

# Planning & Engineering Feasibility Study for Purcell's Cove Road Servicing

Presentation to Halifax and West  
Community Council

7 October 2013



- ◆ HRM issued an RFP in Oct./11 for a Planning and Engineering Feasibility Study related to the potential extension of central water and sewer services along Purcell's Cove Road
- ◆ CBCL Limited awarded project in Feb./12
- ◆ **Primary Purpose:** Assess and Determine the Feasibility and Costs Associated with the Extension of Central Water and Sewer Services along Purcell's Cove Road
  - Determine appropriate development density and community form
  - Assess potential traffic impacts for development
  - Develop and assess options for extending central service
  - Prepare construction cost estimates

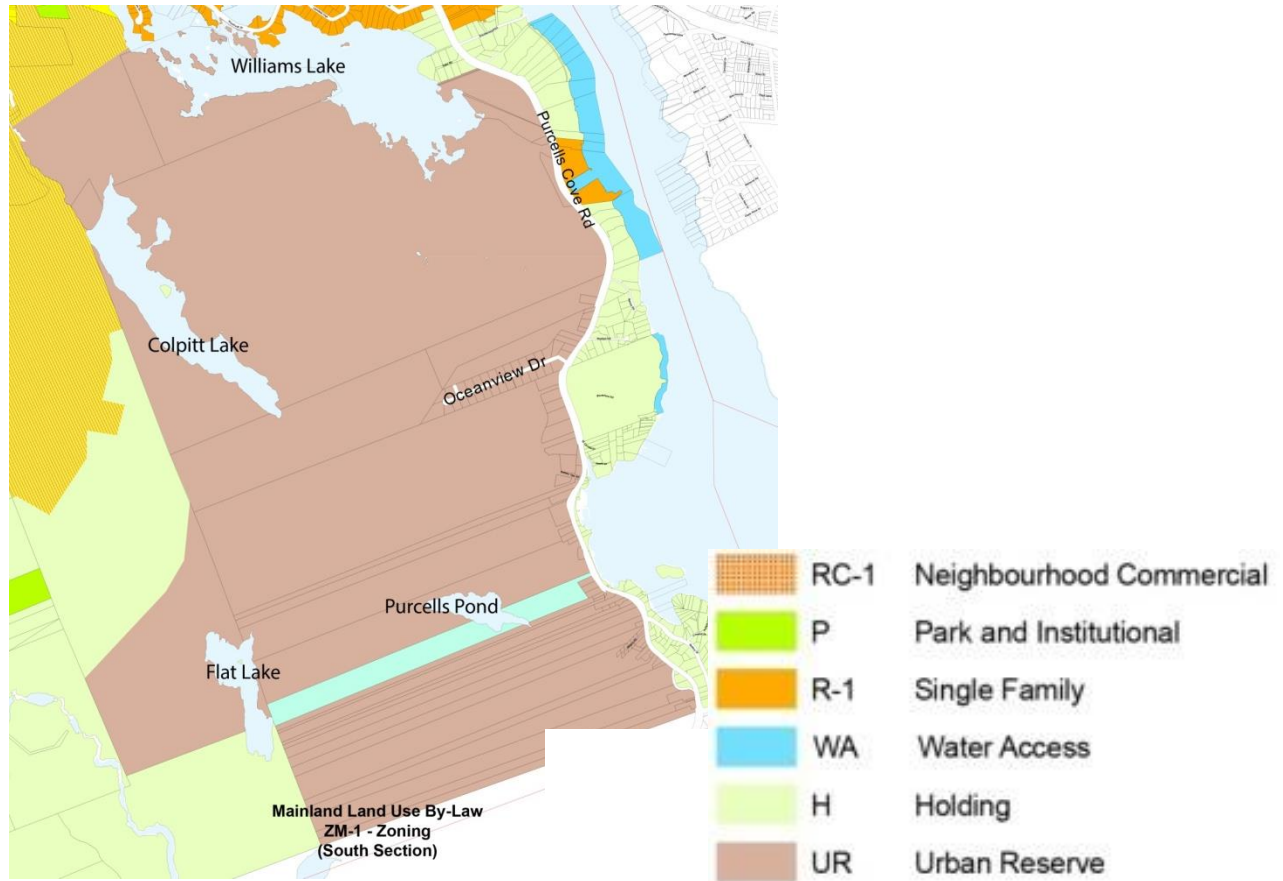
# Study Area





# Service Area Analysis

◆ Current Land Use Zoning – Halifax Mainland Land Use By-Law:



Portion of Zoning Land Use Map from Halifax Mainland Land Use By-law

# Service Area Analysis

## ◆ Future Land Use – Municipal Planning Strategies:



Portion of Generalized Future Land Use Map from 2006 HRM Regional Municipal Planning Strategy



**Generalized Future Land Use**

-  RDD Residential Development District
-  LDR Low Density Residential
-  P Major Community Open Space

Portion of Generalized Future Land Use Map from Halifax Mainland Municipal Planning Strategy

◆ Suitability Analysis:

- Development will occur on lands that are considered desirable and that have the ability to be serviced in a cost-effective manner
- Areas with Limited Development Potential:

Waterbodies
Watercourse, Wetland and Coastal Buffers *
Cemeteries
All lands below elevation 4.5m above sea level
Existing developed areas
Crown lands
Areas of elevated cultural significance
Areas of elevated archaeological significance
Protected areas
Open space and natural resources network

Note:

\* The Nova Scotia Department of Natural Resources Wildlife and Watercourses Protection Regulations states that for watercourses with channel widths over 50 cm, upland buffers are to be a minimum of 20 metres on either side of the watercourse and where average slopes within that area exceed 20%, the width is to be increased by one metre for each 2% of slope, up to a maximum of 60 metres in width.

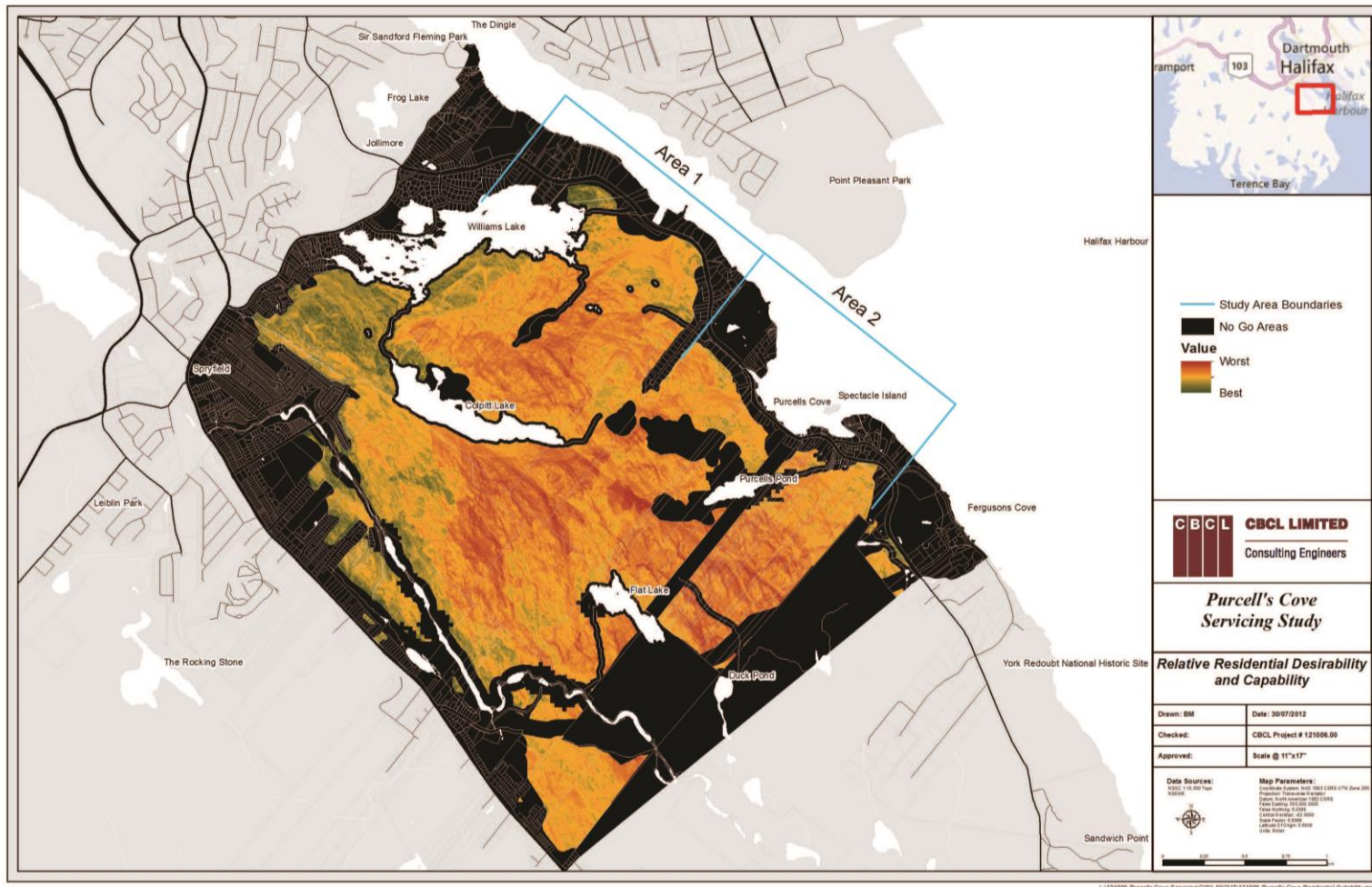
- Capability and Desirability for Development:

	CAPABILITY	DESIRABILITY
SLOPE	×	
SOIL DEPTH	×	
SOIL DRAINAGE	×	
TREE COVERAGE		×
ASPECT		×
VIEWS		×
DISTANCE TO SCHOOL		×
DISTANCE TO SERVICES		×
DISTANCE TO ROADS		×
DISTANCE TO BUS STOPS		×



# Service Area Analysis

- Relative Residential Desirability and Capability:





## ◆ Public Input:

- Community Steering Committee (CSC)
- Public Meeting/Workshop Oct. 29, 2012:
  - 48 People from Area 1
  - 42 People from Area 2
  - 91 People from Outside the Study Area
  - 4 People Unable to Assign
- Workshop Summary:
  - Attendees expressed concern that process is being manipulated to achieve a desired result
  - Attendees expressed satisfaction with existing on-site septic and water service
  - Attendees concerned that central services will be forced upon them
  - Attendees do not want additional development in the study area
  - Desire to preserve backlands a public open space/greenbelt
  - Attendees concerned that development will affect woodlands, wildlife and water quality in the area

◆ Potential Future Development:

- Study area is not designated as a growth centre in the Regional Plan
- Residents not willing to provide input related to potentially acceptable locations and forms for additional development in the area
- CBCL developed a conservative approach to estimate the number of additional lots that could be developed in the area:
  - Subdivision of Existing Lots as Allowed under Current Zoning

	Area 1	Area 2
Existing Lot Count (as provided by HRM)	160	185
Estimated Additional Lots that Could Be Created	85	170
Total	245	355

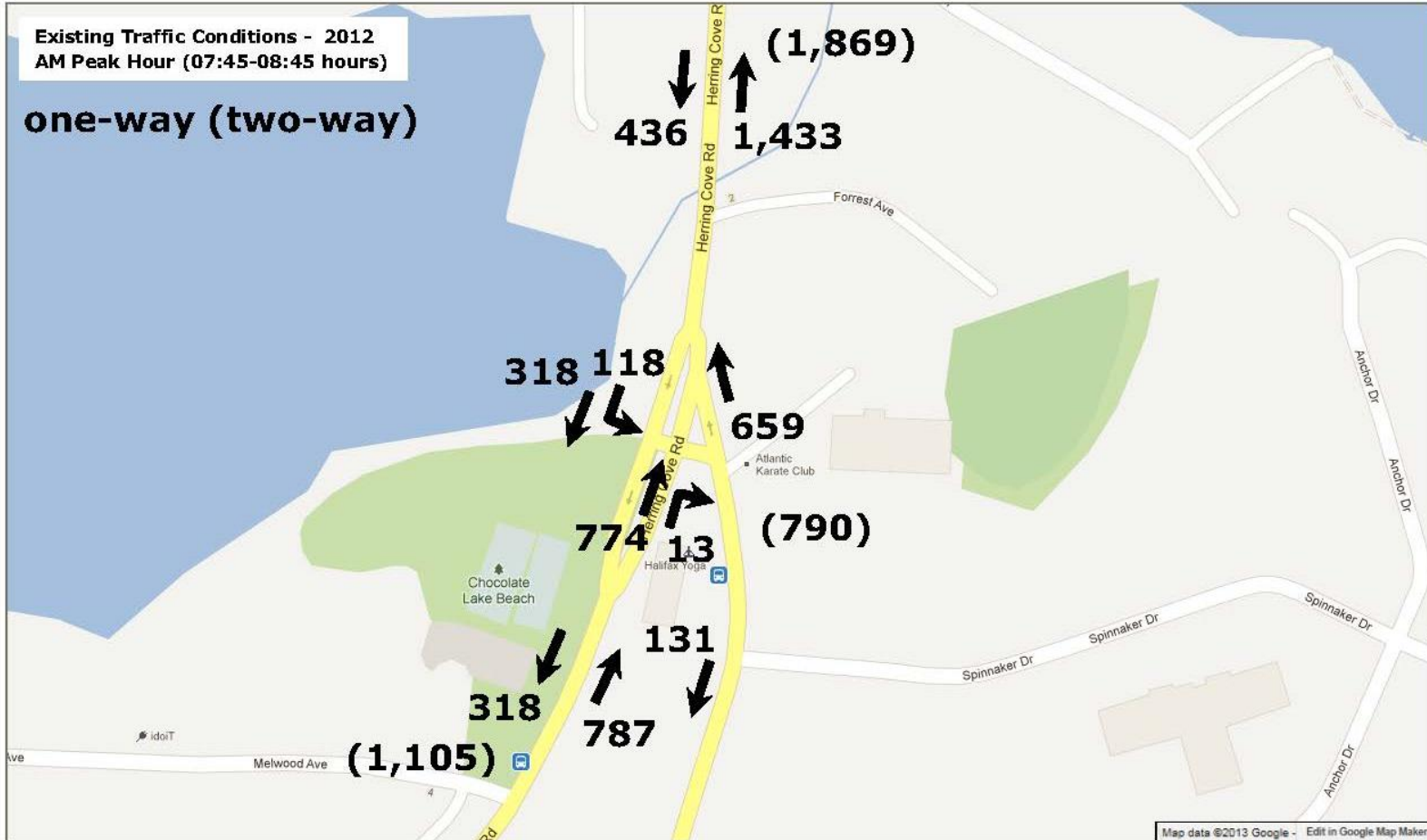
- Additional Development from Rezoning: 1200 lots on Clayton Lands (Area 1) – only permitted under “Plan Amendment” process

## ◆ Existing Conditions:

- Purcell's Cove Road is Primary Collector Road for Study Area
  - Posted Speed Limit 50km/hour
  - One Lane of Travel in Each Direction
- Primary Intersection is Purcell's Cove Road/Herring Cove Road
  - Unsignalized
  - Traffic Coming from the South along Purcell's Cove Road and Turning Right on Herring Cove Road must Yield to Traffic on Herring Cove Road
  - No Left Turn Permitted from Purcell's Cove Road to Herring Cove Road
  - Protected Left Turning Lane for Southbound Vehicles from Herring Cove Road to Purcell's Cove Road
- Traffic Counts Completed by HRM On Sept. 11 and 12, 2012

# Traffic Impact Analysis

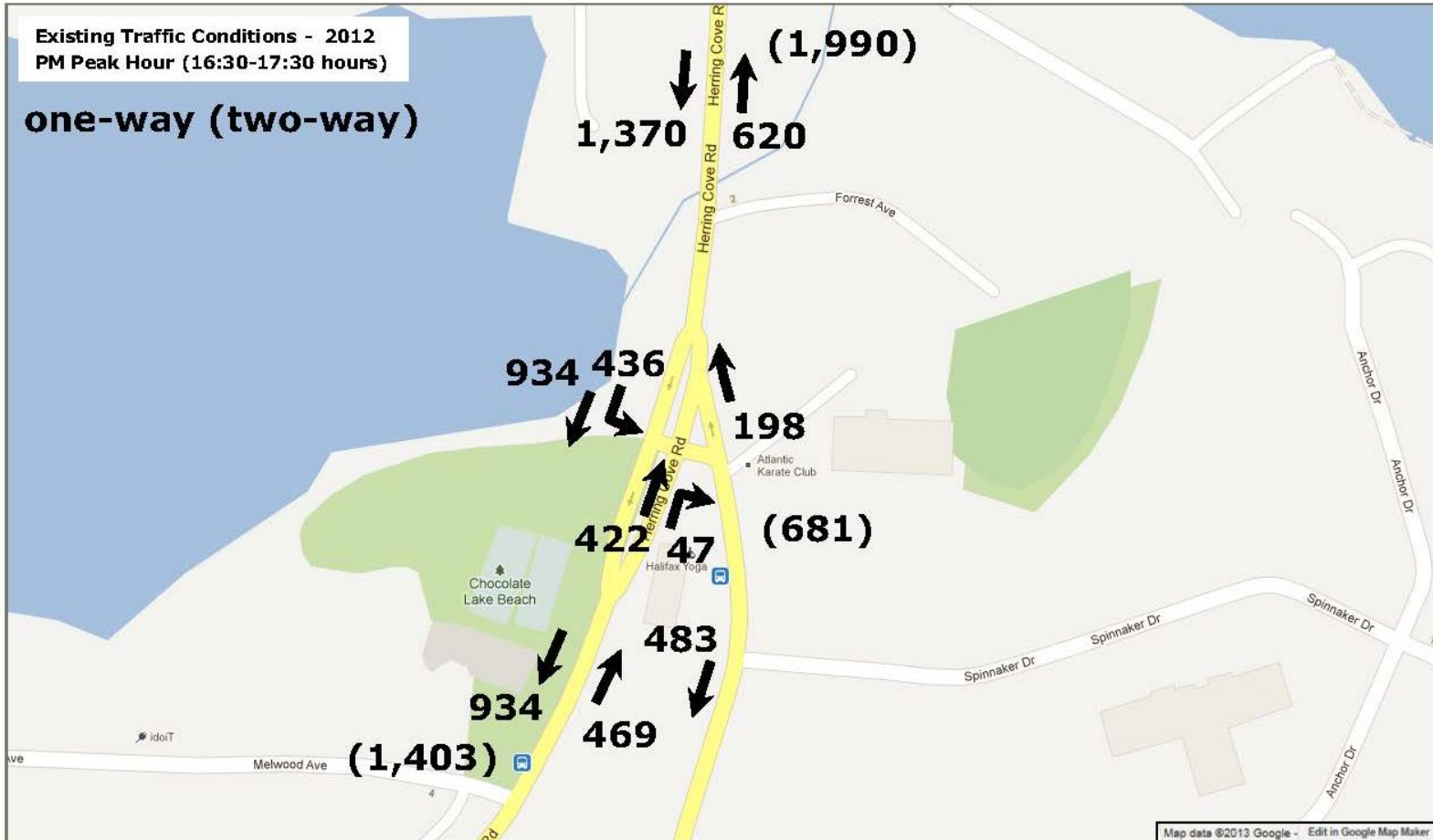
- ◆ Herring Cove Road/Purcell's Cove Road Intersection – 2012 AM Peak Hour:





# Traffic Impact Analysis

- ◆ Herring Cove Road/Purcell's Cove Road Intersection – 2012 PM Peak Hour:



- ◆ Expected Future Conditions:
  - 0.5% Growth per Year in Background Traffic for Area (as per discussions with HRM)
  - Clayton Development:
    - 600 Dwellings by 2018
    - Additional 600 Dwellings by 2023
    - For 2018 - Assume 95% of Peak AM trips would arrive at Purcell's Cove Road/Herring Cove Road Intersection and turn right towards the Armdale Roundabout. Reverse pattern assumed for PM peak hour
    - For 2023 - Assume 83% of Peak AM trips would arrive at Purcell's Cove Road/Herring Cove Road Intersection and turn right towards the Armdale Roundabout. Reverse pattern assumed for PM peak hour

# Traffic Impact Analysis

◆ Traffic Performance Indicators:

- Level of Service(LOS) – Average Amount of Delay Experienced by Motorists for each Intersection Movement

Level of Service (LOS)	Average Delay per Vehicle (sec)	
	Signalized	Unsignalized
A	<10	<10
B	>10 and <20	>10 and <15
C	>20 and <35	>15 and <25
D	>35 and <55	>25 and <35
E	>55 and <80	>35 and <50
F	>80	>50

- LOD D – Minimum Acceptable Standard during Peak Periods
- Volume-to-Capacity (V/C) Ratio – Relationship Between Estimated Traffic Volumes and Maximum Theoretical Intersection/Turning Movement Capacity
  - 0.90 or Less is Considered Acceptable

# Traffic Impact Analysis

◆ Summary of Herring Cove Rd./Purcell's Cove Rd. Intersection Analysis:

Intersection Movement	AM Peak Hour				PM Peak Hour			
	V/C Ratio	Average Delay (sec)	Average Queue Length (m)	LOS	V/C Ratio	Average Delay (sec)	Average Queue Length (m)	LOS
<b>Existing (2012) Traffic Conditions</b>								
PCR/HCR N/b Right	2.48	704.0	~400	F	0.54	20.2	~22	C
HCR/PCR S/b Left	0.17	10.8	~4	B	0.47	11.6	~18	B
<b>Estimated 2018 Traffic Conditions (600 dwellings)</b>								
PCR/HCR N/b Right	3.87	1,326.7	~712	F	0.97	49.7	~70	E
HCR/PCR S/b Left	0.35	12.4	~11	B	0.87	26.7	~79	D
<b>Estimated 2023 Traffic Conditions (1,200 dwellings)</b>								
PCR/HCR N/b Right	5.54	2,081.1	~971	F	1.32	183.5	~180	F
HCR/PCR S/b Left	0.56	16.7	~23	C	1.25	138.1	~277	F
<p><b>Legend:</b>            PCR/HCR N/b Right – Purcell's Cove Road Northbound Right Turn on to Herring Cove Road            HCR/PCR S/b Left – Herring Cove Road Southbound Left Turn on to Purcell's Cove Road</p>								



# Traffic Impact Analysis

## ◆ Summary of Armdale Roundabout 2023 AM Peak Hour Analysis:

y-intercept = 100%							
	Delay (s)	LOS	Queue (m)	V/C Ratio	Overall Delay	Overall LOS	Residual Capacity
Chebucto Rd	2	A	< 20	0.24	6	A	15% (St Margaret's Bay Rd)
Joseph Howe Dr	3	A	< 20	0.32			
St. Margaret's Bay Rd	10	A	< 20	0.79			
Herring Cove Rd	6	A	< 20	0.57			
Quinpool Rd	2	A	< 20	0.23			

y-intercept = 90%							
	Delay (s)	LOS	Queue (m)	V/C Ratio	Overall Delay	Overall LOS	Residual Capacity
Chebucto Rd	3	A	< 20	0.27	11	B	3% (St Margaret's Bay Rd)
Joseph Howe Dr	3	A	< 20	0.36			
St. Margaret's Bay Rd	24	C	144	0.91			
Herring Cove Rd	9	A	< 20	0.68			
Quinpool Rd	3	A	50	0.27			

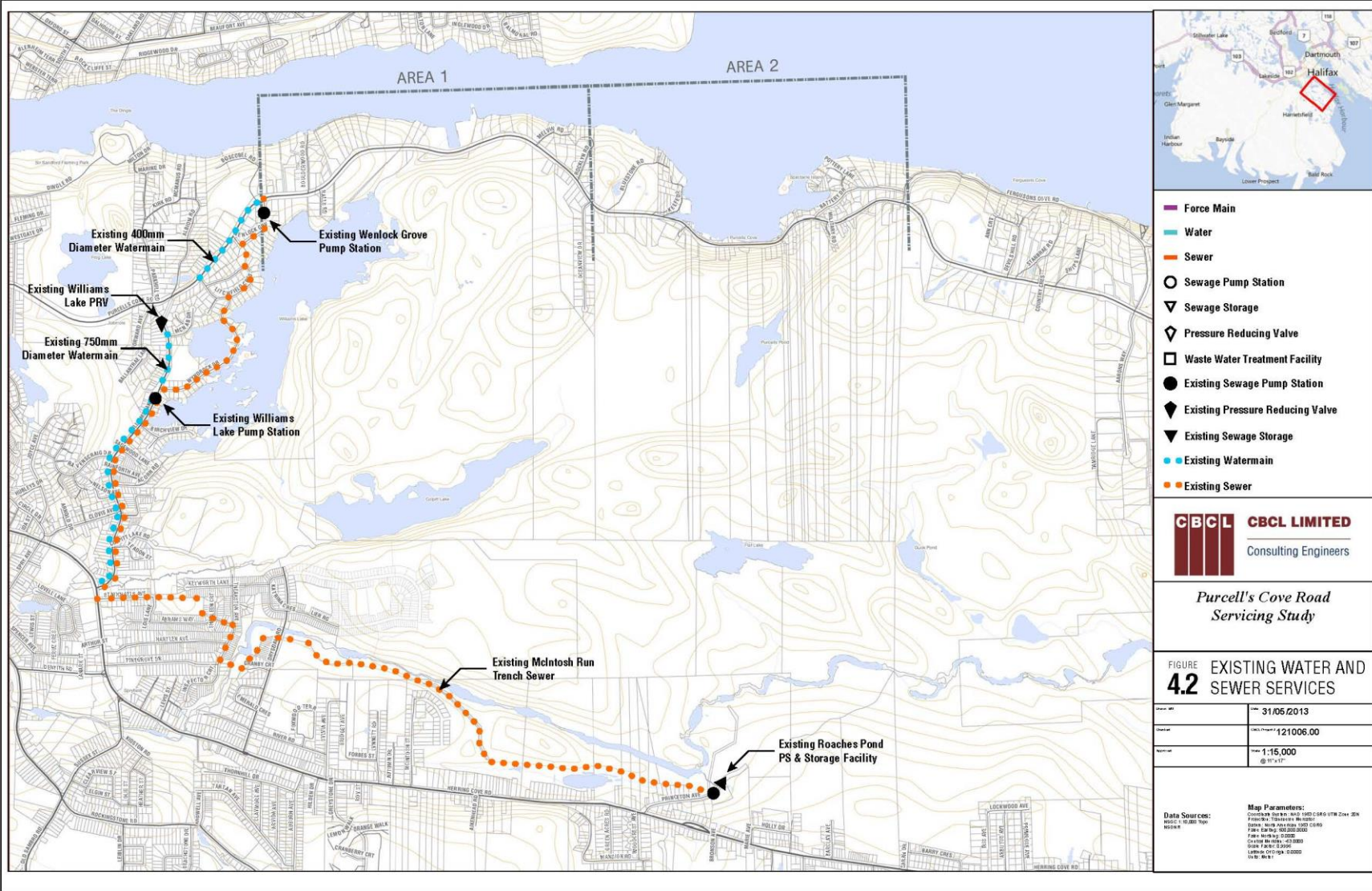
# Traffic Impact Analysis

◆ Summary of Armdale Roundabout 2023 PM Peak Hour Analysis:

y-intercept = 100%							
	Delay (s)	LOS	Queue (m)	V/C Ratio	Overall Delay	Overall LOS	Residual Capacity
Chebucto Rd	6	A	< 20	0.65	5	A	12% (Joseph Howe Dr)
Joseph Howe Dr	10	B	< 20	0.55			
St. Margaret's Bay Rd	5	A	< 20	0.41			
Herring Cove Rd	4	A	< 20	0.45			
Quinpool Rd	5	A	< 20	0.72			

y-intercept = 90%							
	Delay (s)	LOS	Queue (m)	V/C Ratio	Overall Delay	Overall LOS	Residual Capacity
Chebucto Rd	11	B	< 20	0.78	11	B	0% (Joseph Howe Dr)
Joseph Howe Dr	32	D	42	0.79			
St. Margaret's Bay Rd	8	A	< 20	0.50			
Herring Cove Rd	5	A	< 20	0.51			
Quinpool Rd	9	A	35	0.82			

# Central Servicing Analysis – Existing Services



**CBCL CBCL LIMITED**  
Consulting Engineers

*Purcell's Cove Road  
Servicing Study*

**FIGURE 4.2** EXISTING WATER AND SEWER SERVICES

Date:	31/05/2013
Scale:	1:121006.00
North:	1:15,000 @ 1"=1'

**Data Sources:**  
 NSIC 1:10,000 Topographic  
 NSIC 1:50,000 Topographic

**Map Parameters:**  
 Coordinate System: UTM  
 Datum: NAD 83  
 Units: Meter  
 Contour Interval: 10.0000  
 Contour Label: 10.0000  
 Contour Color: 0.0000  
 Contour Width: 0.0000  
 Contour Style: Solid  
 Contour Color: 0.0000  
 Contour Width: 0.0000  
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 Contour Style: Solid

## ◆ Design Parameter for New Services:

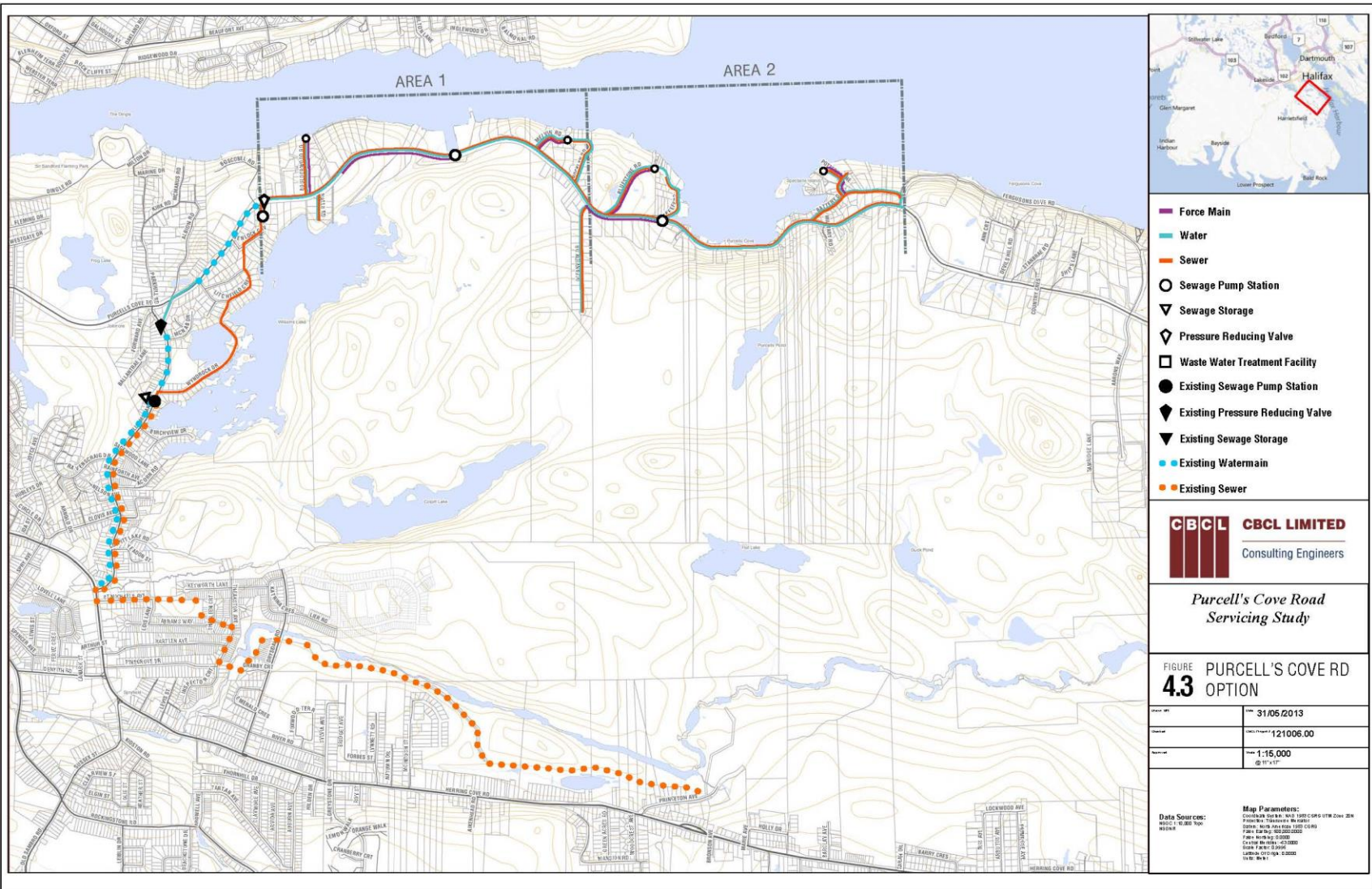
- Based on Halifax Water's *Design and Construction Specifications*
  - Water System:
    - ◆ Designed to accommodate the greater of max daily demand plus fire flow, or max hourly demand
    - ◆ Minimum pipe diameter – 200mm Local Mains, 300mm Main Feeder
    - ◆ Maximum Hydrant Spacing 150m
    - ◆ A single water service lateral shall be installed to each existing lot or potential future lot which could be created under zoning in effect at the time of installation



## ◆ Design Parameter for New Services (con't):

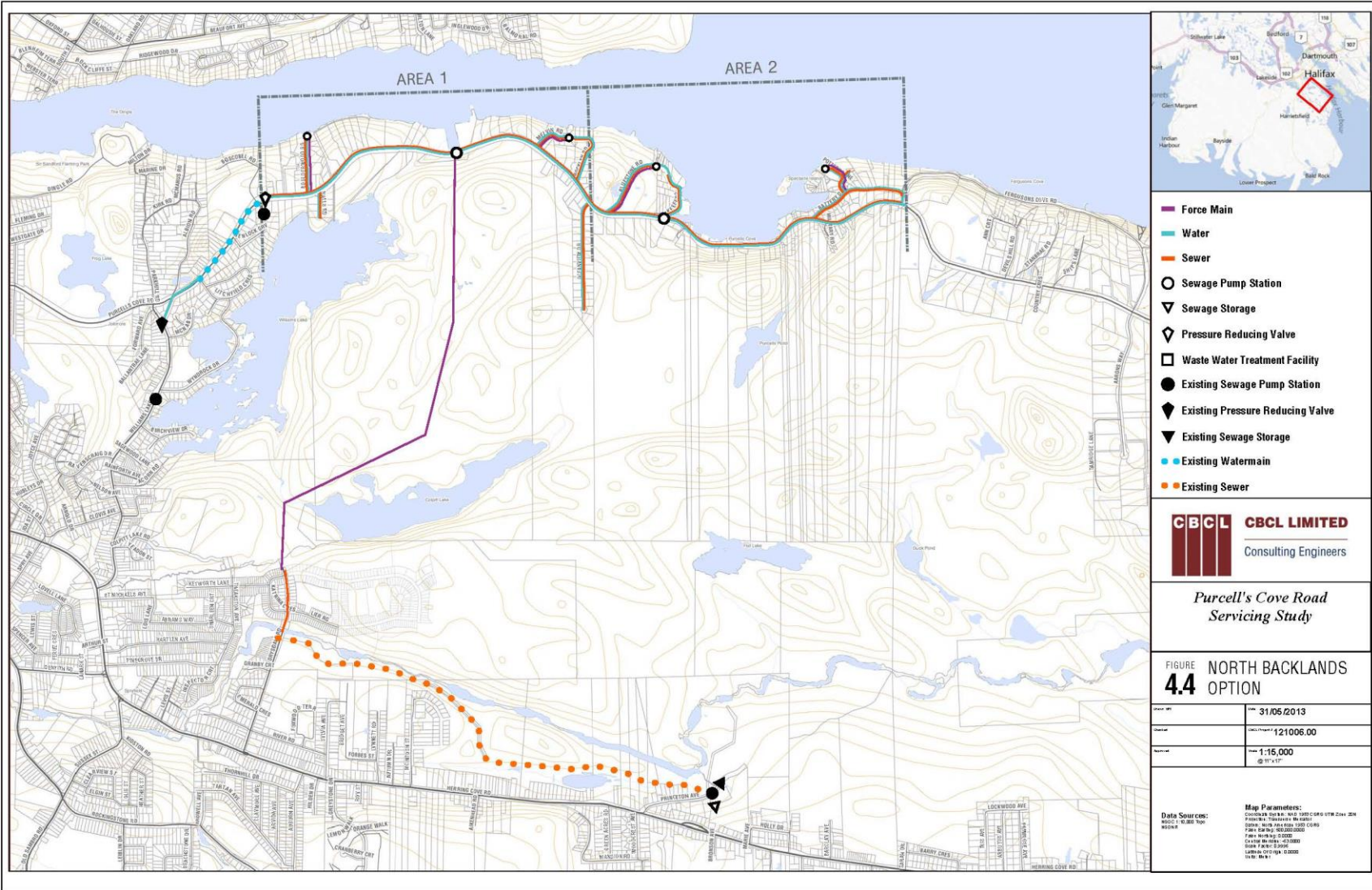
- Sanitary Sewer System:
  - ◆ Minimum pipe diameter – 250mm
  - ◆ Maximum manhole spacing 100m
  - ◆ Sewage pumping stations are to be provided with dual forcemains
  - ◆ Minimum forcemain diameter – 100mm
  - ◆ A service lateral shall be installed to each existing lot or potential future lot which could be created under zoning in effect at the time of installation

# Central Servicing Analysis – Purcell's Cove Road Option



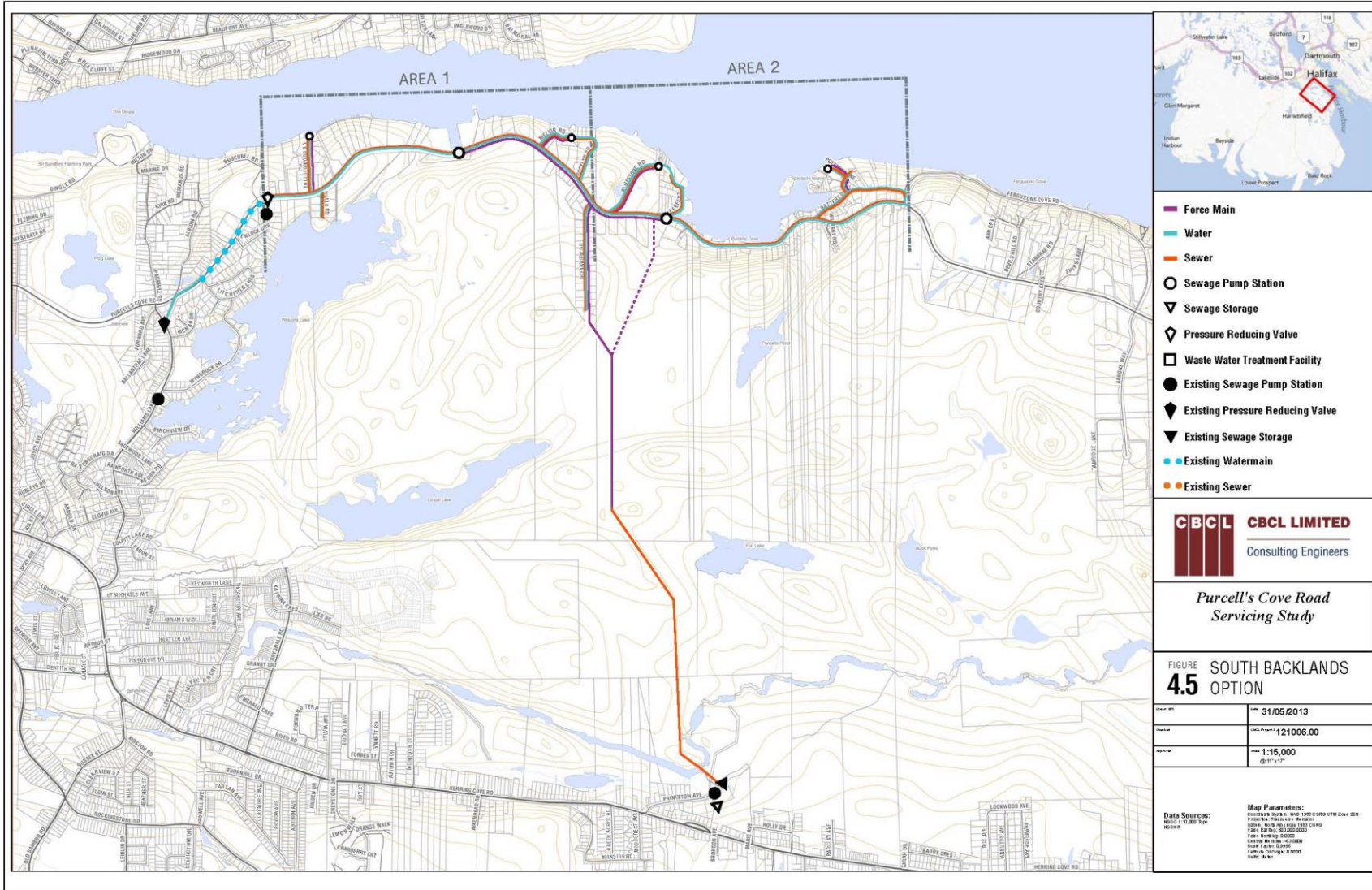


# Central Servicing Analysis – North Backlands Option



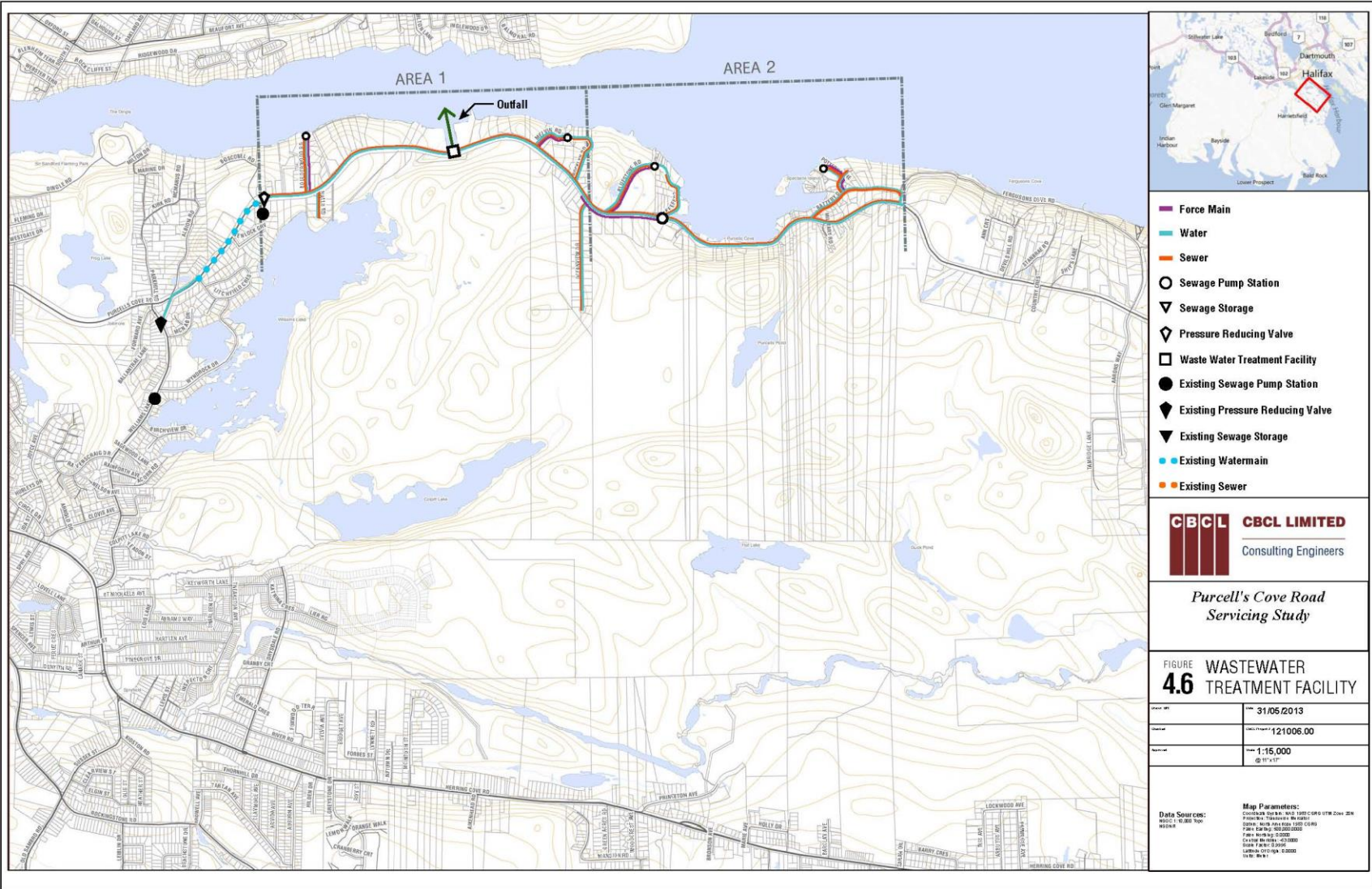


# Central Servicing Analysis – South Backlands Option





# Central Servicing Analysis – Wastewater Treatment Facility



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*Purcell's Cove Road Servicing Study*

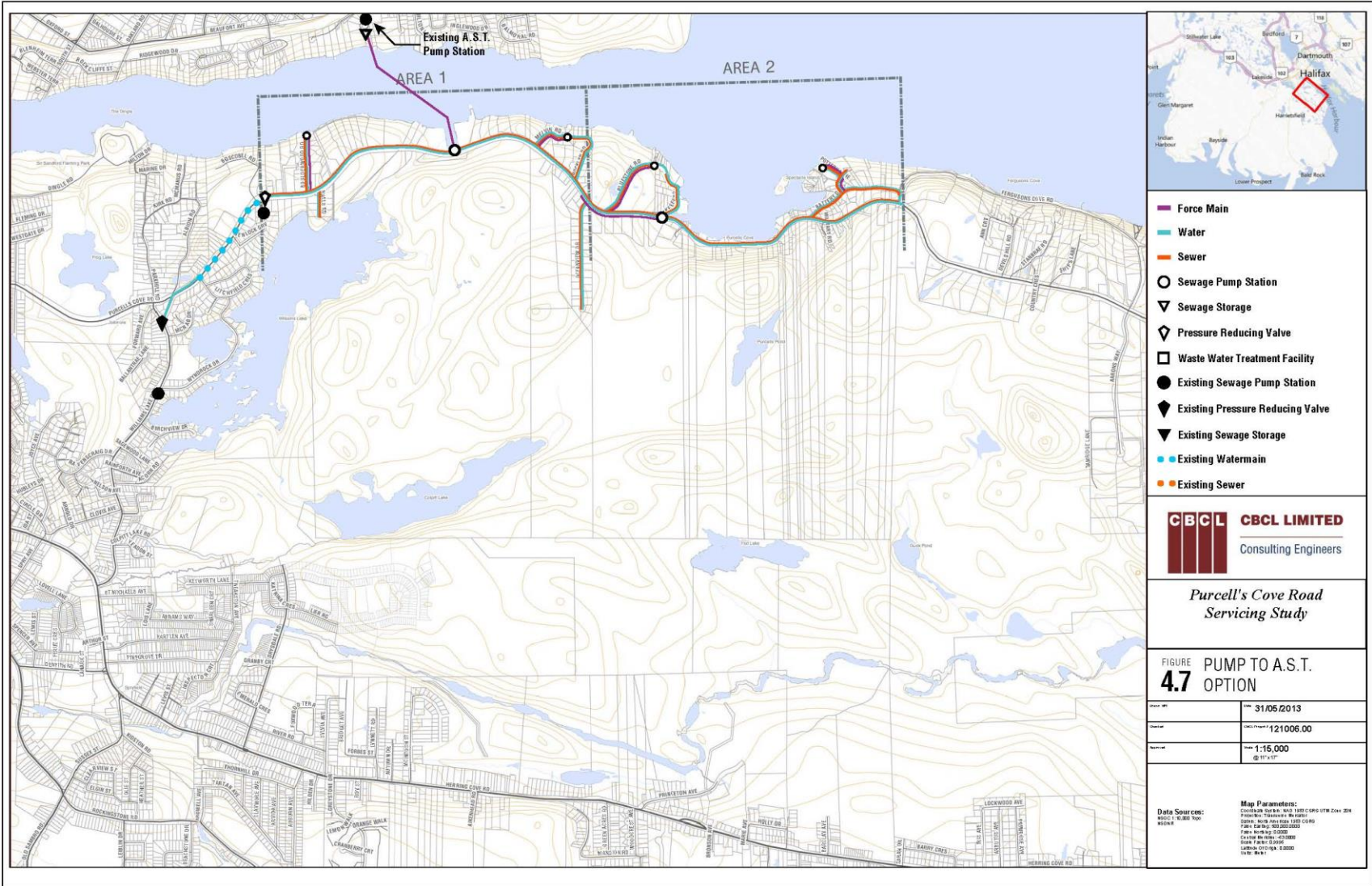
**FIGURE 4.6 WASTEWATER TREATMENT FACILITY**

Date:	31/05/2013
Project:	121006.00
Scale:	1:15,000 @ 11" x 17"

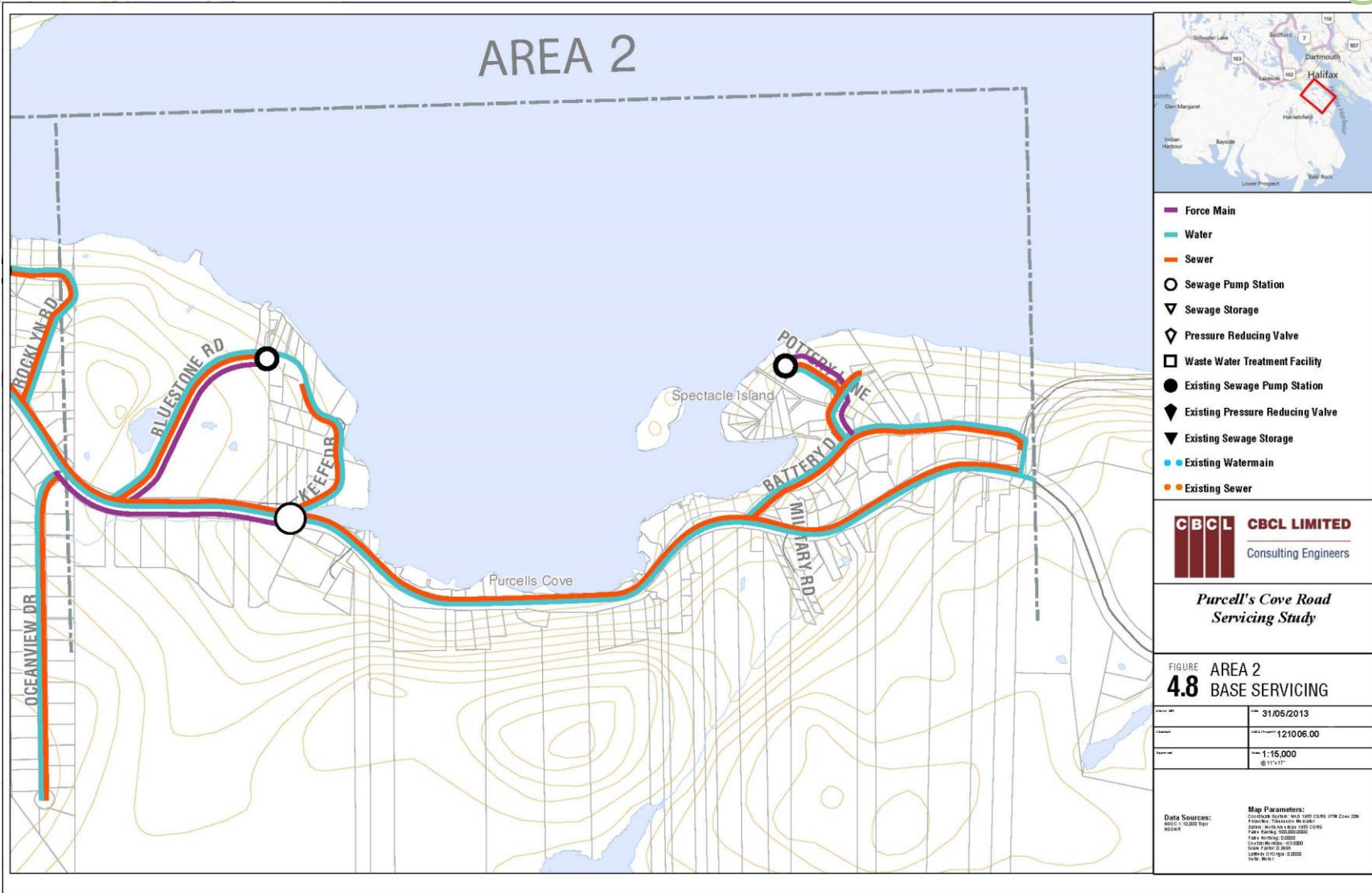
**Data Sources:**  
 1/10/08 Topo  
 1/10/08



# Central Servicing Analysis – Pump to Atlantic School of Theology



# Central Servicing Analysis – Area 2 Base Servicing



## ◆ Definition of Terms:

- **Base Cost:** Capital cost to provide sufficiently sized infrastructure to service existing lots as well as any new lots resulting from subdivision that may be allowed under current zoning regulations
  - Area 1:
    - ◆ 160 current properties
    - ◆ Allowance for 245 total properties with subdivision
  - Area 2:
    - ◆ 185 current properties
    - ◆ Allowance for 355 total properties with subdivision
- **Upsize Cost:** Additional capital cost to increase base infrastructure sizes to accommodate flows from other areas



# Central Servicing Analysis – Servicing/Costing Scenarios

1. Area 1 Base Cost: Service Area 1 only plus subdivision as permitted under current zoning (total 245 properties)
  - Cost payable for Area 1 property owners
2. Upsize for Area 2: As per Item 1 above plus upsize to allow provision to include Area 2 in the future (additional 355 properties)
  - Cost initially payable by HRM complete with financing
  - Payable by Area 2 residents in the future
3. Upsize for Development: As per Item 2 above plus upsize to allow for future development (additional 1200 units)
  - Only permitted by plan amendment
  - Cost payable by developer

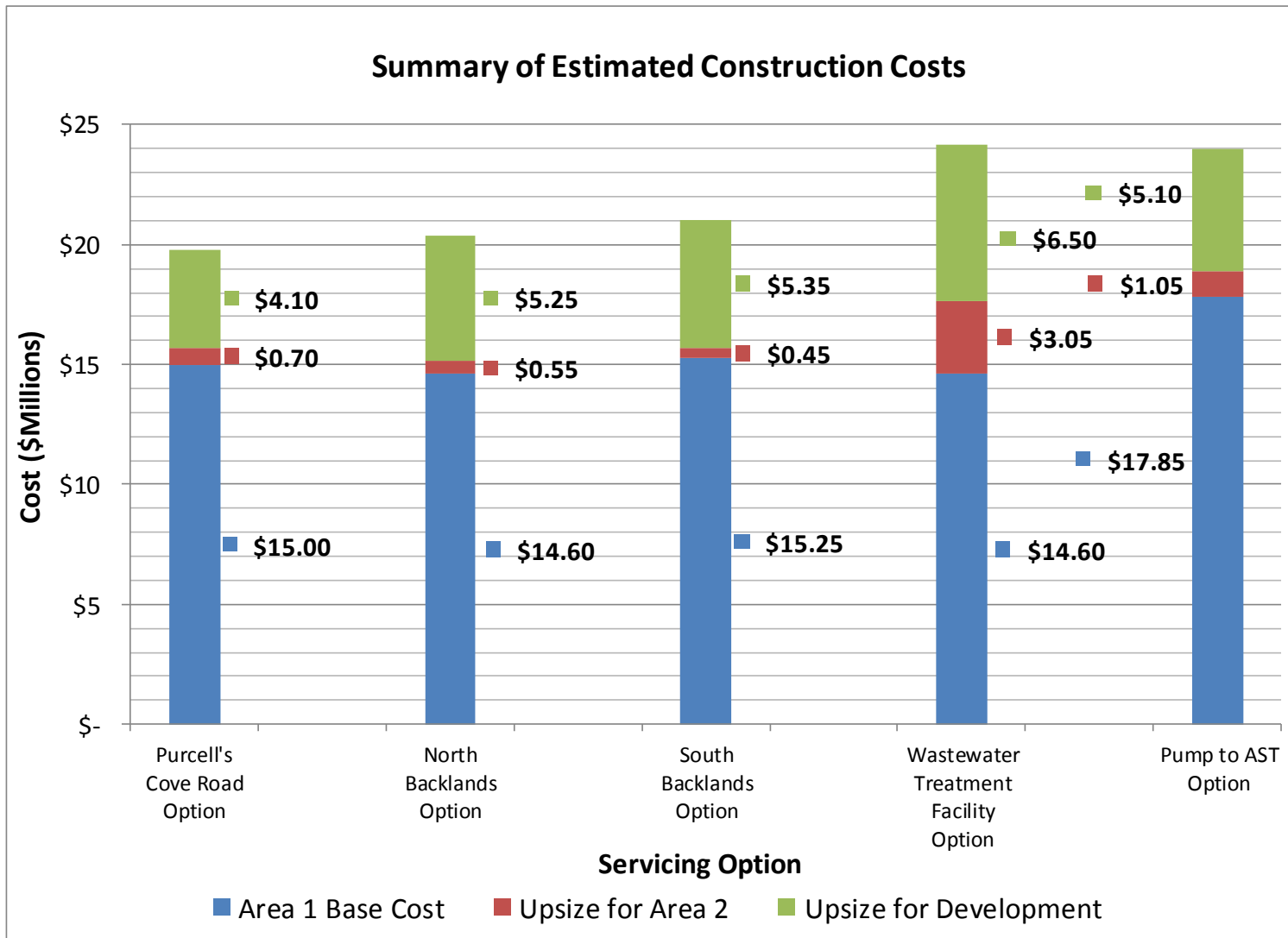
# Central Servicing Analysis – Estimated Construction Costs

<b>Servicing Option</b>	<b>Base Cost (\$Millions)</b>	<b>Area 2 Upsize Cost (\$Millions)</b>	<b>Development Upsize Cost (\$Millions)</b>	<b>Total Estimated Construction Cost (\$Millions)</b>
Purcell's Cove Road	\$15.00	\$0.70	\$4.10	<b>\$19.80</b>
North Backlands	\$14.60	\$0.55	\$5.25	<b>\$20.40</b>
South Backlands	\$15.25	\$0.45	\$5.35	<b>\$21.05</b>
Wastewater Treatment Facility	\$14.60	\$3.05	\$6.50	<b>\$24.15</b>
Pump to Atlantic School of Theology	\$17.85	\$1.05	\$5.10	<b>\$24.00</b>

Note: Estimates are Based on 2013 Construction Costs



# Central Servicing Analysis – Estimated Construction Costs



# Central Servicing Analysis – Possible Cost Sharing Scenarios

## 1. Area 1 Base Cost Shared for by Area 1 Property Owners

- Cost per Area 1 Property Owner = Area 1 Base Cost ÷ 245 Lots
- Area 2 Upsize Cost initially paid by HRM
- Development Upsize Cost paid by Developer (Clayton)

## 2. Area 1 Base Cost Shared by Area 1 Property Owners and Developer

- Cost per Area 1 Property Owner = Area 1 Base Cost ÷ 1,445 Lots
- Area 2 Upsize Cost initially paid by HRM
- Development Upsize Cost paid by Developer (Clayton)

# Central Servicing Analysis – Possible Cost Sharing Scenarios

## 3. Total Area 1 Construction Cost (less Area 2 upsize cost) Shared by Area 1 Property Owners and Developer

- Cost per Area 1 Property Owner = Total Area 1 Construction cost (less Area 2 Upsize Cost) ÷ 1,445 Lots
- Area 2 Upsize Cost initially paid by HRM

# Central Servicing Analysis – Possible Cost Sharing Scenarios

## 4. Common Infrastructure Area 1 Base Cost Shared by Area 1 Property Owners and Developer and Remaining Base Cost Paid by Area 1 Property Owners

- Common Infrastructure includes elements that are required to jointly service both Area 1 and the proposed Clayton Development
- Cost per Area 1 Property Owner = (Common Area 1/Clayton Base Cost ÷ 1,445 Lots) + (Remaining Area 1 Base Cost ÷ 245 Lots)
- Area 2 Upsize Cost initially paid by HRM
- Development Upsize Cost paid by Developer (Clayton)

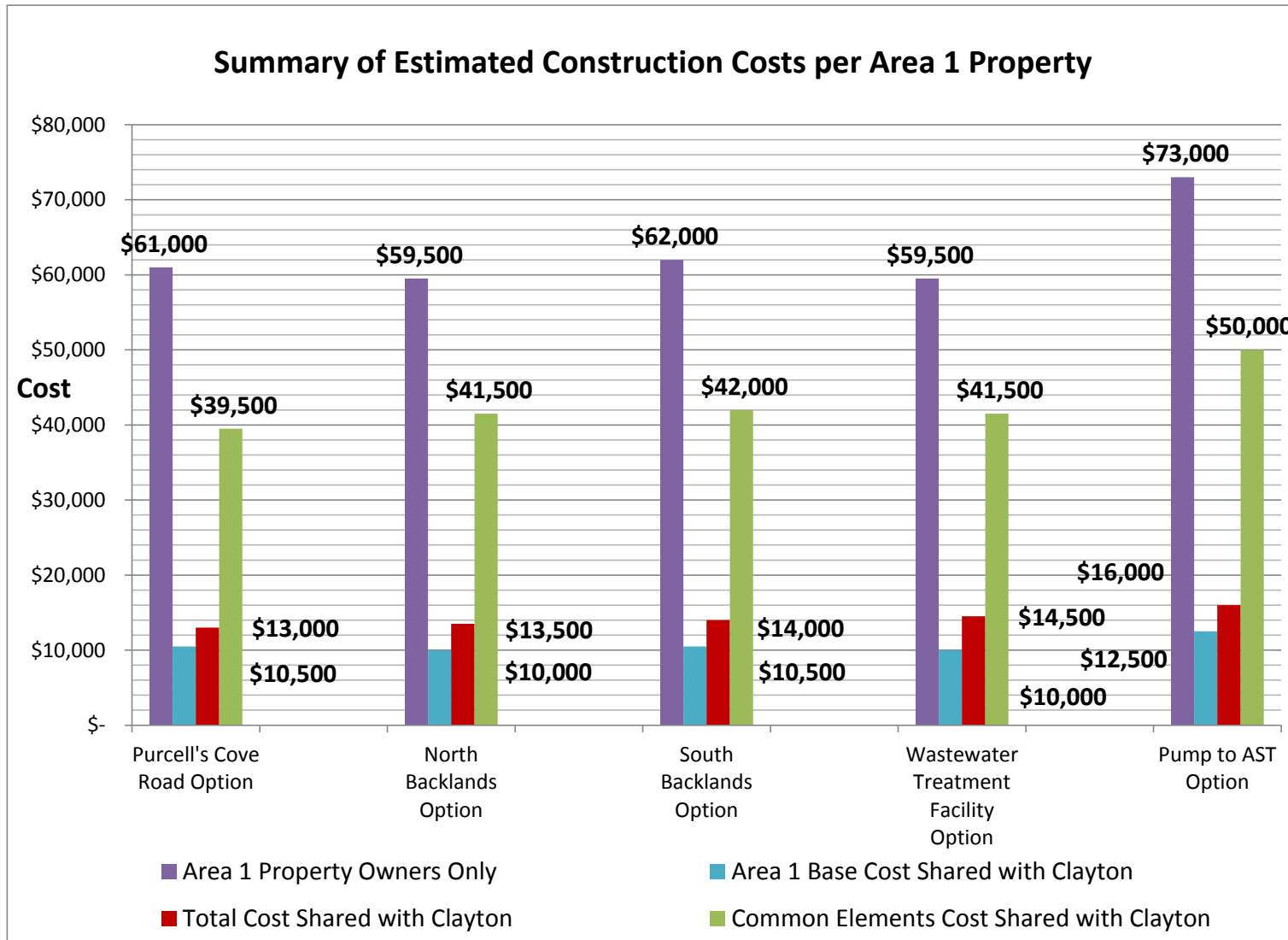
# Central Servicing Analysis – Estimated Capital Cost per Area 1 Property (\$/Lot)

Servicing Option	Possible Cost Sharing Scenario			
	Base Cost Shared by Area 1 Property Owners	Base Cost Shared by Area 1 Property Owners and Clayton	Total Cost Shared by Area 1 Property Owners and Clayton	Common Infrastructure Base Cost Shared by Area 1 Property Owners and Clayton
Purcell's Cove Road	\$61,000	\$10,500	\$13,000	\$39,500
North Backlands	\$59,500	\$10,000	\$13,500	\$41,500
South Backlands	\$62,000	\$10,500	\$14,000	\$42,000
Wastewater Treatment Facility	\$59,500	\$10,000	\$14,500	\$41,500
Pump to Atlantic School of Theology	\$73,000	\$12,500	\$16,000	\$50,000

Note: Estimates are Based on 2013 Construction Costs



# Central Servicing Analysis – Estimated Capital Cost per Area 1 Property (\$/Lot)



# Central Servicing Analysis – Alternative Development Scenario

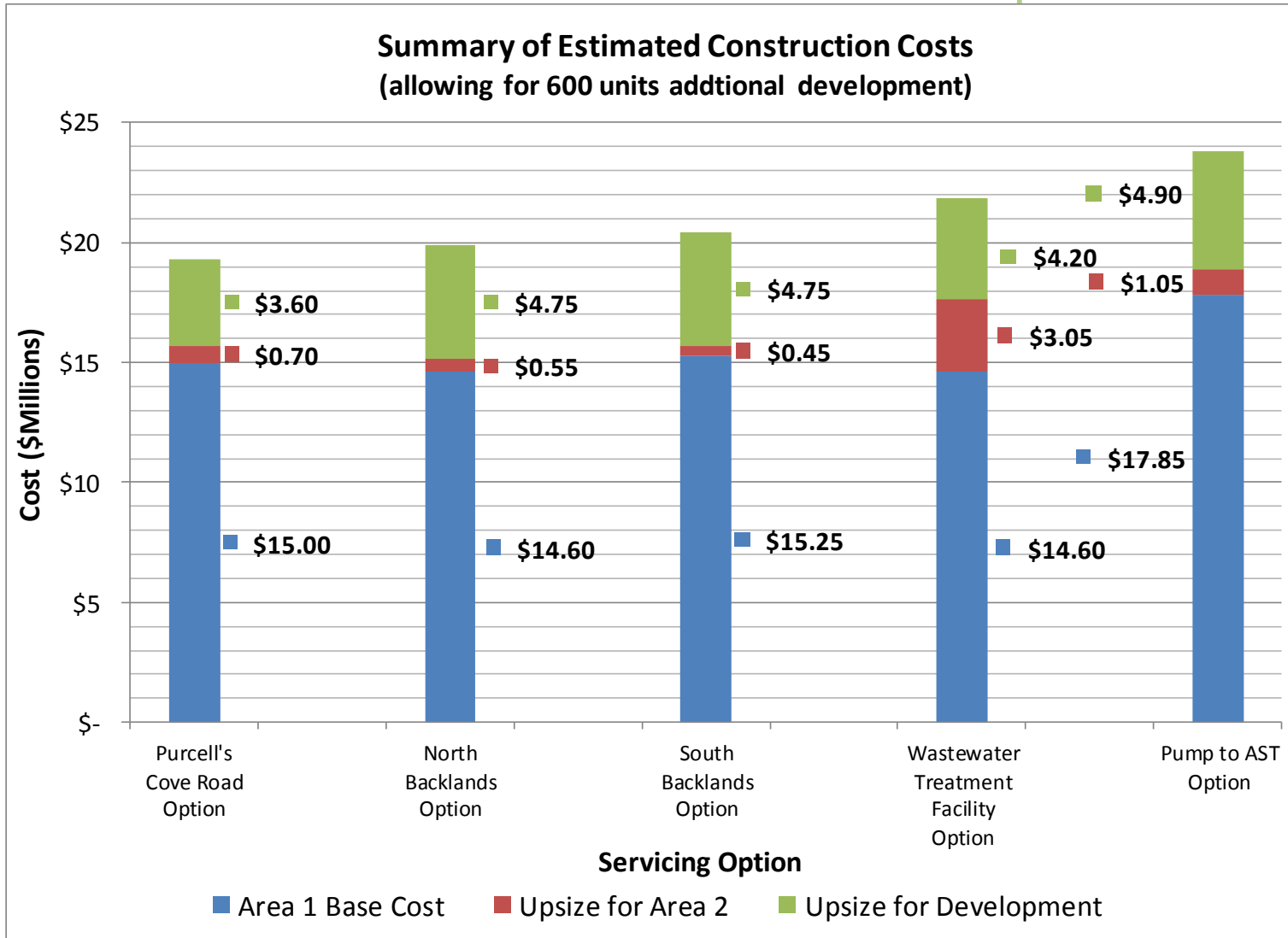
- ◆ Alternate Development Scenario Analysis Requested by HRM
- ◆ 600 Lot Development on Clayton Lands instead of 1200 Lots
- ◆ Base Costs Remain the Same
- ◆ Upsize Costs related to Development are Lower

# Central Servicing Analysis – Estimated Construction Costs for Alternative Development Scenario

<b>Servicing Option</b>	<b>Base Cost (\$Millions)</b>	<b>Area 2 Upsize Cost (\$Millions)</b>	<b>Development Upsize Cost (\$Millions)</b>	<b>Total Estimated Construction Cost (\$Millions)</b>
Purcell's Cove Road	\$15.00	\$0.70	\$3.60	<b>\$19.30</b>
North Backlands	\$14.60	\$0.55	\$4.75	<b>\$19.90</b>
South Backlands	\$15.25	\$0.45	\$4.75	<b>\$20.45</b>
Wastewater Treatment Facility	\$14.60	\$3.05	\$4.20	<b>\$21.85</b>
Pump to Atlantic School of Theology	\$17.85	\$1.05	\$4.90	<b>\$23.80</b>

Note: Estimates are Based on 2013 Construction Costs

# Central Servicing Analysis – Estimated Construction Costs for Alternative Development Scenario



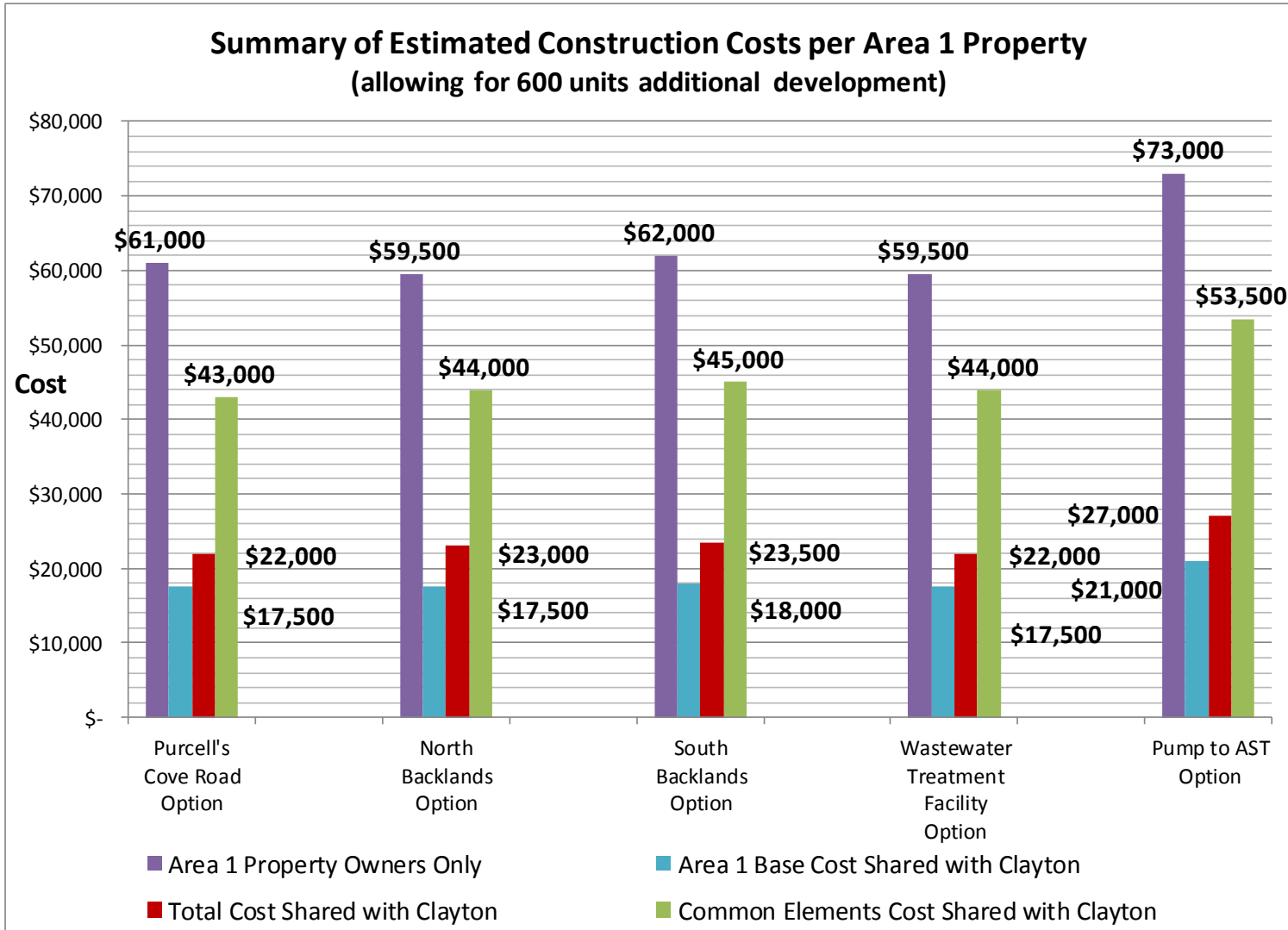
# Central Servicing Analysis – Estimated Capital Cost per Area 1 Property (\$/Lot) for Alternative Development Scenario

Servicing Option	Possible Cost Sharing Scenario			
	Base Cost Shared by Area 1 Property Owners	Base Cost Shared by Area 1 Property Owners and Clayton	Total Cost Shared by Area 1 Property Owners and Clayton	Common Infrastructure Base Cost Shared by Area 1 Property Owners and Clayton
Purcell's Cove Road	\$61,000	\$17,500	\$22,000	\$43,000
North Backlands	\$59,500	\$17,500	\$23,000	\$44,000
South Backlands	\$62,000	\$18,000	\$23,500	\$45,000
Wastewater Treatment Facility	\$59,500	\$17,500	\$22,000	\$44,000
Pump to Atlantic School of Theology	\$73,000	\$21,000	\$21,000	\$53,500

Note: Estimates are Based on 2013 Construction Costs



# Central Servicing Analysis – Estimated Capital Cost per Area 1 Property (\$/Lot) for Alternative Development Scenario



## **Public Input:**

- Based on input received through the CSC meeting process and public consultation process, the majority of area residents who attended these sessions:
  - ◆ Expressed satisfaction with the on-site septic and water service that they have and are concerned that central services will be forced upon them;
  - ◆ We are opposed to any additional development in the area and would like to see the Purcell's Cove Backlands preserved as public open space;
  - ◆ Were concerned that development will affect the woodlands, wildlife and ground and surface water quality in the area; and
  - ◆ Were not willing to provide input related to potentially acceptable locations and forms for additional development within the study area.

## **Service Area Analysis:**

- Purcell's Cove Study Area is not a Designated Growth Area in the Current HRM Regional Plan
- In order to determine the potential impact that additional development in the area may have on the possible extension of central water and sewer services, a conservative estimate of the number of lots that could be created was developed as follows:
  - ◆ 85 additional lots in Area 1 created by subdivision of existing lots;
  - ◆ 170 additional lots in Area 2 created by subdivision of existing lots; and
  - ◆ 1,200 additional lots in Area 1 created by plan amendments for the existing Clayton lands.

## **Traffic Impact Analysis:**

- The Herring Cove Road / Purcell's Cove Road intersection is currently overcapacity during the AM peak hour for traffic turning right from Purcell's Cove Road on to Herring Cove Road towards the Armdale Roundabout.
- Conditions at the Herring Cove / Purcell's Cove Road intersection during the PM peak hour are currently well within current operating capacity;
- With first phase of Clayton development, by the year 2018, the AM peak right turn movement from Purcell's Cove Road would be anticipated to operate with over 20 minutes of delay, which equates to over 700 meters of queue length. With continued development, by 2023, the delay would be 35 minutes and a queue length of 950 metres.
- For the PM peak, the queue length would be 277 meters back along Herring Cove Road in 2023.
- The Armdale Roundabout would continue to have an acceptable level of service.

## **Least Cost Options:**

- Estimated construction costs for the Area 1 central servicing concepts range from \$19.80 million to \$24.15 million;
- The estimated construction cost for the Area 2 central servicing concept is \$12 million;
- Depending on the selected servicing option for Area 1 and the selected cost sharing scenario, the estimated capital cost per Area 1 property to provide central water and sewer to the area range from \$10,000/lot to \$73,000/lot;
- Excepting the proposed Clayton development, the estimated capital cost for Area 1 property owners to receive central water and sewer service could range between \$59,500 and \$73,000 per Area 1 property;
- Using a cost sharing scenario whereby the common Area 1 infrastructure base cost is shared by Area 1 property owners and Clayton (probably the fairest allocation), the estimated capital cost for Area 1 property owners to receive central water and sewer service could range between \$39,500 and \$50,000 per Area 1 property.
- Should HRM decide to proceed, further detailed engineering will be required to determine the best least cost option.