Appendix N: Final Preferred Solutions
Conceptual Designs – Bunkers Creek Watershed
SWMF RETROFIT FOR WATER QUALITY TREATMENT:
LEVEL 1 "ENHANCED" TREATMENT (80% TSS REMOVAL)
PHOSPHORUS REDUCTION = 30.4 kg/year
ADDITIONAL ACTIVE STORAGE = 750 m³

UNDERGROUND INFILTRATION SYSTEM:
DRAINAGE AREA = 26.6 ha
AREA = 535 m² (28 m X 19 m)
STORAGE VOLUME = 750 m³
PEAK DESIGN FLOW = 0.71 m³/s (25 mm STORM)
TARGET CONTROL VOLUME = 2.83 mm
DEPTH OF COVER = 0.60 m (MIN.)
BOTTOM ELEVATION = 294.30 m

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LEGEND
- PR STORM MAINTENANCE HOLE
- PR. STORM SEWER
- EX. SANITARY SEWER
- EX. SANITARY MAINTENANCE HOLE
- PR. LID
- EX. WATERMAIN
- EX. STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. WATERCOURSE
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 31
SWMF RETROFIT No. 10 (BK03)
BUNKERS CREEK WATERSHED
SCALE = 1:500
DATE: MARCH 2019
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LEGEND

- EX. WATERCOURSE
- EX. STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. PROPERTY LINE
- PROPERTY ACQUISITION
- TRUNK STORM SEWER (PREFERRED ROUTE)
- EX. SANITARY MAINTENANCE HOLE
- EX. SANITARY SEWER
- EX. WATERMAIN

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 32
TRUNK STORM SEWER No. 1
BUNKERS CREEK WATERSHED
SCALE = 1:3,500
DATE: MARCH 2019
CONSTRUCT STEP-POOL SEQUENCE BED TREATMENT DOWNSTREAM OF EXISTING GABION WATERCOURSE LINING TO REACH Bu-5 TO ADDRESS SCOUR (SEE DETAILS)

STABILIZE EXISTING WATERCOURSE BANKS WITH BIO-ENGINEERED BANK TREATMENT TO ADDRESS BANK EROSION/FAILURE (SEE DETAILS)

LIMITS OF WATERCOURSE IMPROVEMENTS

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STABILIZE EXISTING WATERCOURSE BANKS WITH BIO-ENGINEERED TREATMENT TO ADDRESS BANK SLUMPING (SEE DETAILS).

REPLACE EXISTING GABION WATERCOURSE LINING WITH A STEP-POOL SEQUENCE BED TREATMENT TO ADDRESS SCOUR (SEE DETAILS).

LEGEND
- BANK EROSION
- BED EROSION/ KNICKPOINT
- INFRASTRUCTURE AT RISK
- PR. STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. SANITARY MAINTENANCE HOLE
- EX. SANITARY SEWER
- EX. WATERCOURSE
- EX. WATERMAIN
- EX. STORM MAINTENANCE HOLE
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

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DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 35
WATERCOURSE IMPROVEMENT No. 5
BUNKERS CREEK WATERSHED
SCALE = 1:750
DATE: MARCH 2019
REMOVE AND REPLACE EXISTING LOCAL STORM SEWER WITH TRUNK STORM SEWER

TIE EXISTING STORM SEWER INTO PROPOSED TRUNK STORM SEWER

EXISTING TWIN 1800 mm x 1200 mm CONC. BOX TRUNK STORM SEWER TO REMAIN

EXISTING TWIN 1800 mm x 1200 mm CONC. BOX TRUNK STORM SEWER TO BE REMOVED

EXISTING STORM SEWER TO REMAIN

PROPERTY ACQUISITION:
NONE

LEGEND

EX. WATERCOURSE
EX. STORM MAINTENANCE HOLE
EX. STORM SEWER
EX. PROPERTY LINE
PROPERTY ACQUISITION
TRUNK STORM SEWER
(PREFERED ROUTE)
EX. SANITARY MAINTENANCE HOLE
EX. SANITARY SEWER
EX. WATERMAIN

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DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 40B
TRUNK STORM SEWER No. 2
BUNKERS CREEK WATERSHED

SCALE = 1:1,250

DATE: MARCH 2019
INSTALL TOE TREATMENT TO ADDRESS BANK SCOUR AND UNDERCUTTING (SEE DETAILS)

LIMITS OF WATERCOURSE IMPROVEMENTS

LIMITS OF WATERCOURSE IMPROVEMENTS

TRUNK STORM SEWER No.2 (SEE PROJECT No. 40)

BUNKERS CREEK (REACH Bu-11)

INSTALL TOE TREATMENT TO ADDRESS BANK SCOUR AND UNDERCUTTING (SEE DETAILS)

LIMITS OF WATERCOURSE IMPROVEMENTS

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PROJECT No. 41
WATERCOURSE IMPROVEMENT No. 8
BUNKERS CREEK WATERSHED
(SHEET 1 OF 2)
SCALE = 1:1,000
DATE: MARCH 2019
PROPERTY ACQUISITION:
A) 130 VESPRA ST. (PORTION OF)
MINIMUM RECOMMENDED
PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO
BE CONFIRMED AT DETAILED DESIGN

INSTALL TOE TREATMENT TO ADDRESS
BANK SCOUR AND UNDERCUTTING (SEE DETAILS)

THE CITY IS TO PROGRESSIVELY ACQUIRE
LAND OR EASEMENTS FOR DRAINS,
WATERCOURSES AND STORAGE AREAS
CROSSING OR UPON PRIVATE PROPERTY
WHERE IT IS CONSIDERED IN THE CITY’S
INTEREST TO DO SO (BY-LAW 90-92: TO
PROHIBIT OBSTRUCTION OF DRAINS &
WATERCOURSES). PROPERTY ACQUISITION
VIA EASEMENT, BLOCK, LOT OR PARCEL IS
TO THE CITY’S DISCRETION.

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LEGEND
- BANK EROSION
- BED EROSION/ KNIckPOINT
- INFRASTRUCTURE AT RISK
- PR. STORM MAINTENANCE
  HOLE
- PR. STORM SEWER
- EX. SANITARY MAINTENANCE
  HOLE
- EX. SANITARY SEWER
- EX. WATERCOURSE
- EX. WATERMAIN
- EX. STORM MAINTENANCE
  HOLE
- EX. STORM SEWER
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 41
WATERCOURSE IMPROVEMENT No. 8
BUNKERS CREEK WATERSHED
(SHEET 2 OF 2)

SCALE = 1:1,000

DATE: MARCH 2019
REINSTATE POND/WATERCOURSE BANKS WITH NATIVE PLANTINGS WHERE APPROPRIATE

CLEANOUT MILLIGANS POND AND REINSTATE WATERCOURSE

BUNKERS CREEK (REACH Bu-11)

BUNKERS CREEK (REACH Bu-12)

BUNKERS CREEK (REACH Bu-15)

NOTE: MILLIGAN’S POND IS NOT A SWMF

LEGEND

- BANK EROSION
- BED EROSION/KNICKPOINT
- INFRASTRUCTURE AT RISK
- PR. STORM MAINTENANCE HOLE
- EX. SANITARY SEWER
- EX. WATERCOURSE
- EX. WATERMAIN
- EX. STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

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The subject road has been identified for future road widening as part of the transportation master plan. The culvert improvement shown has been designed for the existing road width. The culvert length to be confirmed as part of detailed design in coordination with the transportation master plan.

**LEGEND**

- **PR. CULVERT**
- **PR. STORM SEWER**
- **PR STORM MAINTENANCE HOLE**
- **EX. CULVERT**
- **EX. STORM SEWER**
- **EX. STORM MAINTENANCE HOLE**
- **EX. SANITARY SEWER**
- **EX. SANITARY MAINTENANCE HOLE**
- **EX. WATERMAIN**
- **EX. PROPERTY LINE**
- **PROPERTY ACQUISITION**
- **WATERCOURSE**
- **PROPERTY ACQUISITION: A) 80 BRADFORD ST. (PORTION OF) MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN**
COMMERCIAL PLAZA ENTRANCE ROAD:
ROAD CLASSIFICATION = N/A
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING TWIN 2400 mm x 1550 mm CSPA CULVERTS
CONVEYANCE CAPACITY < 7.0 m³/s (EXISTING FLOWS)
RETURN FREQUENCY < 1:2 YEAR
DEPTH OF OVERTOPPING = 0.73 m (REGULATORY EVENT)

PROPOSED PEDESTRIAN SPAN BRIDGE

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY’S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY’S DISCRETION.

PROPERTY ACQUISITION:
A) 80 BRADFORD ST. (PORTION OF)
MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN

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LEGEND
- PR. CULVERT
- PR. STORM SEWER
- PR STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. MAINTENANCE HOLE
- WATERCOURSE
- EX. SANITARY SEWER
- EX. SANITARY MAINTENANCE HOLE
- EX. WATERMAIN
- EX. CULVERT
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 44
CULVERT IMPROVEMENT No. 23
(COMMERICAL PLAZA ENTRANCE ROAD)
BUNKERS CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019
**BRADFORD STREET:**

**ROAD CLASSIFICATION = ARTERIAL**

**DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR**

**EXISTING TWIN 2440 mm x 1730 mm CSPA CULVERTS**

CONVEYANCE CAPACITY < 8.9 m³/s (EXISTING FLOWS)
RETURN FREQUENCY < 1:2 YEAR
DEPTH OF OVERTOPPING = 0.59 m (REGULATORY EVENT)

**PROPOSED TWIN 7.62 m OPEN BOTTOM SPAN STRUCTURES**

CONVEYANCE CAPACITY = 41.7 m³/s (EXISTING FLOWS)
RETURN FREQUENCY = REGIONAL (HURRICANE HAZEL) STORM
DEPTH OF OVERTOPPING = 0.0 m (REGULATORY EVENT)

**MATCH TO EXISTING AT 3:1 SLOPE**

**TWIN OPEN BOTTOM SPAN STRUCTURES**

**SPAN = 7.62 m EACH**

**LENGTH 22.0 m**

**CLEAR HEIGHT = 1.35 m**

**REGRADE ROAD TO RELOCATE LOW POINT OF ROAD TO CENTRE OF CROSSING**

(ELEVATION 220.85 m)

**TWIN OPEN BOTTOM SPAN STRUCTURES SPAN = 7.62 m EACH**

**LENGTH 22.0 m**

**CLEAR HEIGHT = 1.35 m**

**THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN.**

**THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.**

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**LEGEND**

- **PR. CULVERT**
- **PR. STORM SEWER**
- **PR STORM MAINTENANCE HOLE**
- **EX. STORM SEWER**
- **EX. STORM MAINTENANCE HOLE**
- **WATERCOURSE**
- **EX. SANITARY SEWER**
- **EX. SANITARY MAINTENANCE HOLE**
- **EX. WATERMAIN**
- **EX. CULVERT**
- **EX. PROPERTY LINE**
- **PROPERTY ACQUISITION**

**DRAINAGE MASTER PLAN**

**FINAL PREFERRED ALTERNATIVE SOLUTION**

**PROJECT No. 45**

**CULVERT IMPROVEMENT No. 24 (BRADFORD STREET)**

**BUNKERS CREEK WATERSHED**

**SCALE = 1:500**

**DATE: MARCH 2019**

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PROPERTY ACQUISITION:
A) 80 CHECKLEY ST. (PORTION OF)
B) 93 BRADFORD ST.
MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN

NATURAL WATERCOURSE ENHANCEMENT TO INCREASE CONVEYANCE CAPACITY, HABITAT AND CANOPY.

PROPERTY ACQUISITION:
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B) 93 BRADFORD ST.
MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN

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