FINAL REPORT

Kennedy-Burnett Stormwater Management Facility Project File and Functional Design Report

Prepared for

City of Ottawa

June 2017

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Section 1

Executive Summary

The South Nepean Urban Area has been undergoing significant urbanization, and as a result, the City of Ottawa has undertaken studies to address how the subwatershed will be managed. Two studies that have addressed both Master Servicing and Subwatershed Planning are the South Nepean Urban Area Master Servicing Study – Environmental Study Report (J.L. Richards & Assoc. Ltd., 1997), and the Jock River Reach One Subwatershed Study (Stantec 2007). Both studies recommended a stormwater management (SWM) plan to address both existing and future development lands in the area.

CH2M HILL Canada Limited (CH2M) was retained by the City of Ottawa to assist in the preparation of an Environmental Assessment (EA) and Functional Design for the expansion and retrofit of the existing Kennedy-Burnett (KB) Stormwater Management Facility (SWMF). The existing Kennedy-Burnett SWMF receives runoff from approximately 200 hectares of predominantly residential lands north of Strandherd Drive, along with a portion of commercial development in the Barrhaven Town Centre. The expansion of the existing facility is required to achieve current Ministry of the Environment and Climate Change (MOECC) and City of Ottawa water quality standards for the respective catchment area, as well as the proposed development area which lies adjacent to the facility south of Strandherd Drive.

The EA study was planned under Schedule B of the Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011, and 2015). To ensure compliance with Ontario's Environmental Assessment Act, the EA planning process has generally included the following key components, which are detailed in this report:

- Consultation early and throughout the process;
- Identification of a reasonable range of alternatives;
- Consideration of effects on the environment and ways to avoid/reduce impacts;
- Systematic evaluation of alternatives;
- Clear documentation;
- Traceable decision making.

Due to significant developer input during the EA process the landowners retained a second consultant, Novatech Engineering Consultants Ltd. (Novatech) in 2013. Novatech, a firm with experience in land development, was responsible for combining the input of local land developers to develop storm servicing options. Novatech produced a report titled *Storm Servicing Options Evaluation¸ Future Development Lands Adjacent to Kennedy-Burnett SWM Facility* (Appendix A), which defined storm sewer servicing options for the treatment of stormwater from the new development lands adjacent to the KB SWMF. Novatech described the following four servicing options:

- Option 1: All New Development to Expanded Kennedy-Burnett SWM Facility
- Option 2: Water Quality Treatment Units

- Option 3a: Adjacent Lands to Kennedy-Burnett SWMF/New Pond for Fraser Fields and Clarke Residential Lands/Hydrodynamic Separators for Remaining Areas
- Option 3b: Same as Option 3a, Plus Hydrodynamic Separators at Outfalls to Kennedy-Burnett SWMF (recommended option)

The combined input of local land developers summarized by the recommended options in the Novatech report provided a framework for CH2M to develop potential upgrade options for the KB SWMF. CH2M conducted additional hydraulic and hydrologic studies based on the Novatech servicing options to assess the KB SWMF upgrades, particularly from a water quality perspective. In conjunction with the City of Ottawa and additional stakeholders CH2M identified three potential alternatives for the expansion of the KB SWMF, and through additional consultation, including an alternative solutions evaluation (Appendix J), a preferred alternative was identified for the expansion of the Kennedy-Burnett SWMF. The solution generally includes the use of hydrodynamic separator (HDS) units combined with an expanded SWMF to achieve an enhanced (80% removal of total suspended solids) level of water quality treatment.

Section 2

Introduction

The existing Kennedy-Burnett SWMF is an online wet pond constructed in 1976. As a result of a design that pre-dates current MOECC standards, coupled with significant urban development in the watershed, the facility is undersized for the existing catchment and has difficulty achieving current effluent water quality objectives, despite operational modifications such as increasing the permanent pool depth. Maintenance is a challenge as flows cannot be easily bypassed during sediment removal operations, and limited area is available for sediment management. The facility has limited public appeal and poor aesthetics.

The South Nepean Urban Area Master Servicing Study (MSS) Environmental Study Report (J.L. Richards & Assoc. Ltd., 1997) provided the groundwork for follow-on studies. The report recommended the retrofitting or reconstruction of the existing Kennedy-Burnett SWMF, and for such a retrofit to be implemented in accordance with the following general principles:

- Minimize complexity and capital, operation and maintenance costs;
- Facilitate post-construction monitoring;
- Integrate the facility in overall surrounding landscape;
- Incorporate wetland features to enhance pollutant removal;
- Landscape to improve visual and aesthetic aspects and discourage presence of waterfowl and seagulls to minimize defecation (which can elevate bacteria levels), and to minimize safety hazards to the nearby Macdonald-Cartier International Airport;
- Undertake a site specific detailed inventory of the natural, social and economic environments. In particular, have regard to the existing natural vegetation and attempt to incorporate it, as much as possible, in the implementation of an “end-of-pipe” facility. Similarly, assess and, if required, protect the value of the natural habitat of the receiving stream up to the Jock River.

According to the study, although runoff quantity control is not deemed to be necessary for the purposes of preventing adverse effects on the control of flooding and erosion on the Jock and Rideau Rivers, it might be found to be necessary and/or desirable for protecting the conditions of any lower order watercourses connecting end of pipe stormwater management facilities to these higher order rivers.

The Jock River Reach One Subwatershed Study (Stantec, 2007) further refined the work completed as part of the 1997 MSS. The study defines the expectations for the Kennedy-Burnett SWMF, recommending the “Future retrofit and expansion of the Kennedy-Burnett stormwater management facility to accommodate and treat stormwater runoff from existing and future developments within Kennedy-Burnett and Fraser-Clarke drain catchment area”. The study defined the following criteria for the facility expansion:

- Sufficient storage volume and detention time to be provided in order to achieve ‘Enhanced Level’ (80% TSS removal) treatment of urban runoff as per MOECC 2003;
- Detailed assessment of existing fish habitat required to demonstrate no adverse impact and net loss in fish habitat;

- Quality control required such that flow capacity does not exceed up to and including the 100-year event, in order to maintain the existing floodplain and not to compromise existing crossings;
- Low flow augmentation required, such that the SWMF outlet will augment low flows to the extent possible for the enhancement of fish habitat and low flow augmentation for the Jock River;
- Detailed assessment of existing erosion potential/threshold of tributary to determined recommended storage volumes/release rates to maintain existing erosion index for the maintenance of existing channel stability, and reduced suspended sediment concentration;
- Detailed assessment of existing erosion potential/threshold of tributary to determined recommended storage volumes/release rates to maintain existing erosion index.

2.1 Summary of Constraints and Opportunities

Existing constraints relating to the expansion and retrofit of the Kennedy-Burnett SWMF include:

- Future Widening of Strandherd Drive – Affects SWMF layout;
- Property – Acquisition of private lands;
- Topography – Flat land results in constrained hydraulics;
- Jock River 100-year Floodplain Elevation – Must stay out of floodplain;
- Subsurface Condition (sensitive Leda marine clays) – Affects sideslope stability and foundation for construction; high groundwater table;
- Facility is Online – Management of flows and sediment during construction.

Opportunities for improvements to the natural environment within the study area include:

- Water Quality – Enhanced water quality discharged to the Fraser-Clarke Drain and Jock River;
- Water Quantity – Protection of downstream channels from erosion;
- Public Use & Recreation – Incorporation of passive and active recreation activities (e.g. pathways, parks);
- Operations – Ease of operation for City of Ottawa.

2.2 Purpose and Objectives

The purpose of this Project File and Functional Design Report can be described in two parts. Firstly, the Project File is intended to satisfy Phases 1 and 2 of the Municipal Class EA Planning Process, as defined by the MEA's *Municipal Class Environmental Assessment* (October 2000 as amended in 2007, 2011, and 2015) and described further in this report.

Secondly, this report describes a Functional Design for the expansion of the existing Kennedy-Burnett SWMF. The ultimate intent of the Functional Design is to implement recommendations contained in the Jock River Reach One Subwatershed Study. The study identified high-level watershed goals, which included improving water quality and quantity

control, augmenting low flows, enhancing aquatic communities/habitat, and providing opportunities for public use and enjoyment.

Another key objective of this report is to describe Novatech's initial evaluation and identification of a preferred servicing plan, according to land owner/developer input. The Novatech study ultimately defined the catchment areas which would be serviced by the pond expansion. This provided CH2M with the necessary information to conduct additional analyses, which led to determining a preferred pond expansion design.

Additional specific project objectives, based on discussions with project stakeholders, include the following:

- Provide 80 percent long-term removal of suspended solids for the runoff from the respective catchment areas, as per MOECC guidelines;
- Design to mitigate any potential negative impact to the existing Hydraulic Grade Line (HGL) in the tributary sewers upstream of the facility;
- Consider future facility operating levels as a result of further development that will discharge to the Kennedy-Burnett SWMF;
- Maximize the available footprint within City of Ottawa owned lands;
- Be consistent with City of Ottawa guidelines for SWMF design.

Section 3

Municipal Class EA Planning Process

3.1 Ontario Environmental Assessment Act

Ontario's Environmental Assessment Act (EA Act) was passed in 1976 and first applied to municipalities in 1981. The EA Act requires the study, documentation, and examination of the environmental effects that could result from major projects or activities.

The objective of the EA Act is to consider the possible effects of these projects early in the planning process—when concerns are most easily resolved—and to select a preferred alternative with the fewest environmental impacts.

The EA Act defines the environment very broadly as:

- Air, land, or water;
- Plant and animal life, including humans;
- The social, economic, and cultural conditions that influence the life of humans or a community;
- Any building, structure, machine, or other device or thing made by humans;
- Any solid, liquid, gas, odour, heat, sound, vibration, or radiation resulting directly or indirectly from human activities;
- Any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario.

The following two types of EA planning and approval processes are applied to projects to meet requirements of the EA Act:

- **Individual EAs (Part II of the EA Act):** Projects for which a Terms of Reference (TOR) and an individual EA are carried out and submitted to MOECC for review and approval;
- **Class EAs:** Projects that are approved subject to compliance with an approved Class EA process with respect to a class of undertakings. Provided that the appropriate Class EA approval process is followed, a proponent will comply with Section 13(3) a, Part II.1 of the EA Act.

3.2 Municipal Class EA Process

All municipalities in Ontario are subject to provisions of the EA Act when undertaking public works projects. The MEA's "Municipal Class Environmental Assessment" (October 2000 and amended in 2007, 2011, and 2015) document provides municipalities with a five-phase planning procedure approved under the EA Act to plan and undertake all municipal sewage, water, stormwater management, and transportation projects that occur frequently, are usually limited in scale, and have a predictable range of environmental impacts and applicable mitigation measures.

The EA planning process includes the following key components:

- Consultation early and throughout the process;
- Identification of a reasonable range of alternatives;

- Consideration of effects on the environment and ways to avoid/reduce impacts;
- Systematic evaluation of alternatives;
- Clear documentation;
- Traceable decision making.

Figure 3-1 illustrates the process followed in the planning and design of projects covered by a Municipal Class EA. The figure incorporates steps summarized in the following subsections that are considered essential for compliance with the EA Act.

3.3 Municipal Class EA Schedule

The Kennedy-Burnett SWMF project described in this report matches the MEA definition of 'Schedule B' Wastewater Management Project #3 – 'Enlarge stormwater retention/detention ponds/tanks or sanitary or combined sewage detention tanks by addition or replacement, at substantially the same location where additional property is required.' This Project File Report has therefore been prepared to satisfy the requirements for the successful completion of Phases 1 and 2 of the MCEA process for a Schedule B project.

3.3.1 Schedule B

Schedule B projects generally include improvements and expansions to existing facilities which have the potential for some adverse environmental effects. Proponents are required to proceed through a screening process including mandatory consultation with relevant review agencies and affected public to ensure that they are aware of the project and that their concerns are addressed.

Schedule B projects require that Phases 1 and 2 of the Class EA planning process, described below, be followed and that a Project File Report be prepared and submitted for public review. If there are no outstanding concerns raised by the public and/or review agencies, then the proponent may proceed to project implementation. However, if the screening process raises a concern that cannot be resolved, then the Part II Order procedure (formerly referred to as a "bump-up") may be invoked. Alternatively, the proponent may voluntarily elect to plan the project as a Schedule C project.

3.3.2 Phase 1

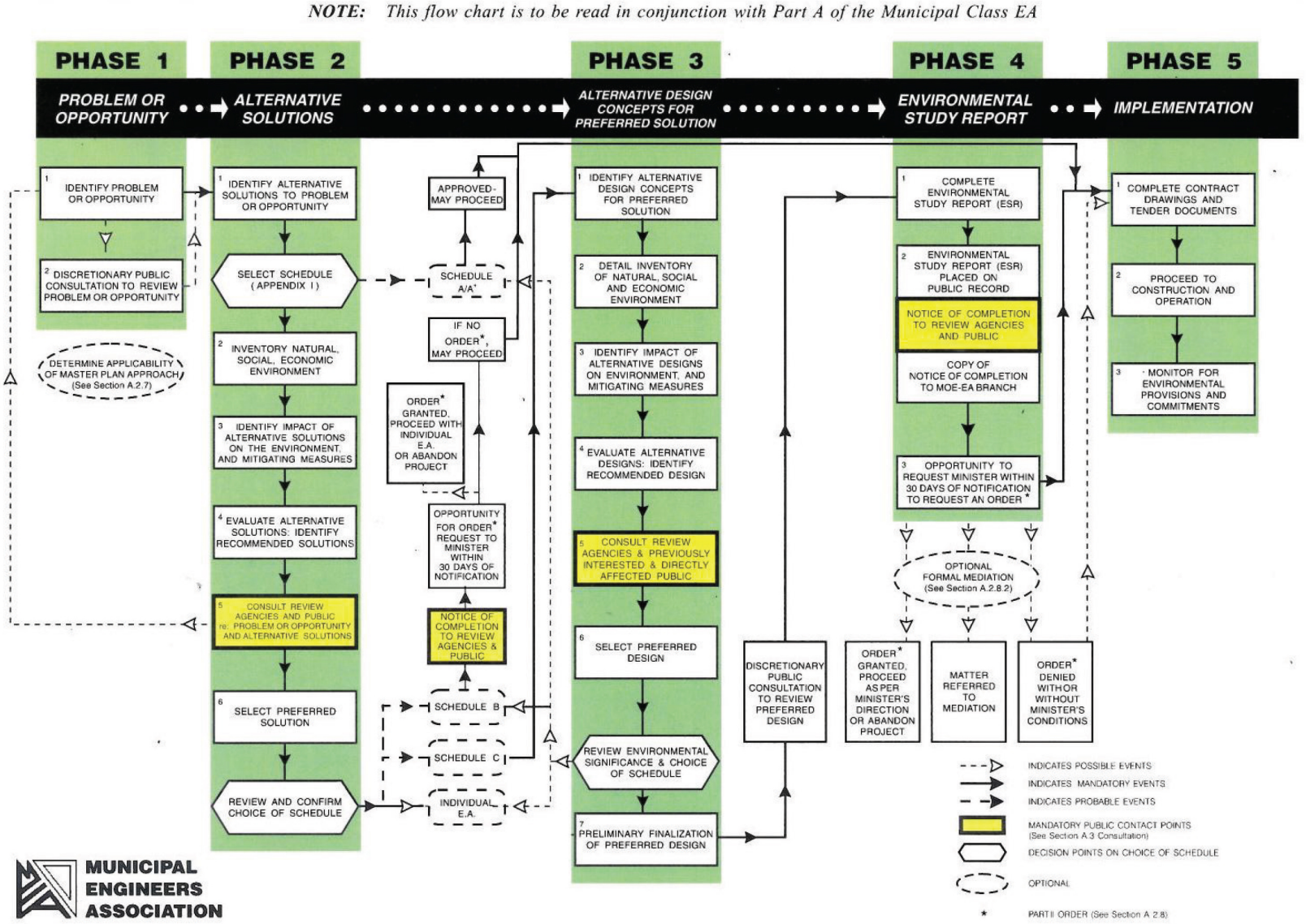
Identify the problem (deficiency) or opportunity.

3.3.3 Phase 2

Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input. Determine the appropriate Schedule for the undertaking and document decisions in a Project File for Schedule B Projects, making this report available for scrutiny by review agencies and the public.

FIGURE 3-1

Overview of the Class Environmental Assessment Planning Process



3.4 Problem Statement

Phase 1 of the two-phase Municipal Class EA planning process for Schedule B projects requires proponents of projects to document why infrastructure improvements are needed and to develop a Problem Statement that identifies what is being investigated.

A Municipal Class EA begins with a Problem Statement that becomes the central integrating element through the course of the project and helps to define the scope of work.

For the current study, the problem statement is as follows:

- The existing Kennedy-Burnett SWMF needs to be upgraded to meet the current MOECC and City of Ottawa water quality standards for the existing and future developments within its respective catchment area, as per recommendations from the Jock River Reach One Subwatershed Study.

Section 4

Existing Conditions

4.1 Existing SWMF and Study Area

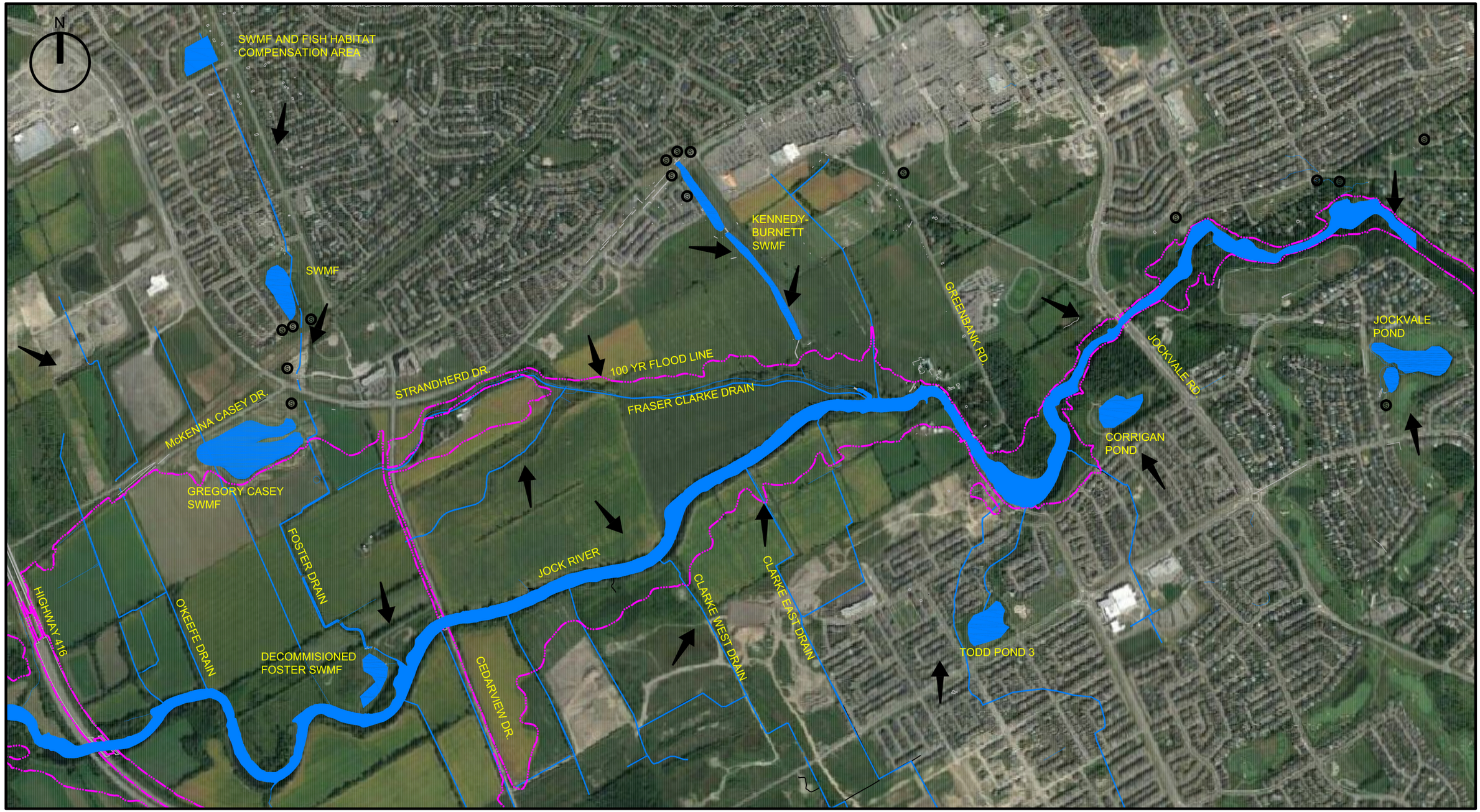
The Kennedy-Burnett SWMF is located at 3783 Strandherd Drive, and lies on approximately 8 hectares of City of Ottawa-owned lands. From north to south the facility discharges into the Fraser-Clarke Drain, which subsequently releases to the Jock River. The property title is listed as the Corporation of the Township of Nepean, which was a municipality prior to the 2001 amalgamation with the Regional Municipality of Ottawa-Carleton to form the City of Ottawa.

The facility borders Strandherd Drive at the north end, a residential area to the northwest, and a mixed commercial strip mall to the northeast. The south and central parts of the facility are surrounded by agricultural lands. Current zoning designation for the property is "Development Reserve Zone" indicating that it will be urbanized in the future. A small strip of land to the east of the pond south of the existing Home Depot store is currently zoned mixed commercial development. Currently, it is still agricultural land (GeoOttawa).

Figure 4-1 illustrates the Kennedy-Burnett SWMF, as well as surrounding stormwater infrastructure. The figure includes local stormwater management facilities, storm sewer outlets, drains, watercourses, and general overland flow routes, all of which are tributary to the Rideau River. Due to the rapid expansion of the South Nepean Urban Area this figure is not intended to be representative of all local stormwater infrastructure.

The Kennedy-Burnett EA project study area illustrated by Figure 4-2 includes a 316-hectare catchment area. The catchment consists primarily of residential lands, encompassing part of the Barrhaven Community located north of the Fraser-Clarke Drain and Jock River, south of Fallowfield Road, east of Ontario Highway 416, and west of the Southwest Transitway. The Bus Rapid Transit Route is located east of Greenbank Road. Figure 4-2 illustrates the 14 subcatchment areas which are under evaluation for the expansion of the Kennedy-Burnett SWMF. Under existing conditions, the residential area north of Strandherd Drive (subcatchments KB1 and KB2) and the commercial and residential development south of Strandherd Drive (subcatchments KB4 and KB5) discharge to the KB facility.

The existing facility hydraulic profile, shown in Figure 4-3, consists of a forebay, main cell, and outlet channel. The outlet channel consists of two sewers with inverts at 90.25 metres and 90.62 metres. The second sewer, a 525-millimetre diameter sewer with an invert of 90.62 metres, dictates the normal water level (NWL) of the facility. The facility's operating level was raised from 90.25 metres to 90.62 metres in 2007 to utilize additional permanent pool facility volume. The emergency spillway has a design elevation of 91.30 metres.



LEGEND

- 100 yr. FLOOD LINE
- OVERLAND STORMWATER FLOW ROUTES
- SEWER OUTLETS
- DRAIN \ WATERCOURSE

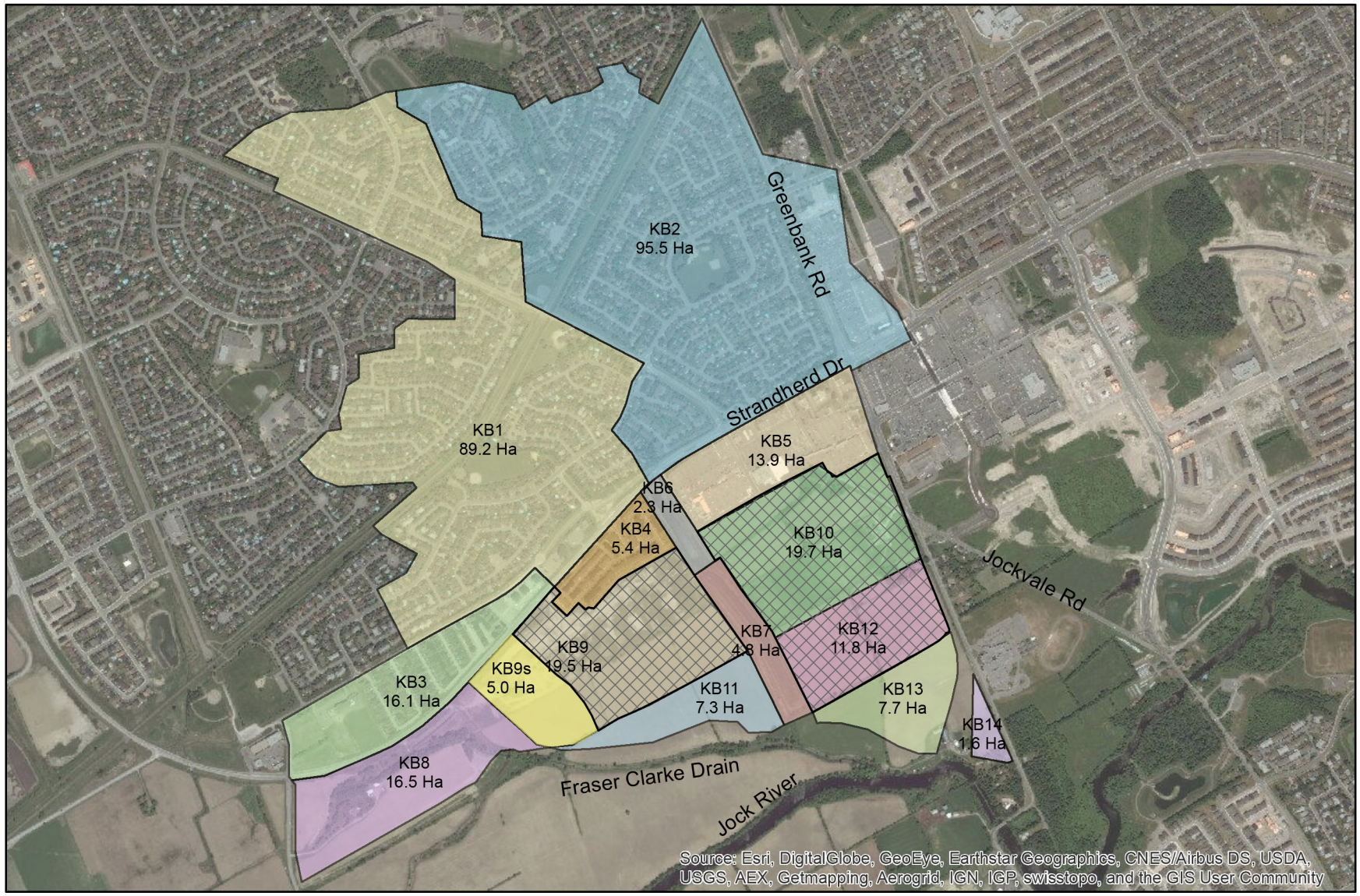
0 250 500m

ch2m. SM

PROJECT No. 482163

CITY OF OTTAWA
Kennedy Burnett SWMF EA

Figure 4-1
Kennedy-Burnett Surrounding Area Stormwater Infrastructure



N

0 500

Meters

Figure 4-2
Kennedy-Burnett SWMF Study Area
Catchment Areas

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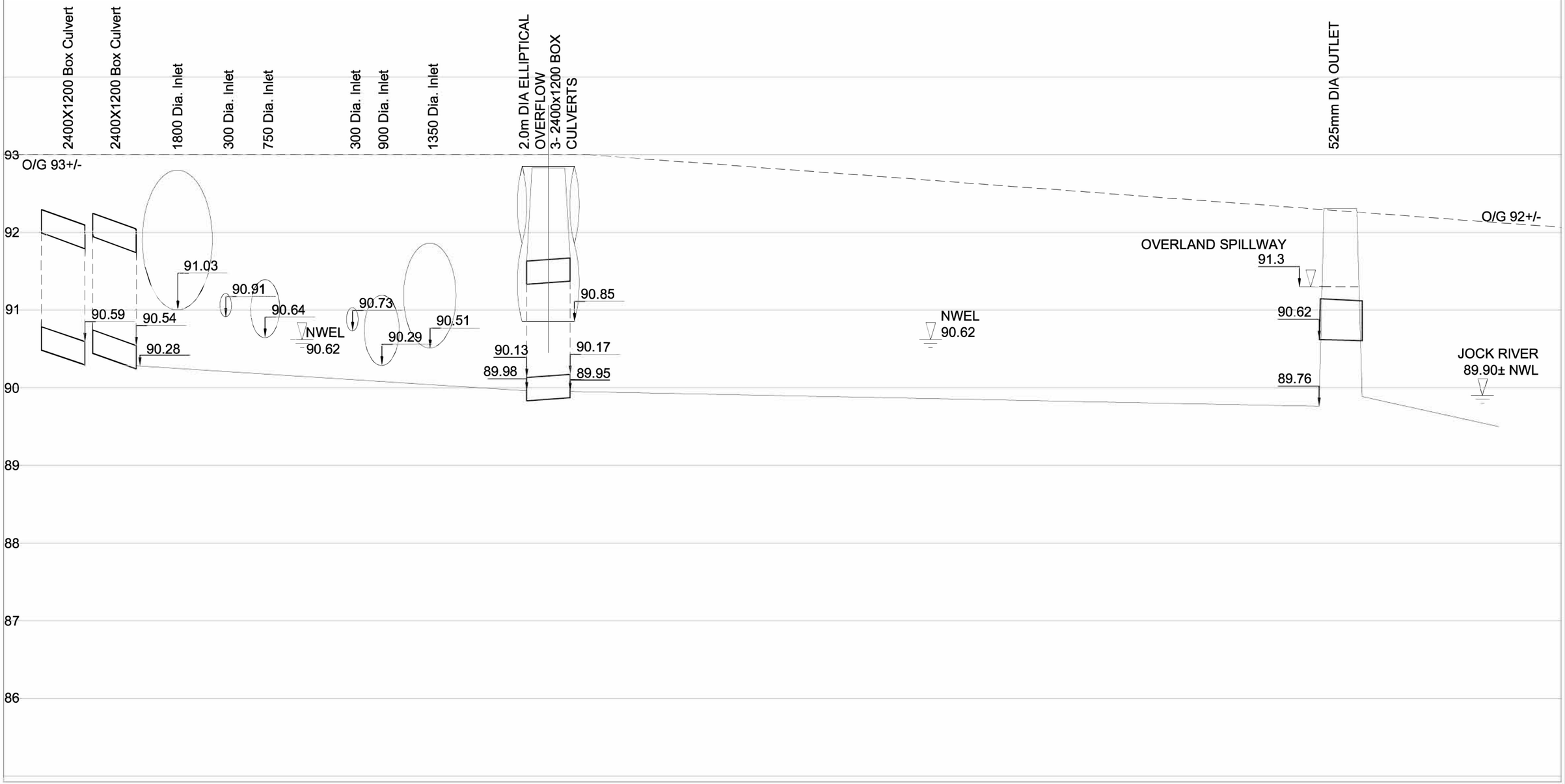
FOREBAY

MAIN CELL

OUTLET CHANNEL



KENNEDY BURNETT SMF
HYDRAULIC PROFILE (NTS)
EXISTING CONDITION
FIGURE 4-3

482163

ch2m:

4.2 Natural Environment Report

A report titled Kennedy-Burnett Drain Lot 13 to 15, Concession 3 Nepean Township, City of Ottawa Natural Environment – Existing Conditions Report was prepared by Niblett Environmental Associates Inc. in May of 2014 to characterize the existing natural environmental conditions of the Kennedy-Burnett Drain. Site visits to the study area were reported, to take inventory of: current SWMF infrastructure, investigations to confirm aquatic and fish habitat, wildlife corridors and wetland boundaries, rare plants, Species-at-Risk (SAR), vegetation, wildlife, fish, and surface water quality. The report also included an assessment of existing natural features and ecological function in the study area.

The site visits noted three vegetation communities (Old Field Meadow, Pond Edge-Riparian Zone and Riparian Zone-Outlet Channel and widenings), but no provincially significant wetlands, Earth Science Areas of Natural and Scientific Interest and Life Science were noted.

Within the study area, one mammal species (white tailed deer) and seven bird species (great blue heron, ring billed gull, Canada goose, mallard, red-winged black bird, American crow and song sparrow) were observed. No Species-at-Risk or nationally or provincially rare bird, fish, wildlife or plants species were observed during the site visits, though reference material noted the study area is possible habitat for the common nighthawk, bobolink, eastern meadowlark, grasshopper sparrow, snapping turtle and ram's head lady's slipper. The fish species within the study area identified by reference material were summarized in the report.

Surface water test results noted dissolved oxygen levels were at least 8.15 milligrams per litre over two sample sites, which were above the lowest acceptable range for warm water dissolved oxygen biota (5 to 8 milligrams per litre). The pH for both sample sites were 7.1 and 7.6, which fall within the acceptable range of 6.5 to 8.5. Turbidity at both sites, defined by Nephelometric Turbidity Units (NTU), was noted to be normal (3.34 NTU and 6.27 NTU).

The full report is included in Appendix B. Note that natural environmental conditions will be reviewed during detailed design to determine if any changes have occurred since the preparation of this report.

4.3 Phase 1 Environmental Site Assessment

In 2010, CH2M prepared a Phase 1 Environmental Site Assessment (ESA) report for the Kennedy-Burnett SWMF (Appendix C). The Phase 1 ESA was intended to assess the general property with respect to potential sources of contamination, and to identify the actual and potential for site contamination through a combination of activities such as records review, site visits, and interviews.

A Phase 1 ESA may assist in reducing uncertainty about potential environmental liabilities and may provide a basis for further property investigations. The report's conclusions included the following:

- Given that the Kennedy-Burnett SWMF is the receiving body of water for a significant area of development, there is the potential for contaminants discharged into the sewers, or washed from the street surface such as petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), chloride and metals or other compounds could accumulate in the sediment of the pond and require remediation;

- Asphaltic concrete in the bottom of the northern cell and the overflow weir will require appropriate disposal off-site;
- The report for the on-site disposal of sediment in 2000 indicated that precautions were taken for appropriate management of material during the cleanout work. However, pond modifications conducted in 1986 would likely have required sediment removal and no documentation of the disposal site or sediment characterization was available;
- Based on available information the potential impacts to shallow soil and groundwater in the vicinity of the site in general are considered low to moderate. However, in the absence of site-specific soil and groundwater quality information, the potential for impacts associated with the potential issues noted cannot be completely ruled out.

Based on a review of available information and a site visit, CH2M identified five potential areas of concern (PAOCs) outlined in Table 4-1.

Table 4-1. Summary of Potential Areas of Concern (PAOCs)

Potential Area of Concern	Site Location & Process/Area of Site	Rationale	Chemicals of Potential Concern
PAOC 1	3194 Jockvale Road, Adjacent Farm Property	Diesel fuel spill from aboveground storage tank to ditch with potential for groundwater and soil contamination, pesticide, herbicide, and fertilizer contamination from farm.	PHC, BTEX, herbicides, pesticides and potential for groundwater contaminants associated with use of agricultural fertilizers.
PAOC 2	Kennedy-Burnett SWMF 3783 Strandherd Drive, North Sediment Forebay	Offsite disposal of asphalt and concrete pond bottom, if removed. Sediment has potential for contamination above criteria for institutional use.	Anions, metals, PHC, BTEX and PAHs, herbicides, pesticides and potential for groundwater contaminants associated with use of agricultural fertilizers.
PAOC 3	Kennedy-Burnett SWMF 3783 Strandherd Drive, North Sediment Forebay – Home Depot storm sewer headwall	Localized contamination potential from Home Depot stormwater due to waste generator and pesticide registry results.	Anion, metals, PHC, BTEX and PAHs, herbicides, pesticides and potential for groundwater contaminants associated with use of agriculture fertilizers.
PAOC 4	Kennedy-Burnett SWMF 3783 Strandherd Drive, Sediment disposal areas western side of south cell (2 distinct areas)	Sediment disposal areas separate from native soils. Excavated native soils may be utilized on other sites with lower regulatory limits.	Anion, metals, PHC, BTEX and PAHs, herbicides, pesticides.
PAOC 5	Kennedy-Burnett SWMF 3783 Strandherd Drive, Outlet Weir Structure	Offsite disposal of asphalt and concrete pond bottom, if removed.	PHS and PAHs

4.4 Geotechnical Study

A report titled Soil and Bedrock Inventory and Preliminary Geotechnical Guidelines Foster and Kennedy-Burnett Stormwater Management Facilities Environmental Assessment, Ottawa, Ontario was prepared by Houle Chevrier Engineering in 2009. This report presents an inventory of the soil, bedrock, and groundwater conditions for the Foster and Kennedy-Burnett SWMF.

Surficial maps of the Ottawa area indicate that most of the EA study area is underlain by deposits of silty clay of marine origin. Deposits of glacial till are mapped at the northeast corner of the study area near the intersection of Strandherd Drive and Greenbank Road. A plan showing the general overburden conditions within the study area is provided in the report.

Bedrock geology maps show that the study area is either underlain by sandstone with interbeds of dolostone of the March formation, or by limestone with interbeds of dolostone of the Gull River formation. Drift thickness maps indicate that the thickness of the overburden is variable, with ranges of 0 to 1 metre, 2 to 3 metres, or 5 to 10 metres below ground surface within the northern catchment areas of the study, but with depth increases to 10 to 15 metres for the majority of the southern study area catchments.

The groundwater levels in the overburden are expected to be variable. Previous boreholes that have been advanced within the Kennedy-Burnett area and along Strandherd Road indicate that the groundwater levels in the silty clay overburden deposit typically range from about 0.4 to about 2 metres below ground surface. The groundwater levels in the overburden near the Jock River are likely closer to ground surface. The groundwater levels are expected to be higher during wet periods of the year, such as the early spring, or following periods of heavy precipitation.

A review of the existing borehole records indicated that the information in the records generally agrees with the overburden soil, drift thickness and bedrock mapping.

The full Houle Chevrier report is provided in Appendix D. Note that geotechnical conditions will be reviewed during detailed design to determine if any changes have occurred since the preparation of this report.

4.5 Fluvial Geomorphic Assessment

Minto Communities Inc., a developer with lands contained within the Kennedy-Burnett SWMF catchment areas, retained PARISH Aquatic Services, a division of Matrix Solutions Inc. (Matrix) to conduct a geomorphic erosion threshold assessment of the Fraser-Clarke Drain. The report, titled *Clarke Drain Erosion Threshold Assessment* (Matrix, 2016), described two reaches.

The first reach, CD-R1 extends from Borrisokane Road to the confluence with the main branch of the Fraser-Clarke Drain. The first reach consists of 4.5 to 10.0 metres bankfull width and 0.3 to 0.5 metres bankfull depth channel dimensions, with low average channel bottom slope of roughly 0.30 percent. Vegetation through the majority of the bed of the channel included cattails and long grasses, and at the downstream end, the drain widens to a marsh with dense cattail growth. Root wads were identified to have been installed throughout the reach to increase channel stability. The reach was given a high stability ranking (37) and was in regime, with a stability index of 0.06.

The second reach, CD-R2, extends from the confluence of CD-R1 with the main branch of the Fraser-Clarke Drain to the confluence with the Jock River. The banks are mostly composed of

muck and clay, and are vegetated with tall grasses and small trees. In certain locations the reach widens and is overgrown with cattails. Bankfull widths ranged from 5 to 10 metres and bankfull depths from 0.8 to 1.3 with a low average channel bottom slope of approximately 0.30 percent. The drain was moderately to highly stable (RSAT ranking of 35) and in regime (stability index of 0.12) with signs of widening, including leaning trees, large organic debris, exposed tree roots, and siltation in pools.

An analysis of critical erosion discharge rates for reaches 1 and 2 are 1.78 and 1.70 cubic metres per second, respectively. The analysis and conclusions of the report were accepted by the RVCA, as per a letter dated November 7, 2016. A copy of the threshold report and the RVCA letter stating their acceptance of the report conclusions are provided in Appendix E.

A previous report titled "Foster & Kennedy-Burnett Geomorphic Assessment – Update (Update Study – Foster & Kennedy-Burnett SWSF – August 2009)" was also prepared by Parish Geomorphic during November 2013 to update the original August 2009 study, available in Appendix E. The 2013 report updates and confirms the 2009 report findings.

The results from the 2013 Rapid Geomorphic Assessment (RGA) indicate that the channel has remained in a transitional state, as first reported in the 2009 report, from the SWMF to the Fraser-Clarke Drain with agradation being the dominant geomorphic adjustment process at work. Throughout the Kennedy-Burnett Drain, the 2013 study noted bank heights which ranged from 1.6 to 1.9 metres, and bankfull channel width and depth were 4.5 metres and 1.2 metres on average, respectively. The channel was found to be 'in regime' and in moderate stream health with RGA and RSAT scores of 0.15 and 25, respectively. The meandering channel was found to have rip rap along both banks and channel bed at a farm crossing culvert outlet near the upstream end. Throughout the middle channel section, clay was exposed in channel pools, and some riffles were found which consisted of fine gravels, pebbles and medium sands. The downstream end contained an unconsolidated fine sediment zone due to the backwatering effect of the Jock River and Fraser-Clarke Drain. The 2013 update noted rip rap from around the farm crossing culvert has moved 10 to 15 metres further downstream between 2009 and 2013, which indicated the drain can move cobble sized waterborne material. Riparian vegetation was composed primarily of tall grasses, pond weed, arrowheads, cattails and several trees.

Erosion threshold parameters were evaluated, and it was noted that the channel was found to be stable and moderately healthy in both 2009 and 2013. Heavy vegetation and controlled flows from the SWMF have contributed to the stabilization of the channel and substrates were at the same levels during both years. The critical discharge occurs slightly below bankfull flow, which indicates that fluctuations in water level do not affect sediment transport and erosion. However, if there were to be an increase in flow above the current bankfull levels, sediment mobility and erosion could increase.

4.6 Jock River Reach One Subwatershed Study

The Jock River Reach One Subwatershed Study (Stantec, 2007) provides a comprehensive summary of the existing conditions of the Jock River Reach One Subwatershed which includes the Kennedy-Burnett catchment including:

- Climate;
- Land use;

- Geology and Hydrogeology;
- Geomorphology;
- Hydrology and Hydraulics;
- Water Balance;
- Water Quality;
- Natural Environment.

The focus of the current study is to update the existing information for the Kennedy-Burnett catchment area, specifically that which has the potential to impact the design and construction of the expanded Kennedy-Burnett SWMF.

4.7 Aquatic Habitat

A report titled Foster and Kennedy-Burnett Stormwater Project – Fish Habitat Assessments – Foster and Fraser Clarke Drains, Barrhaven, City of Ottawa was prepared by Muncaster Environmental Planning Inc. (Muncaster, 2009). The purpose of the aquatic habitat assessment was to identify sensitive areas on the receiving watercourse that could potentially be impacted by changes in characteristics of the outlet from a proposed SWMF expansion. No fish sampling was completed as part of this report, although existing information was reviewed. Detailed fish habitat information was collected on August 11, 2009. Notes were made on the Kennedy-Burnett Stormwater Pond from the Stormwater Pond downstream to the confluence with the Fraser-Clarke Drain and the Fraser-Clarke Drain to the confluence with the Jock River.

In general, habitat along the Fraser-Clarke Drain was noted to be limited by the straight, ditch-like characteristics of the channel morphology, lack of pool habitat, dominance of fine substrate and minimal canopy cover. The inputs from the Kennedy-Burnett Drain and drain outlet contribute nutrients and flow to the fish habitat in the Jock River. The fish habitat has been described as non-critical in tributaries to the Jock River, however, the Fraser-Clarke Drain supports cool and warmwater fish habitat. Reported densities and diversity of fish in the tributaries of the Jock River are less than the Jock River itself however the tributaries still provide a flow, food and nutrient source to the overall Jock River system. It is noted that the confluence of tributaries with the Jock River and related pool habitat provide refuge during drier times.

Fish habitat in the tributaries to the Jock River is described as non-critical due to the ephemeral nature of the tributaries. However, a diversity of warm and coolwater forage fish along with pumpkinseed and white sucker have been reported in the Fraser-Clarke Ditch.

The majority of fish species reported for the watercourse are spring spawners, with some early summer and summer spawners. The in-stream vegetation will provide spawning habitat for many species such as brook stickleback, pumpkinseed, banded killifish, central mudminnow, and fathead minnow. Spawning habitat for the other species such as white sucker, common shiner, rock bass, blacknose dace, mottled sculpin and creek chub appeared more limited in the reaches of the watercourses examined. These species likely spawn in portions of the Jock River system that have a greater availability of coarse substrate.

In terms of sensitivity to elevated suspended sediment and turbidity levels, many of the fish species observed, such as creek chub, white sucker, blacknose dace and blacknose shiner are considered highly sensitive to sediment and turbidity for respiration activities, while creek chub and rock bass are considered to have a high sensitivity to elevated levels for feeding. Bluntnose

minnow, mottled sculpin, banded killifish and central mudminnow are considered to have a moderate sensitivity for reproduction, while brook stickleback, mottle sculpin, banded killifish and central mudminnow have a moderate sensitivity for feeding. A low sensitivity is reported for fathead minnows for respiration, reproduction and feeding functions, with brook stickleback designated a low sensitivity for reproduction and bluntnose minnow has a low sensitivity for feeding.

In summary, the aquatic habitat diversity of the Kennedy-Burnett Drain is limited, but still a diverse fish community is reported from the watercourse. This diversity adds to the productivity of the overall Jock River system.

The Muncaster (2009) report is included in Appendix F. Note that aquatic habitat conditions will be reviewed during detailed design to determine if any changes have occurred since the preparation of this report.

4.8 Archaeology

In 2016 Stantec produced a report titled "Stage 1 Archaeological Assessment, Chapman Mills Extension and Bus Rapid Transit – Environmental Assessment Study" (Stantec, 2016). The report included an analysis of new development areas, including catchment areas pertinent to the KB SWMF expansion project. The purpose of the study was to compile all available information about the known and potential archaeological heritage resources within the study area and to provide specific direction for the protection, management and/or recovery of these resources.

The report identified one Historic Euro-Canadian site recorded archaeological site within a one kilometer radius of the Chapman Mills Extension and Bus Rapid Transit study area. Based on the report considerations and background research, the pre-contact and post-contact Aboriginal archaeological potential of the study area was judged to be moderate to high. In addition, according to historic transportation routes and buildings within the study area being in close proximity to early Euro-Canadian settlements, the Euro-Canadian archaeological potential of the study area is judged to be moderate to high. In the context of the Kennedy-Burnett SWMF, areas of archaeological potential were identified in Figure 7 of the report.

A report titled Stage 1 Archeological Assessment (AA) for: Proposed Development Activities for the Foster and Kennedy-Burnett Stormwater Management Facilities Part of Lots 13 through 15, Concessions 3 and 4 Rideau Front City of Ottawa Ontario was prepared by Archaeoworks (2009). The purpose of the study was to determine what archeological impacts might occur within the study area to accommodate the proposed construction activities.

Detailed background research was conducted to illustrate the specific features contributing to the classification of high archeological potential zones within the limits of the subject lands. This research included a review of the Ministry of Culture archeological site database, which has revealed that no archeological sites have been found in a 2-kilometre radius of the subject lands. However, it was noted that the paucity of archeological sites within proximity to the subject lands is not reflective of the scale of previous inhabitation, but more likely a lack of detailed archeological surveys in the immediate area as there is high potential to encounter Aboriginal material due to the close proximity of Jock River and its tributaries.

A review of the "1879 Illustrated Historical Atlas of Carleton County" indicates a high potential for locating historical remains within the Kennedy-Burnett SWMF study area based on the illustration of a historic structure less than 100 metres from its eastern limits.

Non-intrusive field reviews of the Kennedy-Burnett Drain area were conducted in order to identify disturbances and physiographic conditions resulting in areas of low archeological potential and those undisturbed areas warranting Stage 2 assessment. Due to the disturbed condition of the study area, further systematic archaeological surveying was not deemed warranted in this specific area. However, as the majority of the study area is comprised of undisturbed open agricultural fields, based on the established potential for recovery of archeological material, further Stage 2 archeological investigations are warranted in all undisturbed locations to be impacted by construction.

The Stantec (2016) and Archaeoworks (2009) reports are included in Appendix G.

Section 5

Evaluation of Alternatives

5.1 Planning Alternatives

In accordance with Phase 2 of the MCEA process for Schedule B projects, a preliminary list of alternatives was considered for the Kennedy-Burnett SWMF including:

- Do Nothing/Limit Local Growth;
- No Stormwater Management;
- Expand Existing Kennedy-Burnett SWMF.

The "Do Nothing/Limit Local Growth" and "No Stormwater Management" alternatives are not considered viable options as they do not meet the City of Ottawa's Official Plan requirements for developments in the study area and are not consistent with recommendations from the South Nepean Urban Area Master Servicing and Jock River Reach One Subwatershed studies. Expanding the existing Kennedy-Burnett SWMF is the most viable option for treating runoff from the upstream catchment area and is consistent with the South Nepean Urban Area Master Servicing and Jock River Reach One Subwatershed studies.

5.2 Design Basis

The design for the expansion of the existing Kennedy-Burnett SWMF is intended to implement, as previously noted, recommendations described by the South Nepean Urban Area Master Servicing and Jock River Reach One Subwatershed studies. Several objectives lay the foundation for the basis of design for the expansion of the facility, which include, but are not limited to the following:

- Provide an enhanced (80% long-term suspended solids) level of water quality treatment for the runoff arising from the upstream catchment area;
- Mitigate negative impact to the existing hydraulic grade line in the sewers upstream of the facility. The reference points for HGL comparison are the two upstream manholes which are located on the 2,100-millimetre (MHST15316) and 1,800-millimetre (MHST51648) sewers on Strandherd Drive;
- Remain consistent with City of Ottawa guidelines for SWMF design;
- Consider future SWMF operating levels resulting from further urban development which will discharge to the Kennedy-Burnett SWMF;
- Maximize the available footprint within City of Ottawa-owned lands.

5.3 Stormsewer Servicing Technical Evaluation

Due to significant developer input during the EA process the landowners retained a second consultant, Novatech Engineering Consultants Ltd. (Novatech) in 2013. Novatech, a firm with experience in land development, and having existing land developer relationships, was responsible for combining the input of local land developers to develop storm servicing options. Novatech produced a report titled "Storm Servicing Options Evaluation¸ Future Development Lands Adjacent to Kennedy-Burnett SWM Facility" (Appendix A), which defined storm sewer

servicing options for the treatment of stormwater from the new development lands adjacent to the KB SWMF.

In 2014 Novatech produced an initial evaluation of servicing options for the area. The preliminary stormwater management options included:

- Construction of a new SWM facility adjacent to the Kennedy-Burnett SWMF;
- Construction of a new SWM facility east of Greenbank Road;
- Expansion of the existing Kennedy-Burnett SWMF;
- Hydrodynamic separators for new development.

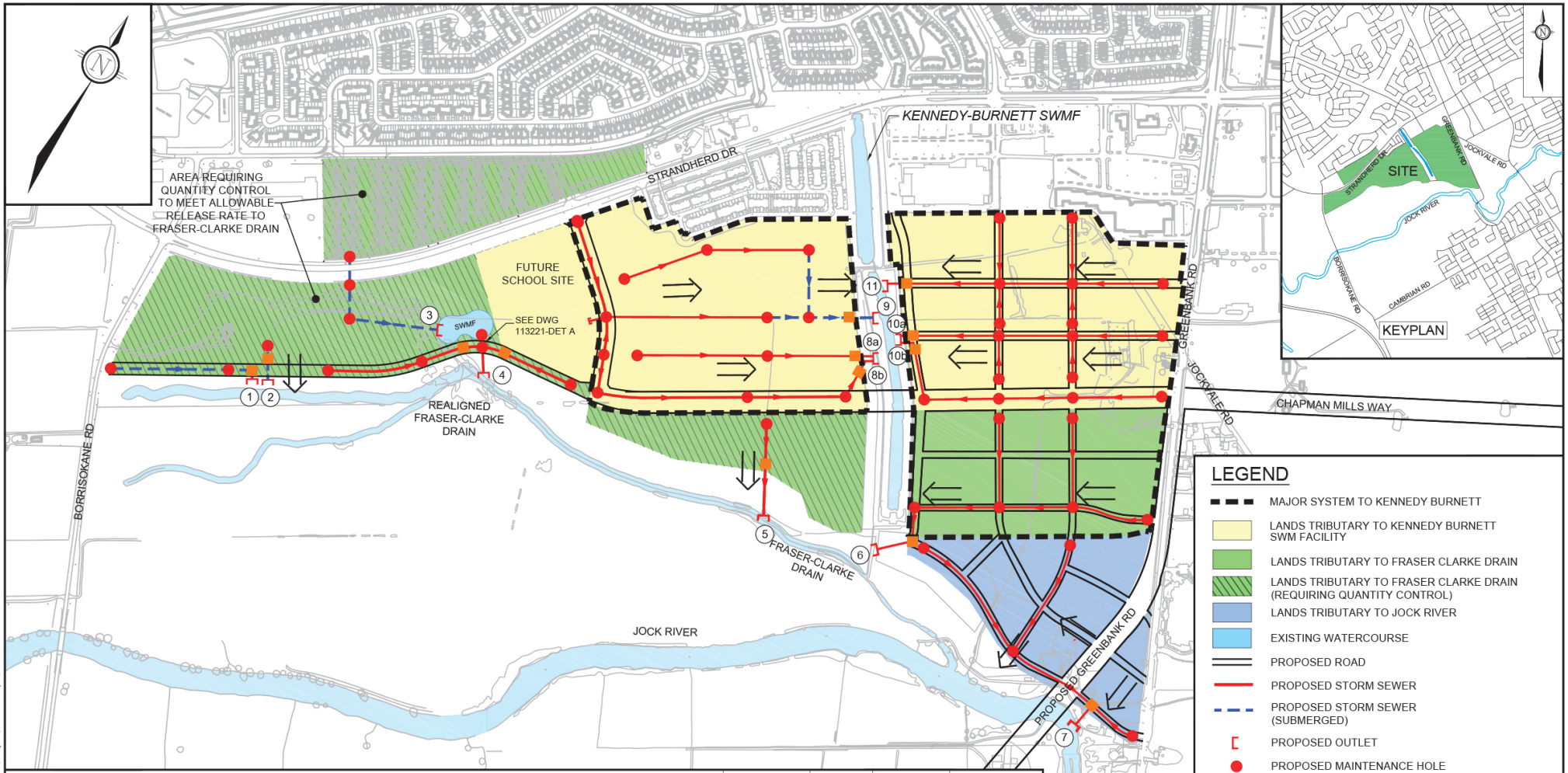
The report recommended the use of hydrodynamic separators to provide stormwater quality treatment for all new development south of Strandherd Drive, as this approach provides flexibility for the various developers by providing independent storm outlets, and does not require expansion of the existing Kennedy-Burnett SWM Facility to accommodate new development.

Feedback from the City of Ottawa's technical advisory committee included that regardless of whether new developments are directed to the pond, the existing Kennedy-Burnett SWMF requires expansion to improve the existing catchment area level of treatment. In addition, MOECC and City of Ottawa staff expressed concerns relating to HDS performance when servicing large areas while operating under continuously submerged conditions, as well as stormwater quantity control requirements for the Fraser-Clarke Drain.

Based on feedback received, Novatech's final servicing evaluation included the following four servicing options:

- Option 1: Trunk Storm Sewers to Expanded Kennedy-Burnett SWMF;
- Option 2: Storm Sewer Outfalls to Fraser-Clarke Drain/Jock River;
- Option 3a: Adjacent Lands to Kennedy-Burnett SWMF/New Pond for Fraser Fields and Clarke Residential Lands/ Hydrodynamic Separators for Remaining Areas;
- Option 3b: Same as Option 3a, Plus Hydrodynamic Separators at Outfalls to Kennedy-Burnett SWMF.

A technical evaluation of the storm sewer options was completed in collaboration with City of Ottawa stakeholders and land owners/developers, detailed in Appendix A. The primary storm servicing constraint in the servicing area was defined as the relatively low elevation of the site combined with geotechnical grade raise restrictions. Key factors influencing the grade raise requirements are the 100-year hydraulic grade line (for areas with foundation drains) and the required cover over the proposed storm sewers. Other factors weighing into the analysis include the extent of submerged sewers, land requirements for stormwater infrastructure, costs (capital, maintenance, life cycle), and flexibility for development. Based on the evaluation, Option 3b was the recommended alternative. Details of the technical evaluation, and additional advantages and disadvantages of the recommended option are provided in Appendix A. Figure 5-1 from the Novatech report illustrates the proposed servicing option drainage plan.



LEGEND

- MAJOR SYSTEM TO KENNEDY BURNETT
- LANDS TRIBUTARY TO KENNEDY BURNETT SWM FACILITY
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN (REQUIRING QUANTITY CONTROL)
- LANDS TRIBUTARY TO JOCK RIVER
- EXISTING WATERCOURSE
- PROPOSED ROAD
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER (SUBMERGED)
- PROPOSED OUTLET
- PROPOSED MAINTENANCE HOLE
- PROPOSED HYDRO DYNAMIC SEPARATOR (HDS)
- MAJOR OVERLAND FLOW DIRECTION

	OUTLET						SUBMERGED SEWERS	DEPTH TO OBVERT	MAX GRADE RAISE	STM HGL (D/S - U/S)
ID	WATER COURSE	DRAINAGE AREA	NWL	PIPE INVERT	PIPE SIZE	PEAK FLOW *CONTROLLED				
1	FRASER-CLARKE DRAIN	0.97 ha	90.25	90.15	600mm	28 L/s*	75m	1.5m	1.1m	91.75m - 92.30m
2	FRASER-CLARKE DRAIN	5.34 ha	90.25	89.85	965 x 1525mm ELLIPTICAL	187 L/s*	400m	1.5m	0.9m	91.75m - 92.20m
3	MINTO SWM POND	14.64 ha	90.00	89.81	1220mm x 1930mm ELLIPTICAL	1,785 L/S	195m	1.5m	0.8m	91.65m - 92.23m
4	FRASER-CLARKE DRAIN	1.29 ha + 14.64 ha	89.90	89.90	1050mm	692 L/S*	0m	1.5m	1.0m	91.65m - 92.25m
5	FRASER-CLARKE DRAIN	6.49 ha	89.87	89.87	965 x 1525mm ELLIPTICAL	363 L/S*	0m	1.8m	0.9m	91.65m - 92.00m
6	FRASER-CLARKE DRAIN	11.83 ha	89.90	89.90	1220mm x 1930mm ELLIPTICAL	1,649 L/S	0m	1.8m	0.8m	91.75m - 92.65m
7	JOCK RIVER	9.24 ha	89.20	89.20	965 x 1525mm ELLIPTICAL	1,252 L/S	0m	1.8m	0.1m	91.60m - 92.45m
8A	KENNEDY-BURNETT SWMF	6.58 ha	90.20	90.20	1050mm	915 L/S	0m	1.5m	0.9m	91.80m - 92.80m
8B	KENNEDY-BURNETT SWMF	2.44 ha	90.20	90.20	825mm	444 L/S	0m	1.8m	0.9m	91.80m - 92.76m
9	KENNEDY-BURNETT SWMF	15.49 ha	90.20	90.00	1220mm x 1930mm ELLIPTICAL	2,034 L/S	200m	1.5m	1.2m	91.90m - 93.18m
10A	KENNEDY-BURNETT SWMF	6.68 ha	90.20	90.20	1050mm	928 L/S	0m	2.0m	0m	91.80m - 92.80m
10B	KENNEDY-BURNETT SWMF	2.07 ha	90.20	90.20	825 mm	365 L/S	0m	2.0m	0m	91.80m - 92.78m
11	KENNEDY-BURNETT SWMF	10.90 ha	90.20	90.20	1220mm x 1930mm ELLIPTICAL	1,892 L/S	0m	1.8m	0.3m	91.90m - 92.78m

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KENNEDY-BURNETT SWMF SERVICING OPTIONS

OPTION 3b: HYBRID EXPANDED K-B SWIMF / HDS UNITS

SCALE 1 : 7500 (0, 100, 200, 300)

DATE JAN 2017 | JOB 113221 | FIGURE FIG-5-1

M:\2013\113221\CAD\Design\Figures\SWM\113221-FIGs 5-6.dwg, FIG-6, May 25, 2017 - 4:39pm, rhillier

5.4 Servicing Alternatives

Based on the stormwater servicing options prepared by Novatech, and through consultation with the City of Ottawa, CH2M prepared a report titled "Kennedy-Burnett Stormwater Management Facility – Alternative Definition and Assessment," which describes three potential servicing options for the facility expansion described within the study area. This report was distributed to the project stakeholders and is included as part of Appendix J.

Among the three options, the servicing for areas north of Strandherd Drive and including the Barrhaven Town Centre and Mattamy Homes Development remains consistent. Note that the Novatech study previously described (and included in Appendix A) provides a description of land ownership in the local area. However, alternatives consider different storm servicing options for vacant lands south of Strandherd Drive. This includes provision of water quality treatment via the expanded SWMF, offline from the SWMF via hydrodynamic separators, or a combination of the two. The three options are detailed in Figures 5-2 through 5-4 and are generally described as follows:

Option 1 – Figure 5-2

- Major and minor flow from north of Strandherd Drive, Barrhaven Town Centre east of the SWMF, and Mattamy Homes Development west of the SWMF, conveyed to the expanded facility for treatment;
- Minor flow from all areas south of Strandherd Drive and the Fraser Fields Subdivision conveyed to HDS for treatment and discharged to Fraser-Clarke Drain or Jock River (offline from SWMF);
- Major flow from a portion of the catchment area south of Strandherd Drive conveyed to SWMF with remainder conveyed overland to Fraser-Clarke Drain or Jock River.

Option 2 – Figure 5-3

- Major and minor flow from north of Strandherd Drive, Barrhaven Town Centre east of the SWMF and Mattamy Homes Development west of the SWMF conveyed to the expanded facility for treatment;
- Minor flow from all areas south of Strandherd Drive and the Fraser Fields Subdivision conveyed to SWMF for treatment;
- Major flow from a portion of the catchment area south of Strandherd Drive conveyed to SWMF with remainder conveyed overland to Fraser-Clarke Drain or Jock River.

Option 3 – Figure 5-4

- Major and minor flow from north of Strandherd Drive, Barrhaven Town Centre east of the SWMF and Mattamy Homes Development west of the SWMF conveyed to the expanded facility for treatment;
- Minor flow from a portion of the area south of Strandherd Drive conveyed to the SWMF for treatment with the remainder conveyed to HDS for treatment and discharged to Fraser-Clarke Drain or Jock River;
- Major flow from a portion of the catchment area south of Strandherd Drive conveyed to SWMF with remainder conveyed overland to Fraser-Clarke Drain or Jock River.

Stormwater quantity measures would be required for all areas draining to the Fraser-Clarke Drain.

N

0 500
Meters

KB SWM Facility
Minor to Fraser-Clarke Drain and Jock River
Minor and Major to KB SWM Facility
Major to KB SWM Facility

Figure 5-2
Option 1 Catchment Areas
June 2017

ch2m

Figure 5-3
Option 2 Catchment Areas
June 2017

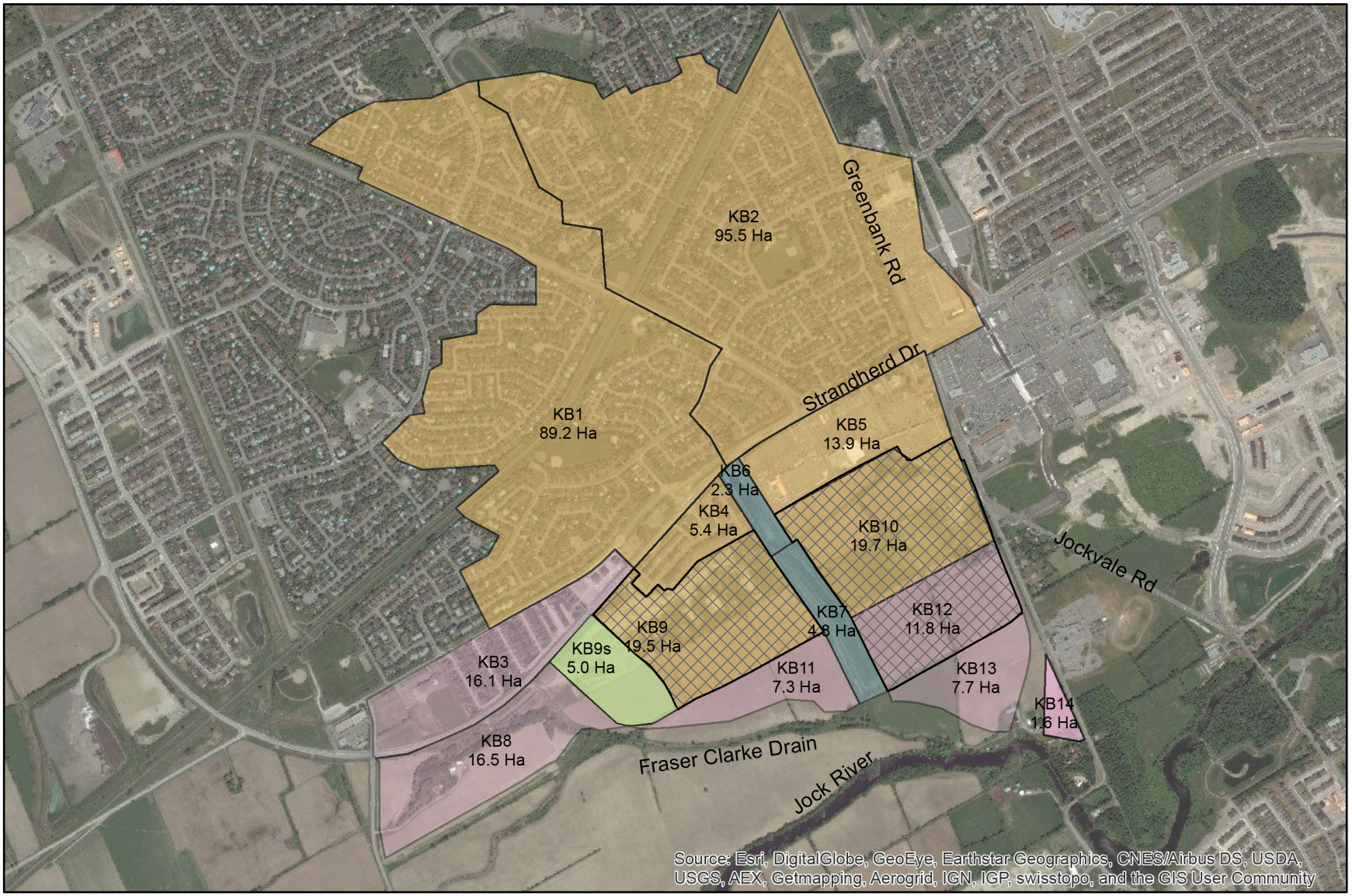


Figure 5-4
Option 3 Catchment Areas
June 2017

5.4.1 Catchment Areas

Summarized in Table 5-1 are the minor system catchment areas tributary to the expanded Kennedy-Burnett SWMF and those that are directed to HDS for offline quality control treatment for each option. For each option, there is a total of 255 hectares of major system discharge to the Kennedy-Burnett SWMF. The remaining 61 hectares of major system discharge drains either to the Fraser-Clarke Drain, to the Jock River, or is contained onsite.

Table 5-1. Minor System Area Draining to SWMF per Servicing Option (hectares)

Servicing Option	Total Minor System Area to KB SWMF (hectares)*	Total Minor System Area to HDS (hectares)
Existing	211	0
1	211	105
2	316	0
3	255	61

*Includes area of KB SWM Facility (approximately 7 hectares)

5.4.2 Quality Control Requirements

The volume requirements for 80 percent long-term suspended solids removal, per the 2003 MOECC Guidelines are summarized in Table 5-2 for the three servicing options. Of the specified storage requirement interpolated based on average imperviousness, 40 cubic metres per hectare is extended detention while the remainder represents the permanent pool.

Table 5-2. Storage Volume Required for 80 Percent Long Term Suspended Solids Removal, per MOECC (2003)

Servicing Option	Average Imperviousness (%)	Storage Volume Required (m^3/ha)	Minor System Area to SWMF (ha)*	Permanent Pool Volume Required (m^3)	Extended Detention Volume Required (m^3)
1	54	187	211	31,095	8,444
2	59	200	316	50,475	12,652
3	58	196	255	39,809	10,212

*Includes area of KB SWMF (approximately 7 hectres)

m^3/ha = cubic metre per hectare
ha = hectare

5.4.3 Operating Levels

The City of Ottawa has recently initiated a water level monitoring program to record levels in the Kennedy-Burnett SWMF, at the confluence of the SWMF outlet and Fraser-Clarke Drain and downstream at the outlet to the Jock River. Preliminary water level monitoring data collected by the City of Ottawa from May 13 to June 12, 2015 indicates that the Jock River water level is fairly

constant at approximately 89.9 metres over this period. This elevation has been therefore defined as the NWL in the Jock River for the current EA. Subsequent level data collected by the City of Ottawa, including longer-term Jock River water surface elevation trends will be incorporated into the detailed design of the SWMF.

The proposed NWL in the expanded SWMF was set 0.3 metres above the Jock River NWL at elevation 90.2 metres. This operating level is similar to the original design intent of the existing Kennedy-Burnett SWMF outlet structure (90.25 metres). This proposed NWL is also lower than the existing NWL which provides greater flexibility for servicing adjacent development parcels.

The proposed SWMF outlet structure will consist of a weir/orifice with invert set at elevation 90.2 metres which will be sized to control drawdown of the extended detention volume over at least 24 hours. The invert of the outlet conveyance culverts, which are sized in order to convey the peak flow through the facility in the 100-year event such that acceptable HGL elevations are maintained at the upstream reference manholes, will be located at the elevation corresponding to the required extended detention volume in the facility. This extended detention elevation varies per servicing option, as does the size of the conveyance structures at the crossings throughout the facility.

5.5 Conceptual Layouts

Conceptual layouts for the three scenarios were developed, and are detailed in Figures 5-5 through 5-7. The layout options were refined using criteria which included: volume requirements for permanent pool/extended detention; configuration to maximize water quality treatment (that is, encourage plug flow, discourage short circuiting); hydraulic feasibility (upstream and downstream conveyance and control structures); operation and maintenance considerations (access, bypasses, cleanout, and onsite sediment management); aesthetics; staging; and constructability.

In addition to maximizing the volume within the existing SWM block, the conceptual layouts also accommodate three crossings which are defined in the “South Nepean Town Centre Community Design Plan,” described as follows:

- 20.0-metre wide local crossing at the same location as the current access road between the north and south cells;
- 41.5-metre wide Chapman Mills crossing;
- 20.0-metre wide local roadway immediately north of the Jock River 100-year floodline (note that alignment has not been provided and is therefore shown conceptually on plans outside of SWM block).

Additional considerations included in the conceptual layouts include:

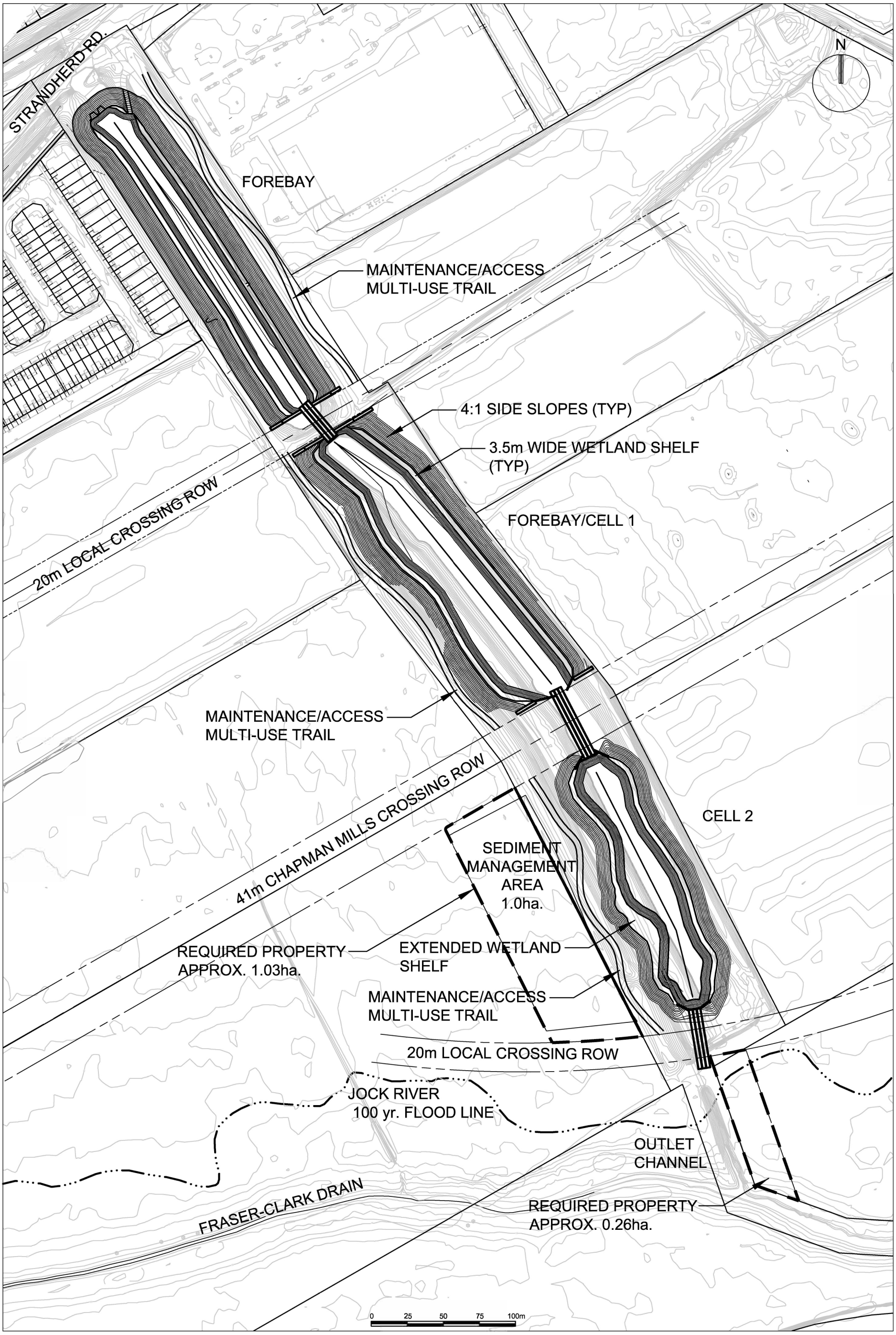
- Deepening of the SWMF by approximately 2.0 metres in order to maximize permanent pool treatment volume within the SWM block;
- Provision of a maintenance/multi-use trail through SWM block;
- Inlets from proposed development lands assumed to discharge into Forebay/Cell 1;
- Minimum 4:1 sideslopes as per City of Ottawa’s SWM Guidelines;

- 3.5-metre wetland shelf as per City of Ottawa's SWM Guidelines;
- Sediment management area equal to surface area at NWL in Forebay and upstream of Cell 1 inlets;
- Required SWMF footprint outside of SWM Block to be accommodated in lands west of SWMF and south of the proposed Chapman Mills ROW.

Upon a review of the conceptual layouts in conjunction with City of Ottawa land parcel data, it is noted that the acquisition of property is required for sections of the facility development, including portions of the following: outlet channel, sediment management area, multi-use pathway, and pond retrofit south of the future Chapman Mills crossing. Temporary easements may also be required, and should be investigated during preliminary and detailed design. Estimated land acquisition areas are provided in Figures 5-5 through 5-7, and generally include the following:

Table 5-3. Estimate of Required Land Acquisition per Servicing Option

Servicing Option	Area of Property #045950057 (hectares)	Area of Property #045950060 (hectares)	Total Property Required (hectares)
1	1.03	0.26	1.29
2	1.48	0.26	1.74
3	1.16	0.26	1.42



KENNEDY BURNETT SMF
PROPOSED LAYOUT
OPTION 1
FIGURE 5-5

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PLOT TIME: 9:29am

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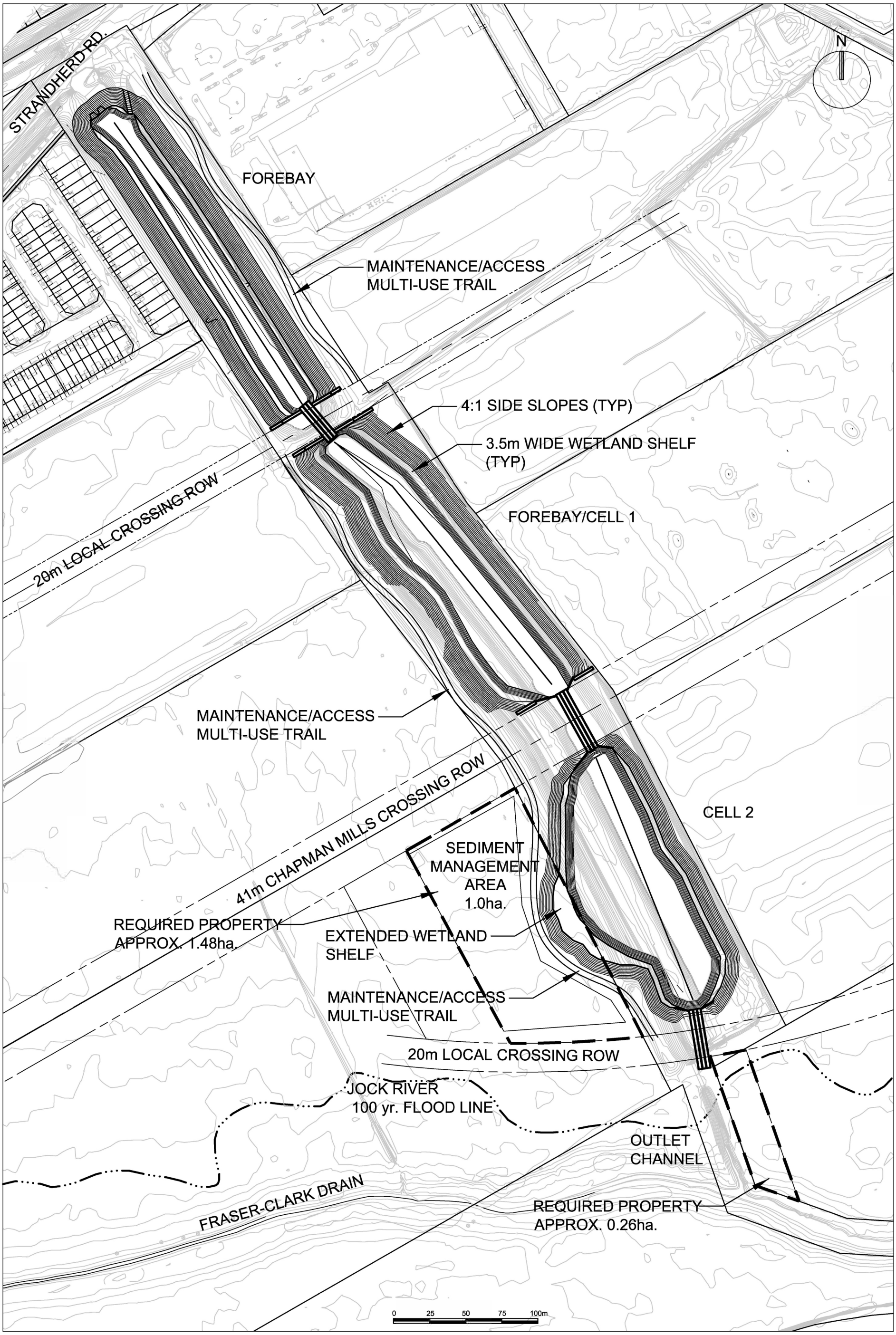

KENNEDY BURNETT SMF
PROPOSED LAYOUT
OPTION 2
FIGURE 5-6

FILENAME: FIG5_OPT2-EN.dwg
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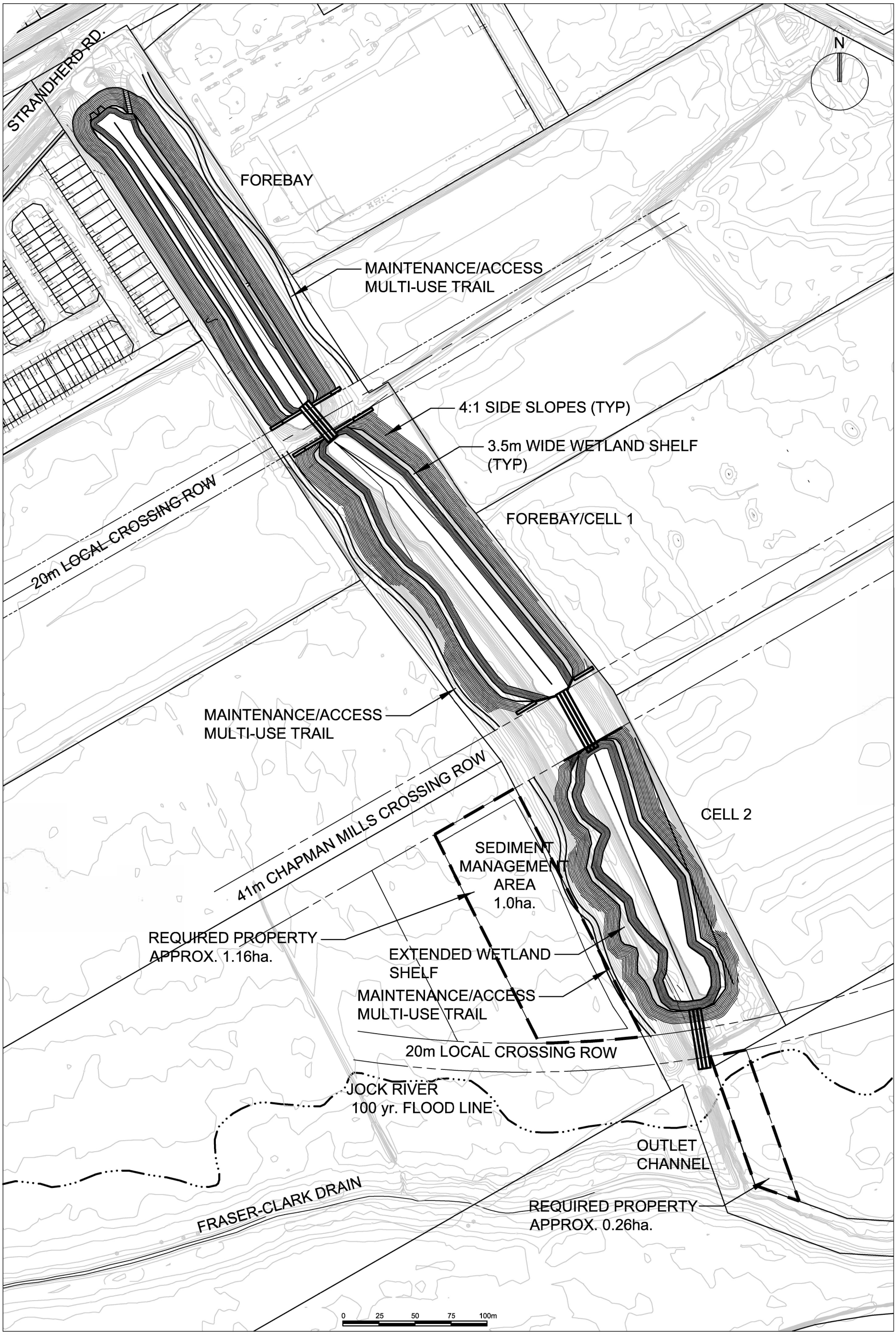
PLOT TIME: 9:26am



KENNEDY BURNETT SMF
PROPOSED LAYOUT

OPTION 3

FIGURE 5-7

FILENAME: FIG6_OPT3-EN.dwg PLOT DATE: Jan 31, 2017 PLOT TIME: 9:38am

5.6 Hydrologic Analysis

The hydrologic input parameters utilized in the SWMHYMO model are summarized below.

The 3-hour 100-year design rainfall event was generated using the IDF data available from the City of Ottawa's 2012 City Sewer Design Guidelines. In previous modeling work it was established that the 3-hour 100-year design rainfall event run against the 5-year Jock River boundary condition is the most critical event for peak flow analysis. The design storms were generated on a 12-minute time step to be consistent with other studies completed in the area.

The SWMHYMO Calib Standhyd command with SCS Curve Number loss method was utilized for all subcatchments. The CN value for the pervious surface was estimated based on Table 5-9 (CN values for Various Soil Groups) from the City of Ottawa Sewer Design Guidelines, and per the SWMHYMO manual which states that CN values for typical landscaped grass surfaces range from 75 to 85.

The total and directly connected percent impervious values for the subcatchments were estimated from GIS layers and aerial imagery. Based on sample calculations for representative areas, it was estimated that the directly connected impervious area is approximately 9% lower than the total impervious area for the residential areas. For highly impervious commercial areas with flat roofs (such as subcatchment KB3) all of the impervious area is assumed to be directly connected. The total and directly connected impervious areas for the residential subcatchments KB1 and KB2 north of Strandherd Drive were obtained from CH2M's Barrhaven Basin 3 Dual Drainage Modeling (2012).

The initial abstraction values for the pervious and impervious surfaces were estimated as 4.67 millimetres and 1.57 millimetres, respectively, as per Section 5.4.5.4 of the City of Ottawa Sewer Design Guidelines for depression storage in typical pervious and impervious surfaces in the City of Ottawa.

The slope of the pervious surfaces was estimated at 2 percent for all subcatchments, which represents an average slope for residential lots. The slope of the impervious surface was estimated by measuring the slope of the average conveyance route (that is, the storm system) in the subcatchment.

The length of pervious surface was estimated as 40 metres for all subcatchments, which represents an average length of the residential lots. The length of the impervious surface was estimated from GIS as the average representative travel length of the main conveyance system (that is, the storm system).

The manning's roughness coefficient for the pervious surface was estimated as 0.25 (representing flow across grassed lots) and 0.013 (representing flow in the concrete storm sewer).

The inlet capture rate for each subcatchment was simulated using a Route Reservoir command, whereby the average inlet capture rate for the subcatchment is applied as the outflow rate, across a range of arbitrary storage values that represents the available storage for overland ponding in the subcatchment. For subcatchments KB1 and KB2, which were modelled as part of CH2M's Barrhaven Basin 3 Dual Drainage Modeling (2012), the average capture rates are 120 litres per second per hectare for the 3-hour 100 year Chicago Event. For the other subcatchments in the study area, a capture rate equal to the 5-year flow rate has been applied.

Summarized in Table 5-4 are peak flow rates discharging to the SWMF for each servicing option. For proposed development lands south of Strandherd Drive, it is assumed that runoff tributary to the expanded SWMF would discharge into the middle (Forebay/Cell 1) cell.

Table 5-4. Peak Inflow (m^3/s) Hydrographs to SWMF

Servicing Option	Peak Inflow from Existing Development, North of Strandherd Drive (m^3/s)		Peak Inflow from Existing Development, South of Strandherd Drive at Forebay (m^3/s)	Peak Inflow Future Developed Lands at Forebay/Cell 1 (m^3/s)
Model Node	**-51648**	**-15316**	**Forebay[a]**	**Forebay/Cell 1[b]**
1	11.5	10.7	3.14	8.73
2	11.5	10.7	3.14	19.56
3	11.5	10.7	3.14	14.17

[a.] Includes runoff generated by Mattamy Homes development, Home Depot commercial area, and Kennedy-Burnett SWMF Forebay.

[b.] Includes runoff according to the given scenario. Refer to Figures 5-2,5-3 and 5-4 for illustration of catchment areas tributary to Forebay/Cell1.

m^3/s = cubic metre per second

5.7 Hydraulic Analysis

A hydraulic model was developed using XPSWMM (v2012) to represent each of the proposed servicing options. Hydrographs generated from hydrologic modelling (SWMHYMO) were input to the hydraulic model at their respective inflow locations.

Two design conditions were applied to the hydraulic model as follows:

- Condition 1 – 5-year flow (Chicago 3-hour design rainfall event) tributary to the Kennedy-Burnett SWMF with a Jock River 100-year level of 91.59 metres;
- Condition 2 – 100-year flow (Chicago 3-hour design rainfall event) tributary to the Kennedy-Burnett SWMF with a Jock River 5-year level of 90.93 metres.

Condition 2 in which the 100-year runoff and 5-year Jock River boundary condition was applied to the model resulted in the more conservative HGL elevations in the SWMF and upstream conveyance system and was therefore defined as the critical event for the current analysis.

The hydraulic model was used for preliminary outlet structure sizing as described above as well as conveyance under each of the proposed crossings. Summarized in Table 5-5 are proposed culvert crossing details for each scenario as well as the extended detention elevations associated with each.

Table 5-5. Culvert Crossing Dimensions and Elevations for Three Servicing Options

Servicing Option	Pedestrian Crossing	Future Chapman Mills	Local Road
1	24 m length of (3) 1.2 m x 2.4 m at 90.2 m (NWL)	50 m length of (3) 1.2 m x 2.4 m at 90.2 m (NWL)	40 m length of (3) 1.2 m x 2.4 m at 90.6 m (Ext. Det Elev.)
2	24 m length of (3) 1.8 m x 2.4 m at 90.2 m (NWL)	50 m length of (3) 1.8 m x 2.4 m at 90.2 m (NWL)	40 m length of (3) 1.5 m x 2.4 m at 90.8 m (Ext. Det Elev.)
3	24 m length of (3) 1.5 m x 2.4 m at 90.2 m (NWL)	50 m length of (3) 1.5 m x 2.4 m at 90.2 m (NWL)	40 m length of (3) 1.2 m x 2.4 m at 90.7 m (Ext. Det Elev.)

Table 5-6 summarizes the resulting HGL at the upstream reference manholes under the existing condition as well as for the three proposed servicing options under the critical event condition. The maximum HGL through the facility is also provided.

Table 5-6. HGL Elevations for Existing and Proposed Servicing Options

Servicing Option	Critical Event HGL (m)				
	MHST15316	MHST51648	Cell 1	Cell 2	Cell 3
Existing Model	93.21	93.85	92.76	-	92.71
Scenario 1	93.04	93.85	92.00	91.78	91.49
Scenario 2	93.27	93.85	92.12	92.02	91.78
Scenario 3	93.15	93.85	92.03	91.89	91.65

As shown in Table 5-6, the HGL in the 1,800-mm diameter storm sewer (MHST51648) upstream of Strandherd Drive remains consistent between the existing and proposed servicing options. However, the HGL in the 2,100-mm diameter storm sewer (MHST15316) upstream of Strandherd Drive is impacted by each of the hydraulic conditions associated with the various options. As such, sizing of conveyance culverts at the crossings as well as at the outlet were optimized in order to mitigate impacts to the existing HGL upstream of Strandherd Drive.

Under the existing condition the 100-year water surface elevation (WSEL) in the upper cell is 92.76 metres. Under the proposed scenarios, the 100-year WSEL in the upper cell is lowered by 0.76 metres, 0.64 metres, and 0.73 metres as compared to the existing condition for Options 1, 2, and 3, respectively. Similarly, the 100-year WSEL is between 0.93 metres and 1.22 metres lower than the existing condition in the lower cell for the proposed options.

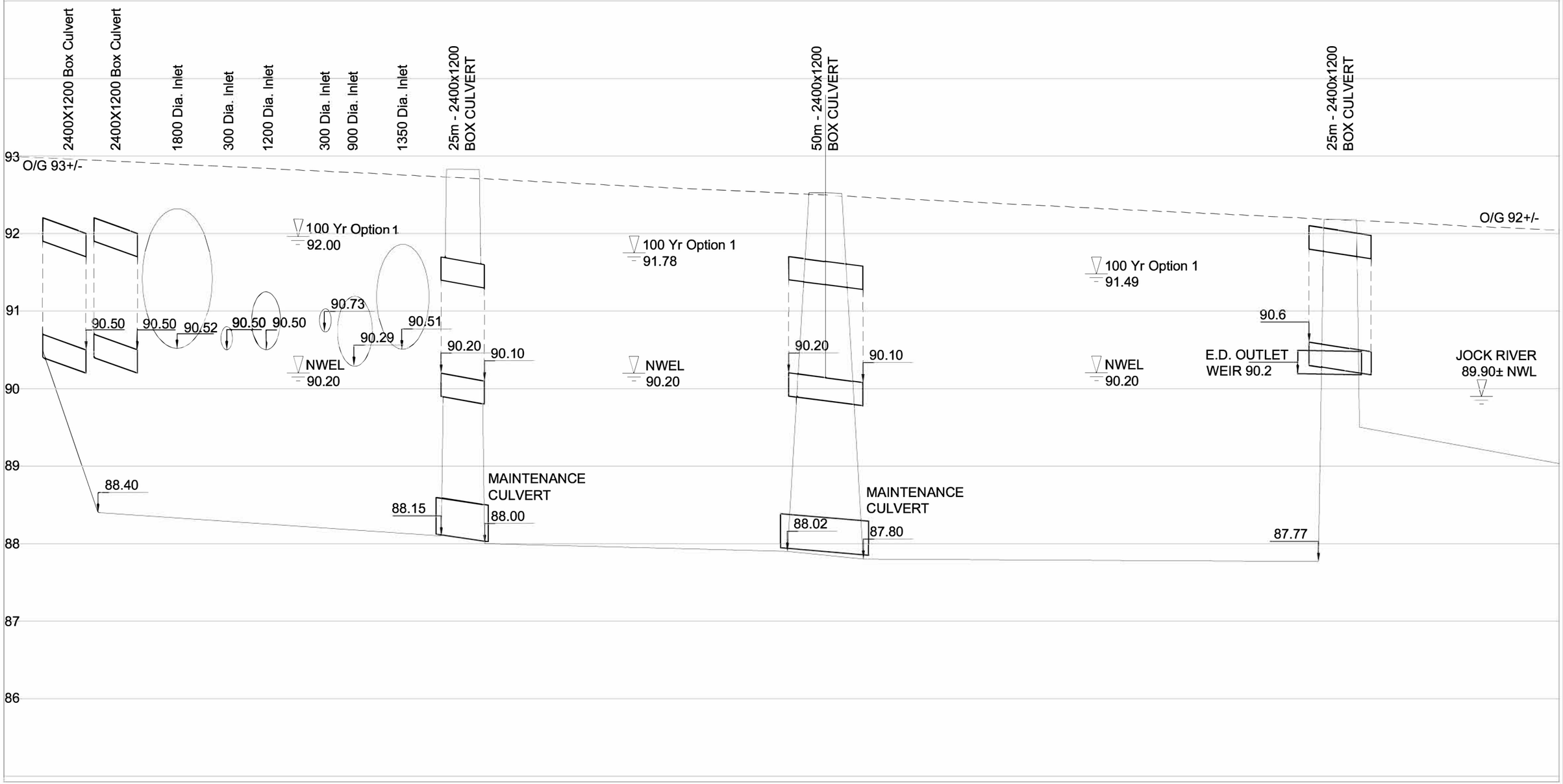
Based on hydraulic model results and preliminary design discussed above, hydraulic profiles for the existing and each of the proposed options were developed and are shown in the following Figures 5-8 through 5-10.

FOREBAY

FOREBAY/CELL 1

CELL 2

OUTLET CHANNEL



KENNEDY BURNETT SMF
HYDRAULIC PROFILE (NTS)

PROPOSED CONDITION - OPTION 1

FIGURE 5-8

482163

ch2m:

FOREBAY | FOREBAY/CELL 1 | CELL 2 | OUTLET CHANNEL

2400X1200 Box Culvert
2400X1200 Box Culvert
1800 Dia. Inlet
300 Dia. Inlet
1200 Dia. Inlet
300 Dia. Inlet
900 Dia. Inlet
1350 Dia. Inlet
25m - 2400x1800 BOX CULVERTS
50m - 2400x1800 BOX CULVERTS
25m - 2400x1500 BOX CULVERTS

93
O/G 93+/-
O/G 92+/-
92
100 Yr Option 2
92.12
100 Yr Option 2
92.02
100 Yr Option 2
91. 78
91
90.50
90.50
90.52
90.50
90.50
90.73
90.29
90.51
90.20
90.10
90.20
90.10
90.8
NWEL
90.20
NWEL
90.20
NWEL
90.20
90
OUTLET
WEIR
90.2
JOCK RIVER
89.90± NWL
89
88.40
MAINTENANCE
CULVERT
88.15
88.00
MAINTENANCE
CULVERT
87.90
87.80
87.77
88
87
86

KENNEDY BURNETT SMF
HYDRAULIC PROFILE (NTS)

PROPOSED CONDITION - OPTION 2
FIGURE 5-9

482163

ch2m:

FOREBAY | FOREBAY/CELL 1 | CELL 2 | OUTLET CHANNEL

2400X1200 Box Culvert
2400X1200 Box Culvert
1800 Dia. Inlet
300 Dia. Inlet
1200 Dia. Inlet
300 Dia. Inlet
900 Dia. Inlet
1350 Dia. Inlet
25m - 2400x1500 BOX CULVERTS
50m - 2400x1500 BOX CULVERTS
25m - 2400x1200 BOX CULVERTS

93
O/G 93+/-
O/G 92+/-
92
91
90
89
88
87
86

100 Yr Option 3
92.03
100 Yr Option 3
91.89
100 Yr Option 3
91.65

90.50
90.50
90.52
90.50
90.50
90.73
90.29
90.51
NWEL
90.20
90.20
90.10
NWEL
90.20
90.20
90.10
NWEL
90.20
90.7
E.D. OUTLET
WEIR 90.2
JOCK RIVER
89.90± NWL

88.40
88.15
MAINTENANCE
CULVERT
88.00
87.90
MAINTENANCE
CULVERT
87.80
87.77

KENNEDY BURNETT SMF
HYDRAULIC PROFILE (NTS)

PROPOSED CONDITION - OPTION 3
FIGURE 5-10

ch2m:

5.8 Cost Estimate

As per direction from the City of Ottawa, a Class "C" Cost Estimate was prepared based on the functional requirements of the EA, which provides a +/- 30% level of accuracy according to the City of Ottawa's Cost Estimate Classification System. The analysis for the three servicing options is provided in Appendix H, and generally includes the following limitations as they pertain to each servicing option:

- Does not include the segment of the South Nepean Collector Sanitary Sewer to be constructed across the facility;
- Does not include road infrastructure for ROW crossings (North ROW, Chapman Mills Drive, South ROW). Only culverts are included;
- Does not include hydrodynamic separators constructed as part of the STM sewer network in the new developments;
- Does not include modifications to the north inlet headwalls at Strandherd Drive. These are to be undertaken as part of the Strandherd Drive Widening Project.

According to the analysis provided, estimated total project costs for Alternatives 1 through 3 for the expansion of the Kennedy-Burnett SWMF are $12.15 million, $13.68 million, and $12.96 million, respectively. This estimate includes construction cost, engineering design and contract administration, unforeseen utility issues, City of Ottawa internal costs, property costs, miscellaneous costs, and contingency. The next phases in design, pending acceptance of the EA after the 30-day review period, will provide a more accurate representation of the final project costs.

As part of Novatech's Storm Servicing Options Evaluation (Appendix A), a Class 'C' Cost Estimate was prepared for the four potential sewer servicing options in the neighbouring lands. The evaluation, including noted assumptions, is provided in Appendix C of Novatech's report. The total estimated cost including contingency, for storm servicing options 1 through 3b is $12.35 million, $10.11 million, $10.67 million, and $11.14 million. These costs do not include the expansion of the Kennedy-Burnett SWMF, which are summarized in the paragraph above.

5.9 Alternatives Evaluation

As part of the selection process in accordance with EA planning principles, CH2M, in conjunction with the relevant stakeholders, produced an Alternatives Evaluation Matrix (Appendix I) to assess which option was preferred for the expansion of the Kennedy-Burnett SWMF. The basis for evaluating each option was discussed with the Technical Advisory Committee, which included the following members:

- City of Ottawa
  - James Hall
  - Joseph Zagorski
  - Michael Burt
  - Selma Hassan
  - Jonathan Knoyle
  - Eric Tousignant
  - Ron Rooke

  - John Bougadis
- Rideau Valley Conservation Authority
  - Glen McDonald
  - Jennifer Lamoureux
- CH2M
  - Brian Graham
  - Dave Turcotte
  - Kelly Meaney

The following five categories and their respective subcategories were developed, and used to select the preferred option.

Technical

- Water Quality: The robustness of the alternative to provide ongoing treatment of water quality control (Enhanced Level – 80% TSS removal);
- Conveyance Control: The ability of the alternative to convey stormwater flows and improve the capacity of the conveyance system;
- Compatibility with Development and Growth: The compatibility of the alternative with development planning;
- Constructability, Implementation, and Work Scope: The ability of the alternative to be constructed and implemented on a technical, regulatory, and practical basis; within a reasonable scope of work;
- Submerged Sewers: The ability of the alternative to reduce submerged sewers;
- Operations & Maintenance: The ability of the alternative to be operated and maintained with ease.

Environmental

- Quality Control: The potential of the alternative to maintain or improve water quality;
- Vegetation: The ability of the alternative to protect high quality vegetation including native species;
- Terrestrial Habitat: The potential for the alternative to maintain or enhance terrestrial habitat;
- Aquatic Habitat: The potential for the alternative to maintain or enhance aquatic habitat;
- Groundwater: The ability of the alternative to protect groundwater resources.

Social

- Cultural Heritage: The potential of the alternative to protect cultural/heritage resources;
- Public Health & Safety: The potential of the alternative to minimize the risk of liability to community health and safety;
- Occupational Health & Safety: The potential of the alternative to minimize risk or liability to occupational health and safety resulting from flooding;

- Recreation: The ability of the alternative to provide or enhance recreational activities (existing trails and potential greenspace development);
- Aesthetics: The ability of the alternative to maintain or enhance the visual character of the area and mitigate potential odour issues;
- Stakeholder Acceptance: The potential of the alternative to be accepted by stakeholders including landowners, First Nations, and the public.

Planning

- Consistency with Planning Policy: The ability of the alternative to adhere to the City of Ottawa's Official Plan;
- Agency Approvals: The ability of the alternative to meet required approvals from the City of Ottawa and regulating agencies (RVCA, MNRF, MOECC, DFO);
- Property Acquisitions: The relative impact that the alternative has on property acquisition requirements.

Economic

- Capital cost: Estimated capital cost;
- Operations & Maintenance Cost: Estimated ongoing operation and maintenance.

A 'Reasoned Argument' evaluation methodology was used to identify a preferred option based on the relative advantages/disadvantages of each concept, in consultation with the City of Ottawa and project stakeholders. Based on the evaluation, the preferred servicing option was determined to be Option 3, the hybrid solution of Options 1 and 2 where stormwater servicing for vacant lands south of Strandherd Drive would be treated via a combination of offline hydrodynamic separators and an expanded SWMF.

A sensitivity analysis was also conducted using a weighted/scoring methodology to test the robustness of the evaluation scenarios including:

- Even Weighting Criteria;
- Excluding Cost Criteria;
- High Social Criteria;
- High Environmental Criteria;
- High Planning Criteria.

Other than the High Planning Criteria sensitivity analysis, where Option 1 scored highest and Option 2 and 3 scored equally, Option 3 was the preferred option for each sensitivity analysis. Generally, Option 3 was the preferred alternative as it provides substantial improvements to conveyance and capacity. While some property is required, it generally minimizes impacts to natural environment and the community, and can be constructed, operated, and maintained economically.

Recommended Servicing Alternative

The recommended alternative for the expansion of the Kennedy-Burnett SWMF, as per the evaluation described in Section 5, is Option 3 (refer to Figures 5-1, 5-4, 5-7, and 5-10) a hybrid of Options 1 and 2 where stormwater servicing for vacant lands south of Strandherd Drive will be treated via a combination of offline hydrodynamic separators, a new SWM pond on the Minto Clarke lands and the expanded SWMF. The following section describes the proposed functional design based on a summary of the design details discussed in Section 5.

6.1 Description of Functional Design

The proposed NWL in the expanded SWMF was set 0.3 metres above the Jock River NWL at elevation 90.2 metres. This operating level is similar to the original design intent of the existing Kennedy-Burnett SWMF outlet structure (90.25 metres). This proposed NWL is also lower than the existing NWL which provides greater flexibility for servicing adjacent development parcels.

Table 6-1 below summarizes the storage volume requirements, per Table 3.2 from the MOECC manual. The imperviousness of the 316-hectare catchment area draining to the Kennedy-Burnett SWMF was estimated at 58%. According to this imperviousness, a wet pond facility would require 196 cubic metres of storage volume per hectare of catchment area, in order to achieve a level of protection equivalent to 80% long term suspended solids removal. Of this 196 cubic metres per hectare, 40 cubic metres per hectare is required as extended detention volume while the remaining 156 cubic metres per hectare is available as permanent pool volume.

Table 6-1. Pond Water Quality Requirements, based on a Wet Pond with Enhanced 80 Percent Long-Term Suspended Solids Removal

Average Imperviousness (%)	Storage Volume Required (m^3/ha)	Minor System Area to SWMF (ha)*	Required Storage Volume (m^3)	Permanent Pool Volume Required (m^3)	Extended Detention Volume Required (m^3)
58	196	255	50,021	39,809	10,212

* Includes area of KB SWM Facility (approximately 7 ha)
% = percent
ha = hectare
m^3 = cubic metre

The proposed SWMF footprint and hydraulic profile are provided in Figures 5-7 and 5-10, respectively. Design details are summarized in Table 6-2, and described further. A comparison of the required storage volumes from Table 6-1 with the proposed storage volumes in Table 6-2 indicates that the proposed storage facility will achieve the desired 80% long-term suspended solids removal.

Table 6-2. Kennedy-Burnett SWMF Functional Design Details

Side Slopes	**4:1**
Proposed Forebay Bottom – Upstream to Downstream (m)	88.40 – 88.15
Proposed Forebay/Cell 1 Bottom – Upstream to Downstream (m)	88.00 – 87.90
Proposed Cell 2 Bottom – Upstream to Downstream (m)	87.80 – 87.77
Proposed Total Permanent Pool Volume (m^3)	40,224
Forebay Permanent Pool Volume (m^3)	7,865
Forebay/Cell 1 Permanent Pool Volume (m^3)	16,882
Cell 2 Permanent Pool Volume (m^3)	15,477
Proposed Extended Detention Volume (m^3) at 0.50 m Depth (Extended Detention Elevation of 90.7 m)	13,908
Forebay Detention Pool Volume (m^3)	3,575
Forebay/Cell 1 Detention Pool Volume (m^3)	5,553
Cell 2 Detention Pool Volume (m^3)	4,779

m = metre
m^3 = cubic metre

The proposed SWMF outlet structure will consist of a weir/orifice with the invert set at an elevation of 90.2 metres, which will be sized to control drawdown of the extended detention volume over at least 24 hours. The invert of the outlet conveyance culverts, which are sized in order to convey the peak flow through the facility in the 100-year event such that acceptable HGL elevations are maintained at the upstream reference manholes, will be located at the elevation corresponding to the required extended detention volume in the facility. This extended detention elevation varies per servicing option, as does the size of the conveyance structures at the crossings throughout the facility.

The hydraulic model described in Section 4 applied the following design conditions:

- Condition 1 – 5-year flow (Chicago 3-hour design rainfall event) tributary to the Kennedy-Burnett SWMF with a Jock River 100-year level of 91.59 metres;
- Condition 2 – 100-year flow (Chicago 3-hour design rainfall event) tributary to the Kennedy-Burnett SWMF with a Jock River 5-year level of 90.93 metres.

Condition 2 was applied to the model, resulting in a more conservative HGL elevations and upstream conveyance system and was defined as the critical event for the analysis. The hydraulic model was used for preliminary outlet structure sizing as described above as well as conveyance under each of the proposed crossings.

Summarized in Table 6-3 are proposed culvert crossing details for each scenario as well as the extended detention elevations associated with each.

Table 6-3. Culvert Crossing Dimensions and Elevations for Proposed Design

Servicing Option	Pedestrian Crossing	Future Chapman Mills	Local Road
3	24 m length of (3) 1.5 m x 2.4 m at 90.2 m (NWL)	50 m length of (3) 1.5 m x 2.4 m at 90.2 m (NWL)	40 m length of (3) 1.2 m x 2.4 m at 90.7 m (Ext. Det Elev.)

m = metre

Table 6-4 summarizes the resulting HGL at the upstream reference manholes under the existing condition as well as for under the critical event condition. The maximum HGL through the facility is also provided.

Table 6-4. HGL Elevations for Existing and Proposed Design

Servicing Option	Critical Event HGL (m)				
	MHST15316	MHST51648	Forebay	Forebay/Cell 1	Cell 2
Existing Model	93.21	93.85	92.76	-	92.71
Scenario 3	93.15	93.85	92.03	91.89	91.65

m = metre

As shown in Table 6-4, the HGL in the 1,800-millmetre diameter storm sewer (MHST51648) upstream of Strandherd Drive remains consistent between the existing and proposed servicing options. However, the HGL in the 2,100-millimetre diameter storm sewer (MHST15316) upstream of Strandherd Drive is impacted by each of the hydraulic conditions associated with the various options. As such, sizing of conveyance culverts at the crossings as well as at the outlet were optimized in order to mitigate impacts to the existing HGL upstream of Strandherd Drive.

Under the existing condition the 100-year water surface elevation (WSEL) in the upper cell is 92.76 metres. Under the proposed scenarios, the 100-year WSEL in the upper cell is lowered by 0.73 metres as compared to the existing condition for Option 3. Similarly, the 100-year WSEL is between 0.93 metres and 1.22 metres lower than the existing condition in the lower cell for the proposed options.

6.2 Environmental Impacts/Mitigation Measures

6.2.1 Stormwater Servicing Study

The Novatech *Storm Servicing Options Evaluation Future Development Lands Adjacent to Kennedy-Burnett SWM Facility* report (Appendix A), provided the following servicing recommendation: Option 3b – Adjacent Lands to Kennedy-Burnett SWMF/New Pond for Fraser Fields and Clarke Residential Lands/Hydrodynamic Separators for Remaining Area, Plus

Hydrodynamic Separators at Outfalls at Kennedy-Burnett SWMF. The study also recommended the following:

Storage Drainage Areas:

- Figure 6 from the Novatech report (also referred to in this report as Figure 5-1) recommends drainage boundary for lands to be directed to the KB SWMF. The recommended areas are consistent with the preliminary designs for the Chapman Mills Drive and BRT projects.

Outfalls:

- Paired outfalls should incorporate energy dissipation measures to ensure the bed and banks of the receiving watercourse are adequately protected from scour and erosion;

Water Quality Treatment:

- Hydrodynamic Separators: It is recommended that all HDS units be sized to provide an Enhanced level of water quality treatment (80 percent TSS removal) for catchment areas draining directly to the Fraser-Clarke Drain and Jock River.;
- Kennedy-Burnett SWMF: Option 3b recommends sizing the HDS units upstream of the outfalls to act as sediment traps to pre-treat runoff entering the facility, essentially serving the same role as sediment forebays. Alternatively, it is permissible to size the HDS units to provide an Enhanced level of water quality treatment (80 percent TSS removal). This approach will provide increased flexibility for development.
- Minto Clarke Pond: Option 3b includes a small stormwater management pond on the Minto Clarke lands just west of the future school site. The proposed pond would replace the existing interim pond that currently provides water quality treatment for the Fraser Fields Subdivision. The proposed pond would be sized to provide an Enhanced level of water quality treatment for Fraser Fields (8.23 hectares), as well as future residential development within the Minto Clarke Lands (6.45 hectares), as well as to control release rates to the target erosion thresholds established by Matrix Solutions as part of their geomorphic assessment of the Fraser-Clarke Drain.

Water Quantity Control:

- Fraser-Clarke Drain: The proposed Minto pond will provide quantity control for the Clarke residential lands, as well as the existing Fraser Fields subdivision. The Clarke commercial lands will require onsite controls.
- Kennedy-Burnett SWMF and Jock River: Areas tributary to the Kennedy-Burnett Pond and Jock River will not require quantity control.

Chapman Mills Drive/BRT:

- All runoff from the BRT lands should be confined within the right-of-way and there should be no major system flows routed onto adjacent properties for all storms up to and including the 100-year event;
- It is recommended that Chapman Mills Drive and the BRT be serviced by an independent storm sewer system with no connections to adjacent areas. Using this approach, a storm sewer designed for a 10-year level of service should have sufficient capacity to convey the

100-year peak flow under surcharged conditions without the requirement for storage within the right-of-way.

Fraser-Clarke Drain:

- RVCA approval will be required for any planned modifications or realignment of the Fraser-Clarke Drain. Since the Fraser-Clarke Drain is fully within the 100-year floodplain of the Jock River, a cut-fill balance would also be required;
- Easements will be required along the drain for access and maintenance of the proposed storm outfalls.

Burnett Municipal Drain:

- The Burnett Municipal Drain will be formally abandoned once development in the area is complete, as the flows originally dedicated to the drain will be captured by the proposed storm sewer systems.

Major System Drainage:

East of Kennedy-Burnett SWMF:

- Major system flows north of Chapman Mills Way are to be conveyed overland to the Kennedy-Burnett SWMF;
- Major system flows from Chapman Mills Way are to be confined within the right-of-way and routed to the Kennedy-Burnett SWMF by surcharging the storm sewer;
- Major system flows south of Chapman Mills Way are to be routed either to the outlet channel from the Kennedy-Burnett SWMF, or directly to the Jock River;
- Major system flows from Greenbank Road are to be routed through the Claridge lands to the Jock River. Overland flow routes will be required on both sides of the proposed bridge.

West of Kennedy-Burnett SWMF:

- Major system flows from the Minto and Mion residential lands north/east of Chapman Mills Way are to be conveyed overland to the Kennedy-Burnett SWMF Pond;
- Major system flows from Chapman Mills way are to be confined within the right-of-way and routed to the Kennedy-Burnett SWMF by surcharging the storm sewer;
- Major system flows from the future school site are to be self-contained up to the 100-year event;
- Major system flows from the Clarke commercial lands are to be self-contained up to the 100-year event;
- Major system flows form the Clarke residential lands west of Chapman Mills Way (Minto/Fraser Fields) are to be conveyed overland to the proposed Minto SWM Pond.

Submerged Sewers:

- Option 3b attempts to minimize the extent of submerged sewers for the future development lands. Based on the permissible grade raise, it is proposed that Outlet 9 be partially submerged (0.20 metres) at the outfall to the expanded Kennedy-Burnett SWMF. The upstream sewers would have a slope of 0.1% and would be submerged for a distance of approximately 200 metres upstream of the outfall.

Low Impact Development (LID):

- Development lands south of Strandherd Drive are generally not suitable for LID systems (for example Bioretention swales, permeable pavement, infiltration systems) due to the high water table and impermeable soils. If LID techniques are implemented as part of an overall best-management strategy, it is recommended that the end-of-pipe water quality treatment (that is, HDS units and the Kennedy-Burnett SWMF) should be designed assuming LID measures are not present, but this should be confirmed with the City of Ottawa as development plans are brought forward.

Coordination with Transit EA:

- The findings and recommendations from the EA for the extension of Chapman Mills Drive and the local BRT route, both of which are proposed to cross the KB pond, should be coordinated as much as possible.

Interim SWM Strategy:

- It may be desirable to provide some erosion protection at the major system inlets to the pond, but this should be coordinated with the planned expansion. The location of the major system inlets would be determined as more detailed development plans are brought forward.

Planning for Flexibility:

- Throughout the EA process, there may be other servicing options that satisfy the stormwater quality and quantity control criteria. Based on this, it may be necessary to develop a servicing alternative that will allow for future development alternatives to deal with changes that may occur prior to implementation.

6.2.2 Natural Environment Report

The report titled Kennedy-Burnett Drain Lot 13 to 15, Concession 3 Nepean Township, City of Ottawa Natural Environment – Existing Conditions Report prepared by Niblett Environmental Associates Inc., provides recommendations to mitigate environmental impacts to terrestrial ecosystem. Recommendations from the report are as follows:

- A sediment and erosion control plan should be created and designed in consultation with a professional Aquatic Biologist to minimize potential in-water impacts;
- Dredging of the existing pond should not occur from October 16 to March 15 to protect at risk hibernating turtles. If the proposed works are to occur during this time, fencing the site in early fall may prevent turtles from entering the site;
- Any vegetation clearing should be conducted outside of the peak breeding bird timing window (May 1 to July 31) as per Environment Canada guidelines. Existing vegetation should be retained whenever possible. Use a native see mix to re-vegetate the site after construction

The full report is included in Appendix B. Note that natural environmental conditions will be reviewed during detailed design to determine if any changes have occurred since the preparation of this report.

6.2.3 Ottawa Airport Authority

As per communication with the Ottawa Airport Authority, the expansion project is located in an area that is governed by the "Airport Zoning Regulations" (AZR) in the "take-off/approach surface 07" and close to, but outside the outer limit of the Bird Hazard Zone. As the project is located in a take-off & approach surface, Transport Canada should be notified at least 90 days in advance of any tall temporary construction equipment such as cranes. Since the property is located outside of the AZR's Bird Hazard Zone, any bird hazard mitigation through the design of the project is prescribed by Transport Canada's documentation instead of the AZR. The pond is located within the primary bird hazard zone as defined by Transport Canada's TP8240 – Airport Bird Hazard Risk-Assessment Process. A stormwater management pond is not recommended in the primary zone without effective risk mitigation. The Airport Cooperative Research Program report 125 titled "Balancing Airport Stormwater and Bird Hazard Management" identifies characteristics that reduce wildlife risk to aircraft.

6.2.4 Phase 1 ESA

Recommendations related to design and construction of the proposed Kennedy-Burnett SWMF retrofit were detailed in the Phase 1 ESA (CH2M, 2010). The following are key observations and recommendations related to the expanded Kennedy-Burnett SWMF.

Table 4-1 identified several potential areas of concern for the site, for which recommendations have been made as follows:

- PAOC 1 (3194 Jockvale Road) is an adjacent farm property. If the expansion of the SWMF encroaches on this farm property to parallel drainage ditch east of the facility, then closer soil examination and potentially shallow groundwater should be conducted to assess for the potential presence or absence of the principal chemical of concern;
- PAOC 2 (Kennedy-Burnett SWMF, North Sediment Forebay). The disposal of asphalt from the site should be done as required and sediment characterization should be performed to determine budgeting and disposal options;
- PAOC 3 (Kennedy-Burnett SWMF, North Sediment Forebay at Home Depot Storm Sewer Headwall) A review of Home Depot's practices for storing fertilizers, herbicides, pesticides and other chemicals on site is recommended;
- PAOC 4 (Kennedy-Burnett SMWF, Sediment Disposal Areas at western side of south cell) It is recommended to establish stockpile areas to address potential for different disposal requirements due to different degrees of contamination;
- PAOC 5 (Kennedy-Burnett SWMF, Outlet Weir Structure) The budgeting should address asphalt disposal by obtaining quantities for price/fee schedule.

The Phase 1 ESA report is included in Appendix C.

6.2.5 Geotechnical Considerations

Geotechnical considerations specific to the Kennedy-Burnett SWMF are detailed in the "Soil and Bedrock Inventory and Preliminary Geotechnical Guidelines Foster and Kennedy Burnett Stormwater Management Facilities Environmental Assessment, Ottawa, Ontario" (Houle Chevrier Engineering, 2009) (Appendix D).

The following are preliminary design guidelines or recommendations related to the proposed expansion to the facility:

- Based on the results of the results of the boreholes and test pits, excavation for the SWM pond will be required through surficial deposits of topsoil/peat, fill, and sensitive clay. In some areas, the weathered silty clay is expected to contain sand seams;
- Groundwater inflow should be expected from the sides and bottom of the excavations, and should be controlled along with surface water by pumping from within the excavations or by draining to a sump pit or outlet;
- The main constraint to excavation will be equipment mobility on the sensitive silty clay deposits. The silty clay soils at this site are very sensitive to disturbance and have high water contents. As such, excavation and removal of soil, including trimming to final grade, for the proposed SWM cells, should be carried out from existing ground surface. It is recommended that excavation be planned during winter months on frozen haul roads. Recommendations are made in the report regarding the construction of temporary haul roads;
- Topsoil placement on the sides of the cells could be carried out either after the exposed surface has frozen during the late fall/early winter or, preferably, after a period of drying during the summer;
- Preliminary slope stability analyses were carried out to assess the long term safe side slopes for the SWM cells. Based on the results of the analyses, the cells should be constructed using the following side slopes: Up to 6 metres: 2.5 H to 1V, or flatter, 6.5 to 7.5 metres: 3.0H to 1V, or flatter;
- To prevent sloughing/running of the upper sandy deposits due to groundwater inflow, it is recommended that a 300 mm thick drainage blanket composed of loosely placed, crushed stone meeting OPSS requirements for Granular B Type II should be installed on the slope where wet sands are encountered above the silty clay. Slopes excavated at 2.5H:1V or flatter should be protected against erosion using topsoil and seed. To reduce erosion during the development of vegetative cover, consideration could be given to temporarily protecting the slopes with a layer of mulch or a photodegradable erosion control blanket;
- During excavation of the SWM cells, it is expected that groundwater flow will occur, under both short term and long term conditions. Under short term conditions, it is possible that the groundwater inflow rate into the pond exceeds 50,000 litres per day; therefore, it is advised that a Permit to Take Water be obtained by the MOECC in advance of the construction. Under long term conditions, based on previous experience at other stormwater management facilities with silty clay deposits in the Ottawa area, it is expected that the groundwater inflow will be small (less than 50,000 litres per day). As a result of the short-term and long-term groundwater inflow to the proposed stormwater management facility, some minor and localized groundwater level lowering could occur in close proximity to the cells as a result of

normal gravity flow of groundwater to the cells. The zone of influence of groundwater lowering should be less than about 15 metres from the edge of the cells constructed in silty clay and less than about 15 to 20 metres for cells constructed where thin deposits of silty sand are encountered above the silty clay. Therefore, it is considered that the effects of the stormwater management facility construction on the existing residential development should be negligible, provided that the crests of the slopes to the cells are located more than 20 metres from the nearest structure or service;

- There are no unusual constraints reported for the excavation of new storm sewer connections to the proposed stormwater management facility through the weathered and grey silty clay overburden deposits, both above or below the groundwater level.

Specific guidelines for other construction considerations such as pipe bedding, trench backfilling, seepage barriers, roadway reinstatement, and pavement design are also provided in the full report.

6.2.6 Fluvial Geomorphic Assessment

The PARISH Aquatic Services "Clarke Drain Erosion Threshold Assessment," provided in Appendix E, estimated critical erosion threshold values for the two reaches of the Fraser-Clarke Drain. As previously discussed, the critical discharge rates were 1.78 cubic metres per second (CD-R1) and 1.70 cubic metres per second (CD-R2). The main recommendation from the report is that the estimated critical discharge rates are considered in future development efforts. The thresholds could be used to ensure that the time of exceedance of the erosive flow is matched in the pre and post development scenarios. Ideally the model results would be provided by additional geomorphic interpretation such that additional aspects of the flow regime and channel dynamics could be incorporated into the stormwater management plans.

6.2.7 Aquatic Habitat

Various mitigation measures were outlined in Foster and Kennedy Burnett Stormwater Project – Fish Habitat Assessments – Foster and Fraser Clarke Drains, Barrhaven, City of Ottawa, prepared by Muncaster Environmental Planning Inc. in order to eliminate or minimize the potential impacts imposed on the fish habitat by any work undertaken in the Kennedy-Burnett or Fraser-Clarke Drains (Appendix F).

These measures include:

- Limiting all in-water work to be completed between July 1 and September 15 such that the spawning and rearing periods of fish are not affected;
- Rock placement is not to be placed in any manner, such as above grade, that may impact fish movement. Rock protection that must be placed across the bottom of a channel will be flush with the channel invert;
- All material to be placed in the watercourse, including rock protection, is to be clean and free of fines;
- Woody vegetation removal along outlets should be kept to a minimum where possible. Where removal is required, plantings should be placed along the riparian corridor to replace the trees or shrubs removed;

- Ensure all banks are stabilized as soon as possible after work is completed, and minimize exposed soil at all times;
- Prior to any in-water work, a rock flow check dam, straw bale check dam or similarly effective sediment and erosion control measure is to be installed downstream of the work areas;
- Maintain sediment traps and other sediment and erosion control measures to mitigate sediment and construction debris including, but not limited to asphalt and concrete, from being deposited in the waters of the tributaries;
- Enforce proper maintenance of construction equipment with respect to refueling, washing and fluid changes, and proper disposal of fluids, filters, and other waste materials;
- Monitoring is recommended at all times and any water quality issues such as elevated turbidity levels are to be addressed immediately with cessation of work until proper sediment and erosion controls are in place;
- Information pertaining to future water work and alterations to watercourses will be required for review by the Rideau Valley Conservation Authority for Section 28 of the Conservation Act and Section 35 of the Fisheries Act to obtain necessary permits required for work around or in the watercourses;
- It is recommended that "no mow" or maintenance zone on either side of the watercourses within City-owned land be maintained and expanded where required and feasible to a width of about 15 m to optimize the functions of the riparian corridors;
- The effectiveness of the sediment and erosion control measures must be monitored during construction. A qualified inspector should conduct frequent visits during construction to ensure that the contractor is implementing the mitigation measures as specified. The inspector must ensure that construction vehicles and chemicals, fuels and other potentially hazardous materials remain in designated areas. The inspector will document all environmental activities with site inspections, photographs and progress reports, and will issue a final summary report upon completion of construction.

6.2.8 Archaeology

The Stage 1 Archaeological Assessment, Chapman Mills Extension and Bus Rapid Transit – Environmental Assessment Study for Parts of Lots 13-20 of Concession 4, Parts of Lots 12-16 of Concession 3, and Parts of Lots 12-16 of Concession 2, former City of Nepean, Carleton County, City of Ottawa, Ontario report prepared by Stantec (2016) outlines the following recommendations:

- A Stage 2 archaeological assessment should be conducted on any portion of the project area that falls within the identified area of archaeological potential prior to the initiation of ground disturbing project activities;
- Areas identified in Figure 7 of the report requiring pedestrian survey will be subject to a pedestrian survey at 5 metre intervals as outlined in Section 2.1.1 of the Ministry of Tourism, Culture, and Sport's (MTCS) 2011 Standards and Guidelines for Consultant Archaeologists (Government of Ontario, 2011);

- MTCS standards require that all agricultural land, both active and inactive, be recently ploughed and sufficiently weathered to improve the visibility of archaeological resources. Ploughing must be deep enough to provide total topsoil exposure, but not deeper than previous ploughing, and must be able to ensure at least 80% ground surface visibility;
- Areas identified as having low archaeological potential are not recommended for further work.

The Stage 1 Archaeological Assessment (AA) for: Proposed development Activities for the Foster and Kennedy-Burnett Stormwater Management Facilities Part of Lots 13 through 15, Concessions 3 and 4 Rideau Front City of Ottawa Ontario, prepared by Archaeoworks (2009) outlines several recommended measures based on the findings discussed in Section 5, summarized as follows:

- Subject lands assessed to be undisturbed should be subjected to Stage 2 archaeological field assessment if affected by construction activities with intent to lessen impacts to heritage resources. Should significant archaeological items be encountered, additional background research or fieldwork may be required by the Ontario MTCS;
- If previously unknown or unassessed deeply buried archaeological items are uncovered during development, a new archaeological site may be required and subject to Section 48 (1) of the Ontario Heritage Act. Construction work must cease alteration of the site immediately and retain a licensed archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act. The Heritage Operations Unit office, MTCS should be contacted immediately;
- Discovery of any human remains must be immediately notified to the Heritage Operations Unit Office, MTCS, the police or coroner, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ontario Ministry of Government Services.

Both reports are included in Appendix G.

6.2.9 Municipal Drain

The Ontario Drainage Act governs the creation and maintenance of municipal drains. The City of Ottawa has legislative responsibility for all aspects of the drainage works under the Drainage Act, including the repair and maintenance of existing municipal drains and the construction of new drains.

In the project study area, there is one existing municipal drain called the Burnett Municipal Drain, which is located on the eastern side of the Kennedy-Burnett SWMF and flows south to the Jock River. The drain originally extended north of Strandherd Drive. At present, the drain starts just south of the Barrhaven Town Centre and has a length of approximately 1.3 metres at the confluence of the Jock River. The Burnett Municipal Drain will be formally abandoned once development in the study area is complete, as the flows originally directed to the drain will be captured by the proposed storm sewer systems.

6.2.10 Additional Considerations

The layout of the SWMF (that is, shape) and design details are expected to be revised during the detailed design phase to the acceptance of the City of Ottawa and Rideau Valley Conservation Authority. Adequate maintenance and public access will also have to be investigated during detailed design.

Section 7

Consultation Program

Public and agency consultation is a key element of the Class EA process. The objectives of the consultation program for the Kennedy-Burnett SWMF EA included:

- To conduct a consultation program that is meaningful to those involved;
- To deliver a program that is accessible, transparent, and traceable;
- To engage stakeholders early and throughout the decision-making process.

Consultations completed for this project are consistent with the requirements outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011, and 2015). There are three mandatory points of consultation, including:

- At the commencement of the EA;
- At the identification of alternative solutions;
- At the completion of the Project File.

Stakeholders who were contacted as part of the consultation program include:

- Provincial Government
  - Ministry of the Environment
  - Ministry of Natural Resources
  - Ministry of Transportation Planning and Design – Eastern Region
  - Ministry of Tourism, Culture and Sport
  - Ministry of Aboriginal Affairs
  - Ministry of Infrastructure
  - Ministry of Municipal Affairs and Housing
  - Rideau Valley Conservation Authority
  - Ministry of Agriculture, Food, and Rural Affairs
- Federal Government
  - Department of Fisheries and Oceans
  - Environment Canada
  - Parks Canada
  - Aboriginal Affairs and Northern Development Canada
  - Transport Canada
  - National Capital Commission
- Non-Government
  - Algonquins of Ontario Consultation Office
  - Ottawa Region Métis Council
  - Métis Nation of Ontario
  - Ottawa International Airport Authority
- Local Associations
  - West Barrhaven Community Association
  - Half Moon Bay Community Association
  - Barrhaven Business Association

- Utilities
  - Allstream
  - Bell Canada
  - Birch Hill Telecom
  - Fibre Noir
  - Group Telecom
  - Persona Communications
  - Primus
  - Rogers Ottawa
  - Telus Communications
  - Videotron
  - Hydro Ottawa
  - Hydro One Distribution
  - Hydro One Transmission
  - Enbridge
- School Boards
  - Ottawa Carleton District Schoolboard
  - Ottawa Catholic Schoolboard
  - Ottawa French Public Schoolboard
  - Ottawa French Catholic Schoolboard
- Land Development Companies
  - Richcraft Group of Companies
  - Trinity Development Group
  - Caivan Development Corporation
  - Claridge Homes
  - Minto Group
  - Landform Development Group Inc.
- Consultants
  - Novatech Engineering Consultants Limited
  - J.L. Richards and Associates
  - Stantec Consultants
  - David Schaeffer Engineering Limited
  - Paquette Planning Associates
  - CIMA +
- City of Ottawa
  - Surface Water Management Services Branch
  - Wastewater Services Branch
  - Asset Management, Business and Tech Services Branch
  - Design and Construction – Mun (West) Branch
  - Land Use and Natural Systems
  - Community Planning and Urban Design
  - Development Review Suburban Service – West
  - Infrastructure Policy Unit

This study included the following formal contact points with the public and relevant stakeholders.

7.1 Notice of Study Commencement

A Notice of Study Commencement was distributed on May 15, 2015, to a mailing list of relevant stakeholders. The list covered agency contacts based on the Government Review Team (GRT) list issued by the MOECC. The letter and notice were sent to Provincial, Federal, and Non-government agencies, Community Associations, Utilities, School Boards, Land Owners, Consultants, City of Ottawa officials, and additional Public Stakeholders.

The notice described the motivation for the study, an overview of the existing facility and surrounding area, a brief description of the EA process, City of Ottawa and CH2M points of contact, as well as a link to a City of Ottawa webpage for the Kennedy-Burnett project, where stakeholders could retrieve additional project information.

A copy of the following documents relating to the Notice of Study Commencement are provided as a reference in Appendix J: notice of study commencement report, and a summary of the email replies received from stakeholders and their responses.

There were approximately 32 email replies based on the notices sent out to stakeholders. Replies were generally requests to be included in additional communications. Replies, as summarized in Appendix J, also included the following:

- Ministry of Aboriginal Affairs: Provided additional contact information for groups which may have an interest in the project, including the Algonquins Consultation Office, and the Ottawa Region Métis Council (part of the Métis Nation of Ontario);
- Ministry of Tourism, Culture and Sport: Provided information relating the screening for both archaeological and cultural heritage impacts;
- NCC: Recommended that the local Airport Authority, OMCIAA, be included in the consultation, as the pond area could be on the flight path and require special measures to avoid birds congregating.

7.2 Technical Advisory Committee Meeting #1

On September 2, 2015, the first Technical Advisory Committee (TAC) Meeting was held, which included the following attendees:

- City of Ottawa
  - John Bougadis
  - Jonathan Knoyle
  - Ron Rooke
  - James Hall
  - Cheryl Brouillard
  - Eric Tousignant
  - Michael Burt
  - Joseph Zagorski
- Rideau Valley Conservation Authority (RVCA)
  - Glen McDonald
  - Jennifer Lamoureux

- CH2M
  - Kelly Meaney
  - Brian Graham
  - Dave Turcotte

The meeting generally included a brief review of land servicing options, discussion of draft alternatives and associated design considerations, review of proposed preferred alternative selection criteria, and gathering feedback from the TAC on the alternatives and path forward. The meeting presentation as well as a summary of the meeting are both provided in Appendix J.

Design related comments from the TAC are summarized as follows:

- An alternative was suggested whereby the SWMF is hydraulically disconnected from the receiving watercourse and a pumping station is provided to maintain the NWL lower than the proposed elevation 91.2 metres and to pump events up to a 10-millimetre event; this would allow for lower trunk sewers with less submergence. It was noted that this option was briefly considered however it was noted that the required lowering of the SWMF by approximately 2 metres would result in the need for continuous pumping which was agreed as an infeasible option;
- It was noted that the proposed location of the Chapman Mills ROW is firm and that the team should proceed under the assumption that the other two crossings will also be built with dimensions as included in functional design;
- Minimum sideslopes for the SWMF of 3:1 were discussed as per guidelines. It was noted that 4:1 was used for functional design, which would be refined according to subsequent geotechnical investigations;
- It was documented that the City of Ottawa standard for a proposed pathway is a 6-metre corridor (3.0-metre surface and 1.5-metre shoulders on each side). The pathway width and setback from adjacent properties will be reviewed to ensure conformance with City of Ottawa standards pending comments;
- In terms of overland (major system) flow paths from areas not serviced by the SWMF, it was noted that overland flow from development areas west of the SWMF would be directed to the Fraser-Clarke drain and that the developers would be required to address potential impacts to the drain as a result of runoff from these lands;
- A looped pathway around the SWMF may be beneficial, but crossing of the Chapman Mills ROW and two other crossings would have to be considered;
- The proposed South Nepean Collector (SNC) will be approximately 8 metres deep at the invert of the proposed Chapman Mills ROW. Noted that the SNC will be below the lowered Kennedy-Burnett SWMF;
- In terms of potential impacts to groundwater from the lowering of the SWMF, the normal water level in the proposed SWMF would remain relatively unchanged, therefore it is unlikely to have a significant impact to local groundwater elevations. Furthermore, due to the clayey soils, the radius of influence in changes to groundwater elevations is short.

7.3 Alternatives Definition Assessment Report

Based on the feedback received from the TAC meeting, CH2M developed a report titled "Kennedy-Burnett Stormwater Management Facility – Alternatives Definition and Assessment." The report described the three servicing options for the Kennedy-Burnett SWMF upgrade, including conceptual layouts for each option, additional technical information, and a preliminary list of criteria used to determine the preferred option. The report was distributed to stakeholders on October 16, 2015, and feedback was requested by October 30, 2015. The report is available in Appendix J.

CH2M received significant feedback from stakeholders and provided responses to the comments received (see included Appendix J).

7.4 Public Open House

Stakeholders were invited to a Public Open House (POH), held on March 21, 2016 at the Walter Baker Sports Centre (100 Malvern Drive, Ottawa) from 5:30 to 8:30 pm. The purpose of the POH was to allow participants to learn of the preferred alternative for expanding and retrofitting the facility, and provide them with the opportunity to speak with the project team. Display boards were used to outline the Municipal Class EA process, project purpose, opportunities and constraints, the alternative solutions, evaluation criteria for determining the preferred alternative, describe the recommended servicing option, and next steps.

The POH notice was first distributed as of March 10, 2016, and was made available on the City of Ottawa website. On Monday, March 14, 2016, an email was sent to the relevant stakeholders which provided the date and time of the POH, the POH notice, as well as additional information. A copy of notice distributed is available in Appendix J.

A total of 26 individuals attended the POH and signed the attendance register. POH attendees generally consisted of local residents, although two land developer representatives were also in attendance. Comments received from stakeholders are available in Appendix J.

7.5 Technical Advisory Committee Meeting #2

A second TAC meeting took place on July 19, 2016. The TAC comprised of RVCA, CH2M, and City of Ottawa staff from Planning, Infrastructure and Environmental Services who were asked to review and provide comments on the servicing options. The meeting presentation is available as part of Appendix J. The committee members in attendance included:

- City of Ottawa
  - John Bougadis
  - Eva Spal
  - Michael Burt
  - Chris Melanson
  - James Hall
  - Jonathan Knoyle
  - Eric Tousignant
  - Charles Warnock
  - Marc Gagne
  - Benoit Leroux

- Rideau Valley Conservation Authority (RVCA)
  - Jocelyn Chandler
  - Glen McDonald
- CH2M
  - Brian Graham
  - Dave Turcotte

Section 8

Conclusion

This Project File and Functional Design Report satisfies the Municipal Class EA requirements for a Schedule B project, as per the MEA's "Municipal Class Environmental Assessment" (October 2000, amended in 2007, 2011, and 2015).

The described Functional Design for the expansion of the existing Kennedy-Burnett SWMF is anticipated to satisfy the requirements defined by the Jock River Reach One Subwatershed Study. The SWMF upgrade will satisfy the following objectives, while also taking into consideration project constraints and limitations

- Provide 80 percent long-term removal of suspended solids for the runoff from the respective catchment areas, as per MOECC guidelines;
- Design to mitigate any potential negative impact to the existing Hydraulic Grade Line (HGL) in the tributary sewers upstream of the facility;
- Consider future facility operating levels as a result of further development that will discharge to the Kennedy-Burnett SWMF;
- Maximize the available footprint within City of Ottawa owned lands;
- Be consistent with City of Ottawa guidelines for SWMF design.

The facility layout and associated design details described within this report are of a functional design level, and are expected to be revised during the detailed design phase, to the acceptance of the City of Ottawa and RVCA. Adequate maintenance and public access will also be investigated during detailed design.

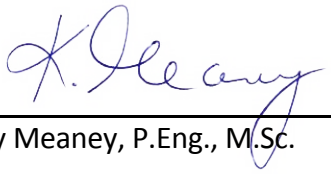
In accordance with the Class EA process for Schedule B projects, a Notice of Completion will be distributed to the project stakeholders, and a period of at least 30 calendar days will be allowed for input and feedback. During this period, there will be the opportunity for an individual to request a Part II Order, should the individual find that the necessary steps have not been taken in order for the project to be compliant with the procedure described by the Municipal Class EA Planning Process.

Following EA approval, the final project phases may be completed, including: detailed design, approvals, construction, operation, and monitoring.

Section 9

Signature Signoff

Approved by:



Kelly Meaney, P.Eng., M.Sc.

Approved by:

Pascal Pitre, P.Eng., M.Pl.

Section 10

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Appendix A
Novatech Storm Servicing Options Evaluation

Appendix B
Natural Environment
Existing Conditions Report

Appendix C
Phase I Environmental Site Assessment Report

Appendix D
Preliminary Geotechnical Report

Appendix E
Geomorphic Assessment

Appendix F
Fish Habitat Assessment

Appendix G
Archaeological Assessment

Appendix H
Class “C” Level Cost Estimate

Appendix I
Alternative Solutions Evaluation

Appendix J
Public Consultation