

TO: Committee of the Whole, District of Oak Bay

FROM: J. A. (Jack) Hull, HJA Water Management Consulting

DATE: February 2, 2016

SUBJECT: Uplands Combined Sewer Separation Project – Pre-design

INTRODUCTION

The Uplands neighbourhood currently has a single pipe system to convey both sanitary sewage and stormwater flows. During heavy rainfall events, the volume of stormwater exceeds the capacity of the system and a combination of stormwater and raw sewage overflows into the ocean at the Rutland and Humber pumping stations. Overflows at the Humber and Rutland pump stations typically occur during rainfall events in the winter months. The number of overflows is monitored and recorded by the Capital Regional District (CRD). The records for the past three years are presented in Attachment 1. Humber overflowed 18 times in 2015 and 12 times in each of 2014 and 2013. Rutland overflowed 26 times in 2015, 13 times in 2014 and 12 times in 2013. These overflows result in temporary no swimming or wading advisories at local beaches. With the projected increased incidence of more intense rainfall events, it is expected that the overflows will occur more frequently.

The provincial government's Municipal Wastewater Regulation (MWR) requires all BC municipalities to have separate stormwater and sanitary sewer systems to eliminate combined sewer overflows. Compliance is mandatory for the District of Oak Bay (the District) as it is for other jurisdictions in the province. Separation of the District's combined sewers is a condition of the approval of the CRD's Core Area Liquid Waste Management Plan (CALWMP), specifically, 'On or before March 31, 2008, complete cost/benefit studies and an implementation schedule directed at the elimination of combined sewers in Oak Bay to be consistent with the Municipal Sewage Regulation.' Compliance with the CALWMP is a legal obligation of the CRD and member municipalities.

BACKGROUND

Councils have grappled for well over a decade with finding the appropriate solution to separate the combined stormwater and sanitary sewer in the Uplands subdivision. Balancing the often competing desires and values of taxpaying residents directly impacted by this project with those desires and values of Oak Bay taxpayers living in neighbourhoods outside the impacted area has been and continues to be a daunting task. In January 2010 Council decided not to proceed with a low pressure sewer system for the Uplands neighbourhood despite having access to a federal grant. The Council motion of January 11, 2010 reads "a solution needs to be found that everyone can live with." Subsequent to 2010, the District explored options previously considered, and also revisited with the provincial government the necessity of the requirement. In 2013, the Ministry of Environment directed the District to proceed under the provincial government's MWR. Compliance with the provincial regulation is mandatory for the District of Oak Bay.

In May 2015 the District retained McElhanney Consulting Services Ltd (Consultant) to undertake a pre-design study of six options for sewer separation in the Uplands neighbourhood.

ASSUMPTIONS

In the terms of reference for the pre-design study, the consultant was asked to study six options. At the commencement of the study, a number of assumptions were made including:

1. The goal of the project is to eliminate (separate) the combined sewers in Oak Bay (the Minister of Environment's condition for approval of the CALWMP) to eliminate overflows in compliance with of the MWR (Section 42).
2. A second pipe would not be installed in the existing easements;
3. The lining of the existing pipe was not part of this project (from the grant funding perspective);
4. The existing pipe would continue to be utilized for either sanitary sewer or stormwater conveyance.
5. A maximum practical trench depth was considered to be five metres;
6. Trenchless technology, specifically directional drilling, is not viable for the installation of the new pipe;
7. The District would be responsible for compliance with the Heritage Conservation Act on District property;
8. Property owners would be responsible for compliance with the Heritage Conservation Act on private property;
9. Given the limitation on trench depth, sanitary and/or stormwater pumps would factor in all options.
10. Stormwater would not be treated (decontaminated) prior to discharge to the sea;
11. Based on the statistics on the duration of power outages, the use of pumps on private property is viable.
12. On-site stormwater management would not be an alternative to a storm sewer connection;
13. In the absence of detailed geotechnical information, assumptions would be made on the occurrence of rock in generating cost estimates;
14. The cost estimates developed for private property are the average of the total cost to all property owners, that is, cost estimates were not developed on a site specific basis; and,
15. At this stage, pre-design, operation and maintenance costs estimates are based on a percentage of the capital costs.

As analysis proceeded, and as a result of feedback from the public engagement process, some of these assumptions were reconsidered. These are discussed later in the report.

In arriving at a preferred option, there are technical and non-technical criteria that need to be considered. From a technical perspective, all of the options considered will achieve compliance with the MWR, however, as is evident from the public engagement process, there are other criteria that Council will have to consider in deciding on a preferred option. As a result of the public engagement process and receiving new information, some of the assumptions were re-evaluated and are discussed in the report, including 2, 4, 5, 6, 11 and 12.

There are, however, areas where direction from the Committee of the Whole (COW) is needed to arrive at a recommended option and these are identified in *bold italics* throughout the report.

THE OPTIONS FOR SEWER SEPARATION

The six options studied are:

Option 1 – New deeper gravity sewer system and existing combined sewer system to remain for stormwater conveyance.

In the Humber catchment, out of a total of one hundred and fifty (150) properties, twenty-nine (29) properties would require sanitary sewer pumps in addition to the ten (10) that already have a pump. In the Rutland catchment, out of the two hundred thirty-six (236) properties, thirty-nine (39) properties would require sanitary sewer pumps in addition to the seven (7) that already have a pump.

Option 2 – New deeper gravity storm drainage system and existing combined system to remain for sanitary conveyance.

In the Humber catchment, out of a total of one hundred and fifty (150) properties, thirty-two (32) properties would require stormwater pumps in addition to the seven (7) that already have a pump. In the Rutland catchment, out of a total of two hundred thirty-six (236) properties, forty (40) properties would require stormwater pumps in addition to the six (6) that already have a pump.

Option 3 – New pumped low pressure system for sanitary sewers collection and existing system to remain for stormwater conveyance.

Under this option all of the properties in both catchments would require sanitary sewage pumps.

Option 4 – A new shallow gravity stormwater system with localized areas requiring municipally owned stormwater pumping stations for roadway runoff.

The McElhanney proposal included a new pumped low pressure stormwater drainage system with the existing combined system to remain for sanitary sewer conveyance. However, it became clear that pumping stormwater from the whole catchment area would not be cost effective either initially or from a lifecycle perspective. Under a low pressure stormwater system, either a large number of pumping stations would be required to capture and convey road runoff, or a parallel shallow gravity network would need to be installed, with fewer, but larger municipally owned stormwater pumping stations. Consequently, this option was not considered further. Instead, a hybrid option was developed in which a relatively shallow new gravity stormwater system would be constructed with smaller, localized areas requiring municipally owned stormwater pumping stations for roadway runoff.

In the Humber catchment, sixty-five (65) properties would require a stormwater pump in addition to the seven (7) that already have a pump. In the Rutland catchment, one hundred and one (101) properties would require a stormwater pump in addition to the six (6) that already have a pump.

Option 5 – A hybrid of shallow gravity sanitary sewer system, pumped where necessary, and existing pipe as a stormwater conveyance.

This option would include a shallow depth gravity sanitary sewer system, with smaller, isolated areas of catchment serviced by municipal pressure sewers.

In the Humber catchment, sixty (60) properties would require a sanitary pump in addition to the ten (10) that already have a pump. In the Rutland catchment, one hundred and fourteen (114) properties would require a sanitary pump in addition to the seven (7) that already have a pump.

The initial capital cost to the municipality for both options 4 and 5 is lower than for options 2 and 1 respectively. However, the number of properties requiring pumps is greater.

Option 6 – A hybrid shallow gravity sanitary sewer system, with localized community sanitary pumping stations where necessary and the existing system as a storm drain.

In the Humber catchment, forty (40) properties would require a sanitary pump in addition to the ten (10) that already have a pump. In the Rutland catchment, ninety-six (96) properties would require a sanitary pump in addition to the seven (7) that already have a pump. This option is a variation of Option 5. More municipally owned pumping stations would be constructed in order to increase the number of dwelling units serviced by gravity sanitary sewer connections compared to Option 5.

The greatest factors differentiating Options 1 and 2 from 4, 5 and 6 will likely be in the costs related to pipe depth (trench excavation and backfilling) and in the cost of additional on-site private pumping systems in the latter, shallower gravity pipe network options.

Copies of the information provided to the public on the key considerations for each option attached (Attachment 2) for information.

All of the options include pumps which under Bylaw 3891 Section 14 (e) are considered to be an acceptable means of providing a service connection to a public sewer.

UPLANDS DESIGN AND SERVICING

The design layout of the Uplands is unique in Oak Bay. The topography slopes from the north west to the south east dropping from approximately 50 metres down to sea level. Unlike other parts of the District, the roads in Uplands run approximately parallel to the slope (contours). As a result of this design, in order to provide gravity service, it was necessary to install the combined sewer pipe in easements at the side, rear and in some cases across properties to get from one parallel road to the next (lower) one. In other parts of the District roads run approximately perpendicular and parallel to the slope making easements for services largely unnecessary as the roadways can be used to install services. As a consequence, providing gravity service to all homes in Uplands will either require the installation of a very deep sewer or re-use of the existing easements, both of which have significant financial and environmental implications. The implications are discussed later in the report.

ARCHAEOLOGY

The Uplands is within the Traditional Territories of the Songhees and the Esquimalt Nations, and the area includes documented heritage sites. The District has begun discussions with the Nations to establish better understanding and relationships of mutual respect, and to explore ways of working collaboratively. The project will involve consultations with both Nations.

To further support this project, the Consultant sub-contracted Golder Associates (Golder) to prepare an archaeological overview assessment. The archaeological consultant undertook a field reconnaissance to identify areas of archaeological potential, documented previously known sites,

and prepared a background report outlining the First Nations history of settlement in the area. A version of the report that does not include specific archaeological site location information is available to the public on the District's web site. Golder has also identified areas of archaeological potential within the project area and recommends an Archaeological Impact Assessment in areas with archaeological potential prior to the start of construction.

The District anticipates that project construction will reveal evidence of archeological sites in some areas. That being the case, the District is responsible for responding to any archeological evidence found on municipal property, and home owners are responsible for responding to any archeological evidence found on their property.

The Heritage Conservation Act

To learn more about the impacts of the Heritage Conservation Act (the Act) on this project, a meeting was held with the senior staff at Provincial Archaeological Branch responsible for administering the Heritage Conservation Act. Ministry staff recommended that a Section 14 Heritage Inspection "Blanket" permit is the best option for the District, as it allows for a number of proponents, in this case Oak Bay and private property owners, to be included in the permit. Property owners and the District would both be signatories to the blanket permit. A blanket permit does not absolve private property owners from full responsibility for protection of archaeological sites that may be present on their property. A Technical Memorandum from Golder entitled 'Uplands Combined Sewer Separation Project: Archaeological Guidelines' that provides details of responsibilities and procedures is available to the public on the District's web site.

The question of directional drilling of small diameter pipes (100mm or less), for pumped systems, within areas of archaeological potential, was posed to Archaeological Branch staff. In their response they indicated that they would in general not recommend archaeological monitoring for the alignment work within areas of archaeological potential. However, the requirements of the Heritage Act would have to be met for the entry and exit locations for the directional drill.

PUBLIC ENGAGEMENT

This is a complex and important project for all residents of Oak Bay, and ensuring that the public had access to clear and accurate information in a format that was accessible and easily understood was a priority for Council and for the project team. The District hosted five public open houses between November 7th and November 30th to provide residents of the District with an opportunity to be informed about the combined sewer separation project, to learn about the options for separation and to provide comments and suggestions for consideration by the District. More than 200 citizens from Oak Bay signed in at the Open House sessions, the majority of the attendees recorded addresses within the Uplands Combined Sewer Separation project catchment areas. In addition to the Open House sessions, the District's website provided online public access to all presentation materials available at the Open Houses along with an online Public Opinion Survey (Survey). The Open House sessions and Survey were advertised prominently in the Oak Bay News and promoted through social media from the District's twitter account. Two reports on the public engagement are attached, 'Uplands Combined Sewer Separation project: Public Engagement Overview', (Attachment 3) and 'Uplands Combined Sewer Separation Project - Report on Survey Research' by Strategic Initiatives Inc., (Attachment 4). A total of 117 completed responses were received, with the majority from Uplands property owners.

Respondents to the Survey were drawn heavily from property owners living in the Uplands neighbourhood, and the Survey findings must be interpreted within this context. Several conclusions, however, can be drawn from the data. The following summarizes the results of the public responses to the Survey:

In response to Q5, 'Council will be weighing a number of considerations as it determines how best to comply with the provincial government's mandatory Municipal Wastewater Regulation. Please rate the importance of each of the following considerations.' Respondents stated the most important considerations are:

- operation/maintenance costs to Uplands Property owners;
- most environmentally appropriate use of existing piping; and
- minimize capital cost to the Uplands property owners.

In response to Q6, 'Please indicate which 3 of the following considerations are the most important to you,' the most important were:

- minimize capital costs to Uplands property owners;
- minimize operations/maintenance costs to Uplands property owners; and
- minimize capital costs to the District.

In answer to Q8, 'Six options have been developed by engineering firm McElhanney Consulting Services Ltd., to separate the combined sewer in the Uplands. Please rank the six technical options in order of your preference,' the preferred options are:

- Option 1 (a new gravity sewer system) was the technical option preferred by the highest percentage of respondents;
- Option 3, (low pressure system) ranked the second; and
- Option 6 (shallow gravity sanitary sewer system, with localized community sanitary sewer pumping stations), third.

Overall there was a preference for a gravity system and negative feelings about pumps and generators. Other comments referenced on-site stormwater management, use of existing easements, trenchless technologies, climate change, the need to implement a long term solution, Uplands should be treated the same as the rest of Oak Bay and be provided with gravity sewers and the question about what is happening with other areas of Oak Bay that still have combined sewers.

OPTIONS PREFERRED BY THE PUBLIC

Option 1 was the most preferred among survey takers, with an average of 1.9. Uplands homeowners were significantly more likely than other Oak Bay homeowners to rank Option 1 and Option 2 as their most preferred of the six options (1.5 vs 3.3 and 3.2 vs 4.7 respectively). Other Oak Bay homeowners were significantly more likely than Uplands homeowners to rank Option 3 as their most preferred technical option (mean ranking 2.4 vs 4.9). The difference between Uplands homeowners and other Oak Bay homeowners in their average rankings of the remaining technical options (Options 4, 5 and 6) were not significant. (Refer to the chart on Page 15 of Attachment 4)

These findings reflect the financial impact of this project on the respective property owners in Uplands and other parts of Oak Bay.

While property owners living in the Uplands project area preferred Option 1 (deep gravity), and property owners living outside of the project area preferred Option 3 (100 per cent pumps), the rankings of the second and third and fourth choices are very close. For both Uplands property owners and property owners living outside the Uplands, the rankings of preferred options (2 through 5) are separated by a factor 1 or less.

The majority of respondents indicated their preference for a new sanitary sewer system while noting the existing pipe leaks and is therefore more appropriate for stormwater. The comments also noted that a new stormwater management system may be the only solution that allows for a reduction in overflows (environmental impact) in a timely fashion.

The context of the small sample size and the fact that it is heavily weighted to reflect the opinions of property owners living in the project area should be considered when viewing these finding.

DISCUSSION AND ANALYSIS

Members of the public who participated in the public engagement process questioned some of the assumptions used in developing the options. In response, additional analyses were undertaken to reassess the assumptions and to provide more information. This is discussed in the following sections.

1. On Site Stormwater Management

Section 2.1 of Bylaw 3891 'A bylaw for the administration and regulation of public sewers', (the Bylaw) attached for reference (Attachment 5) authorizes the Engineer to waive the requirement to connect to a stormwater sewer when storm water management can be accommodated on site, Section 2.1 (1). The Engineer may also waive the requirement for non-residential properties where direct stormwater discharge to the sea can be achieved, Section 2.1 (2). For such a waiver the owner must meet the conditions stipulated in these sections and in Sections 2.2, 2.3 and 2.4.

Given the implications of climate change, specifically more intense rainfall events, it is unlikely that the conditions stipulated in the bylaw for on-site stormwater management could be met (in most cases). Notwithstanding, on-site stormwater management has positive implications for stormwater management in Uplands, particularly if the existing pipe is used as a future stormwater sewer. As noted, with climate change, more intense rainfall events are predicted. These may result in the capacity of existing storm sewers being exceeded. The pre-design study has identified sections of the existing combined sewer that do not meet current capacity design standards for stormwater flows. Surcharging, as evidenced by water flowing from manholes, is occurring in some parts of the Uplands. On-site rainwater management has the potential to reduce the peak flows reaching the storm sewer, possibly deferring the need for replacing some existing stormwater pipes with larger ones. Depending on the type of on-site rainwater management system employed there may be the added benefit of groundwater recharge.

Other municipalities are looking for ways to reduce the peak flow. The City of Victoria has implemented a stormwater utility and is providing incentives for property owners to install on-site

stormwater management systems and has produced a homeowner guide for rainwater management 'Rainwater Management Standards – Do-it-Yourself for Your Home'. The guide is available on-line. The District of Saanich requires on-site holding systems that allow rainwater to infiltrate groundwater with overflows draining to the storm sewer system. It is not known how effective these systems are in the long term, for example, does silting occur, reducing the storage capacity and hence their effectiveness to attenuate the stormflows? Both jurisdictions still require connections to the storm sewers.

District staff have identified the need to develop a drainage master plan. It is recommended that the District include an evaluation of the on-site management programs in other jurisdictions and develop a program specific to the District's conditions.

Assumption 12: On-site management will not be considered as an alternative to a connection to a storm sewer.

2. The feasibility of using the existing easements

Many of the challenges that surround this project stem largely from the topography of the Uplands neighbourhood and the manner in which the combined system was installed in the subdivision 100 years ago.

There were a number of attendees at the open houses who suggested reusing the existing ten foot-wide easements that run between, behind or across properties. In order to assess the feasibility of reusing the easements the Consultant conducted a field reconnaissance to gather more detailed information.

Reusing the easements will require access for an excavator and a truck for removing excavated material and delivering backfill material. Assuming the existing pipe is in the centre of the easement, then an excavator will have to be positioned off-centre to excavate a trench for a new pipe. Sufficient space will have to be left between the old and new pipes to avoid potential damage to the old pipe. This will necessitate negotiating with homeowners for an additional two metres to the existing three metre easement. To work efficiently, the excavator must be able to swing through 180 degrees, so an additional clear working area beyond the easement width will be required during construction. Paved driveways, stone walls, mature trees, hedges and other vegetation very likely will have to be removed to provide the necessary space for construction. There is also potential conflict with BC Hydro distribution lines in the existing easements. It is estimated that the construction cost would be greater than in the road right of way. It may be possible, however, at the design stage to consider use of certain easements and lanes for installation of a new sewer.

Assumption 2: That, in general, the existing or enlarged easements will not be used to accommodate a new sewer pipe.

3. Trenchless Technology

The feasibility of trenchless technology was also assessed. There are three common trenchless technologies, pipe bursting, pipe relining and directional drilling. Pipe bursting is used when an existing pipe is to be replaced or increased in size. Pipe relining is used to extend the life of an existing pipe and reduce inflow and infiltration (I&I). Neither of these technologies is relevant to separating the combined sewers, but may be relevant to increasing the capacity or reducing I&I in the existing pipe. Directional drilling contractors were contacted on the feasibility of directional

drilling for sewer lines where a gradient must be maintained. A large excavation is required at the entry and exit point and at any change in direction. Proximity to the existing pipes in the easements was a significant concern given the pipe material and age, and the difficulty of maintaining a linear alignment. Overall they advised against directional drilling. Directional drilling, however, would be possible for small diameter pressure pipes for service laterals on private property.

Assumption 6: That based on the results of the reconsideration of directional drilling, directional drilling is not a viable alternative for installing a municipal gravity sewer.

4. Deeper (Gravity) sewers to eliminate the need for pumps.

Five metres was established as the practical limit for excavation. Going deeper increases the construction risk and the likelihood of hitting rock. At the Open Houses, going deeper than five metres was suggested as a means of reducing the number of private pumps. In response, the Consultant undertook an assessment of the implication of going deeper in increments of 0 – 1 metre, 1 – 2 metres, 2 – 3 metres and greater than 3 metres to eliminate the need for private pumps. Going deeper than five metres will require a tiered or benched excavation process that will increase the level of disruption to local residents, and extend the construction timeframe. It is expected that the homeowner cost of connecting to the deeper gravity sewer will typically offset the cost of a pumped system, and likely exceed it. The Consultant estimated that for Option 1 the project cost would increase from \$19.9 million to \$29.6 million. This estimate has been prepared without a geotechnical investigation to determine the location of rock. Depending on the occurrence of rock, this estimate could increase significantly.

Assumption 5: That construction of gravity sewers greater than five (5) metres deep to eliminate the need for private pumps, is not a feasible option

5. Climate Change

Climate change models for this area predict warmer, wetter winters and longer drier summers, such as the 2015 summer we recently experienced. Rainfall events in the winter are predicted to be more intense, with more rain in a shorter time. When Uplands was developed it was likely designed for a 5-year storm event (Q5). Today, it is more typical to design for a 10-year storm event (Q10). Over time these statistical events are changing with climate change. This has implications for the existing storm sewers in the Uplands and other areas of the District. The Consultant has identified areas where the existing storm sewer is not large enough to accommodate the Q10 event, leading to surcharging of the sewers and potential overflows from manholes. If the proposed drainage masterplan is developed it should take climate change into consideration and identify potential 'bottle necks' in the existing system and plan for upgrades to accommodate storm flows, if the existing sewer is to be used for stormwater flows. A new stormwater sewer would be designed to current standards.

6. Power Outages

Members of the public expressed concern with the reliability of power supply and the implications for homes relying on pumps. There was the perception that power outages were sufficiently frequent and of a duration to put homes at risk of flooding. To address this concern power outages records were requested from BC Hydro. The reliability statistics for the feeder that serves the Uplands neighbourhood including interruptions due to planned outages are:

Fiscal Year	System Average Interruption Frequency (# of interruptions) ¹	Customer Average Interruption Duration Index (Hours)
2011	0.26	3.56
2012	2.60	2.65
2013	0.31	6.10
2014	2.13	3.16
2015	2.36	4.34

Note 1: This is a utility standard measure of how many sustained interruptions (longer than one minute) an average customer will experience over the course of a year.

Based on comments from the public and District staff there may have been isolated locations within Uplands that have experienced outages with a longer duration.

Assumption 11: Based on the statistics on the duration of power outages, the use of pumps on private property is viable.

The implications of power outages are discussed further under the 'Options Assessment' section of the report.

7. Shoreline Development Permit Area

Some residents raised the question of existing stormwater discharges directly to the sea. It is known that there are currently a number of properties along the Uplands shoreline that discharge stormwater onto the shoreline. The District does not necessarily have a record of all these discharges as some may have been installed in the past without the knowledge or approval of the District. Homeowners currently require a development permit to install a new pipe in the 15 metre development permit zone. It is suggested that if an approved or unapproved pipe exists its use be continued provided that the District's Engineer is satisfied that there is no environmental impact or physical damage to the shoreline. The current practice of requiring connection to a storm sewer whenever renovations or house replacements are undertaken should continue.

It is assumed that the existing stormwater discharges will be phased out over time as homes are renovated or replaced.

8. Other Areas of Oak Bay with Combined Sewers

A number of residents asked what the District planned to do about other areas of Oak Bay with combined sewers or no access to a storm sewer. Based on District records there are a number of locations in other parts of the District with combined sewers or no access to a storm sewer. Typically, these dispersed locations involve only a small number of homes. Homes at two of these locations discharge stormwater directly to the sea because a storm sewer is not available. It is expected that all of these homes will eventually be included in the District's ongoing infrastructure upgrading programme.

There are several homes at the North end of Beach Drive that are currently connected to the District of Saanich sewerage system. It is expected that these homes will be connected to the District's stormwater and sanitary sewage system as part of this project.

OPTIONS ASSESSMENTS:

All six options are technical solutions that will address the District's need to separate the existing combined sewer in the Uplands subdivision. The following section looks at some of the technical considerations that characterize each option.

1. Stormwater Pumps versus Sanitary Sewage Pumps.

In 2010, Council considered a low pressure pump solution for every household in the Uplands subdivision. There was insufficient information to address the concerns of residents and this option was not pursued. Several new homes are being built in Oak Bay using pumps to manage sanitary sewage and stormwater usually from developed basements and perimeter drains. There are also a number of homes in Uplands that have been serviced by pumps for decades. Still, feedback from residents indicates that pumps remain a concern for many of the people who attended the Open Houses and responded to the Survey, the majority being property owners from the Uplands subdivision. Respondents expressed slightly more concern with stormwater pumps than sanitary sewage pumps.

With sanitary pumps, backup power is considered optional in the event of a power failure given the holding capacity within the holding tank and the homeowner's ability to limit water use during the power outage. In the case of stormwater pumps, the homeowner has no control over the amount of water entering the holding tank during a power outage. Consequently, backup power is considered essential when stormwater pumps are being used.

2. Opportunity to reduce the number of pumps providing primary service.

At this pre-design phase, the Consultant assumed that the lowest level of homes would be serviced by either a gravity connection or by pump. No attempt was made to modify pipe gradient to allow a gravity connection even if there was a small elevation difference between a gravity connection and the need for a pumped connection.

At the detailed design phase more precise engineering may result in a reduction in the number of homes requiring pumps. The possibility of servicing the main level and above by gravity, with the lower, basement level serviced by a pump, should be examined at the design stage in order to reduce dependence on a pump for the primary sanitary service. This would reduce the perceived risk associated with power outages.

For stormwater, evaluating the possibility of servicing roof and surface drainage by gravity and perimeter drainage by pump to reduce the risk associated with power outages should also be examined at the design stage.

3. Advantages/Disadvantages of a new sanitary or new stormwater sewer

While providing separate sanitary and stormwater sewers in the Uplands area will achieve compliance with the MWR, the elapsed time to achieve the elimination of combined sewer overflows will depend whether the District chooses an option that uses the existing pipe for conveyance of sanitary sewage or for stormwater conveyance. Feedback from the public

indicated that timely completion of the project and the most appropriate use of the existing pipe were important considerations.

A new sanitary sewer has the following advantages:

- Pipe designed for the expected flows, requiring a smaller pipe than the existing combined sewer pipe.
- Inflow and infiltration (I & I) will also be reduced.

A new sanitary sewer has the following disadvantages:

- Sewage flows will remain combined until the last section of pipe is installed and the last house is connected to the separated sewers.
- Overflows will continue because of the ongoing combined sewage flows.
- A new sanitary sewer delays achievement of the perceived environmental benefit of no sanitary sewage being discharged to the sea during storm events.

A new stormwater sewer has the following advantages:

- Pipe sized to meet today's design standards.
- Eliminates the surcharging currently occurring.
- Flows to the Humber and Rutland pump stations could be progressively reduced as sewer separation proceeds, road drainage catch basins are connected to the new storm sewer and as existing homes with separated sewers are connected.
- The number of combined sewer overflows could be progressively reduced as the project proceeds thus achieving the secondary goal of the project earlier.

A new stormwater sewer has the following disadvantages:

- Sanitary sewage flows in the existing pipe would be higher because of the high I & I rates with the existing sewer.
- Higher operation and maintenance costs of the existing pipe as the pipe would be larger than that required for the expected flows leading to the possibility of deposition of solids in the pipe and the need for flushing.
- Using the existing pipe for sanitary sewage increases the potential for more odour occurrences because of the risk of deposition of solids in the existing larger than required stormwater pipe being used for sanitary sewage.

Regardless of the option selected, given the age of the existing pipe and the high I & I rates, rehabilitation/relining of the pipe will be required at some time in the not too distant future as part of the Districts ongoing infrastructure maintenance program and not eligible for grant funding.

Assumption 4: The existing pipe will continue to be used for either sanitary sewage or stormwater conveyance.

FUNDING ALTERNATIVES

Public feedback indicated that capital costs – both to the District and to impacted property owners - are primary concerns. In anticipation of moving ahead with this infrastructure project the District has been contributing to a Capital Works Replacement Reserve for the Uplands sewer separation since 2005 using Gas Tax Transfer funds received from the federal government and from sewer

user fees. Annual contributions are \$770,000 from gas tax transfers and \$400,000 from sewer user fees. The Reserve currently holds \$7,140,638 comprised of gas tax and sewer user fees of \$5,098,330 and \$2,042,308 respectively.

For several years the District has required property owners in the Uplands to separate sanitary sewer and stormwater services on private property when undertaking major renovations or building a new home. As a result, fifty-eight (58) or thirty-nine (39) per cent of the homes in the Humber catchment and twenty-nine (29) or twelve (12) per cent of the homes in the Rutland catchment have separated sewers to the property boundary. Assuming, for discussion purposes, the most expensive option for the District of \$17.1 million and assuming the construction costs in the Humber and Rutland catchments is proportional to the number of homes then the cost to separate Humber and Rutland would be \$6.7 million and \$10.4 million respectively.

Funding Alternative 1 - Assuming the project is funded entirely by the District using the existing reserve fund and the current contribution level from the federal Gas Tax Transfer funding and user fees, work on the Humber catchment could proceed immediately to completion within five (5) years with annual contracts of about \$1.5 million. With the same level of contribution to the reserve as at present, an additional seven years would be required to complete the Rutland catchment. Completion of the Humber Catchment and separation of sewers on private property would reduce the number of overflows. With current funding levels separation of the sewers could be completed within about 12 years from approval to proceed.

Funding Alternative 2 – Assuming the project is funded entirely by the District but over an extended timeframe, recognizing that the contribution to the reserve may vary depending on other demands for other District infrastructure investments, a 20-year timeframe is suggested. This would equate to average annual funding of \$855,000.

Funding Alternative 3 – Under this alternative the project would be funded entirely by the District but with early completion (within five (5) years) by utilizing the existing reserve fund and borrowing the balance as required, with debt serviced from the annual contributions to the reserve fund. Debt financing would be subject to approval.

Funding Alternative 4 – With this alternative the District receives provincial and federal infrastructure grant funding allowing work to proceed to early completion (within five (5) years). While the District has already submitted an application for provincial and federal funding a decision is unlikely until the District submits an approved project complete with budget details. Grant funding is typically time sensitive.

In choosing a funding alternative the Council will have to weigh this financial commitment against the other demands for capital investment within the District if grant funding is not available.

COMPLIANCE WITH THE PROVINCIAL MUNICIPAL WASTEWATER REGULATION AND THE CORE AREA LIQUID WASTE MANAGEMENT PLAN

While the District is obligated to eliminate combined sewers and overflows the MWR does not stipulate the timeframe over which separation should be implemented. However, it does state that 'the volume of overflows should be reduced by an average of 1% per year over a 10-year period', (Division 2, Section 42 (2) (d)). In the current amendment to the CALWMP, the District was to have sewer separation completed by 2015. This time frame was based on the assumption that the low pressure system, funded in part by provincial and federal grants in 2010, would be

installed. As this deadline has passed the District must submit a new plan and timeframe to the Ministry of Environment by an amendment to the CRD CALWMP. As noted above, the timeframe for completion depends on the available funding. It is expected that the Ministry would accept any of the timeframes presented under the funding alternatives. However, based on conversations with the CRD and the MOE, a 100-year time frame for compliance is unlikely to be an acceptable alternative.

CONNECTIONS TO MUNICIPAL SANITARY AND STORMWATER SEWERS

The District administers connections to the sewer system by policy and by bylaw. The current policies are discussed in this section, the bylaw in the next.

1. Existing Practice – Uplands

For new homes, owners are required to install separate pipes for sanitary sewage and stormwater to the property line. A new single pipe is required within the municipal right of way to the combined sewer, including connection to a pipe in an easement. Because sanitary and stormwater flows are combined, a 150 mm connection is required between the property line and the combined sewer in the municipal right of way. Connections in the Uplands are more expensive because of the larger pipe, the depth (can be up to 8 feet), the longer length, boulevard trees, rock and archaeological requirements. Because of these factors the municipality provides a cost estimate for the work within the municipal right of way, for which the owner is 100 per cent responsible.

2. Existing Practice – Outside Uplands

For new homes, owners are required to separate the sewers and connect to the municipal sewers at their expense. The existing pipes may be used if they are PVC, otherwise the pipes within the municipal right of way must be replaced.

For renovations, additions and where the perimeter tile drain is being replaced the municipality requires that the home owner replace the service lines. Again the cost is borne by the homeowner. The fees for work within the municipal right of way are stipulated in Schedule A of Bylaw No. 3891. Service connections outside the Uplands are typically 100mm in diameter and less expensive to construct hence the use of a schedule of fees. An exception to this is where the laterals are more than eight feet deep or longer than ten metres. In these situations, a cost estimate is prepared and the property owner pays the full cost.

BYLAW NO. 3891 – A BYLAW FOR THE ADMINISTRATION AND REGULATION OF PUBLIC SEWERS

1. Current Requirements

Under the bylaw all buildings or structures from which domestic waste, non-domestic waste and storm water may be discharged are required to connect to a public sewer (Section 2. (1)). The exceptions for stormwater discharges to water courses (Section 2. (2)), for on-site disposal Section 2.1 (1)), and for property abutting the sea Section 2.1 (2)), were discussed earlier in the report.

Under Section 2. (3) when the District is separating combined sewers, homeowners are required to separate the combined lateral into individual storm sewer and sanitary sewer laterals and make the necessary connections to the public sewer within one year of the separated sewers being available. Failure to comply may result in the District undertaking the work at the expense of the

property owner - Section 2. (4) and adding the cost to the taxes payable on the property if the homeowner fails to pay.

In situations where the District is replacing a sewer and the property owner applies for a new connection from the property line to the main in time for the connection to be made as part of the sewer replacement construction, then the fee under Schedule A is discounted by 50 per cent Section 5. (2).

It is known that there are properties outside of Uplands that have a single pipe connection to the sanitary sewer despite a storm sewer being available. When a separate stormwater sewer was installed in other areas of Oak Bay, there apparently was no requirement to separate the existing single pipe connection on private property as there was no regulatory requirement to do so.

The objective of the Municipal Wastewater Regulation and the Core Area Liquid Waste Management Plan is to separate combined sewers to prevent overflows during storm events with a less than 5-year return period. Even though separate sewers are available in most other parts of the District, not all properties have separate sewer connections.

Given the various situations that occur within Oak Bay, the District needs to develop a consistent approach either by policy, such as for the Uplands sewer separation project or by bylaw to address the typical situations throughout Oak Bay.

The following policy suggestions are presented for consideration by COW:

2. Uplands Sewer Separation Project

1. For property owners that have separated their sewers and provided a new single pipe lateral to the combined sewer at their cost, a second connection to the property line would be provided at no cost, that is the cost would be included as a project cost. The connection to the sewers separated by the property owner would be made by the contractor during construction of the new municipal sewer. Requiring the owner to pay for the connection would be requiring the owner to pay twice as had the separate sewers been available, the property owner would have paid for the dual connection at the time.
2. As an incentive to property owners who have not separated their sewers, the sewer laterals from the property line to the separated municipal sewers would be provided at no cost to the property owner by the contractor during construction of the new sewer, provided that sewers on private property are separated prior to construction of the new sewer at that location.
3. Property owners intending to separate their sewers but have not done so prior to separation of the combined sewer may choose to have separate pipes constructed by the contractor within the municipal right of way to their property line at their expense.
4. Property owners that separate their sewers after construction of the new municipal sewer is completed at that location, would be responsible for the full cost of connection to the municipal sewers.

Council's direction is needed to develop policy and/or revisions to Bylaw No. 3891

3. Mandatory or Voluntary Sewer Separation for Property Owners

A number of attendees at the open houses raised the question of mandatory or voluntary separation of sewers and connection to the separated municipal sewers. As noted earlier, if the option of a new sanitary sewer is selected, sewage flows will remain combined and overflows will

continue until all properties in Humber and Rutland catchments have separate sanitary and storm connections. Bylaw 3891 stipulates mandatory separation within a year of a new sewer main being constructed for the purpose of separating the existing combined sewer system. This would mean mandatory separation of sanitary and storm sewers on private property as the sewer separation project proceeded, but could mean the District having to undertake the work if the property owner failed to do so within one year as stipulated in the bylaw. However, given that separation of the sanitary and storm flows is not possible in each catchment area until the sewers have been separated, an alternative approach would be to require separation on private property within one year of the municipal sewer being separated in each catchment, i.e., when the Humber or Rutland catchment is completed homeowners have one year to provide separate sewers. A third alternative would be to rely on home replacements and major renovations to achieve complete sewer separation. This would potentially mean continuing overflows long after the combined sewer separation project was completed. In summary, the three alternatives are:

- a) Mandate separation on private property as the project proceeds;
- b) Mandate separation on private property within one year of the municipal sewer being separated in each catchment; or
- c) Rely on home replacements and renovations to achieve separation.

Other jurisdictions are not mandating separation on private property due to the financial burden on home owners but are relying sewer separation when replacements and renovations are undertaken.

Essentially the difference between mandatory and voluntary connection of private services is the timeframe to achieve separation of sanitary and stormwater flows. Under alternative c), for example, elimination of combined sewers could be achieved before separation of private services.

Council's direction is needed to develop policy and/or revisions to Bylaw No. 3891.

4. Need to Update Bylaw 3891

As noted previously, there are many homes in the District with single pipe connections despite the availability of separate sewers. This is evidenced by the fact that annual average flows are significantly higher than other, older municipalities like Victoria and Esquimalt. There is a need to review and update the bylaw, in particular Section 2 'Requirements to Connect to Public Sewers' to address the implications of the Uplands sewer separation project to ensure consistency throughout the District. Assuming the District decides to rely on home replacements and renovations to achieve sewer separation then the following is suggested for inclusion in the bylaw:

1. New homes, to be provide separate sanitary and storm sewer connections to the District sewers, at the expense of the property owner. A new single or dual pipe connection (lateral) from the property line to the municipal sewer(s) to be provided at the expense of the property owner;
2. When renovations exceed \$100,000, or an existing bathroom is renovated, or a bathroom is added, the requirements for new homes would apply;
3. When a perimeter drain is replaced, separate sanitary and storm sewers to be provided. A new single or dual pipe connection (lateral) from the property line to the municipal sewer(s) to be provided at the expense of the property owner; and

4. If a single pipe has to be replaced, the property owner must provide new separate sewers to the property line and a new single or dual pipe connection (lateral) from the property line to the municipal sewer(s).

With direction from Council amendments to the bylaw will be drafted and brought to council at a later date.

DECISION CRITERIA

As noted earlier, the purpose of undertaking this project is to eliminate combined sewers in the Uplands area to comply with the MWR. Evaluating the project from that focused perspective would potentially lead to a preference for a new gravity sewer (Options 1, 3, 5 and 6). However, sewage flows would remain combined and overflows to the environment would continue until all the sewers were separated and all homes are connected with separated sewers. However, adding the environmental benefit of reducing overflows to the sea to the compliance objective would potentially lead to a preference for a new stormwater sewer (Options 2 and 4). While compliance with the MWR may not be achieved any sooner, combined sewer overflows would be reduced sooner as storm flows would be progressively reduced as the project proceeded with the connection of already separated homes and road surface drainage.

The results of the public engagement indicate that a gravity solution is preferred, that pumps are viewed negatively and a solution that minimizes direct costs to Uplands residents is preferred by Uplands residents. However, the public engagement feedback also indicates that the small percentage of residents who participated in the survey that live in Oak Bay but not in the Uplands believe it is important to minimize the costs to the District and selecting an option that takes into account a long term view.

As noted earlier Council must decide between complying strictly with the Minister's directive to eliminate combined sewers (all of the options), as municipalities on the lower mainland are doing or comply with the directive and progressively reduce combined sewer overflows (Options 2 and 4), assuming separation of sewers on private property is not mandatory.

SUMMARY

The following is a summary of the assumptions and policy issues for consideration by COW:

1. *That on-site management will not be considered as an alternative to a connection to a storm sewer.*
2. *That, in general, the existing or enlarged easements will not be used to accommodate a new sewer pipe.*
3. *That based on the results of the reconsideration of directional drilling, directional drilling is not a viable alternative for installing a municipal gravity sewer.*
4. *That construction of gravity sewers greater than five (5) metres deep to eliminate the need for private pumps, is not a feasible option*
5. *That based on the statistics on the duration of power outages, the use of pumps on private property is viable.*
6. *That existing stormwater discharges will be phased out over time as homes are renovated or replaced.*
7. *On-site management will not be considered as an alternative to a connection to a storm sewer.*

8. *That with direction from Council amendments to the bylaw will be drafted and brought to council at a later date*

Next Steps

1. **Council provide direction to staff on what additional information they may need in order to make an informed decision**
2. **Council direct staff if further public consultation is required and for what specific information**
3. **And /or direct staff to bring forward a preferred option to an upcoming COW (for further discussion or an upcoming Council meeting (for decision)).**

Following the selection of an option by Council, the proposed next steps in this overall project are:

1. Provide the CRD with the District's proposal including the rationale and time frame for the combined sewer separation for submission to the Ministry of Environment as part of an amendment to the Core Area Liquid Waste Management Plan.
2. Resubmit the grant application to the province/federal government with the details of the approved plan.
3. Staff to develop the financial plan for moving this project forward.
4. The District to continue its discussions with First Nations on the archaeological impact of this project.
5. Prepare a terms of reference for a request for proposals for a geotechnical investigation of the Humber and Rutland catchments along the proposed new pipe alignment to ascertain sub-surface conditions for use during detailed design.
6. Prepare the terms of reference for a request for proposals (RFP) for the detailed design of the first phase of the combined sewer separation project.
7. Issue the RFP for the geotechnical investigation after a response to the grant application has been received. (Note that any work done prior to a decision on the grant would be ineligible for funding).