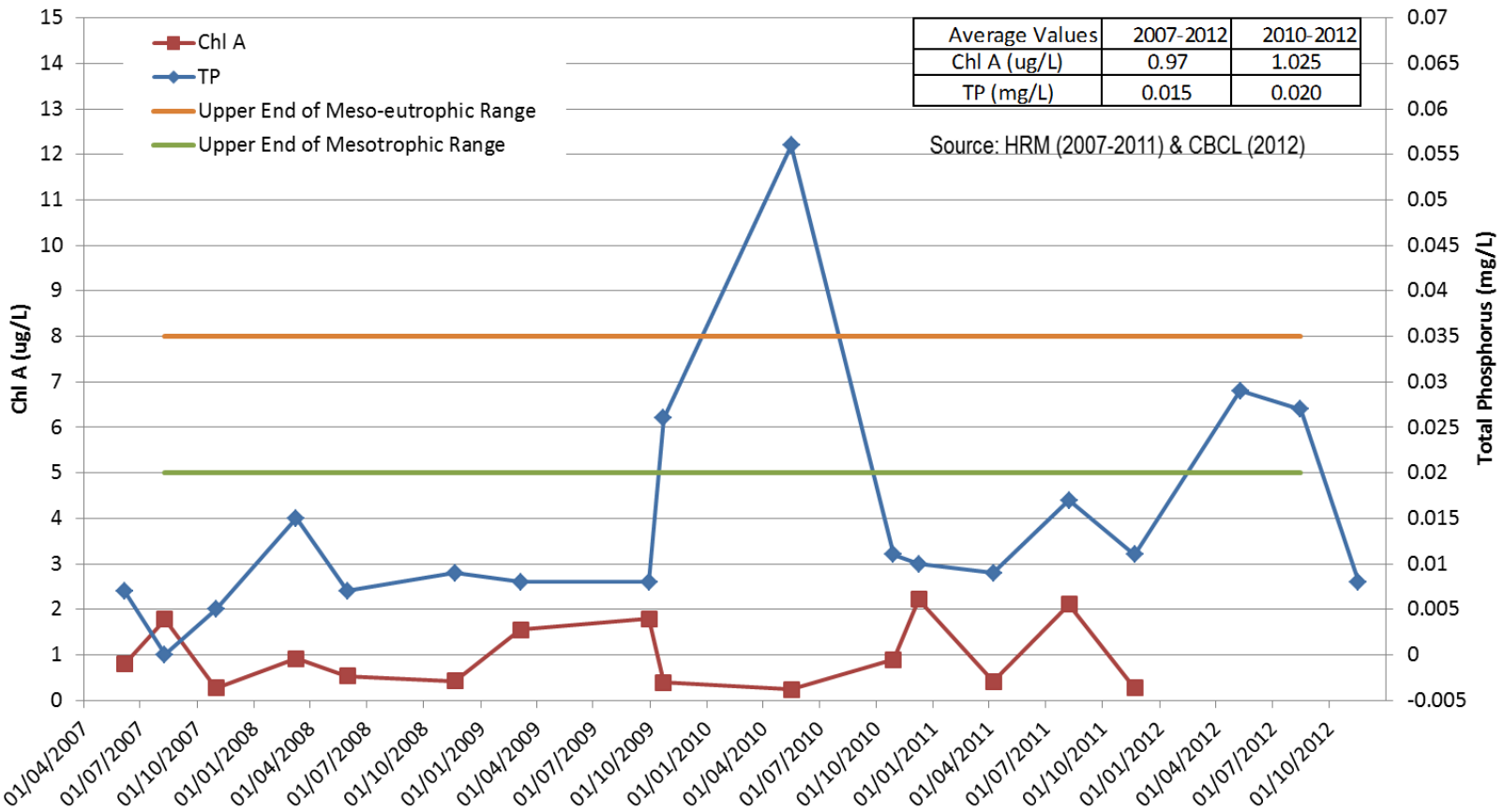
Trophic Status Indicator	TP (mg/l)	Chl a (µg/l)
Oligotrophic	<0.01	<2.5
Mesotrophic	0.01 - 0.02	2.5 - 5
Meso-eutrophic	0.02 - 0.035	5 - 8
Eutrophic	0.035 - 0.1	8 - 25
Hypereutrophic	> 0.1	> 25

Sample Location	Parameter	Mean	Max	Min
PL1	E Coli (CFU/100 ml)	8	19	1
	Tp (MPN/100 ml)	0.012	0.012	0.012
	Chl a(ug/l)	1.2	3.1	0.4
	pH	7.1	7.5	6.7
PL2	E Coli (CFU/100 ml)	32	54	4
	Tp (MPN/100 ml)	0.011	0.011	0.011
	Chl a(ug/l)	0.9	1.7	0.3
	pH	7.1	7.6	6.4
PL3	E Coli (CFU/100 ml)	14	22	6
	Tp (MPN/100 ml)	0.005	0.005	0.005
	Chl a(ug/l)	0.8	1.3	0.3
	pH	7.3	7.6	6.6
PL4	E Coli (CFU/100 ml)	12	21	1
	Tp (MPN/100 ml)	0.01	0.01	0.01
	Chl a(ug/l)	1.0	1.8	0.2
	pH	6.8	7.4	6.2
PL5	E Coli (CFU/100 ml)	19	38	1
	Tp (MPN/100 ml)	0.021	0.03	0.013
	Chl a(ug/l)	1.4	2.1	0.7
	pH	7.2	7.8	5.4

2012 TP Program	Measured TP Concentration		
Sample Site	Average (mg/L)	Maximum (mg/L)	Minimum (mg/L)
PL1	0.021	0.029	0.008
PL2 - surface	0.021	0.030	0.008
PL2 - mid-depth	0.016	0.030	0.007
PL2 - bottom	0.067	0.124	0.020
PL3	0.024	0.039	0.007
PL4	0.016	0.027	0.009
PL5	0.022	0.034	0.015

Measured Water Quality Parameters
HRM's 2007 to 2011 Sampling Program

Was 2010 a representative year?



Average Values	2007-2012	2010-2012
Chl A (ug/L)	0.97	1.025
TP (mg/L)	0.015	0.020

Existing Status of Porters Lake

- **E coli concentrations** were typically below 200 counts in Porters Lake so water is suitable for HRM's objective for swimming in most areas most of the time; mean E coli concentrations were above 14 counts at sites 2, 3 and 5 so water does not meet the objective recommended for habitat that is suitable for consumption of fish.

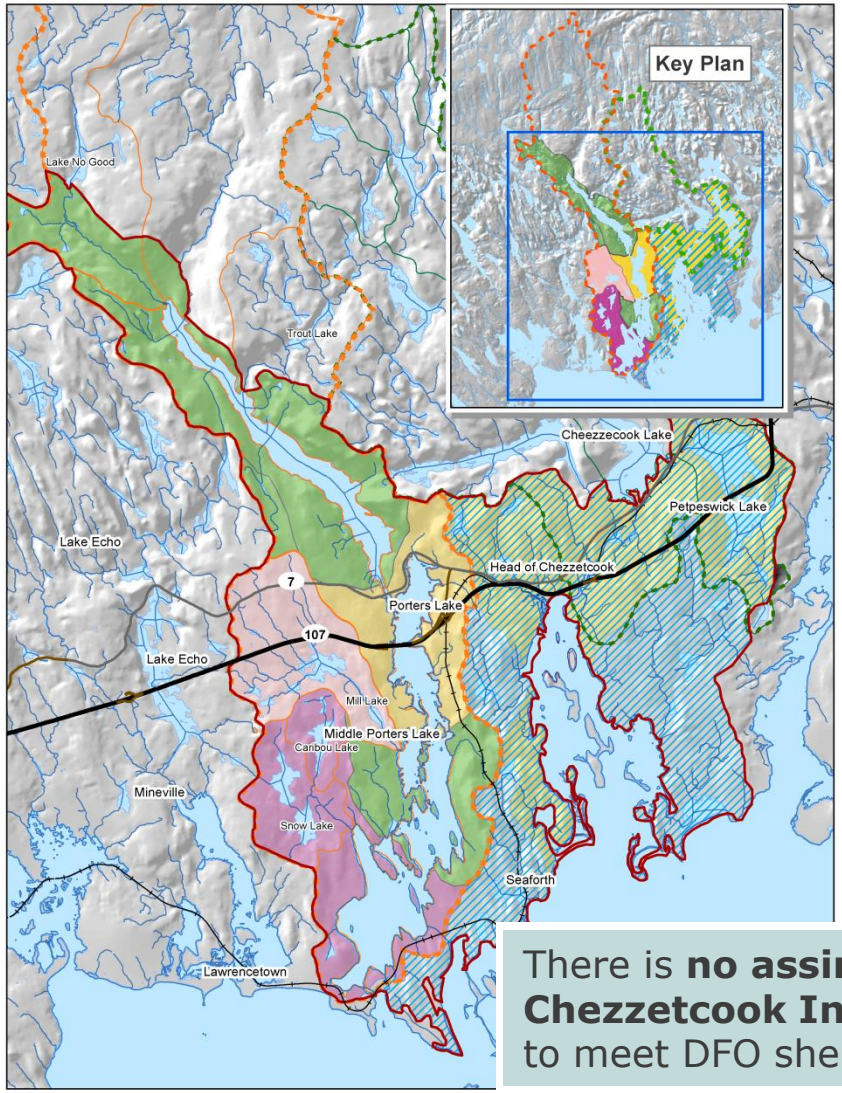
- Porters Lake is considered to be in the **oligotrophic** to **mesotrophic** range based on the average TP and Chlorophyll A concentrations – meets HRM objective, but appears in transition between trophic states, particularly in the areas adjacent existing development.

  Measured **pH** was above 5.4 at all sites for all samples except one so generally meets the DFO objective to be considered suitable for habitat. Lowest measured pH of 5.4 at Site 5 (lake outlet) - pyritic slate bedrock.

Assimilative Capacity

There is **no assimilative capacity in Porters Lake** for additional:

- **E coli** loads to meet habitat objective;
- **TP** and Chl a to meet oligotrophic trophic status objective;



There is **no assimilative capacity in Chezzetcook Inlet** for additional **E coli** loads to meet DFO shellfish harvesting objective

Factors Affecting Existing Water Quality

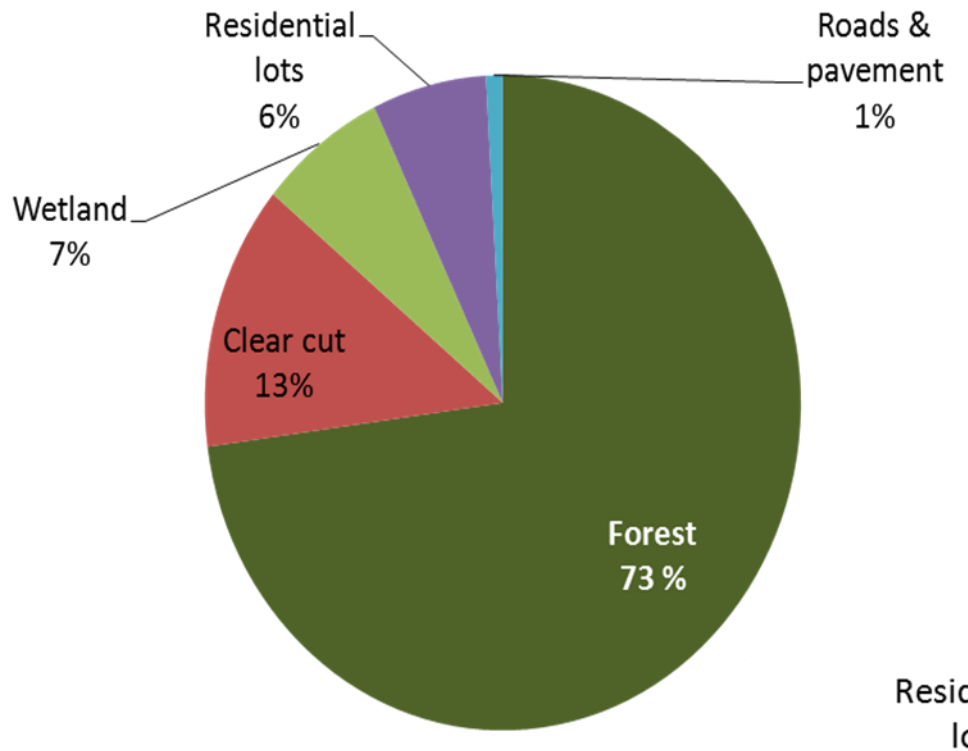
In the questionnaire, the two most popular answers to a request to identify potential sources of contamination:

1. Construction/excavation/development too close to the water;
2. Wastewater treatment systems (including onsite systems, domestic and community) are not functioning properly;
3. Stormwater

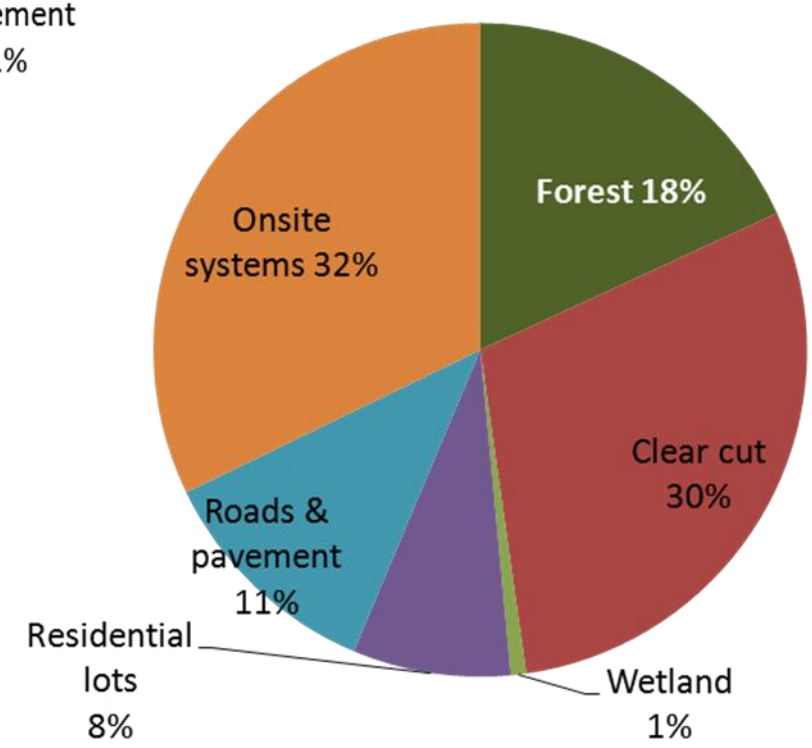
Assessments were completed to evaluate the validity of these suggestions

Potential Sources of Phosphorous

The assessment shows that 51% of the annual phosphorous load from the land is generated by less than 7% of the land use



Land-Use in Porters Lake Watershed



Phosphorus Loads in Porters Lake Watershed

Annual phosphorous loads were estimated using the Nova Scotia phosphorous loading model, developed by Brylinski under the guidance of NSE for use on lakes in Nova Scotia

Where Do We Go from Here?

Need to address **existing water quality issues**:

- Lower E coli discharges
- Lower phosphorous discharges

Need to plan and implement **future development** so that it doesn't cause the same problems

What to Do in Existing Development

1. **Improve wastewater treatment** in the study area:

- Establish an assessment and monitoring program to make sure that existing wastewater treatment systems are operating as required
- Replace or upgrade malfunctioning or failing onsite systems and systems that produce effluent that is not suitable for their receiving waters

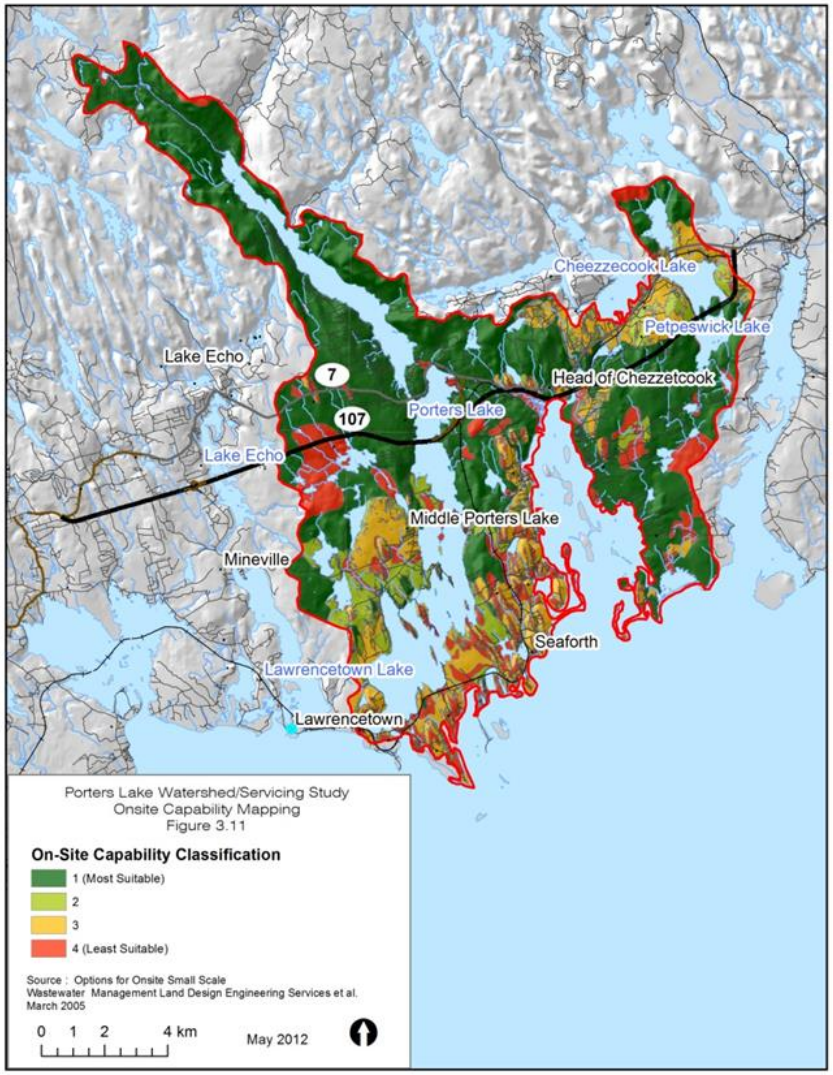
2. **Retrofit stormwater systems** to limit peak flows and enhance infiltration and treatment (rain gardens and barrels on individual lots, wet ponds and constructed wetlands for larger areas)

Potential Future Development

Year	Low Growth Scenario (Community Counts)	High Growth Scenario (Transit Plan)	Mid-Range Community Counts and Transit Plan)
2010 pop	3,200	6,100	
2010 units	1,200	2,300	
2030 pop.	5,100	11,300	8,200
2030 Units	2,200	4,900	3,600
Pop growth 2010-2030	1,900	5,200	3,200
Unit growth 2010-2030	1,000	2,600	1,800

Note: High and low scenarios selected on basis of population change

Onsite Wastewater Treatment



Screening Level Assessment indicates that:

- Most existing development on the lower end of Porters Lake and the western side of Chezzetcook Inlet has occurred on soils identified as less suitable and older lot sizes are typically smaller than current standards.
- There are areas for additional development that are suitable.

Objectives for Future Development

Servicing objectives:

1. Make sure **lots are large enough to support all on-site systems** – site specific plans are required
2. Provide more **strict controls on construction activity** and lot clearing including monitoring plans
3. Need appropriate **stormwater management plans**, including infiltration and treatment of runoff where possible as well as minimizing disturbance of acidic slate bedrock where encountered

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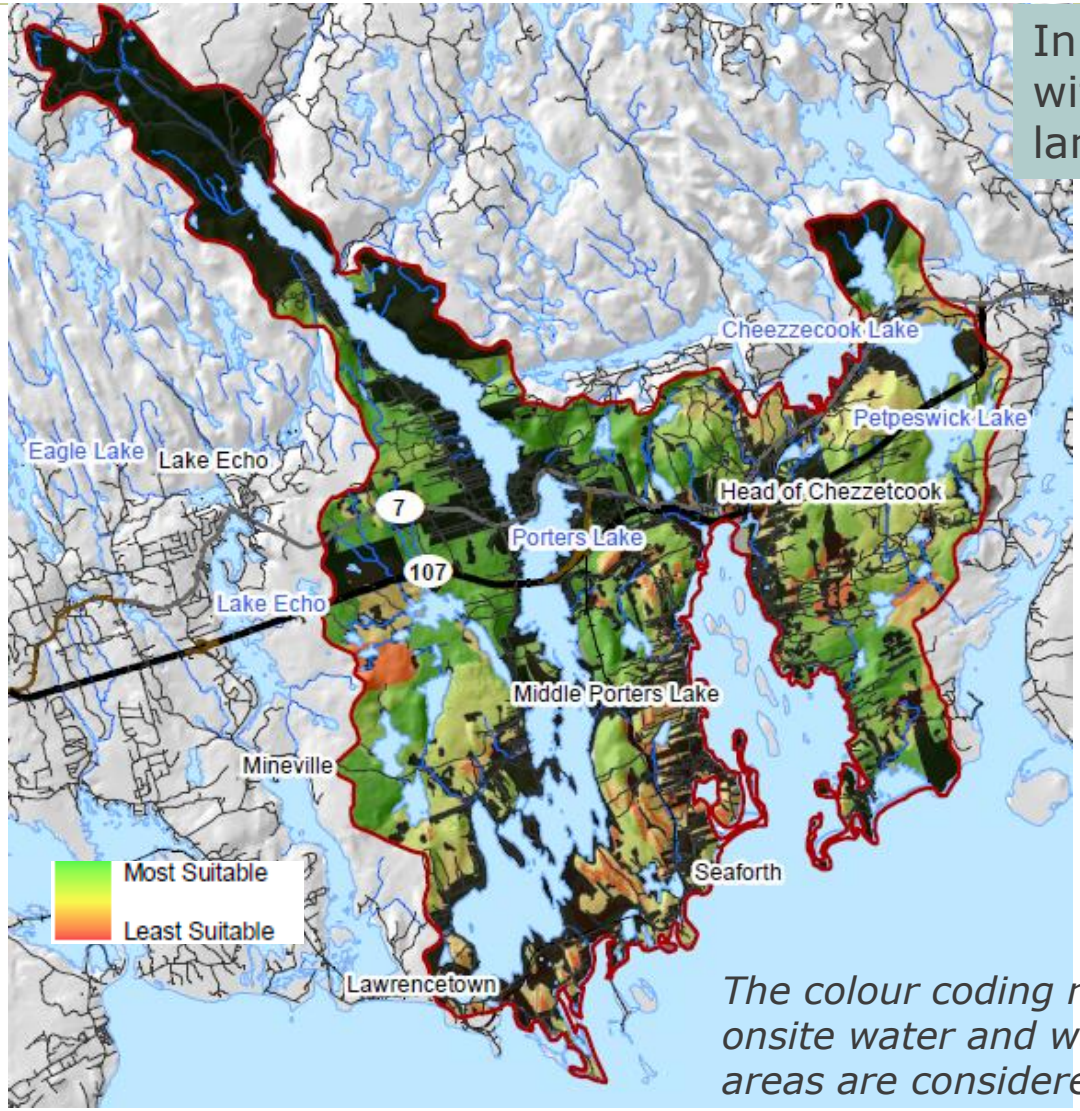
Where Should Future Development be Located?



In the areas tributary to water bodies with assimilative capacity and on the lands most suitable for onsite services

Based on the recommended water quality objectives, Porters Lake does not appear to have assimailative capacity due to E coli, TP and Chl a. Chezzetcook Inlet appear to have assimilative capacity due to E. coli loads.

Additional development in the areas directly tributary to these waterbodies should:

- Include plans to minimize water quality issues in the receiving waters;
- Be preceded by reductions in existing pollutant loads (or reduction in expectations for lake water quality).

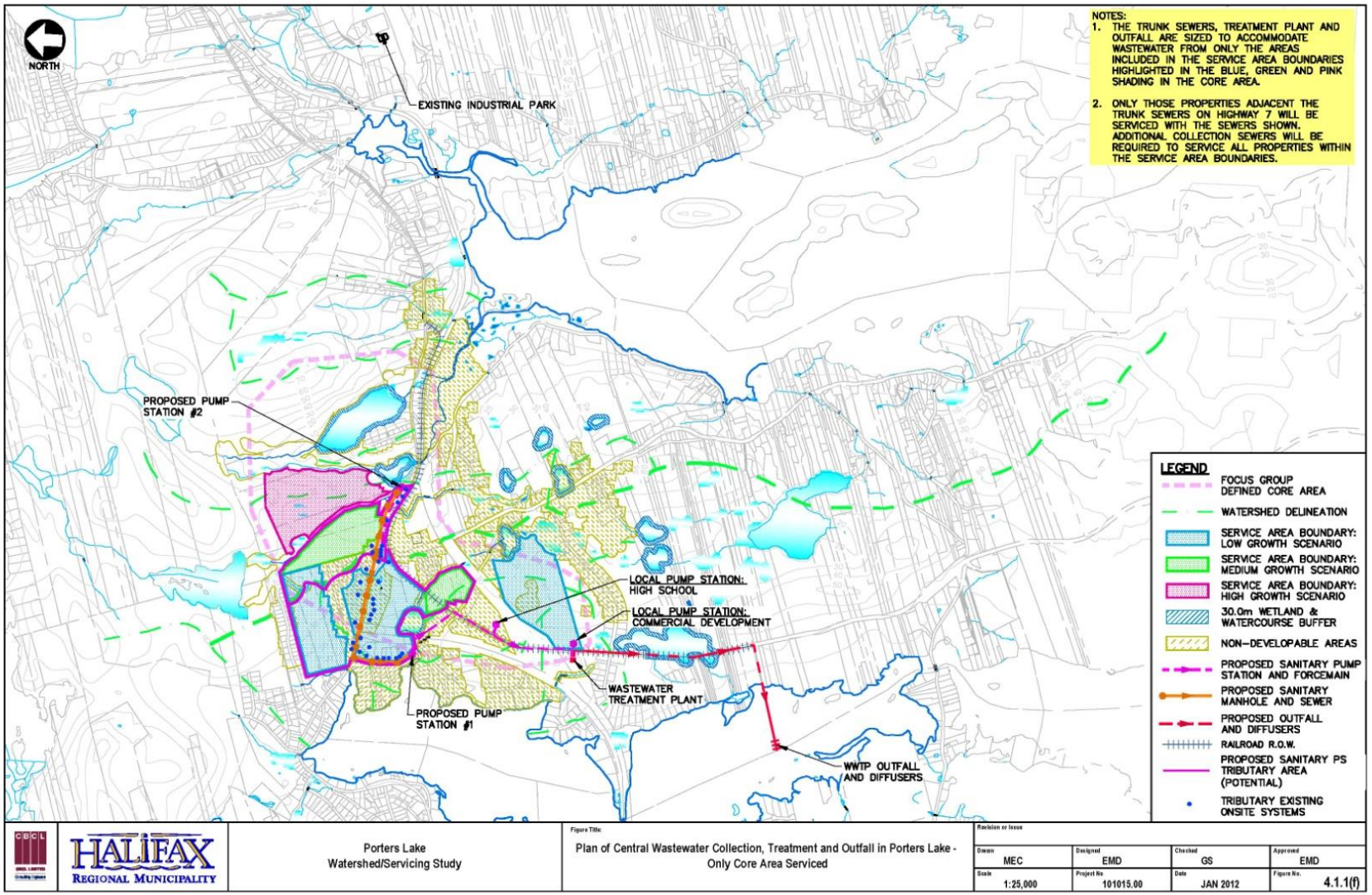
The colour coding ranks the suitability of land for onsite water and wastewater treatment. Dark green areas are considered most suitable for development.

Services for Future Development In Core Area

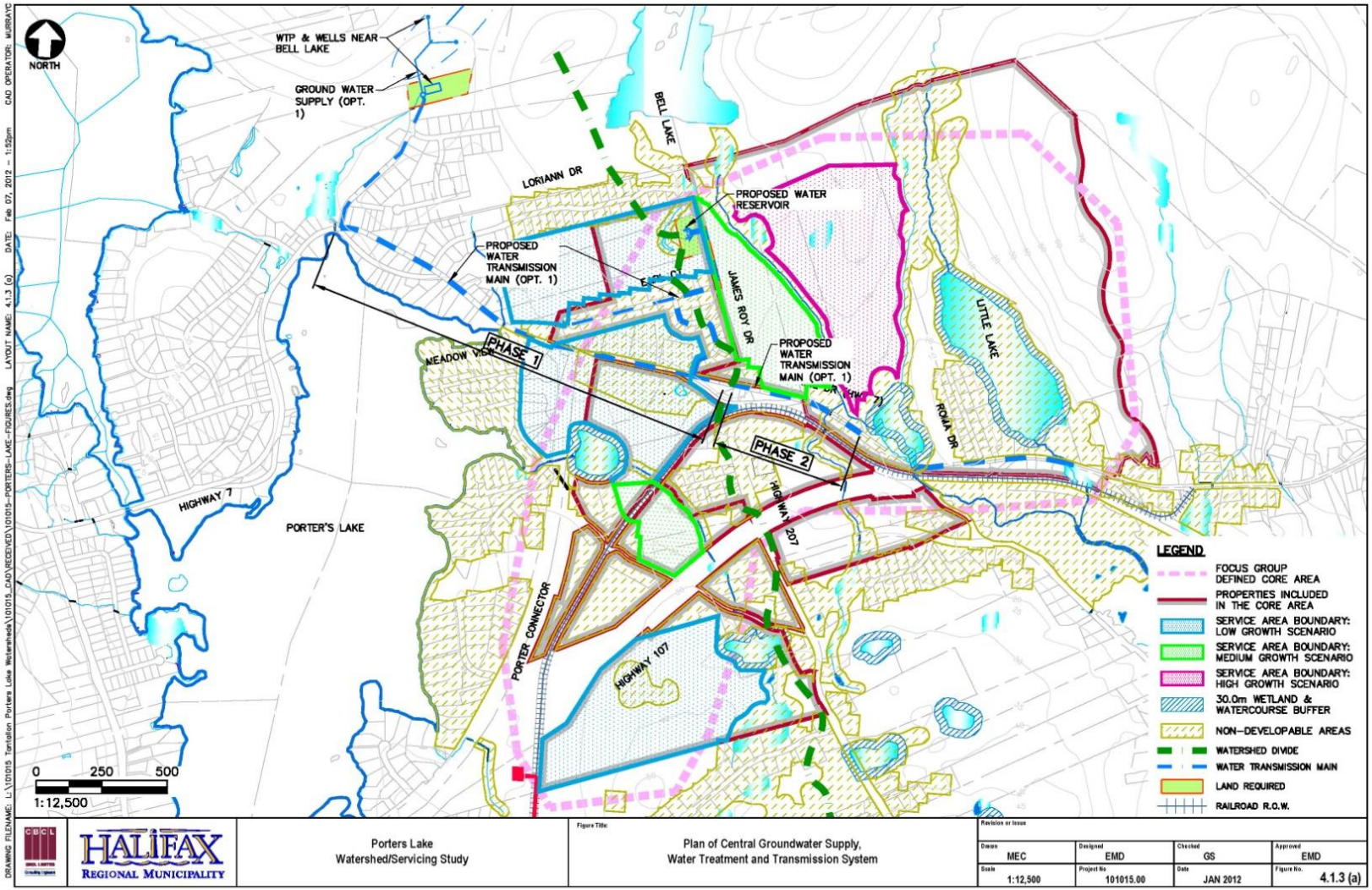
- In keeping with the proposal developed by area residents, a Core Area or community centre, serviced by central services, is envisioned with a center located near the intersection of the William Porter Connector and Highway 7.

- Following are maps showing 3 alternative systems for wastewater collection, treatment and outfall as well as a water distribution system and servicing areas

Wastewater and Clearwater Services in Core Area



Water Services in Core Area



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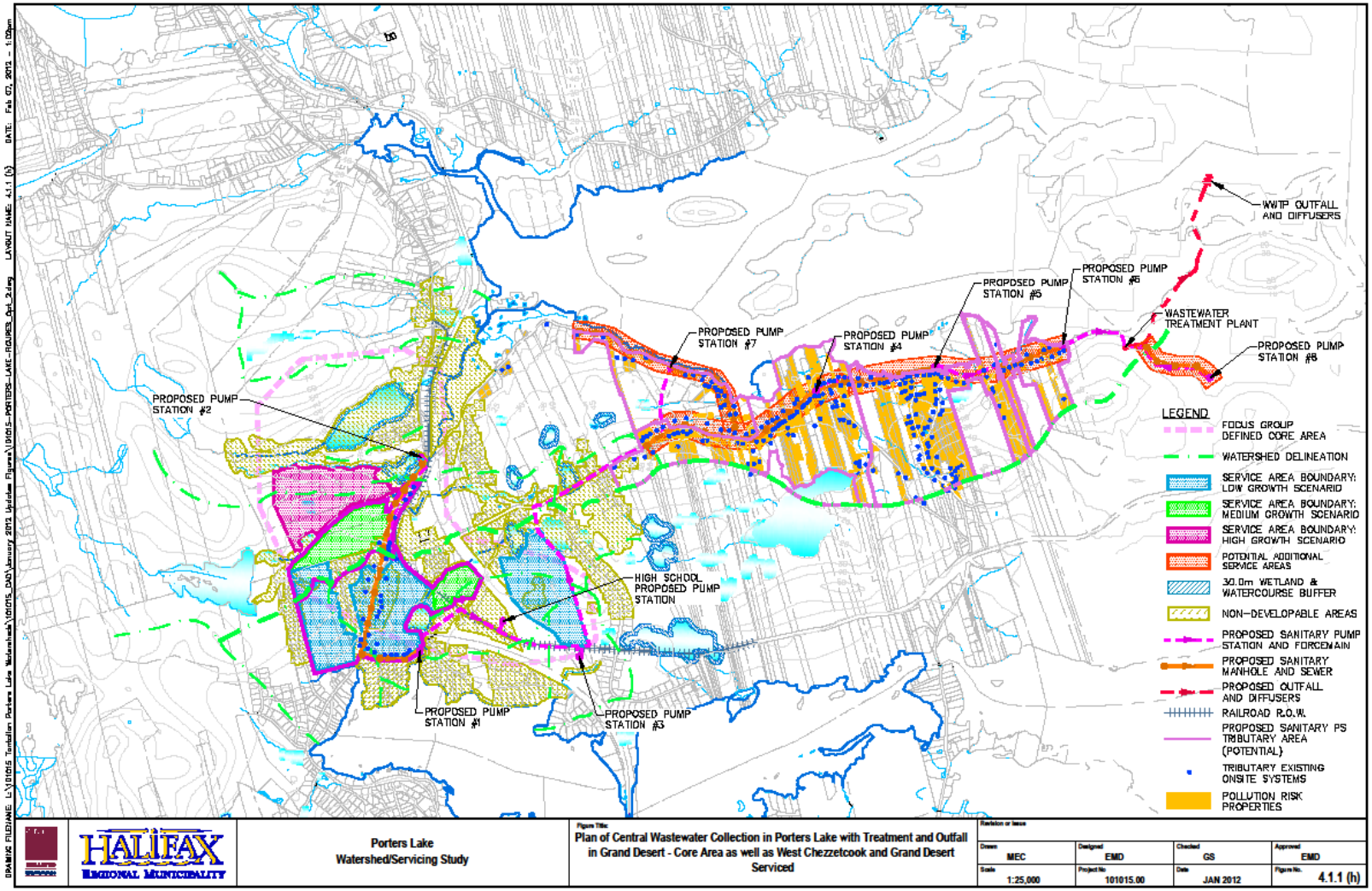
Wastewater Services in Core Area, West Chezzetcook and Grand Desert



Cost of Services

- Costs were developed for comparison of the alternatives and to provide a general indication of costs;
- They are based on construction costs of similar systems, including engineering and HST. Also includes an allowance for inflation to 2014 should Regional Council whish to proceed with servicing.
- Local site conditions and changing regulatory requirements may result in higher costs should approval be given;
- Costs will need to be updated as the process moves along and decisions on approaches are made.

Cost of Central Services

Growth Scenarios	*2010 Average* [2]	*2030 Low*	*2030 Medium*	*2030 High*
Study Area				
Population in Study Area	4650	5,100	8200	11,300
Households in Study Area	1750	2,200	3600	4,900
Central Services Area - Porters Lake Only				
Population in Service Area	100	1050	1700	2700
Households in Service Area	35	447	728	1160
Capital Cost of Wastewater and Clearwater Sewers [1]	n/a	$ 17,523,000	$ 24,922,000	$ 26,564,000
Capital Cost/Service		$ 39,245	$ 34,257	$ 22,900
Capital Cost of Central Water Only [1]		$ 16,499,000	$ 19,198,000	$ 24,270,000
Capital Cost/Service		$ 36,952	$ 26,389	$ 20,922
Capital Costs of All [1]		$ 28,304,000	$ 36,704,000	$ 50,834,000
Capital Cost/Service		$ 63,391	$ 50,452	$ 43,822

Central Services Area - Porters Lake, West Chezzetcook and Grand Desert				
Households in Service Area	261			1856
Capital Cost of Wastewater and Clearwater Sewers [1]	n/a			$ 60,512,000
Capital Cost/Service				$ 32,604

Note (1) Capital Costs are estimated for the year construction starts
Note (2) The High and Low Growth Scenario have different estimates of existing population and units, these are averaged
Note (3) 100 year life cycle was assumed

Thank You!

Porters Lake Watershed / Servicing Study

2010

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Solving Today's problems with Tomorrow in mind