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Item No. 17.1
Halifax Regional Council
February 7, 2017

TO: Mayor Savage and Members of Halifax Regional Council

Original Signed by

SUBMITTED BY:

Jacques Dubé, Chief Administrative Officer

Original Signed by

Jane Fraser, Acting Deputy Chief Administrative Officer

DATE: January 16, 2017

SUBJECT: Herring Cove Water Servicing Phase 2B – Revised Scope

ORIGIN

June 21, 2016 – Halifax Regional Council approval for federal infrastructure funding applications.

August 16, 2016 release by the Government of Canada of federal–provincial bilateral agreements on infrastructure and list of approved projects and funding.

December 6, 2016 - That Halifax Regional Council:

- Waive Rules of order to suspend the rules that the Audit and Finance Standing Committee approve this report and make a recommendation to Regional Council; and,
- Increase the 2016/17 gross capital budget in the amount of $75,000 for a preliminary design for the Herring Cove Water Servicing Project Phase 2B and Phase 4, with funding as a withdrawal from General Contingency Reserve, Q421;
- Authorize a sole source award and reimbursement to the Halifax Regional Water Commission in the amount of $75,000 for the preliminary design of a revised scope of work for the Herring Cove Water Servicing Project Phase 2B and Phase 4; and
- Commence the LIC process with project initiation conditional upon Council approval of the LICs

January 24, 2017 - Council Item 14.1.2 – Halifax Regional Council delayed approval of a contribution agreement for the Herring Cove Water Servicing project until an amended scope was available.

LEGISLATIVE AUTHORITY

Halifax Regional Municipality Charter (HRM Charter) subsections 74 (1)(2)

(1) "The Municipality may agree with…the Government of the Province or of Canada or a department or agency of either of them…to provide or administer municipal or village services.

(2) An agreement made by the Municipality pursuant to subsection may…(a) include any service provided by the Municipality;``

HRM Charter, clauses 79(1)(al)(am) ``The Council may expend money required by the Municipality for…

RECOMMENDATION ON PAGE 2

(al) wastewater facilities and stormwater systems;

(am) water systems;"

HRM Charter, clauses 104 (1)(a)(e) **"**The Council may make by-laws imposing, fixing and providing methods of enforcing payment of charges for

(a) wastewater facilities or stormwater systems, the use of wastewater facilities or stormwater systems and connecting to wastewater facilities or stormwater systems;

(e) the municipal portion of the capital cost of installing a water system"

HRM Charter - Part VIII, Planning & Development.

RECOMMENDATION

It is recommended that Halifax Regional Council:

1. Change the scope of the Herring Cove Water Servicing Phase 2B project so that it connects John Brackett Drive (Highway 253) to water and wastewater servicing, using the hybrid system outlined in Option 3 in the report below with a revised total project cost of $4,561,952. This revised project is conditional upon final approval from Council following community consultation on the Local Improvement Charge (LIC).

2. Direct staff to send the revised scope to the Provincial and Federal governments for approval under the Clean Water & Wastewater Fund;

3. Request Halifax Water proceed with detailed design for the revised scope; and

4. Continue to pursue cost sharing for the full scope of Phase 2B with the provincial and federal governments as per Council's original funding application.

BACKGROUND

Herring Cove Servicing Phase 2B is one phase of a construction project to provide central water and sewer service to the community of Herring Cove. In 1999 Regional Council agreed to extend water service to the area due to the co-location of a Harbour Solutions sewage treatment plant. By 2008, the first three phases were completed; however, Phase 2B was not initiated due to escalating construction prices that exceeded the original budget and insufficient funds.

In June 2014 Halifax Regional Council approved the addition of the Herring Cove Servicing Phase 2B project to HRM's Building Canada Fund submissions. As the project was not approved under the Building Canada Fund, the project was resubmitted to Council for inclusion among HRM's applications to the Clean Water and Wastewater Fund (CWWF). On June 21, 2016, Council approved seven water and wastewater projects to be submitted to the CWWF, including Herring Cove Servicing Phase 2B. HRM submitted an application for the project, estimated at a total cost of $12,750,000. Under this program, cost sharing is 50% Federal, 25% Provincial and 25% Municipal. Based on this cost sharing, HRM requested $9.56 m in senior government funding.

As this project falls outside the Halifax Water service boundary, HRM is responsible for the construction costs of the water system. A Local Improvement Charge (LIC) By-law will be required to cover the municipal portion of project costs, i.e. those not funded through CWWF cost sharing from the provincial and federal governments. After construction, HRM will convey the system to Halifax Water for operation

and maintenance on a full cost recovery basis.

On August 16, 2016 the federal government and provincial governments announced Infrastructure Bilateral Agreements for the Clean Water and Wastewater Fund and the Public Transit Infrastructure Fund, as well as project allocations. The allocation for the Herring Cove Servicing project was $3.42M in senior government funding ($2.28M Federal and $1.14M Provincial). If HRM were to proceed with the full project as described in the application submitted to the provincial and federal governments, HRM would be responsible for the estimated funding shortfall of approximately $9.3M. Rather than undertake this expense, HRM has the option to submit a revised project scope that aligns with available funds to the Provincial and Federal governments. This is what Council decided to do, and on December 6, 2016, Council approved a sole source award and reimbursement to the Halifax Regional Water Commission in the amount of $75,000 for the preliminary design of a revised scope of work for the Herring Cove Water Servicing Project Phase 2B and Phase 4.

The deadline for the Federal Minister of Infrastructure to approve revised projects is February 16, 2017, six months after the initial funding announcement. The deadline for project completion under the CWWF is March 31, 2018.

DISCUSSION

Halifax Water hired WSP Canada to provide revised options for the construction of municipal water and wastewater service construction within the boundaries of Phase 2B and Phase 4 of the Herring Cove Servicing Strategy. The preliminary design report was completed on January 18, 2017 and provides preliminary design level drawings, cost estimates and recommendations for Phases 2B and 4. Detailed design and construction for Phase 4 has been deferred at this time, though the report gives a preliminary design overview and recommendation.

A number of factors affect the type of servicing system available to the Phase 2B area. Installation of municipal water and wastewater infrastructure within a public road right-of-way (ROW) is typically constrained by the overall width of the ROW, the number, type and diameter of pipes to be installed in the road, the depth to bedrock, the depth and character of the glacial till overburden, and the proximity of other buried and surficial public and private buildings and other features. These issues impact the number and placing of pipes, as described in the servicing options below.

The WSP report considers three servicing options to provide adequate water distribution systems and sanitary wastewater collection and transmission systems. Key considerations were physical constraints in the area, traffic disruption, impact to private properties and structures, and cost effectiveness. Each of the three options is intended to accommodate the needs of existing and future residential and commercial development, for the anticipated 75-year service life of buried piping systems. The three options are outlined below:

- **Option 1 – Gravity Collection Sewer System with Two Lift Stations and Dual Forcemain Systems – $9,201,687 total cost**

  This option is Halifax Water's standard system for sanitary collection. Under this option, all of the sanitary sewage within Phase 2B of the study area is collected from the individual residences using a conventional gravity sewer system and delivered by gravity to the John Brackett Drive pumping station (PS). Sewage collected along Shore Drive is delivered by gravity to the Shore Drive PS. Both the John Brackett Drive PS and the Shore Drive PS will be equipped with emergency backup power or with an on-site storage tank to cover off power outages.

  Main Benefits: The conventional gravity sanitary sewer system with manholes is the standard method for sanitary sewage collection in a residential development.

Main Drawbacks: The gravity sewer system is the most expensive system to construct and operate, and is better suited for installation in an urban road right-of-way (ROW) than the lower-density area under consideration. The conventional gravity sewer system with manholes is the most challenging collection system to construct, especially where the surface of the bedrock is located near the surface of the ground and deep rock cuts are required to maintain gravity flow through hills. It is often not well suited for construction in narrow roadways, such as along Shore Drive, where the available travelled roadway is narrower than normal. The need to blast deep trenches into the granite bedrock to accommodate the gravity sewer system also presents a strong potential for disturbance and even structural damage to adjacent private structures.

The intrusion of residential structures in several locations within the Shore Drive and the presence of shallow bedrock complicates the design and construction of the sanitary and water distribution systems along Shore Drive. The two sanitary lift station and forcemain systems, with backup emergency power or temporary storage, would take up valuable space in the road ROW and are expensive to build and operate. Buildings located below the public road, especially the most valuable estate lots near the ocean, will require a sewage pump to deliver their sewage up into the gravity sewer in the public road.

- **Option 2 – Gravity Sewer System with Low Pressure Pump and Common Forcemain with One Duplex Lift Station – $7,339,017 total cost**

  Similar to Option 1, all sanitary sewage within Phase 2B, except for residences along Shore Drive, will be collected in a conventional gravity sewer system and delivered by gravity to the John Brackett Drive PS. This system requires a dual forcemain system to be constructed in one shoulder of Highway 253, and a water distribution pipe to be constructed in the highway's opposite shoulder, resulting in extensive local traffic disturbance on this heavily-travelled public road.

  Sewage collected along Shore Drive will be collected using a low pressure sewer system, with the wastewater pumped from a sewage pump installed at each residence. As currently conceived, residents would be responsible for the purchase and installation of the pump and pressure service lateral to the road ROW. The homeowner would also be responsible for the long-term maintenance and repair of the pump, along with the electrical power required to operate the pump.

  Main Benefits: As with Option 1, the standard gravity sewer system is simplest, most reliable method for the collection of sanitary sewage in a residential community.

  Installing a low pressure sewer system along Shore Drive with individual sewage pumps at each residence eliminates the need to construct 320 metres of gravity collection sewer pipe and a pumping station on Shore Drive. Option 2 allows for shallower trenches in the road cross-section, resulting in significantly less rock breaking during construction and lower potential for damage to public property. A significant number of the existing homes within the service areas are located downhill from the public road and would require a sewage pump to deliver their wastewater up into any collection system installed in the public road. There is no difference in this regard between Options 1, 2 or 3 as residents will still need to pump their sewage.

  Main Drawbacks: Homeowners must accept the long-term ownership, maintenance, and operation of the pump and low pressure lateral system. It is also noted that when the local power grid is out of service, the homeowners will not be able to discharge their sewage unless they have their own backup power system.

- **Option 3 – Hybrid Sewer System Augmented with Low Pressure Pumps and Common Forcemain with One Lift Station – $7,311,190 total cost**

Option 3 is a lower cost hybrid configuration. It would install a conventional gravity collection sewer along John Brackett Drive and Powers Drive, a low pressure sewer system with individual sewage pumps along Shore Drive and the west end of Powers Drive, and a smaller capacity duplex pumping station at the John Brackett PS.

Under this option, all sewage collected by either a gravity sewer, a low pressure sewer system, or the John Brackett PS will be delivered by pumping directly into the dual forcemain system located in Powers Drive. This option would eliminate the construction of the dual forcemains on John Brackett Drive needed under Options 1 and 2, and relocate them to Powers Drive. There would be significantly less disruption to traffic along Highway 253 during construction. There would be lower electrical costs at the John Brackett Drive PS due to the reduced sewage flows.

Main Benefits: Option 3 is a less disruptive variation on the Option 2 arrangement. It has lower construction costs and less traffic disruption than Options 1 and 2. Under Option 3, the dual forcemain system serving the John Brackett Drive PS would be able to handle the ultimate peak wet weather flow with minimal reduced capital, operating and maintenance costs. It would eliminate the need to construct a Shore Drive PS and forcemain, and the pumps at the John Brackett PS would need less than half the capacity needed in Options 1 and 2.

Main Drawbacks: The construction of the John Brackett PS dual forcemain system in Powers Drive results in a slightly longer alignment, however, the additional capital cost is negligible. Additional properties on Shore Road and Powers Drive will require individual grinder pump and low pressure lateral systems, when compared with Option 2. Option 3 will also require homeowners to accept long-term ownership and maintenance of the sewage pump and low pressure lateral system.

All three Phase 2B sanitary servicing options are capable of meeting the sanitary collection and transmission requirements with Phase 2B. However, the WSP report recommends Option 3, based on the reduced potential for disruption to traffic during construction along Shore Road, and the less complicated construction required to install the low pressure sanitary forcemain system within the confined travelled way along Shore Road and along John Brackett Drive (Highway 253). Option 3 also offers the lowest capital cost for servicing Phase 2B. The technology presented in Options 2 and 3 has been used previously in the Springfield Lake system in Middle Sackville. A small diameter pressure system is typically used around shorelines where the majority of homes are below the road level and would need to connect via pumping even if a conventional sewer was installed.

The $4,561,952 in funding currently available for the Herring Cove Servicing – Phase 2B project under the Canada Water and Wastewater Fund amounts to only 62% of the total estimated cost of $7,311,190 for Phase 2B, Option 3, as detailed in Table 8 of the preliminary design report (Appendix II). The complete Phase 2B is expected to provide services for about 100 new water/sewer customers. For the 2017/2018 construction season, the current funding is sufficient to construct only a portion of Phase 2B, with the remainder deferred until a future date when additional funding is secured. The revised project scope proposes to connect properties along John Brackett Drive (Highway 253) and construct the John Brackett Drive Sanitary PS and Dual Forcemain system. This work will provide water and wastewater services to approximately 30 properties along John Brackett Drive.

The revised total project cost is estimated to be $4,561,952, of which a portion of the work provides benefit for future phases. The LIC for this initial portion of Phase 2B will be calculated with an expectation that a portion of municipal costs will be recovered from property owners serviced in future 2B phases. Appendix III provides the cost breakdown of the revised scope of work.

It is important to consider that, if only a portion of Phase 2B is constructed in 2017, it is essential that the sanitary system be completed and functional for those residents who connect to the system this year. While the precise scope of work that can be completed with the existing project funding is still being determined, it is recommended that the construction of water and sanitary services on Shore Road and

along Powers Drive be deferred to a later date, when the estimated $2.75 million in additional funding may be available.

Community consultation on the LIC will start once the revised scope has been confirmed by the Provincial and Federal governments. Council will consider final project approval following the results of the consultation. If the LIC is approved, it is recommended that Council request that Halifax Water proceed with detailed design to allow timely commencement of construction. The $75,000 approved by Regional Council on December 6, 2016 for Halifax Water to complete the preliminary design is sufficient to cover the detailed design as well.

FINANCIAL IMPLICATIONS

Under the CWWF terms, HRM will provide $1,140,488 (25%) of the total project cost ($4,561,952). This is based on the reduced project scope (portion of Phase 2B) outlined above. HRM's portion will be financed through a Local Improvement Charge (LIC), as had been done for earlier phases of work in Herring Cove. The remaining $3,421,464 million in project funding is available through the CWWF program, from the federal and provincial governments.

A portion of municipal costs for work benefiting future phases – the amount to be confirmed as project design proceeds – will need to be financed by the municipality until the remaining properties in Phase 2B are serviced. The average cost of the project is $138,000 per property with an estimated LIC of $30,000. While the actual LIC could be different, there will likely be some properties with a higher than average charge and some with a lower charge. The average market value for those properties expected to pay a LIC is $129,000, suggesting that there may be affordability issues. The LIC will be surveyed in early 2017. The $30,000 LIC amount is 100% higher than the LIC set in 2005, even after inflation. As property tax is not used to fund water and sewer projects, there are no municipal funds from the general tax rate to support the project.

RISK CONSIDERATION

Halifax Water has reviewed the recommended option and determined that it does not have any undue design or operational risks. These types of systems have been in operation in HRM for several years and have caused very little trouble. The proposed system is the most practical solution for the Shore Road area due to the tight traveled way, location of existing homes, bedrock and limited potential for additional development.

The Federal Infrastructure program requires projects to be completed by March 31, 2018. As a significant amount of work is needed before construction can begin, there is a risk that the project could have difficulty in meeting the infrastructure program deadline. HRM would be responsible for all costs incurred after the program deadline.
Next phases are not guaranteed, as they depend on future infrastructure programs for funding. Therefore any portion of the municipal cost not charged through the LIC on this phase (e.g. oversizing costs) is a financial risk to the Municipality.

COMMUNITY ENGAGEMENT

No community engagement was undertaken for this report. Community consultation would be required on an LIC once the project scope is confirmed by the provincial and federal governments.

ENVIRONMENTAL IMPLICATIONS

N/A

ALTERNATIVES

Council could choose to pursue Option 1 or 2. This is not recommended due to the increased traffic disruption, more complicated construction and the higher capital costs of those systems. The construction of the Option 1 and 2 systems is also more involved, leading to a greater risk of not meeting and March 31, 2018 program deadline and the more intrusive traffic issues construction would cause.

Council could proceed with the entire Phase 2B build using Option 3. This is not recommended as HRM would be required to provide $3,889,726 in capital costs (the $1.14M it is already contributing to the project, plus the $2.8M needed to complete the project). HRM would also face time constraints in meeting the March 31, 2018 deadline.

Council could withdraw its funding application for Herring Cove Phase 2B. The current federal and provincial monies granted are the only external funding sources available at this time for the project, and the project has been under consideration by Council since 1999. There is the possibility for funding to become available through future phases of federal infrastructure programs.

ATTACHMENTS

Appendix I: Design Report Cover Letter from WSP, dated January 18, 2017.

Appendix II: Herring Cove Servicing Phase 2B and Phase 4 Water and Wastewater System: Preliminary Design Report, January 18, 2017.

Appendix III: Herring Cove Phase 2B: Construction Cost Summary

Appendix IV Procurement Policy Section 8(11) A

A copy of this report can be obtained online at http://www.halifax.ca/council/agendasc/cagenda.php then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 902.490.4210, or Fax 902.490.4208.

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Report Approved by: _____
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Appendix I: Design Report Cover Letter from WSP, dated January 18, 2017.

January 18, 2017

Greg Rice, P.Eng.
Project Engineer
Halifax Water
450 Cowie Hill Road
Halifax, NS

Subject: **Herring Cove Servicing – Phase 2B and Phase 4 – Preliminary Design – Final Report – Funding Clarification**

Dear Sir,

Further to the submission of our Preliminary Design – Final Report for the Herring Cove Servicing Project – Phase 2B & Phase 4, we are pleased to provide the following clarification on the adequacy of the existing funding provided under the 2016 Canada Water and Wastewater Fund (CWWF) program.

As stated in Table 8 of our Final Report, the preliminary capital cost to construct the water and sanitary infrastructure for Phase 2B of the Herring Cove Residential (HCR) Zone, as recommended under Option 3, is estimated at $7,311,190. The funding provided to HRM under the 2016 CWWF program, in the amount of $4,561,952, is only adequate to service the residents located along the John Brackett Road (Highway 253) and construct the John Brackett Drive Sanitary Pumping Station and Dual Forcemain System. The remaining water and sanitary services proposed for construction along Shore Drive and Powers Drive will be deferred to a future date when the remaining funding, in the amount of $2,749,238, has been secured.

We trust that this is sufficient for you needs at this time. If you have any questions or concerns, please don't hesitate to contact me at your earliest convenience.

Yours truly,

Original Signed

Neil T. Fougere, P.Eng.
Project Engineer, Infrastructure

Cc: Richard Stephenson, P.Eng., WSP Group

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PROJECT NO. 161-17655

HERRING COVE SERVICING - PHASE 2B & PHASE 4

WATER AND WASTEWATER SYSTEM

PRELIMINARY DESIGN – FINAL REPORT JANUARY 18, 2017

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January 18, 2017

Greg Rice, P.Eng.
Project Engineer
Halifax Water
450 Cowie Hill Road
Halifax, NS

Subject: **Herring Cove Servicing – Phase 2B and Phase 4 – Preliminary Design – Final Report**

Dear Sir,

Please find attached 5 copies of our Preliminary Design – Final Report for the Herring Cove Servicing Project – Phase 2B and Phase 4.

If you have any questions or concerns, please don't hesitate to contact me.

Yours truly,

Original Signed

Neil T. Fougere, P.Eng.
Project Engineer, Infrastructure

Cc: Richard Stephenson, P.Eng., WSP Group

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TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

WSP Canada Inc. (WSP) has been hired by Halifax Water, acting on behalf of the Halifax Regional Municipality (HRM), to provide the preliminary engineering design of proposed municipal water and wastewater services to residents within the boundaries of Phase 2B and Phase 4 of the "Herring Cove Area – Settlement and Servicing Strategy". Limited funding for this project has been provided by the Federal and Provincial Governments under the Canada Water and Wastewater Funding (CWWF), with the requirement that the design, construction and commissioning of the infrastructure within Phase 2B be substantially complete by March 31, 2018.

1.2 BACKGROUND

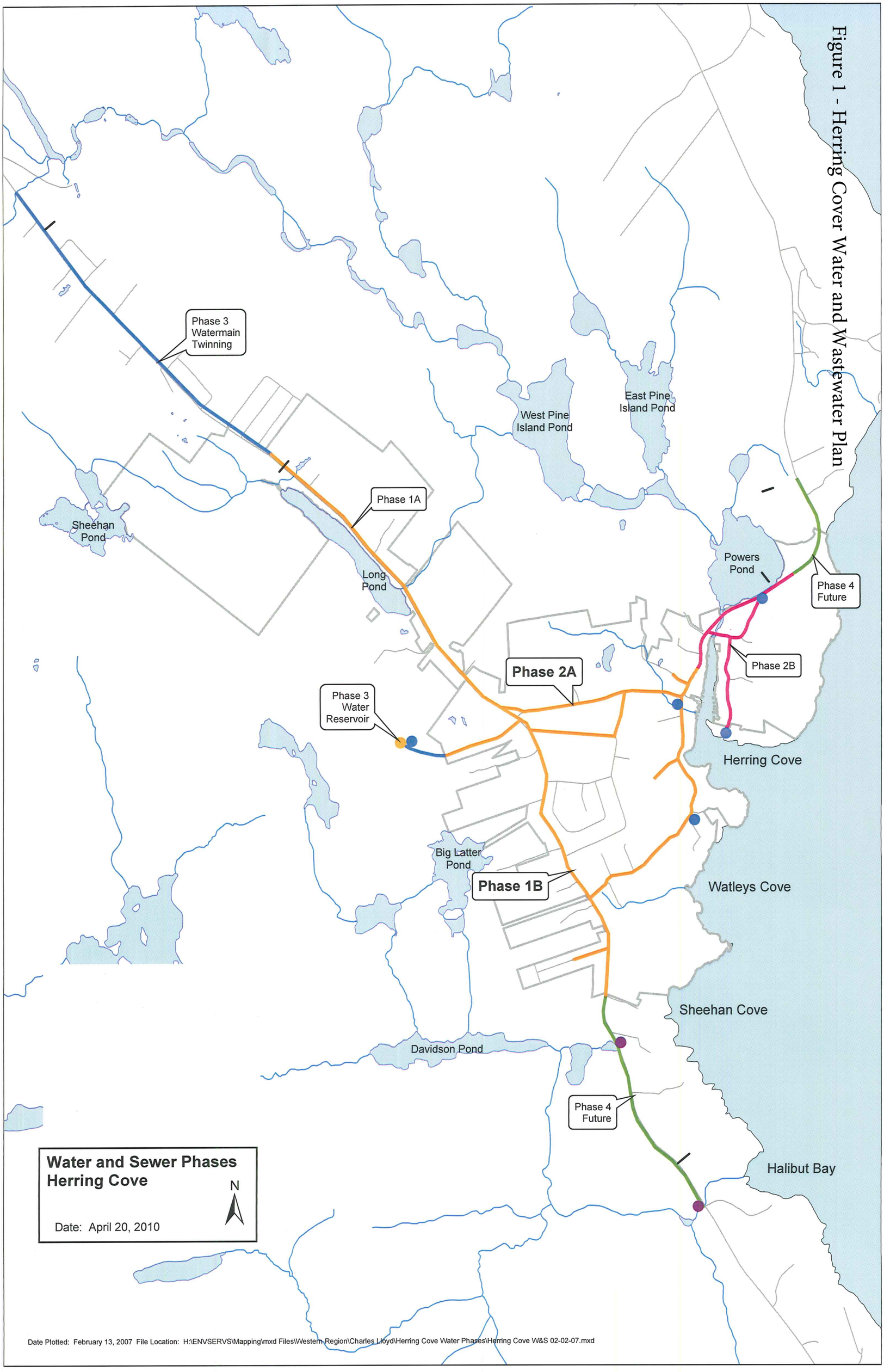
In 1999, as part of the Halifax Harbour Solutions Project (HHSP), the community of Herring Cove was selected by Halifax Regional Municipality (HRM) as the site of the new Herring Cove Wastewater Treatment Facility (WWTF), which was required to treat the existing and future sanitary wastewater generated in the Mainland South area of the City. In May 2004, the final report of the "Herring Cove Water & Sewer Services Pre-Design Study, (CBCL 2004)" defined the concept-level configuration, layout, capacity, and capital cost estimates for the water and sanitary sewer infrastructure required to service the whole of the community within the Herring Cove Serviceable Boundary.

In that study, the future servicing of the community of Herring Cove was subdivided into 6 sub-phases as shown on Figure 1. The water and sanitary sewer systems within Phase 1A, Phase 1B, and Phase 2A were constructed in recent years, and the services proposed for Phase 2B are to be constructed by HRM under the current 2016 CWWF funding arrangement. While the preliminary design of the services for Phase 4 will be completed by WSP as part of the current project, the schedule for detailed design and construction of the Phase 4 infrastructure systems is unknown at this time.

The results of the original Pre-Design Study were endorsed by the Herring Cove Community Liaison Committee (CLC). Funding provided by HRM in the $5 million Community Integration Fund (CIF), along with monies raised from the Local Improvement Charge (LIC), were used to pay for the construction of the water, sanitary, and other services in Phase 1A, Phase 1B, and Phase 2A of the Servicing Plan.

Recently, HRM has received limited funding under the 2016 CWWF program to support the preliminary design and detailed design of municipal services within Phase 2B of the Servicing Plan, with construction and commissioning of Phase 2B infrastructure scheduled for completion during the 2017 and 2018 construction seasons, if the current available funding is adequate. Construction of water and sanitary systems for Phase 4 will be deferred to a later date, pending the acquisition of additional funding.

Figure 1 - Herring Cover Water and Wastewater Plan



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Halifax Water has requested that WSP, as part of the pre-design for Phase 2B, consider a number of alternative sanitary servicing strategies, with the goal of determining the most cost effective, adequate water distribution system and sanitary wastewater collection and transmission system for Phase 2B, from both an initial capital cost and long-term operations and maintenance point of view. At this time, no provision has been made for the design and construction of stormwater management systems within the study area.

This preliminary pre-design report provides the conceptual layout and design for a conventional sanitary gravity sewer and manhole system, as well as a number of alternative hybrid sanitary collection and transmission options that may be suitable for servicing the existing and future residents within the Phase 2B service boundary. The proposed conventional water distribution system will have the capacity to meet existing and anticipated future domestic water and fire protection requirements within the Phase 2B and Phase 4 service boundaries.

1.3 LOCAL IMPROVEMENT CHARGE (LIC) COST RECOVERY

As part of the original negotiations with the City in 2004, the Herring Cove CLC approached HRM staff with a Local Improvement Charge (LIC) Recovery Plan that involved a blend of frontage charge and per lot charge. This LIC recovery plan was subsequently acceptable to the City. Using the blended formula approved by HRM Council in 2005, the normal LIC for water and sanitary services in front of a residential lot with a 100 foot (30 m) long frontage would be $12,300, including the prevalent Capital Cost Charge (CCC) water charge.

At that time, the capital cost estimates used to determine the LIC were based on the preliminary design of the servicing requirements using recent average tender prices received by HRM and Halifax Water for this type of infrastructure construction work. In the 13 years since 2004, the Consumer Price Index in Nova Scotia have increased at approximately 1.7% per annum for a total increase of approximately 25% over the intervening 13 years. It is assumed that the capital costs to construct municipal water and wastewater infrastructure systems have increased by a similar amount over the same 13 year period.

In 2017, the actual cost per residential unit to construct water and wastewater services within Phase 2B and Phase 4 will likely exceed the original LIC reported by HRM. While the access to Federal and Provincial funding under the 2016 CWWF Program will defray a significant portion of the total capital cost to service residents within Phase 2B, the monies recovered using the existing LIC formula will be insufficient to cover the remainder of the capital cost required by HRM to construct the required water and wastewater infrastructure systems.

Due to the presence of shallow granite bedrock, challenging topography, and limited space available within the public road right-of-way (ROW) along Shore Drive, alternative sanitary servicing strategies have been considered here with the goal of determining the most suitable water distribution system and sanitary wastewater collection and transmission system for servicing Phase 2B.

2 RESIDENTIAL ZONING LAND USES AND REQUIREMENTS

2.1 HERRING COVE RESIDENTIAL (HCR) ZONING RESTRICTIONS

HRM's Planning District 5 (Chebucto Peninsula) Land Use By-law covers planning restrictions within the Herring Cove Residential (HCR) Zone, which contains the majority of Phase 2B and Phase 4 of the Herring Cove Servicing Plan.

Figure 2 illustrates the existing Service Boundaries for all lands within the existing Herring Cove Residential (HCR) Zone, including assumed sub-area boundaries associated with the provision of sanitary services within Phase 2B and Phase 4. Originally, as recommended by the "Herring Cove Water & Sewer Services Pre-Design Study, (CBCL 2004)", the servicing of properties within the service boundaries of Phase 2B and Phase 4 was based on the provision of sanitary services using a conventional gravity sanitary sewer and manhole system with the use of duplex sanitary pumping station and dual forcemain systems, where necessary. Adoption of an alternative, hybrid sanitary collection and transmission system may meet the challenges of servicing Shore Road, while still providing an adequate level of service to the residential properties in the short-term and long-term.

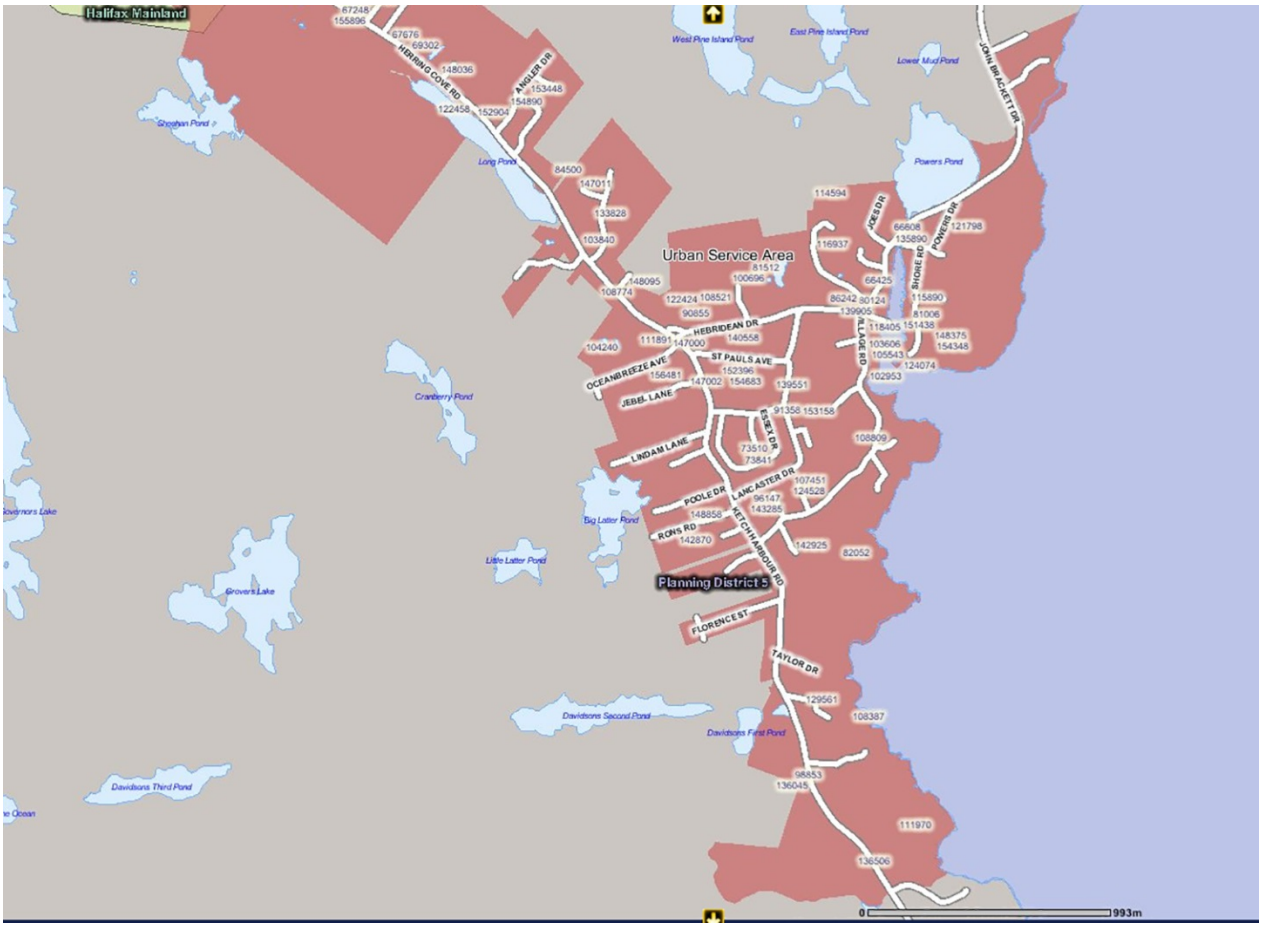
2.2 PERMITTED LAND USES WITHIN HCR ZONE

With respect to future land uses permitted within the Herring Cove Residential (HCR) Zone, the District 5 (Chebucto Peninsula) Land Use By-law states that no development permit shall be issued in any HCR Zone except in conformity with the following:

- Single unit dwellings;
- Two unit dwellings;
- Existing mobile dwellings;
- Fishery support uses;
- Home occupations in conjunction with permitted dwellings;
- Day care facilities for not more than seven (7) children and in conjunction with permitted dwellings;
- Open space uses;
- Bed and Breakfast uses not exceeding three bedrooms in conjunction with permitted dwellings;
- Recreational uses.

WSP Comment: It is evident that the new central municipal water and sanitary wastewater services within Phase 2B and Phase 4 must be capable of meeting the domestic water distribution and fire protection requirements of the residents, along with sanitary collection requirements for these existing and future residential and commercial land uses within the HCR Zone.

Figure 2 – Herring Cove Serviceable Boundaries



2.3 DEVELOPMENT REQUIREMENTS WITHIN HRC ZONE

With respect to future developments within any HCR Zone, the District 5 (Chebucto Peninsula) Land Use By-law, no development permits shall be issued except in conformity with the following:

- Minimum Lot Frontage: 22.9 m (75 feet) per dwelling unit.
- Minimum Lot Area
  - Full Central Services: 929 square metres (10,000 square feet) per dwelling unit.
  - Onsite Service(s): 2787 square meters (30,000 square feet) per dwelling unit.
- Maximum Lot Coverage: 35% of gross area.

WSP Comment: It is evident that all of the existing serviced dwellings within Phase 2B and Phase 4 are serviced using on-site water and wastewater services, situated on private properties that, once they have been supplied with central services, may be sub-divided into two or more smaller serviced lots. In view of the anticipated service life for buried piping systems of at least 75 years, the central water and sanitary wastewater systems must be designed to accommodate the needs of all existing and future tributary residential and commercial developments within the service boundary for the foreseeable future.

3 EXISTING HCR ZONE WATER AND FUTURE SANITARY SEWER SYSTEMS

3.1 WATER DISTRIBUTION SYSTEM – HCR ZONE

Potable water and fire protection in the existing water distribution system within the Herring Cove residential (HCR) Zone is currently produced at the Pockwock Water Supply Facility (WSF). It is withdrawn from the Cowie Hill Storage Reservoir through a dedicated transmission main located in the Herring Cove Road right-of-way (ROW). A new water storage reservoir, proposed for future construction within the HCR Zone (Phase 3), will strengthen the capacity of the local water distribution system to meet future potable water requirements for peak balancing, fire protection, and emergency storage, when required.

The new water distribution system within Phase 2B and Phase 4 must be designed to provide adequate domestic water and fire protection services meeting the requirements of the residents and structures within those service areas. In view of the relatively modest fire protection requirements within these two phases of the HCR Servicing Plan, it is anticipated that all new water distribution piping in local roads will be 200 mm (8”) diameter, Class 52, Ductile Iron (DI) pipe equipped with hydrants and other appurtenances.

In Phase 4B, where the existing 400 mm (16”) diameter water transmission main in the Herring Cove Road will be extended to the south, a 300 mm (12”) diameter or larger, Class 52, Ductile Iron (DI) pipe may be required to service the long-term development south of the community. Prior to the initiation of detailed design of the water system in Phase 4B (South), Halifax Water may wish to provide guidance on the diameter of this trunk water transmission main extension to be located along the Herring Cove Road to service future developments south of the community of Herring Cove.

3.2 SANITARY WASTEWATER COLLECTION SYSTEM - HCR ZONE

3.2.1 EXISTING SANITARY COLLECTION SYSTEM

The existing separate sanitary wastewater collection and transmission system servicing the Herring Cove Residential (HCR) Zone delivers sanitary wastewater to the headworks of the Herring Cove Wastewater Treatment Facility (WWTF), located next to the Atlantic Ocean at the south end of the community. The existing sanitary collection system comprises three (3) distinct phases, as illustrated on Figure 1.

1. Phase 1A – Highway 349 Village Centre North – Primarily a conventional gravity collection sewer and manhole system that receives sewage flows from the north end of the Herring Cove Road adjacent Long Pond and delivers it into the gravity collection system located on the Herring Cove Road at the south end of the community (Phase 1B).
2. Phase 1B – Highway 349 Village Centre South – Primarily a conventional gravity collection sewer system that receives wastewater flows from Phase 1A and the adjacent properties and delivers the flow to the Herring Cove WWTF at the south end of the

community. When completed, sanitary flows from Phase 4B will be delivered by pumping into the Phase 1B sanitary system.

3. Phase 2A – Hebridean Drive (Highway 253) – Primarily a conventional gravity sewer system that currently receives sewage from the core of the community and delivers it through local pumping stations to the trunk gravity sewer system on the Herring Cove Road (Phase 1B). Phase 2A also includes two (2) duplex submersible style sanitary pumping stations complete with dual forcemain systems required to lift the sewage from the lower areas of the Village up into the Phase 1B trunk gravity sewer. When completed, sanitary flows from Phase 2B and Phase 4A (North) will be delivered by pumping into the Phase 2A system.

3.2.2 FUTURE SANITARY COLLECTION AND WATER STORAGE SYSTEMS

The remainder of the Herring Cove sanitary collection system, yet to be constructed, comprises three (3) distinct phases (Phase 2B, Phase 4A and Phase 4B), subdivided into a total of eight (8) sub-areas, as illustrated on Figure 1. The preliminary design for Phase 2B, Phase 4A (North), and Phase 4B (South) form part of the current project, with Phase 2B scheduled for construction during the 2017/2018 construction season. The schedule for detailed design and construction of the Phase 4A (North) and Phase 4B (South) services has yet to be determined.

1. Phase 2B – John Brackett Road/Shore Drive/Powers Road – Generally, this service area is characterized by narrow roadways within the older part of the community surrounding the Harbour, with many residences built partially out into the public right-of-way (ROW) and shallow monolithic granite bedrock located throughout the road rights-of-way. The John Brackett Drive (Highway 253), which serves as a major traffic artery within the community is confined by Powers Pond on one side and by guiderails along a portion of the other shoulder. The proposed sanitary collection system will collect sewage from existing and future residential properties and deliver the sewage into an existing gravity manhole in Phase 2A located along the John Brackett Road. (See Appendix B).

   Normally, a new sanitary collection system would be designed as a conventional gravity collection sewer with manholes and, where required, with one or more duplex sewage pumping station and dual forcemain systems to deliver the sewage up into the gravity sewer system, where necessary. Due to the confined nature of the public roads, the actual encroachment of residences and other private structures into the public road ROW along Shore Road and Powers Drive, the disruption associated with blasting and excavating deep trenches into the granite bedrock, and the challenges associated with working near the Herring Cove Harbour Brook, two distinct forms of sanitary servicing are under consideration:

   a. Conventional Gravity Collection Sewer System, with sanitary manholes and one or more conventional duplex sanitary pumping station and dual forcemain systems to deliver the sewage to the receiving gravity manhole in Phase 2A. Each residence would be equipped with a conventional service lateral to the edge of the public road ROW.

   b. Alternative Hybrid Sanitary Collection System, possibly incorporating an individual grinder sewage pump and low pressure service lateral system with a small diameter common forcemain system located in the public road ROW, which would deliver the sewage to a receiving gravity manhole system, along with portions of conventional gravity sewer and manhole systems, where appropriate.

2. Phase 4A – John Brackett Road (Route 253 North) – This phase of the project involves the future construction of a conventional sanitary collection system required to service the north end of John Brackett Road beyond the limits of Phase 2B, and extending northward as shown in Appendix B. While some of the existing and future residential lots in Phase 4A (North) may be serviced by gravity through gravity service laterals, some areas located downhill from Highway 253 may require the use of a sewage pump and low pressure service lateral to lift the sewage up into the gravity trunk sewer system in Highway 253.

3. Phase 4B – Ketch Harbour Road (Route 349 South) - This phase of the project involves the future construction of a conventional sanitary collection sewer system required to service the south end of the residential development along the Ketch Harbour Road beyond the limits of Phase 1B and extending in a southerly direction as shown in Appendix B. Phase 4B (South) also includes the construction of two duplex sanitary pumping station and dual forcemain systems. While many of the existing and future residential lots in Phase 4B (South) may be serviced by gravity through gravity service laterals, significant areas located downhill from Highway 349 may require the use of a sewage pump and low pressure service lateral to lift the sewage up into the gravity trunk sewer system in Highway 349. In view of the larger amount of undeveloped land within Phase 4B (south), it is more likely that larger developments east of Highway 349 will require construction of duplex sanitary pumping and dual forcemain systems to deliver the sewage up into the gravity system located in Highway 349.

3.3 LOCAL PHYSICAL CONSTRAINTS

Installation of municipal water and wastewater infrastructure within a public road right-of-way is typically constrained by the overall width of the ROW, the number, type and diameter of pipes to be installed in the road, the offset requirements between the water distribution main and sanitary gravity and forcemain piping, the depth to bedrock, the depth and character of the glacial till overburden, and the proximity of other buried and surficial public and private buildings and other features.

The number and layout of the proposed water and sanitary piping systems alternative proposed for Phase 2B, Phase 4A (North), and Phase 4B (South) may include one or more of the following pipe configurations. No stormwater system is proposed for the study area.

1. Two Pipe Layout (Water and Gravity Sanitary Sewer)

   Wherever there is no requirement for one or two forcemains in the same ROW with a water main and gravity sewer, then the water and gravity sewer pipes may be installed in a common trench on one side of the road, thereby achieving a minimal capital construction cost with the smaller amount of disturbance to traffic and neighbouring properties. The typical layout for a water distribution and gravity sewer system permits both pipes to be installed in a common trench with minimum vertical and horizontal separations as shown on Halifax Water's Typical Trench detail (HWSD-1000). This arrangement is typical in serviced roads with no storm sewer system installed.

2. Four Pipe Layout (Water, Gravity Sanitary Sewer and Dual Forcemains)

   Where a road ROW includes the installation of four pipes (water, gravity sanitary, and dual forcemain), then the water main is usually installed in one shoulder of the road and the gravity sewer and dual forcemains are installed in the other shoulder with a minimum separation of 3.0 m (10 feet) from the watermain. Shore Road is the most congested road in Phase 2B with a number of houses built out into the ROW resulting in an available

space for the infrastructure of only 9.05 m at the narrowest point (Civic 25 to Civic 28). Figure 3 illustrates the proposed conventional layout of the water, gravity sewer and dual forcemain systems proposed for Shore Road (see Appendix B for details). In view of the encroachment of private residences into the 20 m wide ROW and the presence of shallow bedrock, it is evident that there is a strong potential for disturbance and even structural damage to adjacent private structures associated with blasting of deep trenches into the granite bedrock to accommodate the gravity sewer system. While it is technically possible to install four pipes in Shore Drive, this arrangement is not recommended due to the potential for disruption and damage to private residences and other structures. Installation of a shallow low pressure forcemain system instead of the deeper gravity sewer will reduce the volume of bedrock to be excavated.

Application of this four-pipe arrangement along John Brackett Drive south of the proposed John Brackett PS, where the ROW is restricted by Powers Pond on the west side and a deep road ditch on the east side, will result in significant disruption to the restricted road shoulders and the paved road surface, especially where the depth to bedrock is shallow and blasting may dewater the pond into the pipe trench. Figure 4 illustrates the four pipe arrangement proposed for John Brackett Drive and the alternative two-pipe arrangement proposed as an alternative.

Any servicing configuration that reduces the number of sanitary pipes in the road ROW, will significantly reduce the disturbance to the existing pavement and to the shallow bedrock. Relocation of the dual forcemain system serving the proposed John Brackett PS to an alternative alignment along Powers Drive will permit the use, in much of John Brackett Drive, of the standard one pipe layout for the water and gravity sewer as described previously. Due to the constraints along John Brackett Drive near the John Brackett PS and the proximity of Powers Pond, it is recommended that the dual forcemain system be relocated onto Powers Drive.

3. Two or Three Pipe Layout (Water and Single or Dual Forcemains)

   Where the road ROW includes only one water main and a single or dual pressurized sanitary forcemain system, then the water and sanitary forcemain pipes must be separated horizontally by at least 3.0 m (10 feet). Typically, when retrofitting an existing residential road, the water main would be installed in one shoulder and the forcemain(s) would be installed in the other shoulder to minimize the disturbance to the existing paved road surface and the disruption to traffic. In Phase 2B, as an alternative to the four-pipe arrangement, the servicing of Shore Road using individual sewage pumps and a single common forcemain system would require installation of the water and sanitary forcemain pipes in separate trenches within a very confined corridor as shown in Figure 3.

   Throughout this project, alternative configurations of water and sanitary sewer piping systems in the public road ROW have been considered with respect to the spatial constraints that existing along Shore Road and John Brackett Road (see Appendix B for details).

SHORE RD - PHASE 2B - OPTION 1
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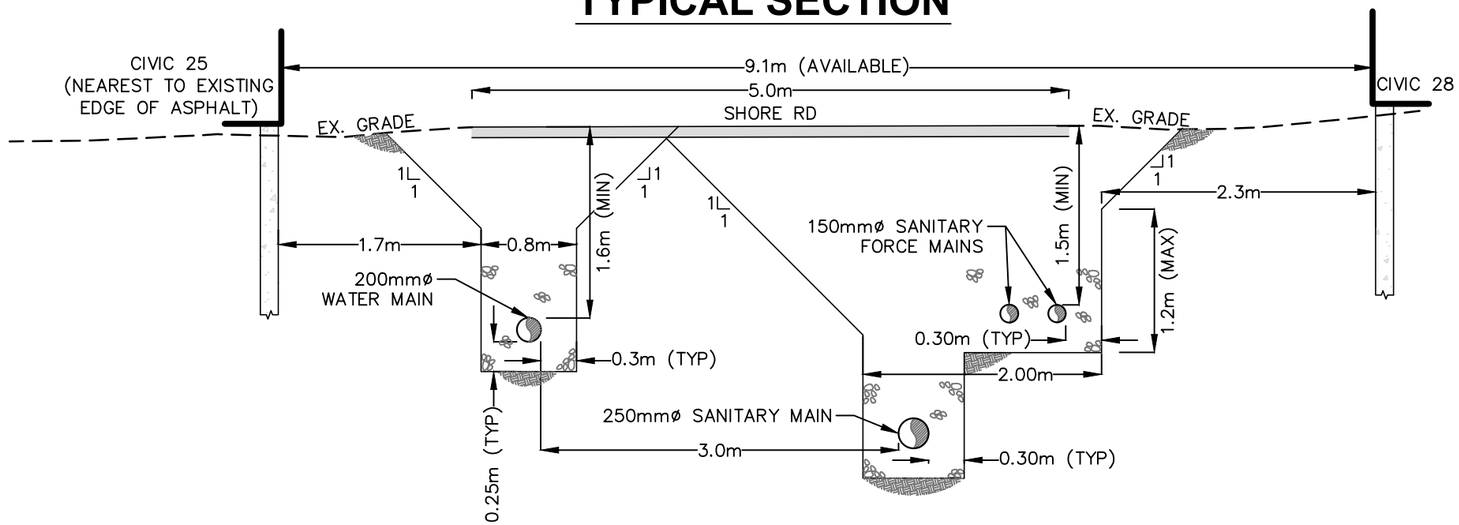
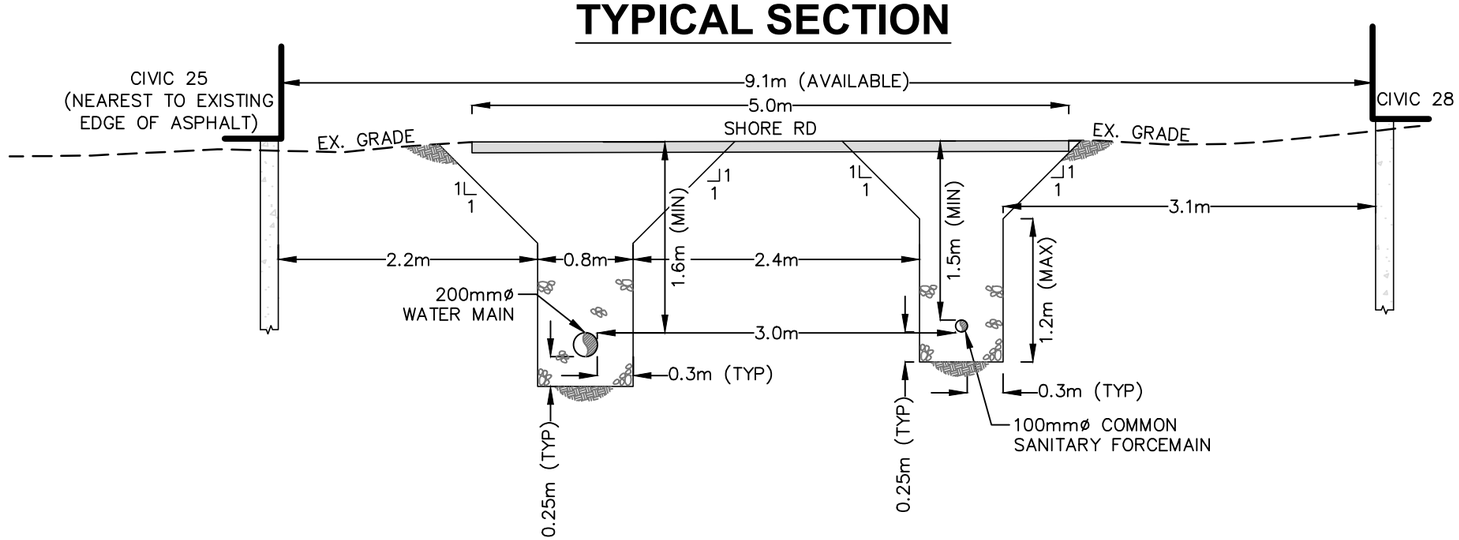


SHORE RD - PHASE 2B - OPTION 2/3
TYPICAL SECTION



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PROJECT:

HERRING COVE PHASE 2B
PRELIMINARY SERVICING PLAN

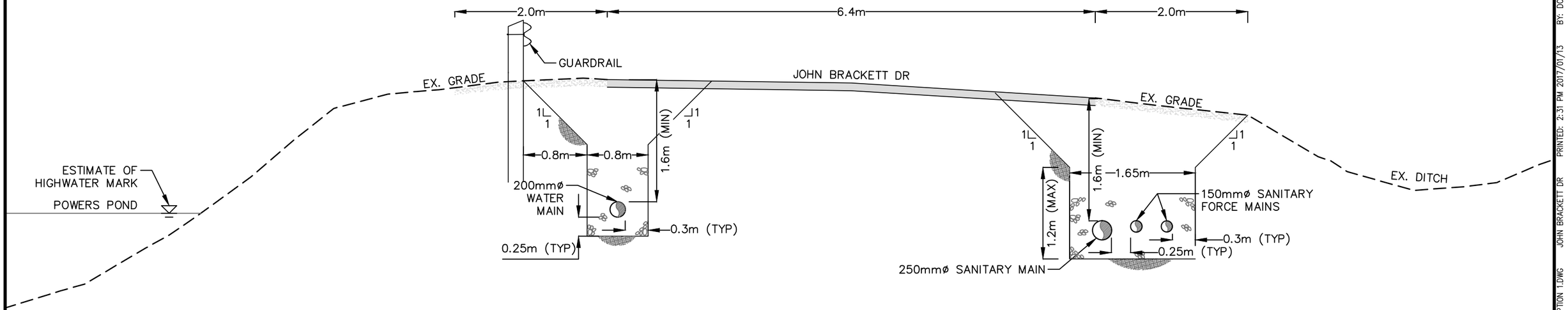
TITLE:

SHORE ROAD
TYPICAL CROSS-SECTION OPTIONS

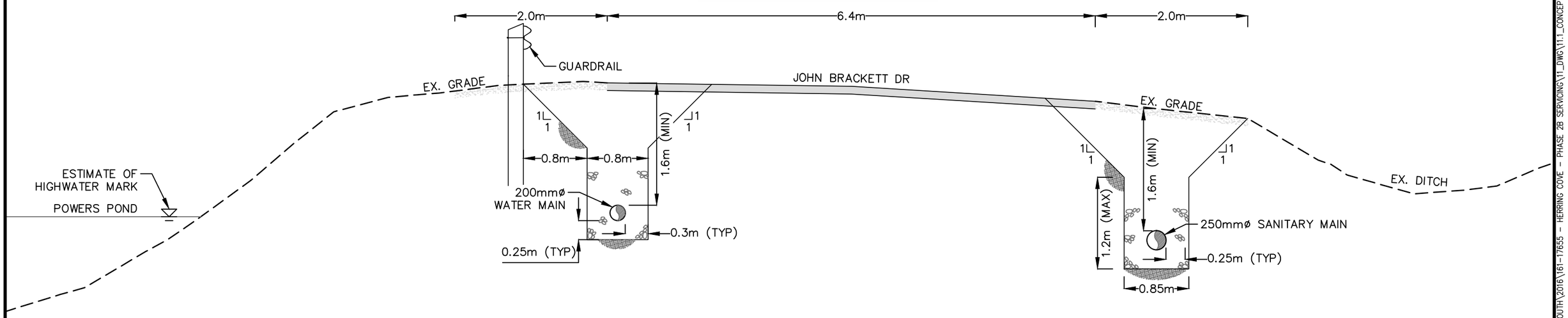
PROJECT NO:	REVISION:	DATE: (YYYY/MM/DD)
161-17655	0	2017/01/13
DRAWN BY:	ISSUE:	
D. MACINNIS, CET	ISSUED FOR REPORT	
CHECKED BY:	DWG NO:	
N. FOUGERE, P.ENG	FIGURE 3	

SCALE: 1:50 METRIC
1 0.5 0 1 2 3

JOHN BRACKETT DR - PHASE 2B - OPTION 1/2
TYPICAL SECTION



JOHN BRACKETT DR - PHASE 2B - OPTION 3
TYPICAL SECTION



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PROJECT:

HERRING COVE PHASE 2B
PRELIMINARY SERVICING PLAN

TITLE:

JOHN BRACKETT DRIVE
TYPICAL CROSS-SECTION OPTIONS

PROJECT NO:	REVISION:	DATE: (YYYY/MM/DD)
161-17655	0	2017/01/13
DRAWN BY: D. MACINNIS, CET	ISSUE: ISSUED FOR REPORT	
CHECKED BY: N. FOUGERE, P.ENG	DWG NO: FIGURE 4	

SCALE: 1:50 METRIC

1 0.5 0 1 2 3

4 SERVICED POPULATION AND DEMAND PROJECTIONS

4.1 WATER SYSTEM DESIGN CRITERIA

The water distribution system proposed for Phase 2B and Phase 4A (North) will be configured based on design guidelines as outlined in the *Halifax Water Design and Construction Specifications for Municipal Water & Wastewater Systems (2016 Edition)*, with 200 mm (8") diameter, Class 52, ductile iron distribution pipe and fire hydrants in the local roads. Due to the residential character of the development and the relatively small fire protection requirements associated with residential structures, no larger water piping will be required.

Depending on the ultimate service potential of future development in Phase 4B (South), south of the HCR Zone, however, a larger diameter (300 mm) trunk water main extension may be required to meet the long-term service requirements of the ultimate configuration Phase 4B (South).

4.2 WASTEWATER SEWER SYSTEM DESIGN CRITERIA

Design of the proposed sanitary collection sewer and manhole system and associated duplex wastewater pumping station and forcemain systems is based on design guidelines as outlined in the *Halifax Water Design and Construction Specifications for Municipal Water & Wastewater Systems (2016 edition)*, the *Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment, and Disposal (2006), the Canadian Electrical Code,* and the *National Building Code (2010).*

Design criteria used for the calculation of normal and peak wet weather design flow requirements for each phase of the proposed Herring Cove Servicing – Phase 2B and Phase 4 are based on the Halifax Water Specifications - Section 5.2.1 and include:

New Residential Development

- Average unit dry weather flow (a) = 0.300 m^3 per person per day
- Long-term infiltration/inflow (I/I) allowance (b) = 24,000 Litres per hectare per day
- Peak dry weather sanitary flow based on Harmon peaking factor x average dry weather flow
- Safety Factor (applied to peak wet weather sanitary flows only) = 1.25
- Peak wet weather flow includes (peak dry weather flow x safety factor) plus I/I allowance

Commercial Development

Existing and future commercial peak dry weather and wet weather flows, if required within the study area, will be based on unit flows per hectare recommended by Halifax Water. Currently, there are no significant commercial flows anticipated within the study area.

Pump Station and Forcemain Configuration

1. Smaller duplex sanitary pumping stations will be equipped with two identical submersible duty pumps, with the lead duty pump having sufficient capacity to handle the peak wet

weather design flow from the service area, and the second identical duty pump held in reserve to handle the same peak wet weather design flow, if the first pump is out of service.

2. Sanitary pumping station will be equipped with dual (twin) forcemain system, with each forcemain sized to handle the peak wet weather design flow from the pumping station, and the second identical forcemain held in reserve to meet the redundancy requirement as stated in the Halifax Water Design Manual.
3. Forcemain design is based on a minimum cleansing velocity of 0.6 m/s (2.0 ft./s) and a maximum scour velocity of 2.4 m/s (8.0 ft./s), with one (1) duty pump operating at full speed. Minimum permissible forcemain diameter is 100 mm (4”).
4. Pump control system will be designed to alternate duty pumps for each pumping cycle to reduce wear on a specific individual pump and to meet the SCADA requirements of Halifax Water.
5. Due to the potential for multi-stage expansion of one or more of the sanitary pumping station systems, the pumping system, station wetwell, forcemain, emergency power and controls systems may be designed to allow for a staged upgrade to facility capacity as the development within the service area is realized.

4.3 EXISTING SERVICED POPULATION – HRC ZONE

Currently, all existing and future wastewater collected within the developed portions of the Herring Cove Residential (HCR) Zone is delivered to the Herring Cove WWTF located at the south end of the community adjacent the Atlantic Ocean. Preliminary design drawings presented in Appendix B illustrate the boundaries of the serviceable sub-sewershed areas within Phase 2B and Phase 4 and the general layout of the existing and future wastewater collection system within the Herring Cove Residential (HCR) Zone, including the general locations of the existing and proposed sanitary pumping stations (P/S) and forcemain systems and the existing Herring Cove WWTF.

Table 1 provides a summary of the proposed sub-sewershed areas within Phase 2B and Phase 4 tributary to the Herring Cove WWTF, the number of existing residential lots, and an estimate of the existing residential population to be serviced by the sanitary system based on an average theoretical population density of 3.35 persons per residential unit. The number of existing residential lots is based on a count of the residential properties in the immediate vicinity of the public road, whether they have an occupied residence already or have yet to have one built. This estimate of existing residential lots is a measure of the potential number of connections that may be made in the short-term.

A detailed breakdown of the sub-areas with population and demand projections is presented in Appendix A. It is noted that the actual serviced population within Phase 2B, Phase 4A and Phase 4B may be slightly more or less than those presented in Table 1, depending on the actual number of persons occupying each residential unit and the number of units that are only occupied within some seasons of the year.

Population projections presented in Table 1 represent a conservative estimate of the number of residents that may require service from the proposed sanitary collection system in the near term. Projections of long-term serviced population within each tributary sub-sewershed area are presented in Section 4.4.

Table 1 – Existing Herring Cove Sewershed Areas and Population Projections

Service Area	Tributary Area (Ha)	Residential Lots (each)	Population Density (persons/unit)	Existing Population (persons)
Phase 2B				
Area 2B-1	2.80	5	3.35	17
Area 2B-2	11.61	29	3.35	97
Area 2B-3	2.98	15	3.35	50
Area 2B-4	10.93	39	3.35	131
Totals	**28.32**	**88**	**3.35**	**295**
Phase 4A (North)				
Area 4-3	2.71	7	3.35	23
Area 4-4	7.84	11	3.35	37
Totals	**10.55**	**18**	**3.35**	**60**
Totals (Ph.2B+Ph.4A)	**38.87**	**106**	**3.35**	**355**
Phase 4B (South)				
Area 4-1	44.68	22	3.35	74
Area 4-2	13.64	21	3.35	70
Totals	**58.32**	**43**	**3.35**	**144**
Grand Exiting Totals (Ph. 2B+ Ph.4A + Ph.4B)				
	97.19	**149**	**3.35**	**499**

4.4 ULTIMATE SERVICED POPULATION – HRC ZONE

The design of municipal water and sanitary piping systems is typically based on the ultimate number of residential units and persons that may be located within the tributary area when the service area has been fully developed or on a minimum pipe size specified by Halifax Water, where appropriate.

Table 2 provides a summary of the existing sub-sewershed areas tributary to the Herring Cove WWTF and the potential ultimate residential population that may be serviced by the sanitary system based on a minimum residential lot area of 929 square metres (10,000 square feet) and an average theoretical population density of 3.35 persons per residential unit.

A detailed breakdown of the Phase 2B and Phase 4 sub-sewershed areas with ultimate population and demand projections is presented in Appendix A.

Table 2 – Ultimate Herring Cove Sewershed Areas and Population Projections

Service Area	Tributary Area (Ha)	Max. Residential Lots (each)	Population Density (persons/unit)	Ultimate Population (persons)
Phase 2B				
Area 2B-1	2.80	30	3.35	101
Area 2B-2	11.61	125	3.35	419
Area 2B-3	2.98	32	3.35	107
Area 2B-4	10.93	118	3.35	394
Totals	**28.32**	**305**	**3.35**	**1021**
Phase 4A (North)				
Area 4-3	2.71	29	3.35	98
Area 4-4	7.84	84	3.35	283
Totals	**10.55**	**114**	**3.35**	**381**
Totals (Ph.2B+Ph.4A)	**38.87**	**418**	**3.35**	**1402**
Phase 4B (South)				
Area 4-1	44.68	481	3.35	1611
Area 4-2	13.64	147	3.35	492
Totals	**58.32**	**628**	**3.35**	**2103**
Grand Ultimate Totals (Ph. 2B+ Ph. 4A +Ph. 4B)				
	97.19	**1046**	**3.35**	**3505**

The service life of buried sanitary sewer systems is typically greater than 75 years. While the actual ultimate serviced population that may be located in the long-term within Phase 2B, Phase 4A (North) and Phase 4B (South) may be somewhat less than those presented in Table 2, it is considered essential that the buried sewer piping systems be designed with sufficient hydraulic capacity to collect and transmit the peak wet weather sewage flows from the theoretical serviced population projections, as presented in Table 2 and shown in Appendix B.

4.5 EXISTING SANITARY DESIGN FLOWS - HCR ZONE

Projections of existing serviced population in Table 1 have been used to prepare projections of existing average and peak dry weather sanitary flows and peak wet weather flows as presented in Table 3. These estimates of the volume of rainfall derived infiltration and inflow (RDII) have been based on a unit wet weather allowance of 24,000 L/day/Hectare and an estimate of the adjacent area directly tributary to the sanitary collection system.

Table 3 – Existing Population and Sanitary Flow Projections

Service Area	Tributary Area (Ha)	Existing Population (persons)	Peak Dry Weather Flow (L/day)	Safety Factor	Inflow/Infiltration Allowance (L/day)	Peak Wet Weather Flow (L/s)
Phase 2B						
Area 2B-1	2.80	17	22,387	1.25	67,152	1.10
Area 2B-2	4.90	97	123,593	1.25	117,600	3.15
Area 2B-3	2.98	50	64,721	1.25	71,544	1.76
Area 2B-4	10.93	131	165,437	1.25	262,320	5.43
Totals	**21.61**	**295**	**361,219**	**1.25**	**518,616**	**11.44**
Phase 4A (North)						
Area 4-3	1.50	23	30,168	1.25	36,000	0.85
Area 4-4	4.20	37	48,167	1.25	100,800	1.86
Totals	**5.70**	**60**	**77,365**	**1.25**	**136,800**	**2.72**
Totals (Ph.2B+Ph .4A)	**27.31**	**355**	**430,925**	**1.25**	**655,416**	**14.16**
Phase 4B (South)						
Area 4-1	7.13	74	94,952	1.25	171,120	3.35
Area 4-2	3.05	70	89,940	1.25	73,200	2.15
Totals	**10.18**	**144**	**181,299**	**1.25**	**244,320**	**5.50**
Grand Exiting Totals (Ph.2B+Ph.4A +Ph.4B)						
	37.49	**499**	**612,224**	**1.25**	**899,736**	**19.66**

It is noted that all sewage flows generated in Phase 2B and Phase 4A (North) will be discharged into the receiving manhole on John Brackett Drive at the north end of Phase 2A and all sewage generated in Phase 4B (South) will be discharged into the receiving gravity manhole at the south end of Phase 1B.

4.6 ULTIMATE SANITARY DESIGN FLOWS - HCR ZONE

Table 4 provides a summary of ultimate serviced population anticipated within the service sub-sewershed areas along with projections of peak dry weather and peak wet weather sanitary design flows, assuming that there is full buildout within the sub-sewershed areas within the service life of the sanitary collection system (75 years). While the wetwell and forcemain systems are designed for at least 75 years, it is noted that the design of the mechanical, electrical, and instrumentation and controls systems within the duplex sanitary pumping station may be based on the relatively short-term service life for this equipment, typically limited to 15 to 20 years.

Table 4 – Ultimate Population and Sanitary Flow Projections

Service Area	Tributary Area (Ha)	Ultimate Population (persons)	Peak Dry Weather Flow (L/day)	Safety Factor	Inflow/Infiltration Allowance (L/day)	Peak Wet Weather Flow (L/s)
Phase 2B						
Area 2B-1	2.80	101	128,544	1.25	67,152	2.164
Area 2B-2	11.61	419	504,371	1.25	278,640	10.52
Area 2B-3	2.98	107	135,957	1.25	71,544	2.80
Area 2B-4	10.93	394	475,786	1.25	262,320	9.92
Totals	**28.32**	**1021**	**1,162,152**	**1.25**	**679,656**	**24.68**
Phase 4A (North)						
Area 4-3	2.71	98	124,831	1.25	65,040	2.56
Area 4-4	7.84	283	347,170	1.25	188,232	7.20
Totals	**10.55**	**381**	**460,870**	**1.25**	**253,272**	**9.60**
Totals (Ph.2B+Ph .4A)	**38.87**	**1,402**	**1,556,466**	**1.25**	**932,928**	**33.32**
Phase 4B (South)						
Area 4-1	44.68	1,611	1,767,391	1.25	1,072,320	37.98
Area 4-2	13.64	492	587,126	1.25	327,360	12.28
Totals	**58.32**	**2,103**	**2,251,509**	**1.25**	**1,399,680**	**48.77**
Future Grand Totals (Ph.2B+Ph.4A +Ph.4B)						
Totals	**97.19**	**3,505**	**3,558,412**	**1.25**	**2,332,608**	**78.48**

4.7 SANITARY SEWER PIPE SELECTION

The minimum gravity sanitary sewer pipe permitted by Halifax Water in a residential development is a 250 mm (10") diameter DR35 PVC or equivalent pipe system. When laid at a minimum slope of 1.0%, this 250 mm diameter PVC pipe has a full flow capacity of 77.3 L/s. Based on the ultimate peak wet weather demand projections associated with the ultimate anticipated serviced population as presented in Table 4, it is noted that a 250 mm diameter sanitary sewer pipe will have adequate capacity to accommodate any of the peak design flows everywhere in Phase 2B, Phase 4A (North), and Phase 4B (South), with room to spare.

4.8 SANITARY LIFT STATION - PUMP SELECTION

Depending on the configuration and capital cost of gravity sanitary collection and pumping systems constructed in the 2017 municipal infrastructure market, some or all of the proposed municipal infrastructure within Phase 2B will be constructed during the 2017 construction season using existing available funding, with construction of the remainder of the Phase 2B water and sanitary infrastructure deferred until 2018 or beyond, when funding permits.

As discussed in the next section of this report, the final layout of the sanitary collection system may include the construction of one (1) or two (2) conventional duplex sanitary pumping station and dual forcemain systems. Based on sanitary demand information presented in Table 4, the exact pump power requirement at each lift station will depend on the ultimate peak volume of sanitary sewage plus I/I being handled by that station. Alternatively, if individual grinder pumps and a small diameter common forcemain system is installed to service the residences along Shore Drive, then the construction of a gravity collection sewer and the Shore Road PS would be unnecessary, potentially resulting in significant savings in capital costs.

5 SANITARY SERVICING OPTIONS

5.1 PHASE 2B SANITARY COLLECTION SYSTEM OPTIONS

In May 2004, the Final Report for the *Herring Cove Water and Sewer Services Preliminary Design Study (CBCL Ltd.)*, proposed the construction of a conventional sanitary collection system to service existing and future residential development within Phase 2B, Phase 4A, and Phase 4B of the Herring Cove Residential (HCR) Zone. In that report, the Shore Road sub-area was identified as a suitable candidate for the installation of a STEP (Septic Tank Effluent Pumping) System or a small diameter common forcemain system with individual grinder pump system. In view of the confined nature of the public road right-of-way and the presence of granite bedrock near or at the surface of the ground, the use of an alternative common forcemain and individual pumping system along Shore Road offers a significantly lower potential for damage to existing private structures within the ROW.

For comparative purposes, WSP has evaluated the suitability and capital costs associated with the following three (3) sanitary servicing configurations for Phase 2B. Preliminary design drawings for each of the three sanitary servicing options are presented in Appendix B for information purposes.

- Option 1 – Gravity Collection Sewer System with Two (2) Lift Station and Dual Forcemain Systems – Under this option, all of the sanitary sewage within Phase 2B of the study area is collected from the individual residences using a conventional 250 mm diameter gravity sewer system and delivered by gravity to the wetwell of the John Brackett Drive PS and forcemain system, from which it is pumped through a dual forcemain system to the receiving manhole at the north end of Phase 2A. Sewage collected along Shore Road is delivered by gravity to the wetwell of the Shore Road PS, from which it is delivered through a forcemain to the intersection with Powers Road, where it discharges into the gravity sewer on an easement to John Brackett Drive. Both the John Brackett Drive PS and the Shore Road PS will be equipped with emergency backup power or with an on-site storage tank to cover off power outages.

  Main Benefits: The conventional gravity sanitary sewer system with manholes is the standard method for the collection of sanitary sewage in a residential development. It is Halifax Water's standard for sanitary collection within HRM and all sanitary sewage from residences is discharged into the local gravity sewer.

  Main Drawbacks: The conventional gravity sewer system with manholes is the most challenging collection system to construct, especially where the surface of the bedrock is located near the surface of the ground and deep rock cuts are required to maintain gravity flow through hills. While it is well suited for installation in a typical 20 m (66') wide urban road right-of-way (ROW), it is often not well suited for construction in narrow roadways, such as along Shore Drive, where the available travelled roadway is narrower than normal. The intrusion of residential structures in several locations within the Shore Road ROW

and the presence of shallow bedrock complicates the design and construction of the sanitary and water distribution systems along Shore Drive. In view of the confined nature of the available utility corridor along Shore Drive, the proposed duplex sanitary lift station and dual forcemain system with backup emergency power or temporary storage takes up valuable space in the road ROW and is relatively expensive to build and operate.

While most homes within in Phase 2B, Phase 4A (North) and Phase 4B (South) can be serviced using a gravity lateral connected to the gravity sewer in the public road ROW, those homes located below the public road, especially the most valuable residential lots along the Harbour and near the Ocean, will require a sewage pump to deliver their sewage up into the gravity sewer in the public road. In Phase 2B, there are approximately 18 homes on Shore Road, 2 on Powers Drive and 5 on John Brackett that will likely require pumped system to connect to the gravity sewer.

- Option 2 – Gravity Sewer System with Low Pressure Pump and Common Forcemain System, and One (1) Duplex Lift Station – Similar to Option 1, all sanitary sewage within Phase 2B, with the exception of the majority of the residences along Shore Road, will be collected in a conventional 250 mm diameter gravity sewer system and delivered by gravity to the wetwell of the John Brackett Drive PS and forcemain system, from which it is delivered by pumping to the receiving manhole at the north end of Phase 2A.

  As with Option 1, the dual forcemain system serving the John Brackett Road PS will be located in the shoulder of Highway 253 with the local gravity sewer, discharging into the receiving manhole in Phase 2A. The water distribution pipe would be located in the opposite shoulder of the highway resulting, during construction, in extensive disturbance to local traffic on this heavily-travelled public road. All four pipes in Highway 253 will be heat traced and insulated where they cross over the brook and are mounted on the local highway bridge.

  Sewage collected along part of Shore Road will be collected using a low pressure sewer system, with the wastewater pumped from each residence through a pressurized service lateral and check valve assembly using an individual grinder or sewage pump installed at each residence. As currently conceived, the individual residents would be responsible for purchase and installation of their own sewage pump and low pressure service lateral to the edge of the road ROW. Long-term responsibility for maintenance and repair of the pump, along with the electrical power required to operate the pump, would reside with the homeowner. The Shore Road PS, along with its dual forcemain system and emergency storage tank, as proposed under Option 1, would no longer be required. All sanitary sewage would be pumped through the common forcemain system in Shore Road to the gravity manhole near the intersection of Shore Road and Powers Drive, from which it would flow by gravity to the wetwell of the John Brackett Road Sanitary PS.

  Main Benefits: The proposed installation of a low pressure sewer system along Shore Drive, with individual sewage pumps located at each residence, eliminates the need for a 320 m long gravity collection sewer and one of the forcemains in the public road, as well as eliminating the Shore Road Sanitary PS (see Appendix B). This arrangement results in shallower trenches in the road cross-section, resulting in significantly less rock breaking and lower potential for damage to public property. It is noted that a significant number of the existing homes within the service areas are located downhill from the public road ROW and therefore would require the use of a sewage pump and pressurized service lateral to

deliver their wastewater up into any collection system installed in the public road. If a low pressure sewer system is installed in the road ROW, these downhill residents would see no difference whether they are discharging into a gravity sewer (Option 1) or into a common forcemain system (Option 2 or Option 3).They would still need to pump their sewage.

Main Drawbacks: The homeowner will be responsible for the long-term ownership, maintenance, and operation of the sewage pump and low pressure lateral system serving the residence. It is noted that when the local power grid is out of service, the homeowners will not be able to discharge their sewage to the common forcemain in the public street, unless they have their own backup power system.

- Option 3 – Hybrid Sewer System Augmented with Low Pressure Pumps and Common Forcemain with One (1) Lift Station - Option 3 is a lower cost hybrid configuration, similar to Option 2 in that it includes the installation of a conventional gravity collection sewer (along John Brackett Drive and Powers Drive), a low pressure sewer system with individual grinder or sewage pumps (along Shore Road and the west end of Powers Drive), and a smaller capacity duplex pumping station at the John Brackett PS with a dual forcemain system. In Option 3, however, the dual forcemain would be installed in the Powers Drive ROW and across the Harbour Brook to the receiving manhole in Highway 253 at the north end of Phase 2A. The low pressure common forcemain in Shore Road will be extended in the common trench with the dual forcemain system across the Harbour Brook and up to the receiving manhole in Phase 2A. It is noted that several houses located at the west end of Powers Drive will also be equipped with individual grinder pumps and low pressure laterals. Houses on the east end of Powers Drive will be serviced by the local gravity sewer that discharges into the wetwell at the John Brackett Drive PS.

  Under this option, all sewage collected by either a gravity sewer, a low pressure sewer system, or the John Brackett PS will be delivered by pumping directly into the dual forcemain system located in Powers Drive. This option would eliminate the construction of the dual forcemains from the John Brackett Drive alignment (see Option 1 and Option 2) and relocate them to the Powers Drive alignment (see Option 3), resulting in significantly less disruption to traffic along Highway 253 during construction and lower electrical costs at the John Brackett Drive PS due to the reduced sewage flows.

  Main Benefits: The use of the John Brackett Drive PS and its dual forcemain system located in Powers Drive and across the Harbour Brook, along with the low pressure sewer system on Shore Drive, to reliably deliver sewage by pumping to the receiving manhole on Highway 253, is a less disruptive variation on the Option 2 arrangement. Under Option 3, the pressure sewer system on Shore Road and Powers Drive and the dual forcemain system serving the John Brackett Drive PS would be able to handle the ultimate peak wet weather flow from all of Phase 2B and Phase 4A (north), with reduced capital, operating, and maintenance costs. In addition to eliminating the Shore Road PS and one of its forcemains, Option 3 would reduce the capacity requirements of the sewage pumps at the John Brackett PS to less than half of those required in Option 1 and Option 2. The relocation of the dual forcemain system and the extension of the Shore Road common forcemain system across the Harbour Brook, will also free up space in a portion of the John Brackett Drive ROW, thereby reducing construction costs and disruption to traffic in Highway 253

Main Drawbacks: The construction of the John Brackett PS dual forcemain system in Powers Drive results in a slightly longer alignment, however the additional capital cost is negligible. Additional properties on Shore Road and Powers Drive will require individual grinder pump and low pressure lateral systems, when compared with Option 2.

5.2 PHASE 4A (NORTH) SANITARY SERVICING

Phase 4A (North) is located along Highway 253 at the north end of the Herring Cove Residential (HCR) Zone (see Figure 1 and Appendix B). In the short-term, sanitary sewage generated within this service area is delivered by gravity to the wetwell at the John Brackett Drive PS. Any residential properties located downhill from Highway 253 will require the installation of an individual low pressure sewage pump and pressure lateral to deliver sewage up the hill into the gravity sewer located in the Highway 253 ROW.

5.3 PHASE 4B (SOUTH) SANITARY SERVICING OPTIONS

Phase 4B (South) is located along Highway 349 at the south end of the Herring Cove Residential (HCR) Zone (see Figure 1 and Appendix B). Due to the presence of an unencumbered public ROW along Highway 349 and the rolling terrain prevalent in Phase 4B, the collection and transmission of sanitary sewage generated along Highway 349, south of Herring Cove will be accomplished using a conventional gravity collection sewer system and two complete duplex sewage pumping station and dual forcemain systems (see Appendix B). Due to the relatively large peak wet weather design flow for each station, the use of a temporary on-site storage tanks is not feasible and therefore each of the duplex pumping stations in Phase 4B (South) will be equipped with a diesel-driven emergency back-up power generator and automatic transfer switch.

While the existing population within the Phase 4B service area is small, there is considerable undeveloped land available within the service boundary for future development. This large area of developable land within the service boundary has the potential to accommodate an ultimate serviced population greater than all of Phase 2B. Therefore, a conventional sanitary collection and transmission system is proposed along Highway 349 (see Appendix B) to service all future development.

Much of the land within Phase 4B is located downhill from the trunk sanitary sewer system to be located in Highway 349. Any residential properties within Phase 4B located downhill from Highway 349 will require the installation of an individual low pressure sewage pump and pressure lateral to deliver sewage up the hill into the gravity sewer located in the public road ROW. Alternatively, larger residential developments may be equipped with a gravity sanitary collection system and their own duplex sanitary pumping station and forcemain system to deliver the sewage up into the regional trunk sewer system in Highway 349.

6 SERVICING STRATEGY

6.1 CONVENTIONAL GRAVITY SEWER AND MANHOLE SYSTEM

A conventional sanitary gravity sewer system proposed for Phase 2B, Phase 4A, and Phase 4B, will include the following components:

- Gravity sewer pipe with a diameter of 250 mm constructed of DR35 PVC pipe installed at a grade of at least 1%.
- Sanitary manholes located at all pipe deflections and pipe intersections.
- 125 mm diameter sanitary service laterals constructed to the edge of the public road right-of-way (ROW) at every existing residential property, including some abutting privately-owned lots or properties that have yet to be built upon.

The hydraulic capacity of a gravity sewer is based on consideration of factors such as projected in-service roughness coefficient, projected future connections during the design life, slope, pipe material and condition, and actual in-service flows. In general, sewers larger than the minimum required size shall be selected so that the minimum velocity at the average flow is not less than 0.6 m/s for self-cleansing purposes, and the maximum velocity at the peak design flow is not greater than 3.0 m/s to minimize turbulence and erosion. Under exceptional circumstances, where velocities greater than 3.0 m/s are attained, provision shall be made to protect the sewer pipe against displacement by erosion and impact.

6.2 LOW PRESSURE PUMPED SANITARY SYSTEMS

An alternative to a conventional gravity sewer system within Phase 2B would be to install a low pressure common forcemain system located in the road ROW, with an individual sewage pump and low pressure lateral installed at each of the residences. In Nova Scotia, sanitary sewage effluent from a Septic Tank Effluent Pump (STEP) System or a Septic Tank Effluent Gravity (STEG) System, may also be carried in sewers of not less than 100 mm diameter.

The STEP (Septic Tank Effluent Pump Systems) low pressure sewer system, typically powered by a submersible sewage pump or grinder pump, is frequently installed as a cost-effective alternative to conventional gravity collection sewer systems. Unlike gravity sewer systems, the low pressure common force main systems are smaller in diameter and follow the general contour of the land, resulting in significantly lower capital costs for materials and trench excavation, especially where shallow bedrock prevails. Typically, in a STEP system, the solids are confined to a septic tank and the primary treated effluent is pumped through a small diameter lateral into a common forcemain (pressure sewer) located in the road ROW. The pump installed is typically a submersible style sewage pump manufactured by any number of makers.

The E/One Sewer system, represented locally by Sansom Equipment, is a particular configuration of low pressure sewer system that is powered by an E/One grinder pump installed at each of the serviced residences. The E-One Grinder Pump has a steep pump curve that can handle a wide range of back pressures and still deliver flow into the common

forcemain. Communities have used E/One grinder pump sewer systems, whether they are replacing septic tanks, upgrading existing pressure sewer systems, or as a cost-effective alternative to conventional gravity sewer systems. The grinder pump station, installed at the residence, collects all of the wastewater from the home and grinds it into slurry, which is then pumped through a small diameter service lateral into the common forcemain to a larger gravity sewer main or directly to a wastewater pumping station, so that no solids remain behind.

Benefits of Low Pressure Sewer Systems

- Safe enclosed system that protects water quality and enhances quality of life in a high density community.
- Shallower trenches reduce disruption to the landscape and potential damage existing built structures, as well as minimizing the excavation of local bedrock.
- Consistent with the requirement for pumping of sewage from houses located downhill from the gravity trunk sewer system.
- Eliminates potential for entry of extraneous infiltration and inflow to central sewer system.

6.3 SANITARY PUMPING STATION AND DUAL FORCEMAIN SYSTEM

The rolling character of the terrain in Herring Cove results in a requirement throughout the community for as many as seven (7) submersible sewage pumping stations with dual forcemain systems. According to the Pre-Design Study (CBCL May 2004), two (2) submersible style duplex sewage lift stations are proposed for Phase 2B and two(2) other similar stations are proposed for Phase 4B (South).

Table 6 – Option 1 - Conventional Sanitary Lift Station and Dual Forcemain Systems.

Phase	Station Name	Location	No. Pumps	Dual Forcemains	
			(each)	Length (m)	Dia.(mm)
Phase 2B	John Brackett Drive PS	John Brackett DR @ Powers Drive	2	490	150
Phase 2B	Shore Road PS	South End of Shore Drive	2	305	100
Phase 4B	Davidson Pond PS	Highway 349 @ Davidson Pond	2	170	200
Phase 4B	Ketch Harbour Road PS	Highway 349 @ Halibut Bay	2	230	200

Table 6 provides a list of the conventional duplex sanitary lift station and dual forcemain systems proposed for construction within Option 1 of Phase 2B and Phase 4B, including an estimate of the length and diameter of dual forcemain systems required to deliver the sewage to the receiving manhole system.

Typically the collection of sanitary sewage within a tributary area located downhill from the central gravity sewer system requires the construction of a duplex sanitary pumping station with dual forcemain system. In such cases, sewage is delivered down the hill by gravity to the pumping station wetwell using a conventional 250 mm diameter gravity sewer and manhole system, typically located in a common trench with the dual forcemain system. There will also

be a requirement for a water distribution main located at least 3 m away from the forcemain system and usually constructed in the opposite shoulder of the road from the sanitary infrastructure. Where the roadway is very narrow, as along Shore Drive, the construction of four (4) pipes (1 sanitary sewer, 2 forcemains, and 1 watermain) with the appropriate separation distances will result in complete reconstruction of the road way accompanied by major dislocation of local traffic during construction. The extensive rock breaking associated with Option 1 will also result in significant potential for damage to private residences and other structure located within the road ROW.

Under Option 1, the construction of the John Brackett Drive PS will require construction of the four (4) pipes along Highway 253 (John Brackett Drive) between Powers Drive and the receiving manhole in Phase 2A. Under Option 3, rerouting of these dual forcemains away from John Brackett Drive onto Powers Drive will permit the construction of only the gravity sewer and watermain in shallow trenches along Highway 253, thereby reducing the cost and disruption along this heavily-travelled transportation corridor. Construction of the dual forcemain system in Powers Drive will result in significantly less disruption to local traffic during construction. In addition to limiting the number of pipes in the road ROW, Option 3 will require construction and heat tracing of only two (2) pipes (water and sewer) on the side of the bridge on Highway 253. Option 3 will, however, require heat tracing and insulation of three (3) forcemains located on the bridge crossing the Harbour Brook at Powers Drive.

6.4 PRELIMINARY PUMP STATION CAPACITY REQUIREMENTS

Under Phase 2B, Option 1, the sewage generated along Shore Road will be pumped to the gravity receiving manhole near the intersection with Powers Road and the sewage in the northern end of Phase 4A (North) will be delivered into the gravity system in John Brackett, which flows to the wetwell at the John Brackett Drive PS. All sewage from Phase 2B and Phase 4A (North) is pumped from the wetwell at the John Brackett Drive PS through a 150 mm diameter dual forcemain system to the receiving manhole at the north end of Phase 2A.

Sewage collected in Phase 4B (South) will be pumped by the Davidson Brook PS through a 200 mm forcemain system to a receiving manhole at the south end of Phase 1B. Sewage collected at the south end of Phase 4B will be pumped by the Proposed Ketch Harbour Road PS northward along Highway 349 toward the Davidson Brook PS, where it is pumped again toward the Herring Cove Wastewater Treatment Facility (WWTF).

Table 7 provides a summary of the preliminary pump system design capacity requirements for each of the four (4) duplex submersible pumping stations required under Option 1 for Phase 2B and Phase 4B (South). The duty pumps and forcemain diameters presented here have been used to calculate the preliminary power requirements for each duty pump and forcemain system. It is noted that the power requirements for duty pumps at each pumping station are approximate and must be confirmed during the detailed design of the project.

Preliminary estimates of the total dynamic head (TDH) requirements for the duty pumps in each of the new pumping stations within Phase 2B - Option 1 and Phase 4B were calculated based on the static head and pipe losses in each of the new forcemains as presented in Table 7. As required by Halifax Water's Design Guidelines for sewage pumping stations, three distinct hydraulic scenarios, each with the appropriate Hazen-Williams coefficient (C-Values) and static head, will be analyzed during detailed design to determine the envelope of total dynamic head (TDH) requirements associated with the operation of the proposed pumping and forcemain system over the range possible pumping scenarios.

Table 7 – Option 1 - Summary of Pump Station Design Capacity Requirements

Pump Station	Duty Point		Efficiency	Nominal Power Requirement	
	Flow (l/s)	TDH (m)	(%)	(hp)	(kW)
Phase 2B - John Brackett Drive PS					
P1	33.32	21.0	50%	20	15
P2	33.32	21.0	50%	20	15
Phase 2B - Shore Road PS					
P1	9.92	16.2	50%	5	3.75
P2	9.92	16.2	50%	5	3.75
Phase 4B - Davidson Pond PS					
P1	48.77	12.2	60%	16	12
P2	48.77	12.2	60%	16	12
Phase 4B – Ketch Harbour Road PS					
P1	12.28	15.5	50%	5	3.75
P2	12.28	15.5	50%	5	3.75

Preliminary hydraulic analysis of the system curve for each of the four (4) submersible duplex pumping station and dual forcemain systems and a duty pump has been selected for each station based on these preliminary calculations. It is noted that the final selection of a duty pump with its best efficiency point (BEP) near the design duty point will help to minimize the electrical energy consumption of the system over the life of the station.

6.5 EMERGENCY BACK-UP POWER OR STORAGE REQUIREMENTS

An electrically driven wastewater pumping station can be rendered unusable for extensive periods when the local power grid is out of service, unless provision has been made for emergency back-up power or on-site storage. Halifax Water's wastewater pumping station design guidelines require the establishment of alternative methods of dealing with this loss of electrical power, typically with the construction of an on-site diesel driven emergency power supply with automatic transfer switch; provision of portable pumping equipment with a manual transfer switch, or construction of a temporary on-site storage tank for the management of the sewage delivered to the station during the duration of the outage.

Under Phase 2B, Option 1, it has been assumed that the Shore Road PS will be equipped with an underground emergency storage tank located adjacent the wetwell and sized to store approximately 4 hours of average day sewage flow from the tributary area. Construction of the Shore Road PS and emergency storage tank within the road ROW may require relocation of some privately-owned structures belonging to adjacent landowners or acquisition of additional land adjacent the road ROW.

It has been determined that on-site storage is not practical at the John Brackett Drive PS and therefore, under all three (3) options of Phase 2B, the John Brackett Drive PS will be equipped with an on-site diesel driven back-up generator equipped with a double-walled belly tank and a sound attenuating cover and an automatic transfer switch. This power unit will be located adjacent the pumping station within a security fence and sized to meet the power requirements of the duty pumps and station loads.

Within Phase 4B, it has determined that on-site storage is not practical at the Davidson Pond PS and the Ketch Harbour Road PS, and therefore each of these stations will be equipped with an on-site diesel driven back-up generator equipped with a double-walled belly tank and a sound attenuating cover and an automatic transfer switch. These power units will be located adjacent the pumping stations within a security fence and sized to meet the power requirements of the duty pumps and station loads.

7

PRELIMINARY CAPITAL COST ESTIMATES

For the Herring Cove Servicing Strategy, WSP has prepared a preliminary layout design drawing for each of the three (3) servicing options for Phase 2B (see Appendix B) , complete with preliminary quantity takeoffs and preliminary capital cost estimates (see Appendix C).

Table 8 provides a summary of the preliminary capital cost estimates for each of the three (3) servicing options for Phase 2B. A detailed breakdown of the capital cost estimate for each servicing option is presented in Appendix C.

WSP has also prepared a quantity takeoff and preliminary capital cost estimate for the servicing of development within Phase 4A (North) and Phase 4B (South) of the Herring Cove Servicing Strategy. Table 9 provides a summary of the preliminary capital cost estimates for this conventional servicing option of Phase 4A (North) and Phase 4B (South). A more detailed breakdown of the capital cost estimate for the servicing plans for Phase 4A (North) and Phase 4B (South) is presented in Appendix C.

In addition to the costs to construct the various options, each of the preliminary capital cost estimates includes an allowance of $75,000 to cover Halifax Water's estimated salary and expenses during the completion of the project, as well as a 35% contingency, an allowance of 1% of the total capital cost of the project to cover Halifax Water's overhead.

7.1 CURRENT CAPITAL BUDGET ALLOCATION

Funding currently available for the Herring Cove Servicing – Phase 2B project under the Canada Water and Wastewater Fund amounts to $4,561,952 or approximately 62% of the total preliminary capital cost estimate for construction of Option 2 or Option 3, as presented in Table 8. Within the 2017/2018 construction season, the current funding is sufficient to construct only a portion of the overall Herring Cove Servicing - Phase 2B project, with the remainder of the project being deferred until a future date when additional funding is secured.

If a portion of the project is to be constructed within the 2017/2018 construction season, it is essential that the sanitary system be completed and functional for those residents connected to the system. While the exact determination of the work that can be completed within the existing funding limits has yet to be determined, it is recommended that the construction of water and sanitary services on Shore Road and along Powers Drive be deferred to a later date.

Table 8 – Phase 2B - Preliminary Capital Cost Estimate Summary

Description	Option No.1	Option No.2	Option No.3
John Brackett Road			
• Earthworks	$575,000	$575,000	$591,400
• Water System	$436,750	$436,750	$436,750
• Sanitary System	$1,921,050	$1,921,050	$1,582,550
• Storm System	$51,800	$51,800	$51,800
Sub-Total Cost ($)	$2,984,600	$2,984,600	$2,662,500
Powers Drive			
• Earthworks	$276,000	$276,000	$359,000
• Water System	$294,250	$294,250	$226,750
• Sanitary System	$360,500	$360,500	$534,130
• Storm System	nil	nil	nil
Sub-Total Cost ($)	$930,750	$930,750	$1,119,880
Shore Road			
• Earthworks	$589,000	$475,000	$445,000
• Water System	$275,050	$275,050	$275,050
• Sanitary System	$1,303,550	$107,600	$251,000
• Storm System	nil	nil	nil
Sub-Total Cost ($)	$2,167,600	$857,650	$971,050
Sub-Total ($)	$6,082,950	$4,773,000	$4,753,430
Engineering Services	$335,000	$335,000	$335,000
Grand Total (excl. HST)	$6,417,950	$5,108,000	$5,088,430
HST (4.286%)	$275,073	$218,923	$218,090
Grand Total (incl. HST)	$6,693,023	$5,326,923	$5,306,520
Contingency (35%)	$2,342,558	$1,864,425	$1,857,282
Estimated Halifax Water Salary & Expenses	$75,000	$75,000	$75,000
Sub-Total ($)	$9,110,582	$7,266,354	$7,238,802
Halifax Water Overhead (1%)	$91,105	$72,663	$72,388
Project Grand Total ($)	$9,201,687	$7,339,017	$7,311,190

Table 9 – Phase 4 - Preliminary Capital Cost Estimate Summary

Description	Preliminary Capital Cost
Phase 4A (North)	
• Earthworks	$395,000
• Water System	$346,000
• Sanitary System	$429,200
• Storm System	nil
Sub-Total – Phase 4A	$1,170,200
Phase 4B (South)	
• Earthworks	$998,000
• Water System	$669,500
• Sanitary System	$2,885,600
• Storm System	nil
Sub-Total – Phase 4B	$4,553,100
Sub-Total – Phase 4	$5,723,300
Engineering Services	$429,248
Grand Total (excl. HST)	$6,152,548
HST (4.286%)	$263,698
Sub - Total (incl. HST)	$6,416,246
Contingency (35%)	$2,245,686
Estimated Halifax Water Salary & Expenses	$75,000
Sub-Total (incl. HST and Contingency)	$8,736,932
Halifax Water Project Overhead (1%)	$87,369
Project Grand Total – Phase 4	$8,824,301

8 CONCLUSIONS & RECOMMENDATIONS

8.1 CONCLUSIONS

WSP has completed the preliminary design of the water and sanitary services required to meet the needs of existing and future residential development within the boundaries of Phase 2B, Phase 4A (North), and Phase 4B (South) of the Herring Cove Residential (HCR) Zone.

The following is a summary of conclusions reached as a result of this analysis.

- All development within Phase 2B, Phase 4A (North), and Phase 4B (South) may be provided with potable water and fire protection water using a conventional 200 mm diameter, Class 52, ductile iron water main system equipped with fire hydrants and other appurtenances.
- All development within Phase 4A (North) may be provided with a conventional sanitary collection and transmission system comprising gravity sewer system. Servicing of individual properties downhill from this gravity sewer system may be accomplished using a low pressure sewer system with individual sewage pumps and pressure laterals at each residence.
- All development within Phase 4B (South) may be provided with a conventional sanitary collection and transmission system comprising gravity sewers and two duplex sanitary pumping station and dual forcemain systems.
- All development within Phase 2B may be provided with a conventional sanitary collection and transmission system comprising gravity sewers and duplex sanitary pumping station and dual forcemain systems or using a low pressure sewer system with individual sewage pumps and pressure laterals at each residence or some combination of both.
- Option 3 – Hybrid Sewer System with Low Pressure Pumps and Common Forcemain with One (1) Lift Station offers the lowest potential for damage and disruption to private property due primarily to the confined space available within the road right-of-way (ROW) on Shore Drive, where many of the private structures are currently located well into the public right-of-way and the shallow bedrock is located within the required trench depth. Option 3 also eliminates the requirement for acquisition of an easement connecting Powers Drive to John Brackett Drive (Highway 253).

8.2 RECOMMENDATIONS

Based on the analysis presented in this report, WSP makes the following recommendations:

- The provision of water servicing within Phase 2B and Phase 4 should be a conventional 200 mm diameter watermain system with hydrants and other appurtenances.
- The provision of sanitary services within Phase 2B should be configured as shown in Option 3 (see Appendix B), based on the reduced potential for disruption to traffic during construction along Shore Road, and the less complicated construction required to install the low pressure sanitary forcemain system within the confined travelled way along

Shore Road and along John Brackett Drive (Highway 253). As an added benefit, Option 3 offers the lowest capital cost for servicing Phase 2B.

- The provision of sanitary services within Phase 4A (North) should be configured as a combination of gravity sewer and low pressure sanitary forcemain system along Highway 253 as shown on Drawing 4 in Appendix B.
- The provision of sanitary services within Phase 4B (South) should be configured as a conventional gravity sewer system along Highway 349 with two (2) duplex sanitary pumping station and dual forcemain systems, as shown on Drawing 5 and Drawing 6 in Appendix B.
- Given the limited funding currently available under the 2016 CWWF program for the Herring Cove - Phase 2B Servicing project, the entire project cannot be completed as shown under Option 3 in Appendix B. The current funding is sufficient to build approximately two-thirds of the total project. The available funding is sufficient to cover the installation of services along John Brackett Drive, including the construction of the John Brackett PS and the dual forcemain system along Powers Drive. The construction of the remainder of the proposed services on Shore Road and Powers Drive would need to be deferred until additional funding can be secured. In the future, when funding is secured, the water and sanitary collection piping in Powers Drive may be completed in the opposite shoulder without disturbing the forcemain system already installed under the current funding.

Appendix A

Detailed Population and Sanitary Design Flow Calculations

Herring Cove Servicing - Phase 2B and Phase 4

Sanitary Sewer System Calculations - Halifax Water Formula

Project No. 161-17540

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Edited By: Neil Fougere & Richard Stephenson

PHASE 2B

Phase 2B	Units	Density	Population	Average Dry Weather Flow Allowance (l/d/person)	Average Dry Weather Flow (l/d)	Peaking Factor	Peak Dry Weather Flow (l/d)	Tributary Area (ha)	Infiltration/Inflow Allowance (l/d/ha)	Infiltration/ Inflow Flow (l/d)	Safety Factor	Peak Wet Weather Flow (l/d)	Peak Wet Weather Flow (l/s)	Peak Wet Weather Flow (USgpm)	Pipe Size (mm)	Pipe Slope (%)	Manning's 'n'	Pipe Capacity (l/s)	Percent Full
2B-1	5	3.35	17	300	5,100	4.39	22,387	2.80	24,000	67,152	1.25	95,135	1.10	17.40	250	1	0.01	77.3	1.4%
2B-2	29	3.35	97	300	29,100	4.25	123,593	4.90	24,000	117,600	1.25	272,091	3.15	49.76	250	1	0.01	77.3	4.1%
2B-3	15	3.35	50	300	15,000	4.31	64,721	2.98	24,000	71,544	1.25	152,445	1.76	27.88	250	1	0.01	77.3	2.3%
2B-4	39	3.35	131	300	39,300	4.21	165,437	10.93	24,000	262,320	1.25	469,116	5.43	85.79	250	1	0.01	77.3	7.0%
Total Existing	**88**		**295**	**300**	**88,500**	**4.08**	**361,219**	**21.61**	**24,000**	**518,616**		**988,786**	**11.44**	**180.82**	250	1	0.01	77.3	15%
Future																			
2B-1	30	3.35	101	300	30,300	4.24	128,544	2.80	24,000	67,152	1.25	227,832	2.64	41.66	250	1	0.01	77.3	3.4%
2B-2	125	3.35	419	300	125,700	4.01	504,371	11.61	24,000	278,640	1.25	909,104	10.52	166.25	250	1	0.01	77.3	13.6%
2B-3	32	3.35	107	300	32,100	4.24	135,957	2.98	24,000	71,544	1.25	241,490	2.80	44.16	250	1	0.01	77.3	3.6%
2B-4	118	3.35	394	300	118,200	4.03	475,786	10.93	24,000	262,320	1.25	857,053	9.92	156.73	250	1	0.01	77.3	12.8%
Total Max Future	**305**	**3.35**	**1021**	**300**	**306,300**	**3.79**	**1,162,152**	**28.32**	**24,000**	**679,656**	**1.25**	**2,132,346**	**24.68**	**389.94**	250	1	0.01	77.3	32%

PHASE 4 (North)

Phase 4 (North)	Units	Density	Population	Average Dry Weather Flow Allowance (l/d/person)	Average Dry Weather Flow (l/d)	Peaking Factor	Peak Dry Weather Flow (l/d)	Tributary Area (ha)	Infiltration/Inflow Allowance (l/d/ha)	Infiltration/ Inflow Flow (l/d)	Safety Factor	Peak Wet Weather Flow (l/d)	Peak Wet Weather Flow (l/s)	Peak Wet Weather Flow (USgpm)	Pipe Size (mm)	Pipe Slope (%)	Manning's 'n'	Pipe Capacity (l/s)	Percent Full
4-3	7	3.35	23	300	6,900	4.37	30,168	1.50	24,000	36,000	1.25	73,710	0.85	13.48	250	1	0.01	77.3	1%
4-4	11	3.35	37	300	11,100	4.34	48,167	4.20	24,000	100,800	1.25	161,009	1.86	29.44	250	1	0.01	77.3	2%
Total Existing	**18**		**60**	**300**	**18,000**	**4.30**	**77,365**	**5.70**	**24,000**	**136,800**	**1.25**	**234,719**	**2.72**	**42.92**	250	1	0.01	77.3	4%
Future																			
4-3	29	3.35	98	300	29,400	4.25	124,831	2.71	24,000	65,040	1.25	221,079	2.56	40.43	250	1	0.01	77.3	3%
4-4	84	3.35	283	300	84,900	4.09	347,170	7.843	24,000	188,232	1.25	622,194	7.20	113.78	250	1	0.01	77.3	9%
Max Future	**114**	**3.35**	**381**	**300**	**114,300**	**4.03**	**460,870**	**10.55**	**24,000**	**253,272**	**1.25**	**829,359**	**9.60**	**151.67**	250	1	0.01	77.3	12%
Existing Total (Phase 2B + Phase 4 (North)	**106**	**3.35**	**355**	**300**	**106,500**	**4.05**	**430,925**	**27.31**	**24,000**	**655,416**	**1.25**	**1,194,073**	**14.16**	**223.74**	250	1.5	0.01	94.7	15%
Future Total (Phase 2B + Phase 4 (North)	**418**	**3.35**	**1,402**	**300**	**420,600**	**3.70**	**1,556,466**	**38.87**	**24,000**	**932,928**	**1.25**	**2,878,511**	**33.32**	**526.39**	250	1.5	0.01	94.7	35%

PHASE 4 (South)

Phase 4	Units	Density	Population	Average Dry Weather Flow Allowance (l/d/person)	Average Dry Weather Flow (l/d)	Peaking Factor	Peak Dry Weather Flow (l/d)	Tributary Area (ha)	Infiltration/Inflow Allowance (l/d/ha)	Infiltration/ Inflow Flow (l/d)	Safety Factor	Peak Wet Weather Flow (l/d)	Peak Wet Weather Flow (l/s)	Peak Wet Weather Flow (USgpm)	Pipe Size (mm)	Pipe Slope (%)	Manning's 'n'	Pipe Capacity (l/s)	Percent Full
4-1	22	3.35	74	300	22,200	4.28	94,952	7.13	24,000	171,120	1.25	289,810	3.35	53.00	250	1	0.01	77.3	4%
4-2	21	3.35	70	300	21,000	4.28	89,940	3.05	24,000	73,200	1.25	185,625	2.15	33.95	250	1	0.01	77.3	3%
Total Existing	**43**		**144**	**300**	**43,200**	**4.20**	**181,299**	**10.18**	**24,000**	**244,320**	**1.25**	**470,943**	**5.50**	**86.94**	250	1	0.01	77.3	7%
Future																			
4-1	481	3.35	1611	300	483,300	3.66	1,767,391	44.68	24,000	1,072,320	1.25	3,281,559	37.98	600.10	250	1	0.01	77.3	49%
4-2	147	3.35	492	300	147,600	3.98	587,126	13.64	24,000	327,360	1.25	1,061,268	12.28	194.07	250	1	0.01	77.3	16%
Max Future	**628**	**3.35**	**2103**	**300**	**630,900**	**3.57**	**2,251,509**	**58.32**	**24,000**	**1,399,680**	**1.25**	**4,214,067**	**48.77**	**770.63**	250	1	0.01	77.3	63%
System Total (All Phases)	**1046**	**3.35**	**3505**	**300**	**1,051,500**	**3.38**	**3,558,412**	**97.192**	**24,000**	**2,332,608**	**1.25**	**6,780,623**	**78.48**	**1239.98**	250	1.5	0.01	94.7	83%

Appendix B

Conceptual Servicing Layout Options

PHASE 2B
OPTION #1

POWERS POND

JOHN BRACKETT DRIVE

PUMPING STATION #1

2X SANITARY FORCEMAINS

SANITARY MAIN (GRAVITY)

BRIDGE CROSSING

WATER MAIN

POWERS DRIVE

TIMBER BRIDGE

DISCHARGE TO SANITARY MAIN (GRAVITY)

DISCHARGE TO EXISTING SANITARY MAIN (GRAVITY)

DEMPSEY LN

EXISTING SANITARY MAIN (GRAVITY)

EXISTING WATER MAIN

HEBRIDEAN DRIVE

PUMPING STATION

EXISTING 2X SANITARY FORCEMAINS

VILLAGE ROAD

HERRING COVE

SHORE RD

PUMPING STATION #2

PHASE 2B

2B-1

2B-2

2B-3

2B-4

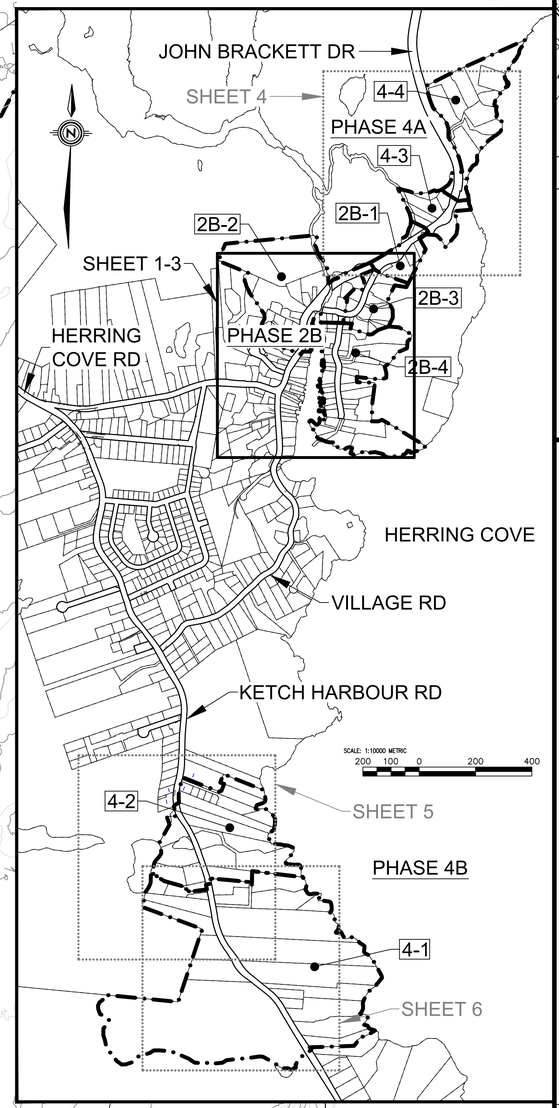
FORCEMAIN FLOW DIRECTION

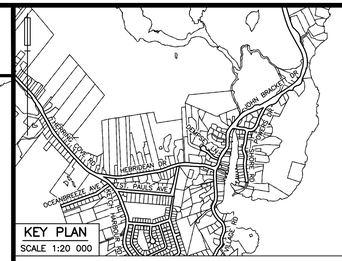
GRAVITY SEWER FLOW DIRECTION

SCALE: 1:1250 METRIC

10 5 0 10 20 30 40 50 60 70 80

OVERVIEW





PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCEMAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

NOTES:

DATE PLOTTED:

SCALE PLOTTED: 1=1

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No.	DESCRIPTION	DATE	BY	CHKD
2	ISSUED FOR REPORT	13/01/17	DMI	NTF
1	ISSUED FOR REVIEW	06/01/17	DMI	NTF
0	ISSUED FOR REVIEW	16/12/16	DMI	NTF

Halifax Water

ENGINEERING DEPARTMENT

PROJECT

HERRING COVE - PHASE 2B (OPTION 1)
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN	D. MACINNIS	SCALE (PLAN)	1:1250
CHECKED	N. FOUGERE	SCALE (PROFILE)	N/A
APPROVED		DATE	
PROJECT No.	161-17655		
DWG. No.	1 OF 6		

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PHASE 2B
OPTION #2

POWERS POND

JOHN BRACKETT DRIVE

PUMPING STATION #1

SANITARY MAIN (GRAVITY)

2X SANITARY FORCEMAINS

BRIDGE CROSSING

SANITARY MAIN (GRAVITY)

SANITARY MAIN (GRAVITY)

POWERS DRIVE

2B-1

2B-2

2B-3

2B-4

WATER MAIN

TIMBER BRIDGE

SANITARY MAIN (GRAVITY)

WATER MAIN

DISCHARGE TO SANITARY MAIN (GRAVITY)

PHASE 2B

2X SANITARY FORCEMAINS

DISCHARGE TO EXISTING SANITARY MAIN (GRAVITY)

DEMPSEY LN

EXISTING SANITARY MAIN (GRAVITY)

EXISTING WATER MAIN

COMMON SANITARY FORCEMAIN

HEBRIDEAN DRIVE

SHORE RD

WATER MAIN

PUMPING STATION

EXISTING 2X SANITARY FORCEMAINS

TERMINAL FLUSHING CONNECTION

HERRING COVE

VILLAGE ROAD

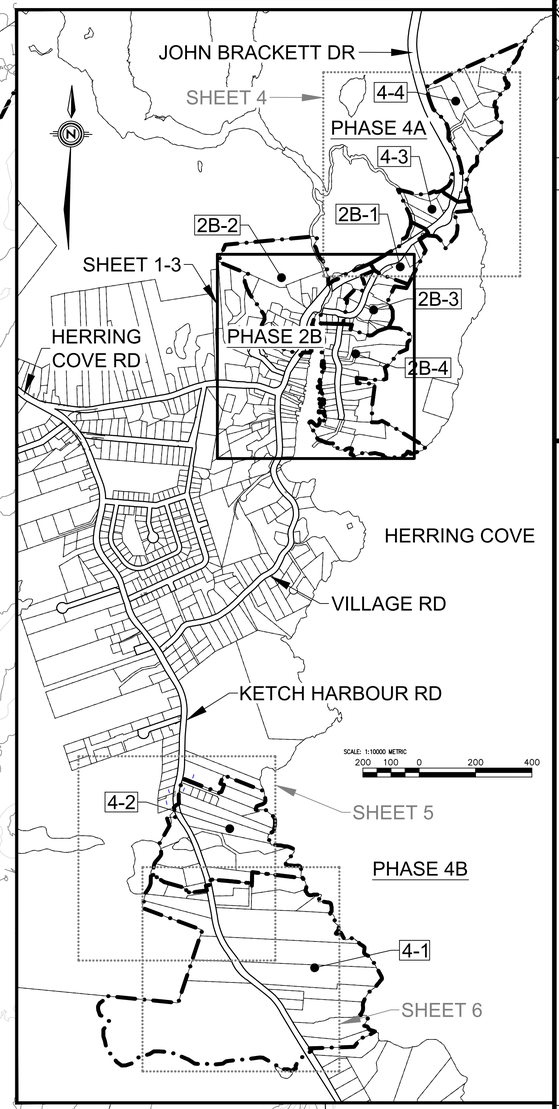
FORCEMAIN FLOW DIRECTION

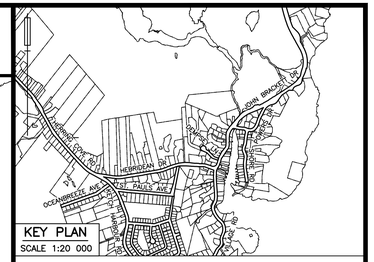
GRAVITY SEWER FLOW DIRECTION

SCALE: 1:1250 METRIC

10 5 0 10 20 30 40 50 60 70 80

OVERVIEW





PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCEMAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

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0	ISSUED FOR REVIEW	16/12/16	DMI	NTF

Halifax Water

ENGINEERING DEPARTMENT

PROJECT

HERRING COVE - PHASE 2B (OPTION 2)
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN	D. MACINNIS	SCALE (PLAN)	1:1250
CHECKED	N. FOUGERE	SCALE (PROFILE)	N/A
APPROVED		DATE	
PROJECT No.	161-17655		
DWG. No.	2 OF 6		

NOTES:

DATE PLOTTED:

SCALE PLOTTED: 1=1

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PHASE 2B
OPTION #3

POWERS POND

JOHN BRACKETT DRIVE

PUMPING STATION #1

SANITARY MAIN (GRAVITY)

BRIDGE CROSSING

2X SANITARY FORCEMAINS

SANITARY MAIN (GRAVITY)

POWERS DRIVE

2B-1

2B-2

2B-3

2B-4

WATER MAIN

TIMBER BRIDGE

COMMON SANITARY FORCEMAIN

2X SANITARY FORCEMAINS

WATER MAIN

2X SANITARY FORCEMAINS

COMMON SANITARY FORCEMAIN

PHASE 2B

SANITARY MAIN (GRAVITY)

DISCHARGE TO EXISTING SANITARY SEWER (GRAVITY)

DEMPSEY LN

EXISTING SANITARY MAIN (GRAVITY)

EXISTING WATER MAIN

COMMON SANITARY FORCEMAIN

SHORE RD

HEBRIDEAN DRIVE

PUMPING STATION

EXISTING 2X SANITARY FORCEMAINS

WATER MAIN

TERMINAL FLUSHING CONNECTION

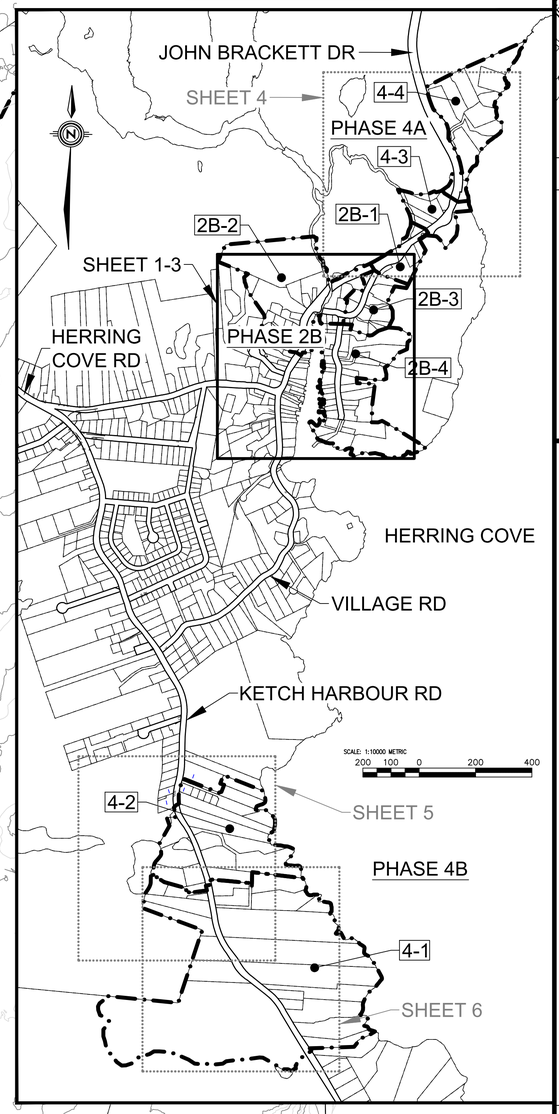
VILLAGE ROAD

HERRING COVE

NOTES:

SCALE PLOTTED: 1 = 1 DATE PLOTTED:

OVERVIEW



FORCEMAIN FLOW DIRECTION

GRAVITY SEWER FLOW DIRECTION

SCALE: 1:1250 METRIC
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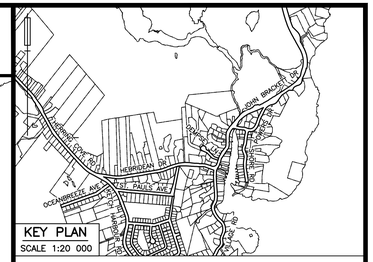

PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCEMAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

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2	ISSUED FOR REPORT	13/01/17	DMI	NTF
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Halifax Water

ENGINEERING DEPARTMENT

PROJECT
HERRING COVE - PHASE 2B (OPTION 3)
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN	D. MACINNIS	SCALE (PLAN)	1:1250
CHECKED	N. FOUGERE	SCALE (PROFILE)	N/A
APPROVED		DATE	

PROJECT No. 161-17655

DWG. No. 3 OF 6

PHASE 4A

TERMINAL FLUSHING CONNECTION

COMMON SANITARY FORCE MAIN

DISCHARGE TO SANITARY MAIN (GRAVITY)

WATER MAIN

SANITARY MAIN (GRAVITY)

4-4

4-3

2B-1

ATLANTIC OCEAN

POWERS POND

PHASE 4A

PHASE 2B

SANITARY MAIN (GRAVITY)

WATER MAIN

CONNECT TO PHASE 2B-1 GRAVITY MAIN

PHASE 2B-1 (OPTION 3) SANITARY SEWER (GRAVITY)

PUMPING STATION #1

JOHN BRACKETT DRIVE

PHASE 2B-1 (OPTION 3) 2X SANITARY FORCE MAIN; SANITARY MAIN (GRAVITY); WATER MAIN

FORCE MAIN FLOW DIRECTION

GRAVITY SEWER FLOW DIRECTION

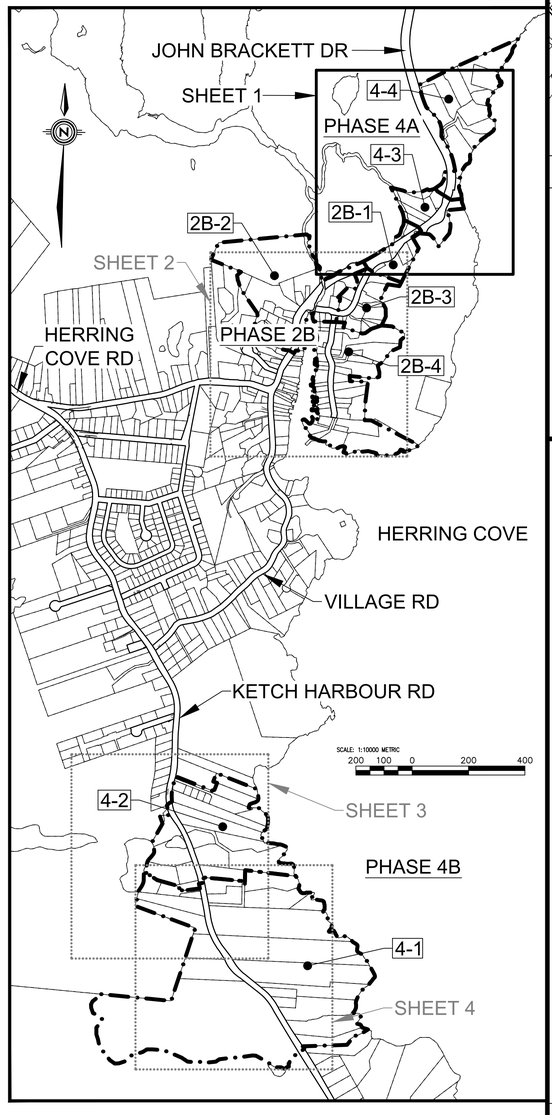
SCALE: 1:1250 METRIC

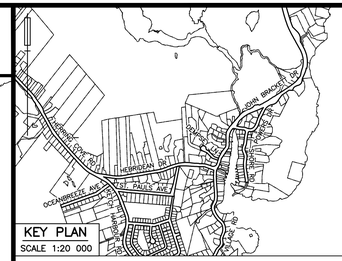
10 5 0 10 20 30 40 50 60 70 80

NOTES:

SCALE PLOTTED: 1 = 1 DATE PLOTTED:

OVERVIEW





PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCE MAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

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1	ISSUED FOR REVIEW	06/01/17	DMI	NTF
0	ISSUED FOR REVIEW	16/12/16	DMI	NTF

Halifax Water

ENGINEERING DEPARTMENT

PROJECT

HERRING COVE - PHASE 4A
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN	D. MACINNIS	SCALE (PLAN)	1:1250
CHECKED	N. FOUGERE	SCALE (PROFILE)	N/A
APPROVED		DATE	
PROJECT No.	161-17655		
DWG. No.	4 OF 6		

PHASE 4B

EXISTING WATER MAIN
EXISTING SANITARY MAIN (GRAVITY)
EXISTING WATER MAIN
DISCHARGE TO EXISTING SANITARY MAIN (GRAVITY)
2X SANITARY FORCE MAIN
CONNECT TO EXISTING WATER MAIN
WATER MAIN
SANITARY MAIN (GRAVITY)
2X SANITARY FORCE MAIN
PUMPING STATION
SANITARY MAIN (GRAVITY)
DISCHARGE TO SANITARY MAIN (GRAVITY)
SANITARY MAIN (GRAVITY)
2X SANITARY FORCE MAIN
SANITARY MAIN (GRAVITY)
2X SANITARY FORCE MAIN

TAYLOR DR
LITTLE POINT DR
KETCH HARBOUR RD
JOE CRACKER RD

ATLANTIC OCEAN
DAVIDSON'S SECOND POND
DAVIDSON'S FIRST POND

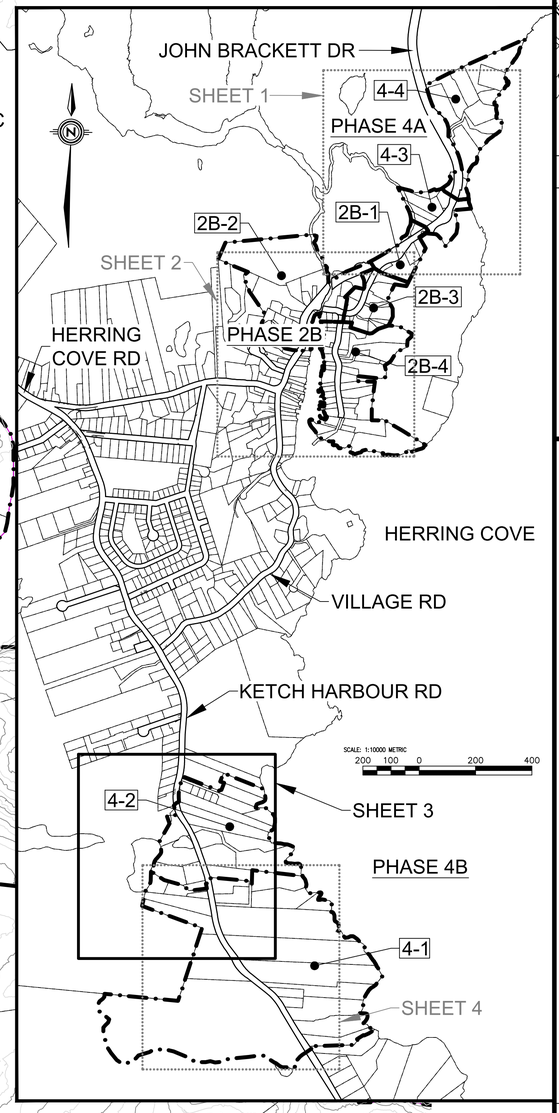
4-2
4-1

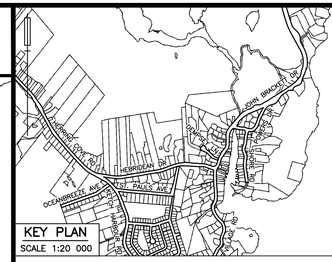
PHASE 4B

FORCE MAIN FLOW DIRECTION
GRAVITY SEWER FLOW DIRECTION

SCALE: 1:1250 METRIC
10 5 0 10 20 30 40 50 60 70 80

OVERVIEW





PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCE MAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

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0	ISSUED FOR REVIEW	16/12/16	DMI	NTF

Halifax Water

ENGINEERING DEPARTMENT

PROJECT
HERRING COVE - PHASE 4B
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN D. MACINNIS	SCALE (PLAN) 1:1250
CHECKED N. FOUGERE	SCALE (PROFILE) N/A
APPROVED	DATE
PROJECT No. 161-17655	
DWG. No. 5 OF 6	

NOTES:

DATE PLOTTED:

SCALE PLOTTED: 1 = 1

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PHASE 4B

SANITARY MAIN (GRAVITY)

DISCHARGE TO SANITARY MAIN (GRAVITY)

4-2

ATLANTIC OCEAN

SANITARY MAIN (GRAVITY)

KETCH HARBOUR RD

JOE CRACKER RD

2X SANITARY FORCE MAIN

2X SANITARY FORCE MAIN

SANITARY MAIN (GRAVITY)

4-1

WATER MAIN

SANITARY MAIN (GRAVITY)

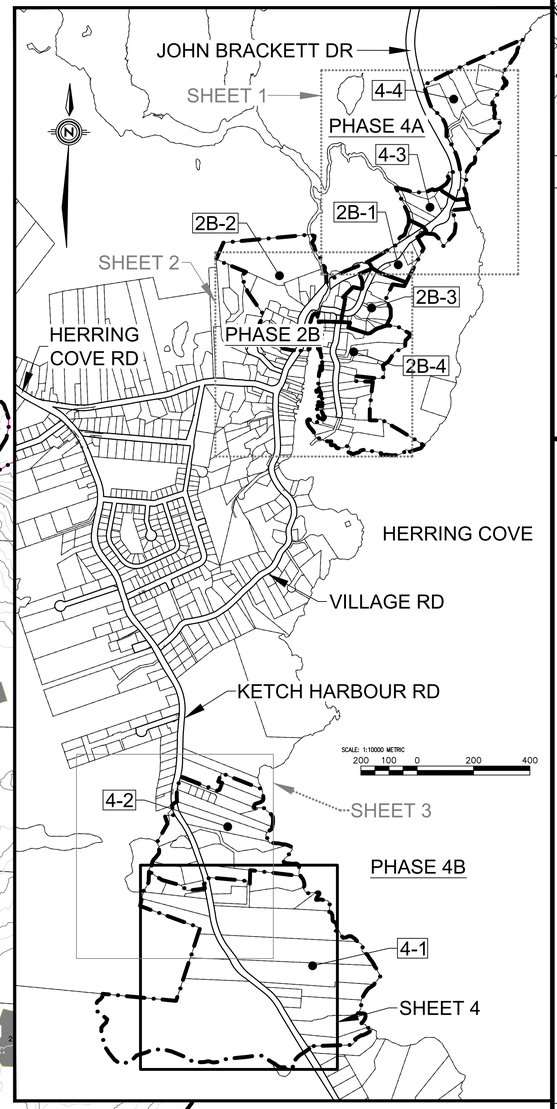
2X SANITARY FORCE MAIN

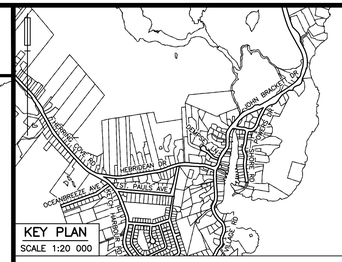
PUMPING STATION

NOTES:

SCALE PLOTTED: 1=1 DATE PLOTTED:

OVERVIEW





PLAN LEGEND

EXISTING		PROPOSED
	WATER MAIN	
	WATER VALVE	
19mmC	FIRE HYDRANT	
	SERVICE CONNECTIONS	
	COMBINED MANHOLE & PIPE	
	STORM MANHOLE & PIPE	
	SANITARY MANHOLE & PIPE	
	SANITARY FORCE MAIN	
	CATCH BASIN	
	GAS LINE	
	U/G CONDUIT	
	FENCE LINE	
	PROPERTY LINE	
UP	UTILITY POLE	

FORCE MAIN FLOW DIRECTION

GRAVITY SEWER FLOW DIRECTION

SCALE: 1:1250 METRIC
10 5 0 10 20 30 40 50 60 70 80

WSP

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1 Spectacle Lake Drive
Dartmouth, Nova Scotia
Canada, B3B 1X7
T 902-835-9955
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No.	DESCRIPTION	DATE	BY	CHKD
2	ISSUED FOR REPORT	13/01/17	DMI	NTF
1	ISSUED FOR REVIEW	06/01/17	DMI	NTF
0	ISSUED FOR REVIEW	16/12/16	DMI	NTF

Halifax Water

ENGINEERING DEPARTMENT

PROJECT

HERRING COVE - PHASE 4B
PRELIMINARY
SERVICING PLAN
HERRING COVE, NS

DRAWN D. MACINNIS	SCALE (PLAN) 1:1250
CHECKED N. FOUGERE	SCALE (PROFILE) N/A
APPROVED	DATE

PROJECT No. 161-17655

DWG. No. 6 OF 6

HRWC-A1.dwg DWG FILENAME: K:\Dartmouth\2016\161-17655 - Herring Cove - Phase 2B Servicing\11_Dwg\11.1_Concept_Plans\x161-17655_Base - Phase 4-1 and 4-2.dwg

Appendix C

Preliminary Capital Cost Estimates

PRELIMINARY COST ESTIMATES SUMMARY

Summary of Probable Costs for the Construction of Subdivision Services
Project Name: Herring Cove Phase 2B - Option #1
Location: Herring Cove, Nova Scotia
Plan NO.s:
Client Name: Halifax Water

ITEM DESCRIPTION		COST ($)
John Brackett Drive		**$2,984,600.00**
Powers Road		**$930,750.00**
Shore Road		**$2,167,600.00**
Engineering Services		**$335,000.00**
	Sub-Total	**$6,417,950.00**
HST (4.286%)		**$275,073.34**

Total Servicing Cost (including HST)	$6,693,023.34
Halifax Water Salary and Expenses	$75,000.00
Contingency (35% of Total Servicing Cost) *	$2,342,558.17
Sub-total	$9,110,581.50
Halifax Water Overhead (1%)	$91,105.82
Total Value	**$9,201,687.32**

Consulting Engineer

*** 10% was added to the contigency to account for market conditions in 2017**

Herrring Cove Phase 2B - Option 1
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

JOHN BRACKETT DRIVE

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2850	$200.00	$570,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$575,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	658	$500.00	$329,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	145	$150.00	$21,750.00
	Sets of Fittings 20mm dia.	each	17	$1,000.00	$17,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m	20	$2,000.00	$40,000.00
				Sub Total	**$436,750.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	605	$600.00	$363,000.00
3	**Manholes**				
	1050 mm dia	each	10	$4,500.00	$45,000.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	230	$450.00	$103,500.00
5	**Pumping Station & Generator**				
	Large	each	1	$1,000,000.00	$1,000,000.00
6	**250mm dia. Gravity Bridge Crossing**	m	20	$1,500.00	$30,000.00
7	**Dual Forcemain Bridge Crossing**	m	20	$2,500.00	$50,000.00
8	**Dual Forcemain (150mm Dia.)**	m	490	$650.00	$318,500.00
9	**CCTV Inspection**	m	1210	$5.00	$6,050.00
				Sub Total	**$1,921,050.00**

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	STORM SYSTEM				
8	**Culverts**				
	450mm dia. CSA A257.2 65D	m		$400.00	$0.00
	525mm dia. CSA A257.2 65D	m	20	$440.00	$8,800.00
	600mm dia. CSA A257.2 65D	m		$500.00	$0.00
	750mm dia. CSA A257.2 65D	m		$650.00	$0.00
	900mm dia. CSA A257.2 65D	m		$850.00	$0.00
	1050mm dia. CSA A257.2 65D	m		$1,000.00	$0.00
	1200mm dia. CSA A257.2 65D	m	20	$1,200.00	$24,000.00
13	**Inlet/Outlet Headwalls**				
	Precast Concrete (300-600mm pipe)	each	2	$1,500.00	$3,000.00
	Precast Concrete (1050-1500mm pipe)	each	2	$8,000.00	$16,000.00
				Sub Total	**$51,800.00**

TOTAL	**$2,984,600.00**

Herrring Cove Phase 2B - Option 1
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

Powers Road

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	1355	$200.00	$271,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$276,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	440	$500.00	$220,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	155	$150.00	$23,250.00
	Sets of Fittings 20mm dia.	each	16	$1,000.00	$16,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each	1	$6,000.00	$6,000.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$294,250.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m	425	$600.00	$255,000.00
3	**Manholes**				
	1050 mm dia	each	9	$4,500.00	$40,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	135	$450.00	$60,750.00
5	**Pumping Station & Generator**				
	Large	each		$1,000,000.00	$0.00
6	**Gravity Bridge Crossing**	m		$1,500.00	$0.00
7	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
8	**Dual forcemain**	m		$650.00	$0.00
9	**CCTV Inspection**	m	850	$5.00	$4,250.00
				Sub Total	**$360,500.00**
				TOTAL	**$930,750.00**

Herrring Cove Phase 2B - Option 1
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

Shore Drive

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2920	$200.00	$584,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$589,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. DI	m	375	$500.00	$187,500.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	257	$150.00	$38,550.00
	Sets of Fittings 20mm dia.	each	33	$1,000.00	$33,000.00
4	**Gate Valves**				
	200mm dia. GV	each	4	$1,000.00	$4,000.00
5	**Fire Hydrants**	each	3	$4,000.00	$12,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$275,050.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m	365	$600.00	$219,000.00
3	**Manholes**				
	1050 mm dia	each	8	$4,500.00	$36,000.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	322	$450.00	$144,900.00
5	**Pumping Station & Storage**				
	Large	each	1	$900,000.00	$900,000.00
6	**Gravity Bridge Crossing**	m		$1,500.00	$0.00
7	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
8	**Dual Forcemain (100mm dia.)**	m	305	$600.00	
9	**CCTV Inspection**	m	730	$5.00	$3,650.00
				Sub Total	**$1,303,550.00**
				TOTAL	**$2,167,600.00**

PRELIMINARY COST ESTIMATES SUMMARY

Summary of Probable Costs for the Construction of Subdivision Services
Project Name: Herring Cove Phase 2B - Option #2
Location: Herring Cove, Nova Scotia
Plan NO.s:
Client Name: Halifax Water

ITEM DESCRIPTION	COST ($)
John Brackett Drive	**$2,984,600.00**
Powers Road	**$930,750.00**
Shore Road	**$857,650.00**
Engineering Services	**$335,000.00**
Sub-Total	**$5,108,000.00**
HST (4.286%)	**$218,928.88**

Total Servicing Cost (including HST)	$5,326,928.88
Halifax Water Salary and Expenses	$75,000.00
Contingency (35% of Total Servicing Cost)*	$1,864,425.11
Sub-total	$7,266,353.99
Halifax Water Overhead (1%)	$72,663.54
Total Value	**$7,339,017.53**

Consulting Engineer

*** 10% was added to the contigency due to market conditions in 2017**

Herrring Cove Phase 2B - Option 2
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

JOHN BRACKETT DRIVE

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2850	$200.00	$570,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$575,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	658	$500.00	$329,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	145	$150.00	$21,750.00
	Sets of Fittings 20mm dia.	each	17	$1,000.00	$17,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m	20	$2,000.00	$40,000.00
				Sub Total	**$436,750.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	605	$600.00	$363,000.00
3	**Manholes**				
	1050 mm dia	each	10	$4,500.00	$45,000.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	230	$450.00	$103,500.00
5	**Pumping Station & Generator**				
	Large	each	1	$1,000,000.00	$1,000,000.00
6	**250mm dia. Gravity Bridge Crossing**	m	20	$1,500.00	$30,000.00
7	**Dual Forcemain Bridge Crossing**	m	20	$2,500.00	$50,000.00
8	**Dual Forcemain (150mm Dia.)**	m	490	$650.00	$318,500.00
9	**CCTV Inspection**	m	1210	$5.00	$6,050.00
				Sub Total	**$1,921,050.00**

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	STORM SYSTEM				
8	**Culverts**				
	450mm dia. CSA A257.2 65D	m		$400.00	$0.00
	525mm dia. CSA A257.2 65D	m	20	$440.00	$8,800.00
	600mm dia. CSA A257.2 65D	m		$500.00	$0.00
	750mm dia. CSA A257.2 65D	m		$650.00	$0.00
	900mm dia. CSA A257.2 65D	m		$850.00	$0.00
	1050mm dia. CSA A257.2 65D	m		$1,000.00	$0.00
	1200mm dia. CSA A257.2 65D	m	20	$1,200.00	$24,000.00
13	**Inlet/Outlet Headwalls**				
	Precast Concrete (300-600mm pipe)	each	2	$1,500.00	$3,000.00
	Precast Concrete (1050-1500mm pipe)	each	2	$8,000.00	$16,000.00
				Sub Total	**$51,800.00**

TOTAL	**$2,984,600.00**

Herrring Cove Phase 2B - Option 2
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

POWERS ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	1355	$200.00	$271,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$276,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	440	$500.00	$220,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	155	$150.00	$23,250.00
	Sets of Fittings 20mm dia.	each	16	$1,000.00	$16,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each	1	$6,000.00	$6,000.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$294,250.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m	425	$600.00	$255,000.00
3	**Manholes**				
	1050 mm dia	each	9	$4,500.00	$40,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	135	$450.00	$60,750.00
5	**Pumping Station & Generator**				
	Supply of Equipment and Installation	each		$1,000,000.00	$0.00
6	**Gravity Bridge Crossing**	m		$1,500.00	$0.00
7	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
8	**Dual Forcemain**	m		$650.00	$0.00
8	**CCTV Inspection**	m	850	$5.00	$4,250.00
				Sub Total	**$360,500.00**
				TOTAL	**$930,750.00**

Herrring Cove Phase 2B - Option 2
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

SHORE ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2350	$200.00	$470,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$475,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	375	$500.00	$187,500.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	257	$150.00	$38,550.00
	Sets of Fittings 20mm dia.	each	33	$1,000.00	$33,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	4	$1,000.00	$4,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	3	$4,000.00	$12,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$275,050.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m	70	$600.00	$42,000.00
3	**Manholes**				
	1050 mm dia	each	1	$4,500.00	$4,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals (Gravity)**				
	125mm dia. PVC DR28	m	62	$450.00	$27,900.00
4	**Sewer Laterals (Forcemain)**				
	50mm dia. PVC DR26	m	260	$125.00	$32,500.00
5	**Pumping Station & Generator**				
	Supply of Equipment and Installation	each	0	$900,000.00	$0.00
6	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
7	**Single Forcemain (100mm dia.)**	m	305	$550.00	
7	**CCTV Inspection**	m	140	$5.00	$700.00
				Sub Total	**$107,600.00**
				TOTAL	**$857,650.00**

PRELIMINARY COST ESTIMATES SUMMARY

Summary of Probable Costs for the Construction of Subdivision Services
Project Name: Herring Cove Phase 2B - Option #3
Location: Herring Cove, Nova Scotia
Plan NO.s:
Client Name: Halifax Water

ITEM DESCRIPTION	COST ($)
John Brackett Drive	**$2,662,500.00**
Powers Road	**$1,119,880.00**
Shore Road	**$971,050.00**
Engineering Services	**$335,000.00**
Sub-Total	**$5,088,430.00**
HST (4.286%)	**$218,090.11**

Total Servicing Cost (including HST)	$5,306,520.11
Halifax Water Salary and Expenses	$75,000.00
Contingency (35% of Total Servicing Cost)	$1,857,282.04
Sub-total	$7,238,802.15
Halifax Water Overhead (1%)	$72,388.02
Total Value	**$7,311,190.17**

Consulting Engineer

*** 10% was added to the contigency due to market conditions in 2017**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

JOHN BRACKETT DRIVE

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2932	$200.00	$586,400.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$591,400.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	658	$500.00	$329,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	145	$150.00	$21,750.00
	Sets of Fittings 20mm dia.	each	17	$1,000.00	$17,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m	20	$2,000.00	$40,000.00
				Sub Total	**$436,750.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	605	$600.00	$363,000.00
3	**Manholes**				
	1050 mm dia	each	10	$4,500.00	$45,000.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	230	$450.00	$103,500.00
5	**Pumping Station & Generator Building**				
	Large	each	1	$900,000.00	$900,000.00
6	**250mm dia. Gravity Bridge Crossing**	m	20	$1,500.00	$30,000.00
7	**Dual Forcemain Bridge Crossing**	m	0	$2,500.00	$0.00
8	**Dual Forcemain (150mm Dia.)**	m	200	$650.00	$130,000.00
9	**CCTV Inspeciton**	m	1210	$5.00	$6,050.00
				Sub Total	**$1,582,550.00**

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	STORM SYSTEM				
8	**Culverts**				
	450mm dia. CSA A257.2 65D	m		$400.00	$0.00
	525mm dia. CSA A257.2 65D	m	20	$440.00	$8,800.00
	600mm dia. CSA A257.2 65D	m		$500.00	$0.00
	750mm dia. CSA A257.2 65D	m		$650.00	$0.00
	900mm dia. CSA A257.2 65D	m		$850.00	$0.00
	1050mm dia. CSA A257.2 65D	m		$1,000.00	$0.00
	1200mm dia. CSA A257.2 65D	m	20	$1,200.00	$24,000.00
13	**Inlet/Outlet Headwalls**				
	Precast Concrete (300-600mm pipe)	each	2	$1,500.00	$3,000.00
	Precast Concrete (1050-1500mm pipe)	each	2	$8,000.00	$16,000.00
				Sub Total	**$51,800.00**

TOTAL	**$2,662,500.00**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

POWERS ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	1770	$200.00	$354,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$359,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	305	$500.00	$152,500.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	155	$150.00	$23,250.00
	Sets of Fittings 20mm dia.	each	16	$1,000.00	$16,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each	1	$6,000.00	$6,000.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$226,750.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m	205	$600.00	$123,000.00
3	**Manholes**				
	1050 mm dia	each	9	$4,500.00	$40,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	86	$450.00	$38,700.00
5	**Sewer Laterals (Forcemain)**				
	50mm dia. PVC DR26	m	45	$125.00	$5,630.00
6	**Single FM (100mm dia)**	m	90	$300.00	$27,000.00
7	**Pressure Pipe Bridge Crossing**	m	20	$3,000.00	$60,000.00
8	**Pressure Pipe (150mm PVC DR18)**	m	0	$400.00	$0.00
9	**Dual Forcemain (150mm dia.)**	m	365	$650.00	$237,250.00
10	**CCTV Inspection**	m	410	$5.00	$2,050.00
				Sub Total	**$534,130.00**
				TOTAL	**$1,119,880.00**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

SHORE ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2200	$200.00	$440,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$445,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	375	$500.00	$187,500.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	257	$150.00	$38,550.00
	Sets of Fittings 20mm dia.	each	33	$1,000.00	$33,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	4	$1,000.00	$4,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	3	$4,000.00	$12,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$275,050.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m		$600.00	$0.00
3	**Manholes**				
	1050 mm dia	each	1	$4,500.00	$4,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals (Gravity)**				
	125mm dia. PVC DR28	m	0	$450.00	$0.00
4	**Sewer Laterals (Forcemain)**				
	50mm dia. PVC DR26	m	322	$125.00	$40,250.00
5	**Pumping Station & Generator Building**				
	Large	each	0	$900,000.00	$0.00
6	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
7	**Single Forcemain (100mm dia.)**	m	375	$550.00	$206,250.00
8	**CCTV Inspection**	m	0	$5.00	$0.00
				Sub Total	**$251,000.00**
				TOTAL	**$971,050.00**

PRELIMINARY COST ESTIMATES SUMMARY

Summary of Probable Costs for the Construction of Subdivision Services
Project Name: Herring Cove Phase 4
Location: Herring Cove, Nova Scotia
Plan NO.s:
Client Name: Halifax Water

ITEM DESCRIPTION	COST ($)
Phase 4 North	**$1,170,200**
Phase 4 South	**$4,553,100**
Engineering Services (7.5%)	**$429,248**
Sub-Total	**$6,152,548**
HST (4.286%)	**$263,698**

Total Servicing Cost (including HST)	$6,416,246
Halifax Water Salary and Expenses	$75,000
Contingency (35% of Total Servicing Cost)*	$2,245,686
Sub-total	$8,736,932
Halifax Water Overhead (1%)	$87,369
Total Value	**$8,824,301**

Consulting Engineer

*** 10% was added to the contigency due to market conditions in 2017**

Herrring Cove Phase 4 - North
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

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JOHN BRACKETT DRIVE

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	1950	$200.00	$390,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$395,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	570	$500.00	$285,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	120	$150.00	$18,000.00
	Sets of Fittings 20mm dia.	each	12	$1,000.00	$12,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	4	$1,000.00	$4,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each	1	$6,000.00	$6,000.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$346,000.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	570	$600.00	$342,000.00
3	**Manholes**				
	1050 mm dia	each	5	$4,500.00	$22,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	120	$450.00	$54,000.00
5	**Pumping Station & Generator**				
	Supply of Equipment and Installation	each		$1,000,000.00	$0.00
6	**250mm dia. Gravity Bridge Crossing**	m		$1,500.00	$0.00
7	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
8	**Dual Forcemain (150mm Dia.)**	m		$650.00	$0.00
9	**CCTV Inspection**	m	1140	$5.00	$5,700.00
				Sub Total	**$429,200.00**
				TOTAL	**$1,170,200.00**

Herrring Cove Phase 4 - South
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

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KETCH HARBOUR ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	4965	$200.00	$993,000.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$998,000.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. DI	m	1030	$500.00	$515,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	430	$150.00	$64,500.00
	Sets of Fittings 20mm dia.	each	43	$1,000.00	$43,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	7	$1,000.00	$7,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	7	$4,000.00	$28,000.00
6	**ARV**	each	2	$6,000.00	$12,000.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$669,500.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	1060	$600.00	$636,000.00
3	**Manholes**				
	1050 mm dia	each	9	$4,500.00	$40,500.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	430	$450.00	$193,500.00
5	**Pumping Station & Generator**				
	(Area 4-1)	each	1	$1,000,000.00	$1,000,000.00
	(Davidsons Pond)	each	1	$1,000,000.00	$1,000,000.00
6	**CCTV Inspection**	m	2120	$5.00	$10,600.00
				Sub Total	**$2,885,600.00**
				TOTAL	**$4,553,100.00**

PRELIMINARY COST ESTIMATES SUMMARY

Summary of Probable Costs for the Construction of Subdivision Services
Project Name: Herring Cove Phase 2B - Option #3
Location: Herring Cove, Nova Scotia
Plan NO.s:
Client Name: Halifax Water

ITEM DESCRIPTION	COST ($)
John Brackett Drive	**$2,901,000.00**
Powers Road	**$0.00**
Shore Road	**$0.00**
Engineering Services	**$335,000.00**
Sub-Total	**$3,236,000.00**
HST (4.286%)	**$138,694.96**

Total Servicing Cost (including HST)	$3,374,694.96
Halifax Water Salary and Expenses	$45,000.00
Contingency (35% of Total Servicing Cost)	$1,181,143.24
Sub-total	$4,600,838.20
Halifax Water Overhead (1%)	$46,008.38
Total Value	**$4,646,846.58**

Consulting Engineer

*** 10% was added to the contigency due to market conditions in 2017**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TOTALS.

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JOHN BRACKETT DRIVE

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m	2932	$200.00	$586,400.00
2	**Environmental Controls**	l.s.	1	$5,000.00	$5,000.00
				Sub Total	**$591,400.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m	658	$500.00	$329,000.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m	145	$150.00	$21,750.00
	Sets of Fittings 20mm dia.	each	17	$1,000.00	$17,000.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each	8	$1,000.00	$8,000.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each	4	$4,000.00	$16,000.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m	20	$2,000.00	$40,000.00
				Sub Total	**$436,750.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.	1	$5,000.00	$5,000.00
2	**Pipe**				
	200mm dia. PVC DR35 (including re-instatement)	m		$550.00	$0.00
	250mm dia. PVC DR35 (including re-instatement)	m	605	$600.00	$363,000.00
3	**Manholes**				
	1050 mm dia	each	10	$4,500.00	$45,000.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m	230	$450.00	$103,500.00
5	**Pumping Station & Generator Building**				
	Large	each	1	$900,000.00	$900,000.00
6	**250mm dia. Gravity Bridge Crossing**	m	20	$1,500.00	$30,000.00
7	**Dual Forcemain Bridge Crossing**	m	20	$2,500.00	$50,000.00
8	**Dual Forcemain (150mm Dia.)**	m	490	$650.00	$318,500.00
9	**CCTV Inspeciton**	m	1210	$5.00	$6,050.00
				Sub Total	**$1,821,050.00**

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	STORM SYSTEM				
8	**Culverts**				
	450mm dia. CSA A257.2 65D	m		$400.00	$0.00
	525mm dia. CSA A257.2 65D	m	20	$440.00	$8,800.00
	600mm dia. CSA A257.2 65D	m		$500.00	$0.00
	750mm dia. CSA A257.2 65D	m		$650.00	$0.00
	900mm dia. CSA A257.2 65D	m		$850.00	$0.00
	1050mm dia. CSA A257.2 65D	m		$1,000.00	$0.00
	1200mm dia. CSA A257.2 65D	m	20	$1,200.00	$24,000.00
13	**Inlet/Outlet Headwalls**				
	Precast Concrete (300-600mm pipe)	each	2	$1,500.00	$3,000.00
	Precast Concrete (1050-1500mm pipe)	each	2	$8,000.00	$16,000.00
				Sub Total	**$51,800.00**
				TOTAL	**$2,901,000.00**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

POWERS ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m		$200.00	$0.00
2	**Environmental Controls**	l.s.		$5,000.00	$0.00
				Sub Total	**$0.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m		$500.00	$0.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m		$150.00	$0.00
	Sets of Fittings 20mm dia.	each		$1,000.00	$0.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each		$1,000.00	$0.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each		$4,000.00	$0.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$0.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m		$600.00	$0.00
3	**Manholes**				
	1050 mm dia	each		$4,500.00	$0.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals**				
	125mm dia. PVC DR28	m		$450.00	$0.00
5	**Sewer Laterals (Forcemain)**				
	50mm dia. PVC DR26	m		$125.00	$0.00
6	**Single FM (100mm dia)**	m		$300.00	$0.00
7	**Pressure Pipe Bridge Crossing**	m		$3,000.00	$0.00
8	**Pressure Pipe (150mm PVC DR18)**	m		$400.00	$0.00
9	**Dual Forcemain (150mm dia.)**	m		$650.00	$0.00
10	**CCTV Inspection**	m	0	$5.00	$0.00
				Sub Total	**$0.00**
				TOTAL	**$0.00**

Herrring Cove Phase 2B - Option 3
ESTIMATE OF PROBABLE COSTS

PROJECT NO. 161-17540
DATE: January 13, 2017
CLIENT: Halifax Water
CONSULTANT: WSP
UNIT PRICE SOURCE: WSP/Halifax Water
NOTE: HST NOT INCLUDED IN INDICATED UNIT PRICES AND TO

This estimate of probable construction cost is approximate only. Actual cost may vary significantly from this estimate due to market conditions such as material and labour costs, time of year, industry workload, competition, etc. This estimate has been prepared based on our experience with similar projects. This estimate has not been prepared by obtaining any estimates or quotes from contractors. Due to the uncertainties of what contractors bid, WSP cannot make any assurances that this estimate will be within a reasonable range of the tendered low bid. When assessing this project for business feasibility purposes this estimate should not be relied upon without considering these factors.

SHORE ROAD

ITEM NO.	DESCRIPTION	UNIT	EST. QUANT.	PRICE	PRICE
	EARTH WORKS				
1	**Excavation**				
	Rock	cu. m		$200.00	$0.00
2	**Environmental Controls**	l.s.		$5,000.00	$0.00
				Sub Total	**$0.00**
	WATER SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	150mm dia. DI	m		$450.00	$0.00
	200mm dia. DI	m		$500.00	$0.00
	250mm dia. DI	m		$550.00	$0.00
3	**Lateral Services**				
	20mm dia. Type "K" Copper	m		$150.00	$0.00
	Sets of Fittings 20mm dia.	each		$1,000.00	$0.00
4	**Gate Valves**				
	150mm dia. GV	each		$900.00	$0.00
	200mm dia. GV	each		$1,000.00	$0.00
	250mm dia. GV	each		$1,200.00	$0.00
5	**Fire Hydrants**	each		$4,000.00	$0.00
6	**ARV**	each		$6,000.00	$0.00
7	**Bridge Crossing**				
	200mm dia. pipe	m		$2,000.00	$0.00
				Sub Total	**$0.00**
	SANITARY SYSTEM				
1	**Connection to Existing**	l.s.		$5,000.00	$0.00
2	**Pipe**				
	200mm dia. PVC DR35	m		$550.00	$0.00
	250mm dia. PVC DR35	m		$600.00	$0.00
3	**Manholes**				
	1050 mm dia	each		$4,500.00	$0.00
	Manhole adjustment	each		$500.00	$0.00
4	**Sewer Laterals (Gravity)**				
	125mm dia. PVC DR28	m	0	$450.00	$0.00
4	**Sewer Laterals (Forcemain)**				
	50mm dia. PVC DR26	m		$125.00	$0.00
5	**Pumping Station & Generator Building**				
	Large	each	0	$900,000.00	$0.00
6	**Dual Forcemain Bridge Crossing**	m		$2,500.00	$0.00
7	**Single Forcemain (100mm dia.)**	m		$550.00	$0.00
8	**CCTV Inspection**	m	0	$5.00	$0.00
				Sub Total	**$0.00**
				TOTAL	**$0.00**

Attachment “Appendix IV”: Procurement Policy Section 8(11) A

8(11)A. Sole Source/Single Source Purchases. These occur:

(a) To ensure compatibility with existing products, to recognize exclusive rights, such as exclusive licences, copyright and patent rights, or to maintain specialized products that must be maintained by the manufacturer or its representative.

(b) Where there is an absence of competition for technical reasons and the goods or services can be supplied only by a particular supplier and no alternative or substitute exists.

(c) For the procurement of goods or services the supply of which is controlled by a supplier that is a statutory monopoly.

(d) For the purchase of goods on a commodity market.

(e) For work to be performed on or about a leased building or portions thereof that may be performed only by the lessor.

(f) For work to be performed on property by a contractor according to provisions of a warranty or guarantee held in respect of the property or the original work.

(g) For the procurement of a prototype of a first good or service to be developed in the course of and for a particular contract for research, experiment, study or original development, but not for any subsequent purchases.

(h) For the purchase of goods under exceptionally advantageous circumstances such as bankruptcy or receivership

(i) For the procurement of original works of art.

(j) For the procurement of goods intended for resale to the public.

(k) For the procurement from a public body or a not-for-profit corporation.

(1) For the procurement of goods or services for the purpose of evaluating or piloting new or innovative technology with demonstrated environmental, economic or social benefits when compared to conventional technology, but not for any subsequent purchases.