FINAL REPORT
OLD DUNDAS ROAD SEWAGE PUMPING STATION (HC005) EMERGENCY SANITARY OVERFLOW TO ANCASTER CREEK FEASIBILITY STUDY

Report Prepared for:

CITY OF HAMILTON
320 – 77 James Street North
Hamilton, ON
L8R 2K3

Prepared by:

AQUAFOR BEECH LIMITED
2600 Skymark Avenue
Building 6, Suite 202
Mississauga, ON
L4W 5B2

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1 INTRODUCTION

The low-lying properties in the vicinity of Old Dundas Road and Montgomery Drive have been prone to sanitary sewer surcharging which has resulted in flooding of basements. In response to flooding events in the 1980s and 1990s, an easement adjacent to the Old Dundas Pumping Station was acquired and registered by the City of Hamilton in November 1992 with the intent of preventing basement flooding by releasing untreated sewage into Ancaster Creek. In May of 1993 the Niagara Escarpment Commission refused application for construction of an emergency overflow. In April of 1997, council authorized the release and abandonment of the overflow easement which was completed on July 25, 1997. In subsequent years, basement flooding has continued culminating in two major flooding events on January 13th and 30th of 2013. In response to the 2013 flooding events, a Wet Weather Relief Master Plan and Class Environmental Assessment Study was undertaken in 2014.

1.1 Background

Aquafor Beech Limited completed *the Old Dundas Road Sewage Pumping Station (HC005) Wet Weather Relief Master Plan and Class Environmental Assessment Study* in October 2014. This study assessed issues relating to flooding within the sanitary sewershed area shown in **Figure 1.1**. The study involved both flow monitoring and the calibration of the Mike Urban computer model together with an assessment and selection of alternatives to mitigate flooding.

The primary areas that were flooded during the January 13th and 30th events of 2013 are the low-lying properties along Old Dundas Road between the pumping station and Montgomery Drive as well as Millcreek Court. The flooding results from flows that exceed the capacity of the Old Dundas Road Sewage Pumping Station. The pumping station has a maximum capacity of 160 litres per second (L/s). Results of monitoring, statistical analysis and hydrologic modeling conducted for the 2014 study indicated that return periods close to 1:5-years exceeded this flow capacity and that the 1:100-year event produced inflow at the pumping station of 240 L/s. Increasing the capacity of the pumping station is not a feasible option in the foreseeable future due to significant capacity constraints downstream of the forcemain.

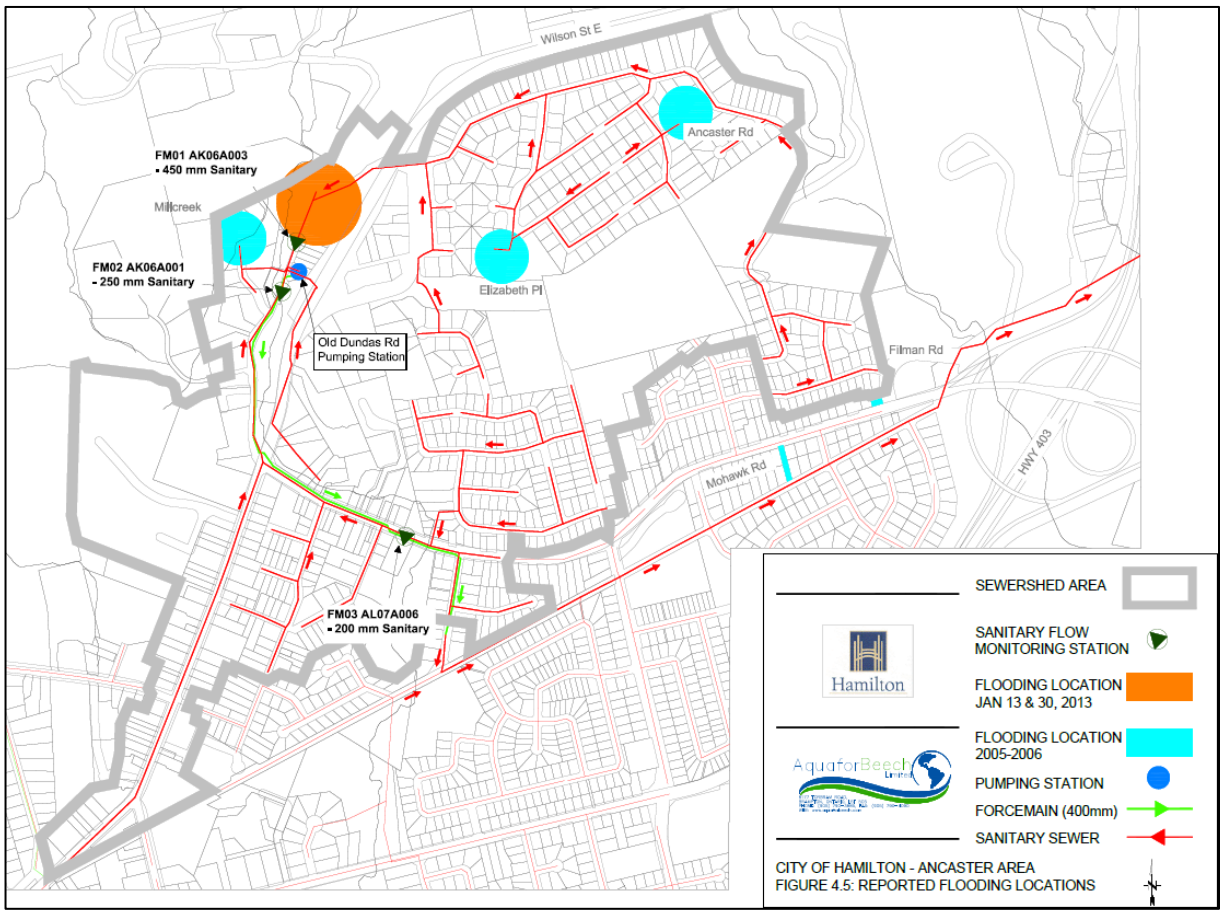

Figure 1.1: Reported Flooding Locations within Study Area

2014 Wet Weather Relief Master Plan Recommendations

The preferred alternative solutions that were initially developed to address the sewer flooding problem and associated issues were broadly categorized as follows:

1. Construct an Underground Inline/Offline Storage Facility
2. Remove Sources of Private Property Inflows
3. Reduce Infiltration / Inflow in the Public Property Works
4. Provide an Emergency Overflow to Ancaster Creek

The 2014 study found that the first three alternatives were required in order to effectively mitigate basement flooding associated with the sanitary sewer system. Based on the evaluation, three alternatives were found to be the most preferred. Collectively, implementation of the Public and Private Property works together with Inline/Offline Storage Facility along Montgomery Drive would provide a level of flood protection against basement flooding up to a 1:100-year level of service for the study area.

The report also noted that implementation of an emergency overflow will provide relief to homeowners who would experience flooding during storms that exceed the 100-year level.

1.2 Retrofits to Reduce Infiltration / Inflow

Partial implementation of the public component of sanitary conveyance network infiltration and inflow reduction measures has occurred in this sewershed draining to the Old Dundas Road Sewage Pumping Station. These measures have primarily consisted of manhole sealants applied to reduce infiltration which typically occurs at concrete joints in manholes or at cast in place components. From 2015 to 2016, 29 manholes were lined with SpectraShield®. SpectraShield® is a polymer liner that seals existing cracks or fractures and prevents infiltration and corrosion. **Figure 1.2** identifies a source of infiltration in a manhole as well as a manhole that has been treated with SpectraShield® to resolve this issue. In 2016, two pipes on Montgomery Drive were relined, although one of these pipes was eventually replaced by the Inline Storage Facility. While three other pipes were scheduled to be relined, one was found to be PVC and not in need of relining, and the other two were cancelled. In addition, two manhole lids at Wilson Street and Church Street were replaced in 2013 and one manhole frame at Wilson Street and Hendry Lane was repaired in 2015. **Figure 1.3** shows the completed and cancelled retrofits. *Note: Manhole AK09A003 at 436 Wilson Street East was identified as having received SpectraShield® lining in 2016; however, this manhole ID is not present in the model layers, and is therefore, not included in the figure.*

Figure 1.2: Infiltration in Manhole (left) and SpectraShield® Sealant in Manhole to Mitigate Infiltration (Right)

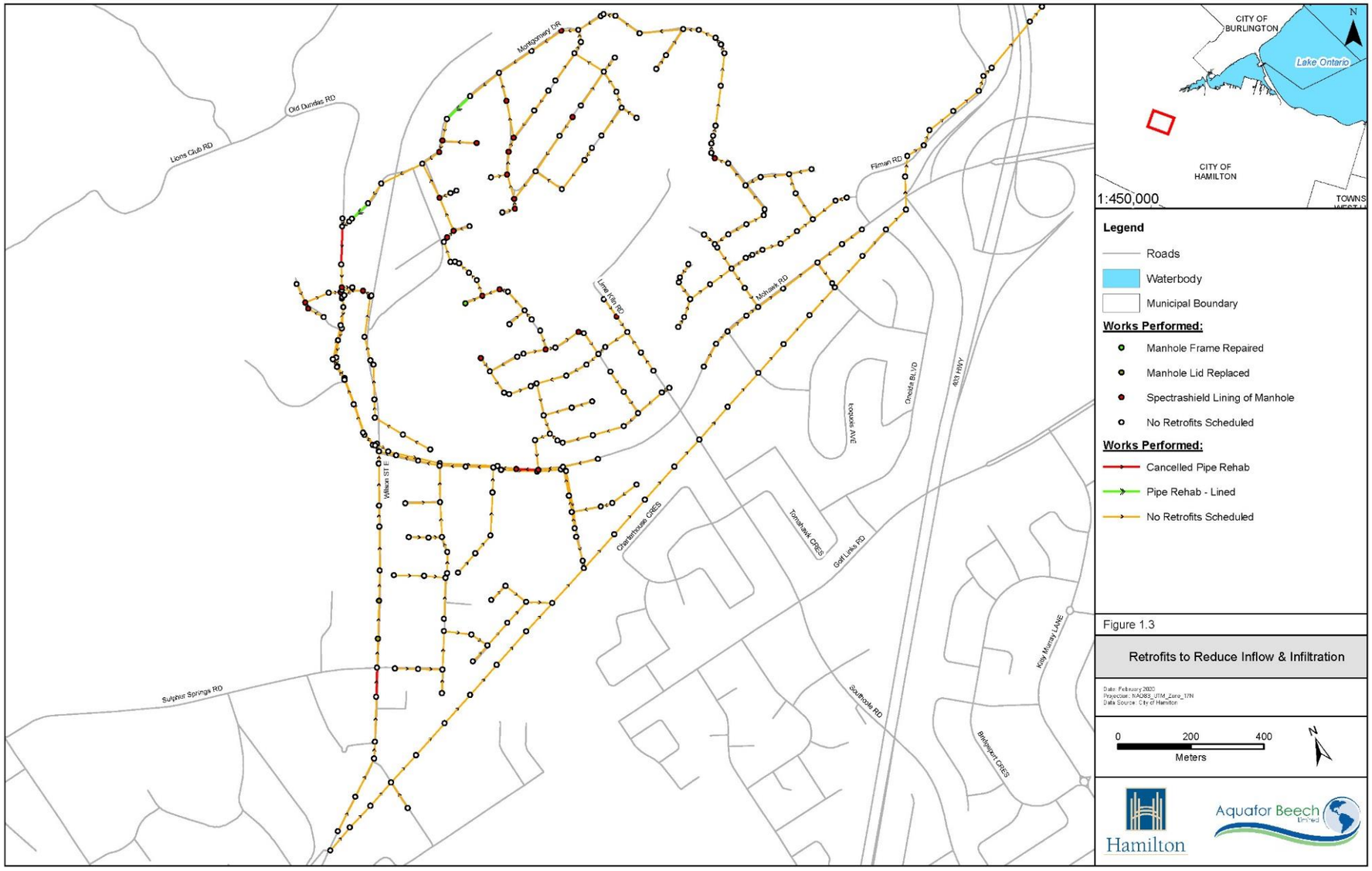

Figure 1.3: Retrofits to Reduce Infiltration / Inflow

1.3 Existing Inline Sanitary Storage Facility on Montgomery Drive

An underground 2100 mm diameter Inline Sanitary Storage Facility, which was designed to limit flows to the upstream of the flood prone areas, was constructed on Montgomery Drive between Old Dundas Road and Wilson St East in 2017. The facility is 121 m in length and has a detention capacity of approximately 460 m^3. The Inline Storage Facility together with the Public and Private Property Works as noted above were designed to provide sufficient detention to ensure that basement flooding does not occur for events up to the 1:100-year return period. **Figure 1.4** shows the Inline Storage Facility profile along with basement elevations assumed to be 1.8 m below surface grade for flooding analysis.

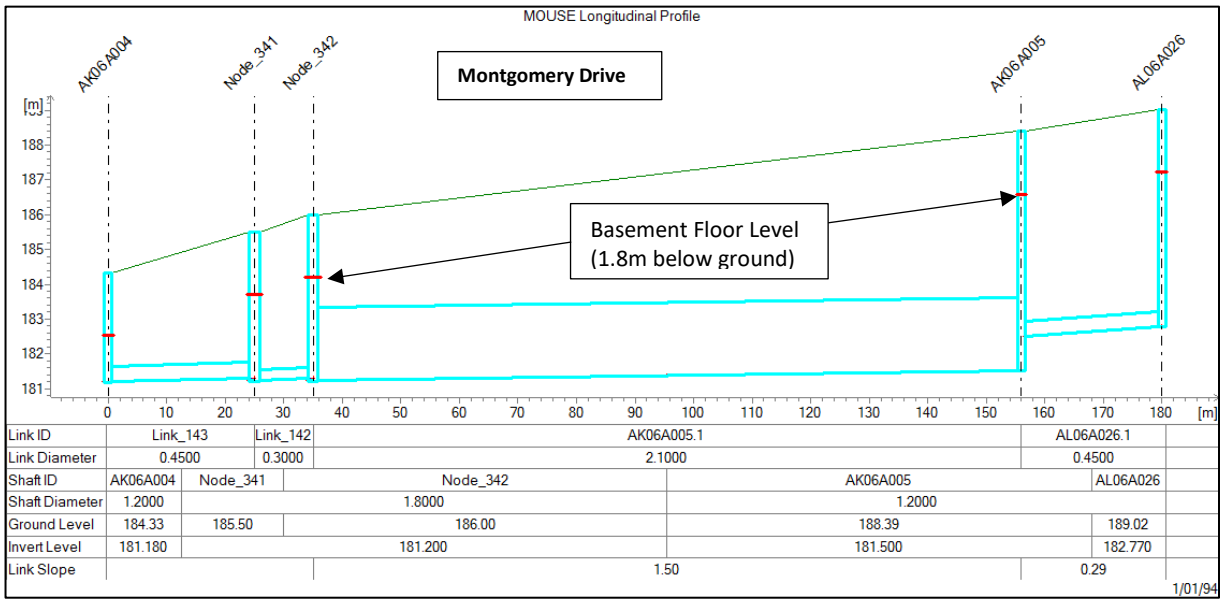

Figure 1.4: Profile of the Inline Storage Facility on Montgomery Drive

A separate assignment was conducted to evaluate the response of the Montgomery Drive Inline Storage Facility to in-situ runoff events. This involved flow monitoring in, and adjacent to, the Inline Storage Facility. Furthermore, a qualitative assessment of performance of the Inline Storage Facility, using the MIKE URBAN computer model and flow monitoring information has been provided to the City.

1.4 Flow Monitoring

In order to verify that the Inline Storage Facility is working as intended, flow monitoring was conducted during 2018 and 2019. ADS Triton+ flow loggers were installed in manholes immediately upstream and downstream of the facility (**Figure 1.5**). These loggers record depth and velocity at a regular interval and use input pipe dimensions to calculate flowrate and discharge volumes. These loggers are ideal for sites where surcharging may occur due to redundant pressure and up-looking ultrasonic depth modules.

Figure 1.5: Locations of Sanitary Flow Loggers

1.5 Flow Monitoring Results and Model Calibration

The existing Mike Urban model, together with the findings from the flow monitoring and flows from the pumping station, were used to assess qualitative performance of the Inline Storage Facility. The assessment was limited to periods of high flows when the in-line facility was detaining sanitary sewage volumes. The Mike Urban model, for select storm events, was run for the following two conditions:

1. Prior to installation of the existing Inline Storage Facility; and
2. With the Inline Storage Facility constructed and partial Public Property rehabilitation works in place.

The design storm events selected for the comparison are provided below:

1. 1:25-year, 6-hour Chicago Distribution;
2. 1:100-year, 6-hour Chicago Distribution; and
3. 1:100-year, 6-hour Chicago Distribution with modified IDF to simulate Climate Change effects.

The climate change storm event was generated by increasing the rainfall intensity by 15%. A comparison of the results is provided below to assess qualitive performance. Flow monitoring and modelling results are further detailed in a separate report submitted to the City of Hamilton in November 2019 titled *Flow Monitoring of Montgomery Drive Sanitary Storage Facility (Aquafor 2019)*.

Conclusions

1) A number of rainfall events were captured during the monitoring period. Listed below are the events which occurred during the flow monitoring period for which flow monitoring data was available.
    1. September 3, 2018 (13.9 mm)
    2. September 10-11, 2018 (17.5 mm)
    3. September 25-26, 2018 (16.8 mm)
    4. December 20-21, 2018 (13.5 mm)
    5. December 31, 2018 (15 mm)
    6. July 29-30, 2019 (20.6 mm)
    7. October 26-27, 2019 (44.1 mm)

2) It was found that the Inline Storage Facility attenuated peak flows for a large event on October 26-27, 2019 (44.1 mm). Peak flows observed at the upstream and downstream flow monitor locations were 59.5 L/s and 34.7 L/s respectively.

3) The MIKE URBAN computer model with and without the Inline Storage Facility and Public Property Works was run for the three design storm events listed above (1:25-year, 1:100-year, and 1:100-year + climate change).

The model results without the Inline Storage Facility and Public Property Works in place shows basement and surface flooding along Old Dundas Road for the three scenarios listed above. The model results with the Inline Storage Facility in place together with the Public Property Works show significant reduction in the hydraulic grade line (HGL) within the sewer system. The critical location for risk of basement flooding is at the intersection of Montgomery Drive and Old Dundas Road where the 1:100-year and 1:100-year + climate change scenario show that the HGL slightly exceeds the 1.8 m below surface and therefore, still poses a basement flooding risk in this area. However, it should be noted under this scenario, the HGL remains well below ground and does not show any surface flooding. A significant level of flood protection is therefore provided by implementing the Inline Storage Facility and the Public Property Works.

2 STUDY PURPOSE AND BACKGROUND

As noted in the 2014 *Old Dundas Road Sewage Pumping Station (HC005) Wet Weather Relief Master Plan and Class Environmental Assessment Study*, the Public and Private Property Works, together with the Inline Storage Facility will provide a 100-year level of flood protection for the study area. Furthermore, monitoring and modelling conducted to assess the performance of the Inline Storage Facility and Public Property Works completed to date, indicates that the facility is performing as designed and will provide an increased level of service for the area of Old Dundas Road that was previously subject to flooding.

The City of Hamilton has requested further investigation of the fourth alternative from the 2014 study – **Provide an Emergency Overflow to Ancaster Creek**. The provision of this emergency overflow would provide protection beyond the existing 1:100-year level of service. The scope of this study is to consider an emergency sanitary overflow which would bypass the Old Dundas Pumping Station during flows in excess of the 1:100-year return period event. An integral component of this study will be to define the potential environmental and social impact of an emergency sanitary overflow to Ancaster Creek.

The *Old Dundas Road Sewage Pumping Station Environmental Impact Statement* (EIS) conducted for the City of Hamilton in 1994 by Totten Sims Hubicki Associates (TSH) investigated two (2) alternatives that involved emergency overflows to Ancaster Creek without treatment. These alternatives were:

1) **Overflow Pipe Only**: This option included a gravity pipe from the pumping station directly to Ancaster Creek preventing surcharging of the pipes feeding the pumping station on Old Dundas Road.

2) **Overflow Pipe with Twinning of Input Pipes**: This option involved providing temporary storage of sewage via a second sanitary sewer along Old Dundas Road and providing an emergency gravity overflow to the creek. It should be noted that providing storage along Old Dundas Road was initially proposed when the Inline Storage Facility was being designed but the Inline Storage Facility was moved to Montgomery Drive due to geologic constraints, utility constraints, and to minimize the impact of construction on local traffic flow.

The 1994 EIS Study concluded that an overflow pipe discharging untreated sewage into Ancaster Creek is not an ecologically sound solution to the problem of residential sewage backup. Agency comments considered as part of the 1994 Study included the following:

> **Niagara Escarpment Commission (NEC):** The NEC was opposed to the overflow alternatives. The subject area is designated Escarpment Protection Area in the Niagara Escarpment Plan and discharge from the overflow would result in the contamination of the stream thereby degrading the quality of water representing a possible threat to fish and wildlife stocks downstream.
>
> It is also noted that NEC staff subsequently commented as part of the 2014 Master Plan consultation, that the study area is in an area of development control and that we must regard Parts 1.7 (Urban Area) and 2.6 (Development Affecting Water Resources) of the Niagara Escarpment Plan.
>
> **Hamilton Conservation Authority (HCA):** HCA was in objection to the overflow since the development could adversely affect a significant fishery resource.
>
> It is also noted that HCA staff subsequently commented as part of the 2014 Master

Plan consultation, that Ancaster Creek is classified as a cold/cool water system through the study area, and ultimately outlets to Cootes Paradise and Hamilton Harbour. HCA staff remarked that portions of the study area, including the tributaries of Ancaster Creek, are regulated pursuant to Ontario Regulation 161/06 (HCA's Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses) made under the Conservation Authorities Act, R.S.O. 1990. Some of the work associated with constructing an overflow may therefore require a permit from HCA. HCA staff commented that alternative 6, emergency overflow to Ancaster Creek, is included within the preferred solution that has been recommended by the study. This project has been identified through the Master Plan study as a Schedule 'C' project and will require further study and assessment prior to any implementation. Notwithstanding this, HCA staff noted that there would be potential environmental concerns with such a proposal. A permit from HCA would also likely be required for any emergency overflow to the creek.

Ministry of Natural Resources (MNR, now MNRF): Comments from MNR staff in 1994 note objection to the overflow because sewage effluent discharged into the Ancaster Creek would be considered a deleterious substance, to permit such an activity would be contrary to Section 35 of the Fisheries Act.

Ministry of the Environment (MOE, now MECP): Comments from MOE staff in 1994 note objection to the overflow and request that the City of Hamilton investigate and implement other measures to address the problem of station/forcemain failure, or alternative means of preventing discharge to Ancaster Creek.

It is also noted that MOE staff subsequently commented as part of the 2014 Master Plan consultation, that the ESR should also include a complete discussion of all the permits, approvals and licenses that will be necessary and should demonstrate that all agencies having jurisdiction have been consulted and can support a discharge to this coldwater stream.

Prior to undertaking the recent environmental assessment, it was determined that local environmental, technical and social constraints and opportunities would need to be re-evaluated. To gain a better understanding of local constraints and opportunities, field work (flow monitoring and water quality sampling) and a review of background information was prioritized to provide a technical basis for evaluating alternatives.

3 PRELIMINARY ALTERNATIVES

This study focuses on three (3) alternatives relating to the sanitary emergency overflow. The scope of each alternative is presented including a brief description, the overall impacts and costs to be incurred.

The alternatives analyzed for this study are:

1) **Do Nothing**: Under this assumption an emergency overflow pipe is not constructed. The existing level of service with the Inline Storage Facility and partial Public Property Works will be maintained. The City will continue to implement further Public Property Works to eliminate inflow and infiltration from the system. Should the capacity of the Inline Storage Facility be exceeded and flow to the pumping station exceed the pumping capacity (or the pumps fail), there is likely to be flooding. It should be noted that upgrades being implemented at the pumping station are occurring outside of this environmental assessment. These upgrades will not increase the capacity of the station but will mitigate the risk of flooding associated with pump failure by providing new pumps, mechanical equipment and an external emergency generator in case of temporary power failure. The Do Nothing alternative will only be selected if there are significant constraints associated with other alternatives.

2) **Install Emergency Overflow without Treatment**: This alternative is similar to the "Overflow Pipe Only" option investigated in the 1994 EIS Study. Sanitary flow would be discharged directly into the Ancaster Creek to prevent surcharging of sanitary sewers into basements along Old Dundas Road. For this option, the emergency overflow is proposed downstream of the Inline Storage Facility tying into an existing storm sewer approximately 180 m north of the pumping station. The layout of this alternative is presented in **Figure 3.1**.

3) **Install Emergency Overflow with Treatment**: For this alternative a long linear filtration system is proposed within the road right of way. The system would include linear wetland features for filtration and perforated pipes to encourage infiltration of partially treated wastewater to in-situ soils. This option would require an extended flow path to allow an increased filtration area. The flow path of the overflow treatment system would follow Old Dundas Road to the intersection with Lions Club Road and discharge effluent downstream of Sherman Falls. The layout of this alternative is presented in **Figure 3.2**.

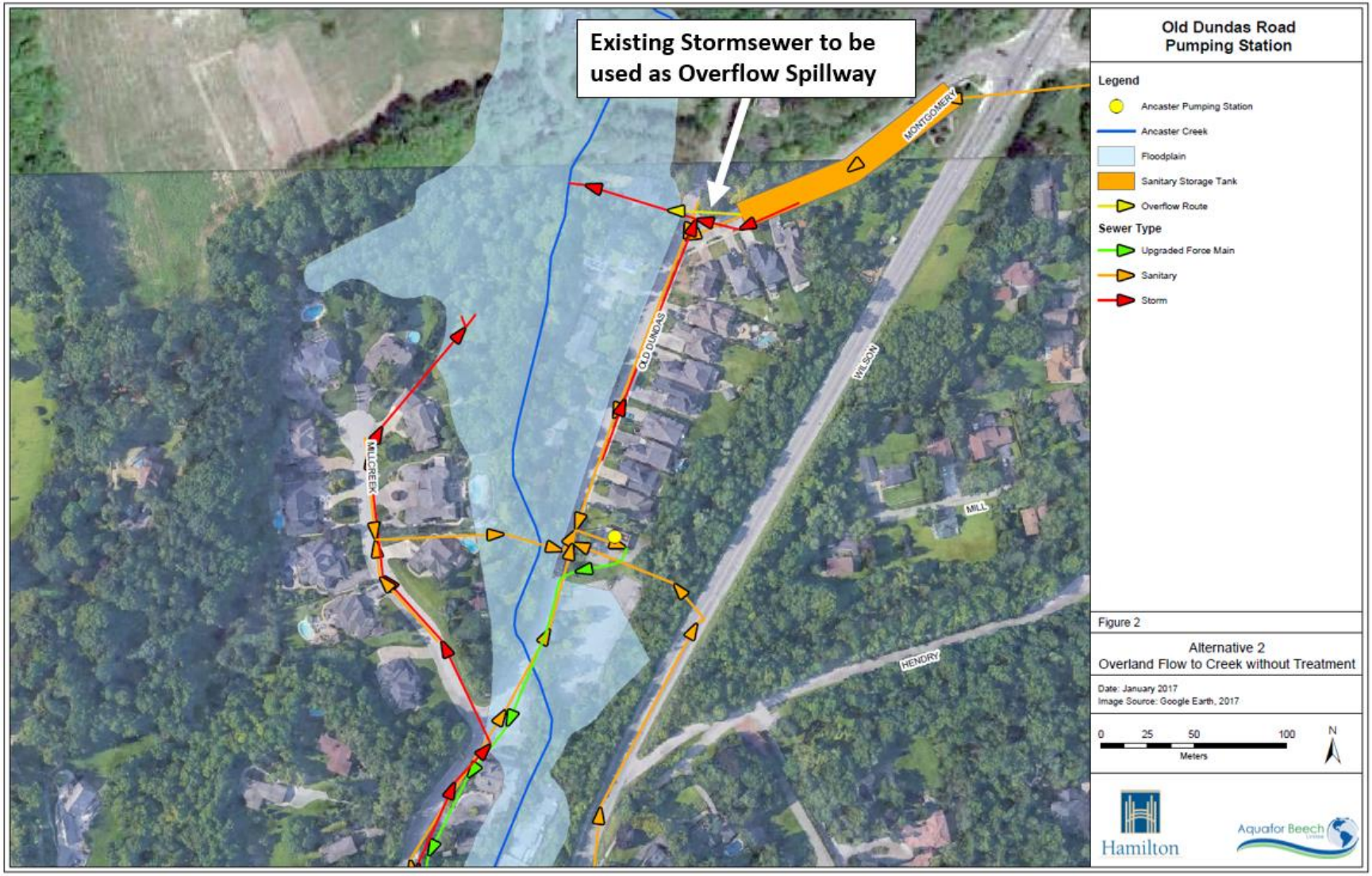

Figure 3.1: Emergency Sanitary Overflow to the Creek without Treatment

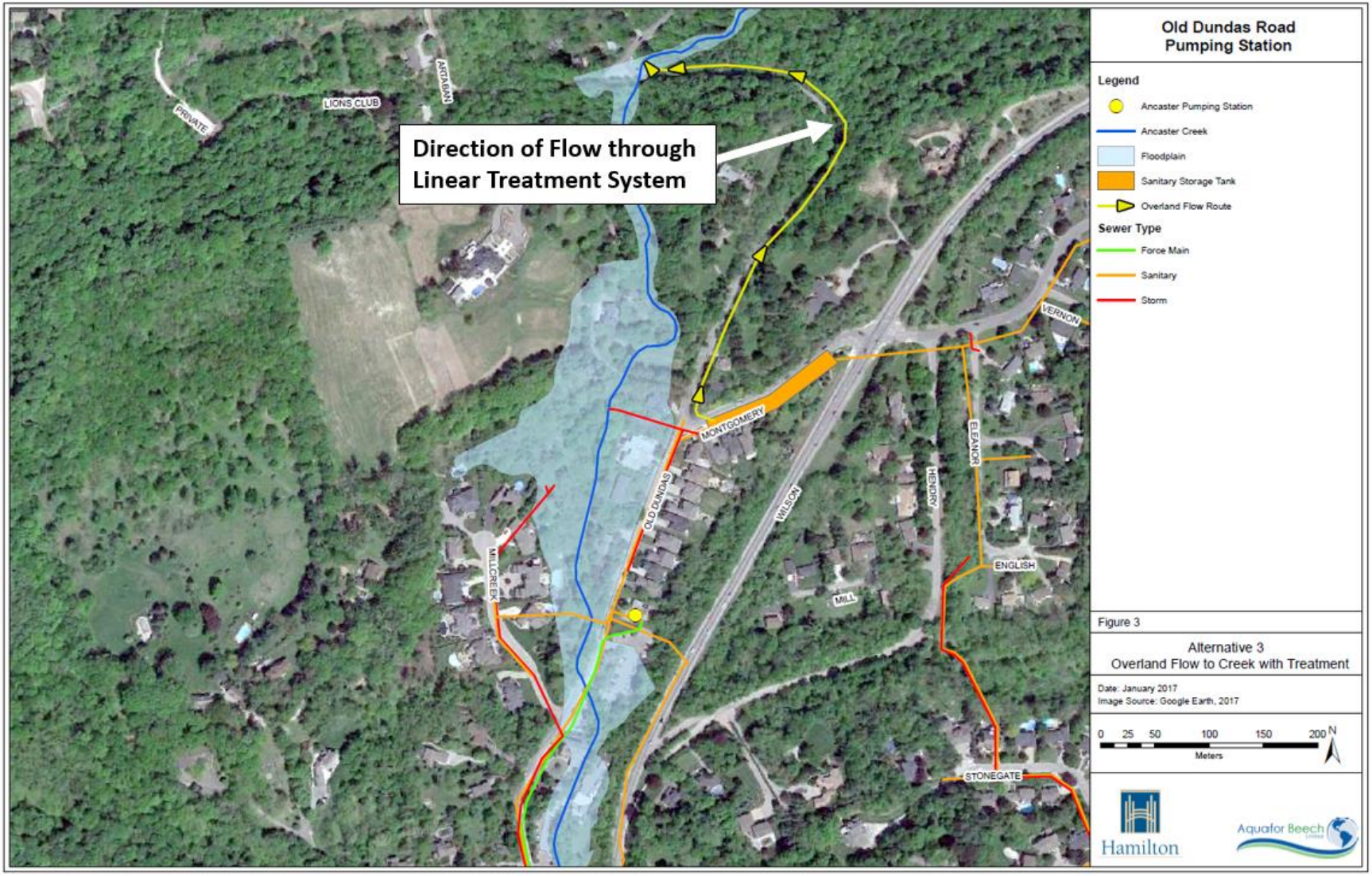

Figure 3.2: Emergency Sanitary Overflow to the Creek with Treatment

4 EVALUATION CRITERIA

For this study the following Evaluation Criteria were used to determine the preferred alternative:

- **Cost**: This criterion includes capital costs associated with implementation as well as ongoing costs associated with operations, maintenance and compliance.

- **Ability to Feasibly Achieve Objective**: This criterion is simply the ability of an alternative to alleviate sewage backup to homes.

- **Fisheries and Natural Environment Impacts**: This criterion reflects positive or negative effects on aquatic resources in Ancaster Creek and includes water quality, sediment load, fish habitat and cumulative effects downstream.

- **Community and Recreational Impacts**: This criterion reflects the effects of each alternative on the recreational attributes of the Environmentally Significant Areas (ESA) and Areas of Natural Scientific Interest (ANSI) areas on recreational fishing, hiking and other passive activities popular in the Ancaster Creek valley.

For each evaluation criteria, the alternatives are ranked from 1 (best score) to 3 (worst score). These ranks are averaged for a final evaluation ranking.

4.1 Cost

The **Do nothing** alternative has no capital costs. Compliance costs associated with flooding of raw sewage to properties along Old Dundas Road are expected to be infrequent due to the level of service provided by the existing Inline Storage Facility and the pumping station upgrades which will mitigate pump failure related flooding.

The **Install Emergency Overflow without Treatment Option** requires construction isolated at the outlet of the Inline Storage Facility. High-level costing estimates approximate the capital cost to be $100,000.

The **Install Emergency Overflow with Treatment Option** requires significant construction along approximately 500 m of roadside ditch to accommodate a linear filtration feature as well as outlet works to Ancaster Creek. High level costing estimates approximate the capital cost to be $500,000.

Table 4.1: Cost Ranking of Alternatives

	Do Nothing	Install Emergency Overflow without Treatment	Install Emergency Overflow with Treatment
Cost Rank	1	2	3

4.2 Ability to Feasibly Achieve Objective

The **Do nothing** alternative does not provide additional flood protection beyond the existing 1:100-year level of service.

The **Install Emergency Overflow without Treatment Option** will provide flood protection by diverting sewage to Ancaster Creek. There are technical concerns associated with the backflow from Ancaster Creek during flooding events. The 1:100-year flood levels in the creek in the vicinity of Montgomery Drive are approximately 183.71 m above sea level. The existing storm sewer outlet that would serve as the overflow is substantially submerged during the 1:100-year event. Infrequent runoff events which overwhelm the sanitary system but produce a smaller response from the creek are possible, but detailed hydrologic modelling of the creek and sanitary network would be required to confirm this and are outside of the scope of this project.

The **Install Emergency Overflow with Treatment Option** will provide flood protection by diverting sewage to Ancaster Creek. There are significant technical concerns associated with grading along the flow route of the linear treatment system. It appears as though there is a negative slope along a significant portion of the flow route which would not allow for gravity flow. There are also concerns associated with utility conflicts along this route.

Table 4.2: Feasibility Ranking of Alternatives

	Do Nothing	Install Emergency Overflow without Treatment	Install Emergency Overflow with Treatment
Feasibility Rank	3	2	1

4.3 Fisheries and Natural Environment Impacts

Fisheries and aquatic considerations impose constraints on any sewage overflow to Ancaster Creek as maintaining habitat associated with aquatic life is a priority. Acute effects of a sewage discharge to the creek may include increased water temperatures, bank erosion, sediment deposition and degradation of water quality.

In 1994, when an overflow was initially considered, concerns from commenting agencies highlighted issues regarding the potential quantity of overflow raw sewage and the time period that Ancaster Creek would be exposed to emergency spillage. At the time, it was estimated that a sewage flow rate of 0.04 m^3/s over a period of 12-hours into the creek would cause adverse effects to the creek, especially considering the size of the stream system and lack of organic layer for absorption. It was stated that the dilution of stream water and sewage outfall would depend very much on time of year, amount of sewage (time of day of failure), and local climate events (storm flush, etc.).

The *Old Dundas Road Sewage Pumping Station Environmental Impact Statement* (Totten Sims Hubicki Associates, 1994) notes that all tributaries to Spencer Creek, including Ancaster Creek

of which would be affected by the proposed works, display characteristics of sensitive coldwater habitat. The report notes that salmonid migration and spawning habitat has been observed within the lower reaches of Ancaster Creek (Totten Sims Hubicki Associates, 1994). Furthermore, the report discussed that fish species as well as habitat is variable throughout Ancaster Creek, with warmwater habitat displayed downstream near Cootes Paradise.

In order to confirm or discount this report, Hamilton Conservation Authority (HCA) was contacted in October 2018 to obtain relevant and up-to-date fisheries data for the study area. In response to this request, Colin Oakes of the HCA provided the fisheries community results associated with the monitoring locations displayed in **Figure 4.1**.

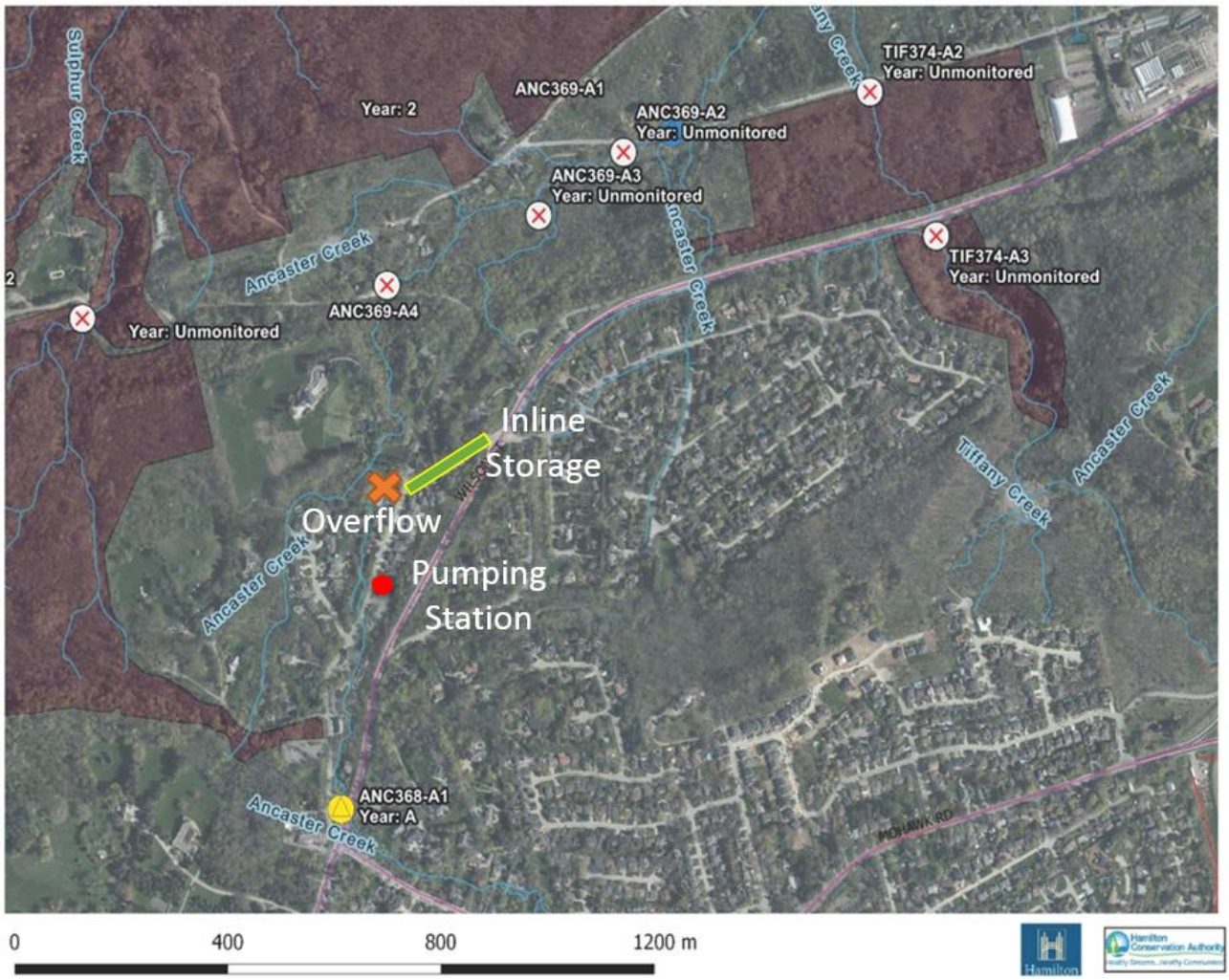

Figure 4.1: HCA Ancaster Creek Fish Community Monitoring Stations

The information provided in the 1994 EIS Report are supported by the results of the fish community results provided by HCA. Overall, 6 species have been observed within the reach impacted by the potential outlet. Station ANC368-A1, which can be observed upstream of the pumping station, displayed a community associated with moderate to high disturbance and a warmwater thermal regime. Conversely, Station ANC369-A3, which can be observed

downstream of the pumping station, displayed a community associated with little disturbance and a cool-coldwater thermal regime. Particular to ANC369-A3, Rainbow trout (*Oncorhynchus mykiss*), a coldwater species that is intolerant of disturbance was observed as the second-most abundant species downstream of the proposed outlet. Results date back to 1998 and have likely changed in composition since the development of adjacent lands. However, Ancaster Creek displays characteristics of a sensitive, coldwater stream which could be negatively impacted from upstream influences. It is also noted that Trout Unlimited Canada is currently doing a study on Ancaster Creek to determine if it can be restored to allow fish to migrate for spawning.

4.3.1 Department of Fisheries and Oceans (DFO) Request for Regulatory Review

The federal *Fisheries Act* requires the following:

- That projects avoid causing the death of fish and the harmful alteration, disruption or destruction of fish habitat unless authorized by the Minister of Fisheries, Oceans and the Canadian Coast Guard. This applies to work being conducted in or near waterbodies that support fish at any time during any given year or are connected to waterbodies that support fish at any time during any given year.

- If a project is permitted to be constructed, upon completion of the detailed design for the works, the works are to be cross-referenced with the DFO "Projects Near Water" online service to determine if a request for regulatory review under the federal *Fisheries Act* is required. Within this online service, the Minister details steps for determining if a project requires regulatory review. Steps include "Measures to protect fish and fish habitat" as well as "Waterbodies where review isn't required" (Department of Fisheries and Oceans, 2019).

Since the proposed emergency overflow works are expected to influence Ancaster Creek which supports fish at any time during any given year and the project has the potential to cause the death of fish and the harmful alteration, disruption or destruction of fish habitat, it is anticipated that if the project is permitted, it will require a DFO regulatory review. As such, a detailed design package, as noted above, would be required including a detailed mitigation plan to reduce the potential of causing the death of fish and the harmful alteration, disruption or destruction of fish habitat.

Additionally, the DFO's Fish Protection Plan would be required to review the project and mitigation plan and would determine if the project would result in the death of fish and the harmful alteration, disruption or destruction of fish habitat. If so, *Fisheries Act* authorization would be required through an issued *Letter of Advice* and the proponent would be required to prepare a *Detailed Offsetting Plan*, which would include a *Letter of Credit* to ensure that the conditions of the *Fisheries Act* authorization would ultimately be completed. The offsetting plan would be required to include some combination of:

1. Habitat restoration and enhancement;
2. Habitat creation;
3. Chemical and biological manipulations; and/or
4. Other complementary measures.

There are currently two potential options for the implementation of offsetting works, including 1) project specific measures; and 2) proponent-lead habitat banks. A flowchart to assist guide proponents in fish habitat offsetting with DFO is provided in **Figure 4.2**.

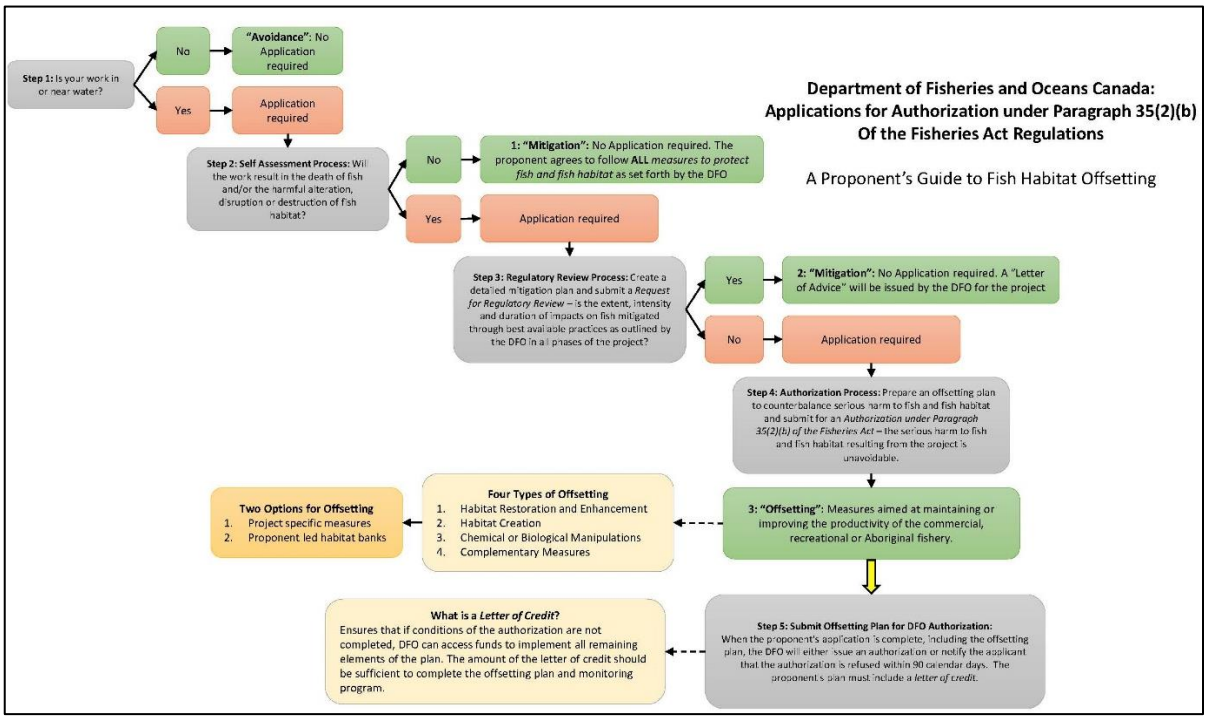

Figure 4.2: A Proponent's Guide to Fish Habitat Offsetting with DFO

4.3.2 Water Quality Analysis

As part of this study, water quality monitoring was conducted at the pumping station (inflows), and in the creek (upstream of Old Dundas Road Crossing). To distinguish between water quality conditions during runoff events and ``dry conditions``, samples were taken both during rainfall events and after 48-hours without precipitation. In total, four water quality events were sampled at four separate times. The results are summarized below for key water quality parameters. Full water quality laboratory results are provided as **Appendix A**. All rainfall depths identified are from Environment Canada Gauge 6153193 at Hamilton Airport.

Table 4.3: Water Quality Sampling Event 1 (July 26th, 2017 – Dry Event)

Water Quality Parameter	Unit	Guideline/ Standard	Sanitary Sewer	Creek
Turbidity	NTU	-	62.6	4.7
TSS	mg/L	-	216	<10

Water Quality Parameter	Unit	Guideline/ Standard	Sanitary Sewer	Creek
Conductivity	*u*S/cm	-	1250	1150
pH	pH units	6.5-8.5 [1]	7.92	8.30
Fluoride	mg/L	0.12 [2]	<0.25	<0.25
Chloride	mg/L	640 [2]	199	183
Total Phosphorus	mg/L	0.03 [1]	2.4	<0.05
Nitrate as N	mg/L	13 [2]	<0.25	1.26
Ammonia as N	mg/L	0.02 [1]	16.6	<0.02
Potassium	mg/L		10.6	2.27
E. coli	CFU/100ml	-	No Data (over-crowding microbial growth)	900
Total Coliforms	CFU/100ml	-	No Data (over-crowding microbial growth)	No Data (over-crowding microbial growth)
Fecal Coliform	CFU/100ml	-	No Data (over-crowding microbial growth)	1200

[1] Provincial Water Quality Objective
[2] Canadian Council of Ministers of the Environment

Table 4.4: Water Quality Sampling Event 2 (October 11th, 2017 - Rain (7.4 mm))

Water Quality Parameter	Unit	Guideline/ Standard	Sanitary Sewer	Creek
Turbidity	NTU	-	133	3
TSS	mg/L	-	360	<10
Conductivity	*u*S/cm	-	1050	1260
pH	pH units	6.5-8.5 [1]	7.85	8.26
Fluoride	mg/L	0.12 [2]	<0.25	<0.25
Chloride	mg/L	640 [2]	177	248
Total Phosphorus	mg/L	0.03 [1]	3.7	0.05
Nitrate as N	mg/L	13 [2]	<0.25	1.31
Ammonia as N	mg/L	0.02 [1]	18.7	0.03
Potassium	mg/L		11.6	2.84
E. coli	CFU/100ml	-	No Data (over-crowding microbial growth)	450
Total Coliforms	CFU/100ml	-	No Data (over-crowding microbial growth)	No Data (over-crowding microbial growth)
Fecal Coliform	CFU/100ml	-	No Data (over-crowding microbial growth)	820

[1] Provincial Water Quality Objective
[2] Canadian Council of Ministers of the Environment

Table 4.5: Water Quality Sampling Event 3 (January 26th, 2018 - Dry Event)

Water Quality Parameter	Unit	Guideline/ Standard	Sanitary Sewer	Creek
Turbidity	NTU	-	49.1	2.2
TSS	mg/L	-	144	<10
Conductivity	*u*S/cm	-	1240	1220
pH	pH units	6.5-8.5 [1]	7.97	8.08
Fluoride	mg/L	0.12 [2]	<0.25	<0.25
Chloride	mg/L	640 [2]	219	204
Total Phosphorus	mg/L	0.03 [1]	1.81	0.03
Nitrate as N	mg/L	13 [2]	0.31	1.73
Ammonia as N	mg/L	0.02 [1]	11.6	<0.02
Potassium	mg/L		11.4	2.29
E. coli	CFU/100ml	-	No Data (over-crowding microbial growth)	No Data (over-crowding microbial growth)
Total Coliforms	CFU/100ml	-	No Data (over-crowding microbial growth)	No Data (over-crowding microbial growth)
Fecal Coliform	CFU/100ml	-	No Data (over-crowding microbial growth)	820

[1] Provincial Water Quality Objective
[2] Canadian Council of Ministers of the Environment

Table 4.6: Water Quality Sampling Event 4 (February 20th-21st, 2018 - Rain (21.4 mm))

Water Quality Parameter	Unit	Guideline/ Standard	Sanitary Sewer	Creek
Turbidity	NTU	-	60.5	142
TSS	mg/L	-	84	279
Conductivity	*u*S/cm	-	763	475
pH	pH units	6.5-8.5 [1]	7.98	7.60
Fluoride	mg/L	0.12 [2]	<0.25	<0.25
Chloride	mg/L	640 [2]	178	124
Total Phosphorus	mg/L	0.03 [1]	0.37	0.34
Nitrate as N	mg/L	13 [2]	2.30	0.44
Ammonia as N	mg/L	0.02 [1]	1.06	0.15
Potassium	mg/L		4.46	3.59
E. coli	CFU/100ml	-	110,000	400
Total Coliforms	CFU/100ml	-	460,000	152,000
Fecal Coliform	CFU/100ml	-	136,000	600

[1] Provincial Water Quality Objective
[2] Canadian Council of Ministers of the Environment

The samples indicate that while the water quality conditions in the creek are degraded by runoff constituents associated with urban and rural pollution, the sanitary sewage is

considerably more degraded. As such, an untreated overflow of sewage to Ancaster Creek would be the least desirable from the perspective of protecting and enhancing fisheries and the natural environment.

The **Do nothing** alternative proposes no release of sewage and is this the highest scoring alternative from a fisheries and natural environment perspective.

The **Install Emergency Overflow without Treatment Option** will result in degraded water quality for a period of time after the overflow occurs. The impact of a spill would depend on volume released, time of year (e.g. during timing windows associated with aquatic life), and creek conditions. This alternative is ranked 3rd with respect to impact on fisheries and the natural environment.

The **Install Emergency Overflow with Treatment Option** will provide some mitigation of pollutant discharge via filtration and infiltration in wetland and perforated pipe components. The system will not involve secondary or tertiary treatment mechanisms and pollutant loading reductions will be subject to design but are not expected to exceed 40% for important water quality parameters. This alternative is ranked 2nd with respect to impact on fisheries and the natural environment.

Table 4.7: Fisheries and Natural Environment Ranking of Alternatives

	Do Nothing	Install Emergency Overflow without Treatment	Install Emergency Overflow with Treatment
Fisheries and Natural Environment Rank	1	3	2

4.4 Community and Recreational Impacts

Ancaster Creek is an area with an abundance of trails, parks and other accessible natural areas. Approximately 200 m downstream of Montgomery Drive is Sherman Falls, a picturesque waterfall accessible to the public from the Bruce Trail. The Monarch Trail and the McMaster Conservation Corridor are also public green spaces downstream of the project site on Ancaster Creek. The impact of an untreated sewage overflow to the creek would potentially include sewage and sanitary debris along the channel. Because an overflow is likely to occur during periods of high flow in the creek, these items may be littered in the riparian vegetation above the typical water line. Odours from sewage littered in the valley may also be present after an overflow especially if it were to occur during warm weather.

As stated in the 1994 EIS Report, allowing the spillage of raw sewage into a tributary of Cootes Paradise and Hamilton Harbour seems counterproductive considering the expenses incurred in restoring these areas and such a project could be harmful to the City of Hamilton's reputation for environmental stewardship.

The **Do nothing** alternative proposes no release of sewage and is this the highest scoring

alternative from the perspective of community and recreational impacts.

The **Install Emergency Overflow without Treatment Option** will likely result in a degraded natural corridor which will be less desirable for optional recreational users. This alternative is ranked 3rd with respect to impact on fisheries and the natural environment.

The **Install Emergency Overflow with Treatment Option** will generally prevent larger debris from spilling into the creek but will still result in the discharge of wastewater that has not undergone any biological or chemical treatment. This alternative is ranked 2nd with respect to impact on local recreation due to the concerns associated with odour.

Table 4.8: Community and Recreational Impact Ranking of Alternatives

	Do Nothing	Install Emergency Overflow without Treatment	Install Emergency Overflow with Treatment
Community and Recreational Rank	1	3	2

4.5 Overall Ranking of Alternatives

Averaging the ranking associated with each alternative identifies the **Do Nothing** alternative as the preferred solution, followed by the **Overflow with Treatment Option** and the **Overflow without Treatment Option**.

Table 4.9: Overall Ranking of Alternatives

Alternatives	Evaluation Criteria				
	Cost	**Ability to Feasibly Achieve Objective**	**Fisheries and Natural Environment Impacts**	**Community and Recreational Impacts**	**Average Rank**
Do Nothing	1	3	1	1	**1.5**
Install Emergency Overflow without Treatment	2	2	3	3	2.5
Install Emergency Overflow with Treatment	3	1	2	2	2.0

4.6 Compliance with MECP Regulation

Although not considered in the evaluation scoring, compliance with the Ministry of Environment, Conservation and Parks (MECP) regulations must also be discussed when considering a sewage overflow into a watercourse receiver. The MECP's July 5, 2019 proposed

new Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health includes the following mandate:

- Promote infrastructure planning and eligible investments that support the reduction of excess nutrients from point sources such as municipal wastewater treatment systems, including overflows and bypasses as priority considerations under applicable infrastructure and other funding programs;

- Review or support demonstration of innovative practices and technologies that result in improved environmental protection, while reducing reliance on conventional infrastructure funding. Examples may include long term strategic planning for infrastructure, sewage treatment plant optimization, reducing runoff volume so less is collected by sanitary or combined sewers, phosphorus/water recovery and reuse, full cost recovery of municipal wastewater and stormwater services with incentives; and

- Update wastewater policies and develop a new stormwater management policy, including policies specific to treatment requirements, sewage overflows and bypasses to enhance environmental protection and reduce nutrient loadings.

Creating a sanitary overflow into Ancaster Creek would be in contravention of the above mandate and it is unlikely that approval would be granted through the Environmental Compliance Approvals process.

5 CONCLUSION

It should be noted that this project started out as a Schedule 'C' Municipal Class Environmental Assessment (MCEA) to determine the location and design of an emergency overflow. Since the "Do Nothing" alternative was chosen as the preferred alternative, the City has decided to abandon the MCEA process for this project and document the study findings through this feasibility report.

After an evaluation considering partially treated and untreated overflows to Ancaster Creek, it was found that the "**Do Nothing**" option is the preferred alternative. The issues and constraints associated with the other alternatives are summarized below.

Install Emergency Overflow without Treatment: This alternative would negatively impact Ancaster Creek. The local coldwater fish species are intolerant of disturbance and would likely suffer both acute and long-term harm after an untreated discharge. Recreational opportunities, which are assets to the local community would also suffer both locally and in downstream areas including Cootes Paradise. There is also a hydraulic constraint in the proposed discharge area as the existing storm sewer in the vicinity of the overflow is significantly submerged during flood events resulting in potential backflow into the overflow pipe.

Install Emergency Overflow with Treatment: Using a passive filtration/infiltration system within the road right-of-way was considered which will generally prevent larger debris from spilling into the creek but will still result in the discharge of wastewater that has not undergone any biological or chemical treatment. However, the grades of the road and utility conflicts as the road follows the creek downstream present a significant constraint.

Based on the above constraints, the "**Do Nothing**" received the highest ranking. This approach generally agrees with the findings of the 1994 EIS Study which concluded that:

"Based on the weighting of alternatives, an overflow pipe discharging untreated sewage into Ancaster Creek is not an ecologically sound solution to the problem of residential sewage backup, as serious as this potential health problem is. The construction may have negative repercussions on critical components of the sensitive Dundas Valley aquatic ecosystem, and damage to its fishery may last for several years, particularly in Ancaster Creek but also in possible areas further downstream. Although residential sewage backup and personal property damage should be averted, the severity of the environmental and social impacts of this proposal should be avoided through the recommended course of action where compromises by all parties may be necessary." (Old Dundas Road Sewage Pumping Station Environmental Impact Statement – TSH, 1994)

Since this EIS Study was undertaken in 1994, the MECP has only reinforced their mandate of eliminating sewage overflows through Procedure F-5-5 which deals specifically with Combined Sewer Overflows as well as with the recent Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health.

It should be noted that since the Old Dundas Road Sewage Pumping Station (HC005) Wet Weather Relief Master Plan and Class Environmental Assessment Study was undertaken in 2014, hydraulic conditions within the sewershed have improved significantly via the implementation of several alternatives designed to effectively mitigate basement flooding associated with the sanitary sewer system. Specifically, the construction of the Montgomery Drive Inline Storage Facility and the reduction of infiltration/inflow in the Public Property Works has provided significant level of flood protection associated with sanitary surcharging. These improvements correspond with an increased level of service and reduced flooding risk to local residents.

With respect to the three alternatives that were considered in this study the "**Do Nothing**" alternative is found to be the preferred alternative. It should be emphasized, however, that of the three preferred alternatives in the study entitled *the Old Dundas Road Sewage Pumping Station (HC005) Wet Weather Relief Master Plan and Class Environmental Assessment Study* in October 2014 only one (the Inline Storage Facility) has been fully implemented. The Public Property Works have been implemented by the City in select locations and the Private Property Works have not been initiated. As noted in the 2014 study, these three preferred alternatives should be prioritized and implemented in order to meet the initial intent of the

2014 study.

Furthermore, preventative measures, such as the implementation of backwater valves for homes in low lying areas should be promoted. A backwater valve is a mechanical device that only allows wastewater to flow in one direction, from a home to the city sewer. In the event of a sewer backup, the backwater valve flap closes, preventing anything from flowing in or out of a sewer until the sewer backup subsides and the flap reopens. A sewer backup could occur if the wastewater system becomes overwhelmed with stormwater during a heavy rain storm. The installation of backwater valves, if properly installed and maintained, would provide a level of protection above the 100-year storm. The City currently promotes the use of backwater values and offers a grant program under the *Protective Plumbing Program*.