Sussex Region Flood Risk Mitigation Plan

Final

Town of Sussex and Village of Sussex Corner

In Association With:

RVA 153074.02

June 28, 2019

Flood Risk Mitigation Plan

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EXECUTIVE SUMMARY

The Town of Sussex and the Village of Sussex Corner retained R.V. Anderson Associates Limited (RVA) to refine project costs, identify benefits and risks, and identify properties and stakeholders affected by six (6) potential flood risk mitigation projects. The objective of this work is to allow the Town and Village to make better informed decisions regarding the development of a regional flood mitigation plan and pursue funding options for same.

The reader is cautioned the information presented in this report was developed at a conceptual level of detail, at that further investigation will be required during detailed design to properly asses and mitigate risks related to geotechnical conditions, flow diversions and hydraulic/hydrologic details, environmental impacts and constructability details.

Descriptions for each of the six (6) potential projects are presented in the main body of this report along with design details and construction quantities (at a conceptual level of detail), property acquisition requirements and a summary of benefits and risks. Summary costs are presented below in Table ES 1.

Table ES1: Overall Project Cost Summary

Project Title	Project Cost
Gateway Mall Flood Berm	$1,471,000
Trout Creek Flood Berm	$2,468,000
East Town Limit Flood Flow Channel	$15,731,000
Parson Brook Flood Flow Channel	$1,649,000
Stormwater Infrastructure Upgrades (NW)	$1,499,000
Stormwater Infrastructure Upgrades (NE)	$1,525,000
Total Project Cost (excl. GST)	**$24,343,000**

1.0 INTRODUCTION

The Town of Sussex and the Village of Sussex Corner retained R.V. Anderson Associates Limited (RVA) to develop a regional flood mitigation master plan. The master plan will focus on the following six flood risk mitigation projects within the Town of Sussex and Village of Sussex Corner:

1. Gateway Mall Flood Mitigation Berm
2. Trout Creek Flood Mitigation Berm
3. East Town Limit Flood Flow Diversion Channel
4. Parson Brook Flood Flow Diversion Channel
5. Stormwater Infrastructure Upgrades North-West (NW)
6. Stormwater Infrastructure Upgrades North-East (NE)

This flood risk mitigation plan developed by RVA will:

- Provide a conceptual design, refine project costs, and identify benefits/risks for each flood risk mitigation project listed above,
- Identify properties and stakeholders affected by each flood risk mitigation project listed above, and
- Identify potential downstream risks associated with flow transfers from the new diversion channels at East Town Limit and Parsons Brook.

This master plan is at a conceptual level of detail and is intended to review conceptual designs provided in previous reports, refine quantities/costing, and identify project risks. Further investigation will be required during detailed design to investigate geotechnical conditions, confirm hydraulic/hydrologic details, assess environmental impacts and confirm constructability details.

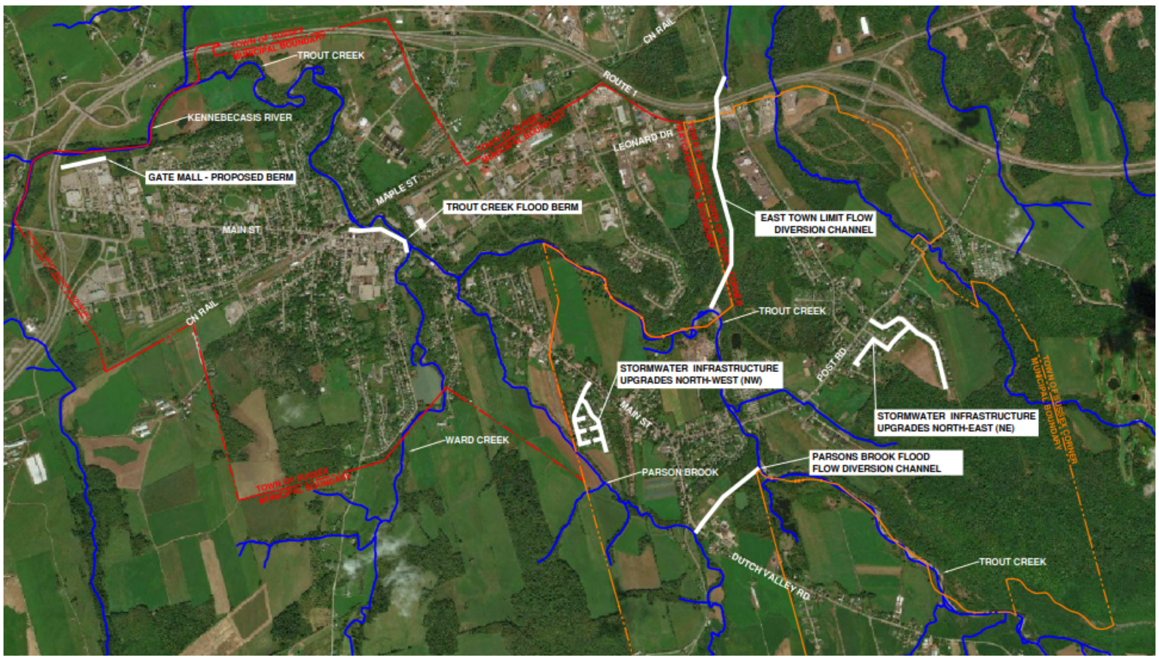
2.0 BACKGROUND

Historically, the Town of Sussex and Village of Sussex Corner has experienced flooding within the municipal boundaries from the Kennebecasis River, Trout Creek, and Parsons Brook. In 2015, the Town of Sussex retained RVA to perform a study to evaluate the flooding risk and identity potential flood risk mitigations measures within Town limits. Further, the Village of Sussex Corner has engaged consultants over the years to investigate flood mitigation measures along Trout Creek. The purpose of this regional flood risk mitigation plan is to review and combine all existing information related to the six flood risk mitigation projects by the Town and Village.

2.1 Project Sites Overview

Six projects have been identified as high priorities to mitigate flooding within the Town of Sussex and Village of Sussex Corner. The following figure provides the locations of each project site and is appended to this report as Drawing 1/11 in Appendix A.

Figure 1: Project Sites Overview



2.2 Existing Information

The existing information was provided by the Town of Sussex and the Village of Sussex Corner and reviewed to define design details and costing associated with each project site. This information includes the following:

- Creighton Drive Subdivision Capital Cost Estimate 2016 (Provided by Village of Sussex Corner);
- Meredith-Buchanan Capital Cost Estimate 2016 (Provided by Village of Sussex Corner);
- Trout Creek Stream Bank Stabilization Assessment 2015 (Provided by Village of Sussex Corner);

- Hydrotechnical Study Sussex Area Flood Plain by ADI 1982 (Provided by Town of Sussex);
- Riverside Park Capital Cost Estimates 2012 (Provided by Town of Sussex); and
- Sussex Flood Study completed in 2016 by RVA.

3.0 CONCEPTUAL DESIGNS

3.1 Gateway Mall Flood Mitigation Berm

3.1.1 Project Description

The Gateway Mall flood mitigation berm will be located between Gateway Street and the Kennebecasis River, which is adjacent to NBDTI Route 1 eastbound within the Town of Sussex. The flood mitigation berm will be constructed using imported fill and will have a lower permeability core to minimize water seeping through the embankment. The proposed berm will be designed to mitigate future flood damages from high water levels and backwater effects from the Kennebecasis River and is shown on Drawing 2/11 in Appendix B.

Conceptual design information for the Gateway Mall Berm is shown in Table 1.

Table 1: Gateway Mall Berm Design Details

Description	Design Details
Top of Berm Width	4.0 m
Side Slopes	3:1
Average Height	± 2.5 m
Berm Length (Access Rd incl.)	± 400 m

Access will be provided to the top of the berm with a new ramp, and a 4-metres wide trail will continue the entire length of the berm. New dual 1500-mm culverts, structures, and flap gates will be provided in the ditch alongside Route 1 to provide overland drainage through the new berm and backwater flood protection. The existing outfall for the Gateway Mall parking lot will be replaced with a new 900-mm pipe, structure, and flap gate, and a shallow storm sewer will be installed to a new manhole with a deep sump that can be used to expel surface water runoff from areas above the flood mitigation berm via portable pump.

3.1.2 Construction Quantities & Cost

The following table provides a summary of estimated conceptual quantities and costs associated with the construction of the Gateway Mall berm:

Table 2: Gateway Mall Berm - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Construction Cost
Berm Construction	9,700	m³	$400,000
Stormwater Management Improvements	305	m	$450,000
Access Trail	400	m	$40,000
Erosion Protection	500	m²	$30,000
Landscape Finish	6000	m²	$60,000
Site Restoration	40	m²	$20,000
Portable Pump Allowance	1	LS	$100,000
	Total Capital Construction Cost		**$1,100,000**

3.1.3 Project Costs

Construction of the berm will be on land owned by the Town and NBDTI, and therefore no property acquisition cost is anticipated for this project. The following table provides a summary of conceptual estimated costs associated with the Gateway Mall Flood mitigation berm project:

Table 3: Gateway Mall Berm - Estimated Project Cost Summary

Description	Cost
Capital Construction	$1,100,000
Contingency (≈25%)	$300,000
Engineering (≈15%)	$170,000
Permitting	$1,000
Property Acquisition	Not Anticipated
Inflation – Projected Year of Completion - 2020 (1 yr. @ ≈2.0%/year)	$29,000
Total Project Cost (excl. GST)	**$1,600,000**

3.1.4 Benefits/Risks

The Gateway Mall flood mitigation berm will be designed to provide flood mitigation from the Kennebecasis River during extreme flooding events. The top of the berm will be designed to elevation 18.00 metres (to be confirmed through detail design), which is 0.71 metres above the April 2014 high water elevation of 17.29 metres.

The risk associated with the berm is runoff from the local drainage area behind the berm will not drain during extreme flooding events. To mitigate this risk, an allowance is provided for a portable pump and generator to lift overland runoff flow. Further, the aesthetics of a berm may be an issue for local residents. The berm will be connected to the existing berm and will be vegetated to blend into the surrounding area.

3.2 Trout Creek Flood Mitigation Berm

3.2.1 Project Description

The Trout Creek flood mitigation berm will be located between Main Street and Trout Creek and extends from Maple Avenue to the Ward Creek/Trout Creek confluence, within the Town of Sussex. The flood mitigation berm will be constructed using imported fill and will have a low permeability core to minimize water seeping through the embankment. The proposed berm will be designed to mitigate future flood damages from high water levels and backwater effects from Trout Creek, and is shown on Drawing 3/11 in Appendix C.

Conceptual design information for the Trout Creek Berm is shown in Table 4.

Table 4: Trout Creek Berm Design Details

Description	Design Details
Top of Berm Width	4.0 m
Side Slopes	3:1
Average Height	± 2.3 m
Berm Length (Access Rd incl.)	± 700 m

A ramp will provide access to the top of the berm, and a 4-metres wide trail will continue the entire length of the berm. Further investigation will be required to determine the minor drainage system layout and outfall locations for the local parking lots. Once determined, a detailed stormwater management plan/design can be developed along with a centralized pumping location.

3.2.2 Construction Quantities & Cost

The following table provides a summary of conceptual estimated quantities and costs associated with the construction of the Trout Creek berm:

Table 5: Trout Creek Berm - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Cost
Berm Construction	17,600	m^3	$580,000
Stormwater Management Improvements Allowance	250	m	$350,000
Access Trail	700	m	$60,000
Erosion Protection	3000	m^2	$180,000
Landscape Finish	11,200	m^2	$60,000
Site Restoration	50	m^2	$20,000
Portable Pump Allowance	1	LS	$100,000
New Park Allowance	1	LS	$250,000
	Total Capital Construction Cost		**$1,600,000**

3.2.3 Project Costs

The property purchase costs were estimated using unit land cost ($ per m^2) from the property assessment information available on GeoNB and multiplied by the total area required for the project. For undeveloped properties the unit land costs were calculated using the listed property assessment value, while for developed properties the unit land costs were estimated assuming the land value represented 20% of the total property assessment value. The following table provides a summary of estimated property acquisition costs associated with the Trout Creek flood mitigation berm project:

Table 6: Trout Creek Berm – Estimated Property Acquisition Cost Summary

Item	Cost
Property Purchase Cost	$155,000
Legal & Real Estate Fees (@ ≈10.0%)	$15,000
Total Property Acquisition Cost	**$170,000**

Table 7: Trout Creek Berm - Estimated Project Cost Summary

Description	Cost
Capital Construction	$1,600,000
Contingency (≈25%)	$400,000
Engineering (≈15%)	$240,000
Permitting	$2,000
Property Acquisition	$170,000
Inflation – Projected Year of Completion - 2021 (2 yr. @ ≈2.0%/year)	$90,000
Total Project Cost (excl. GST)	**$2,500,000**

3.2.4 Benefits/Risks

The Trout Creek flood mitigation berm will provide flood mitigation from the Kennebecasis River during extreme flooding events. The top of the berm will be designed to elevation 22.00 metres (to be confirmed through detail design), which is 0.57 metres above the April 2014 high water elevation of 21.38 – 21.42 metres.

The risk associated with the berm is runoff from the local drainage area behind the berm will not drain during extreme flooding events. To mitigate this risk, an allowance is provided for a portable pump and generator to lift overland runoff flow. Further, the aesthetics of a berm may be an issue for local residents. To offset this potential concern, a trail is provided on top of the berm and a waterfront park is provided for public outdoor activity and to provide access for pumping during flood events.

3.3 East Town Limit Flood Flow Diversion Channel

3.3.1 Project Description

The East Town Limit Flood Flow Diversion Channel will be located between Cougle Road and McLeod Drive within the Town of Sussex and the Village of Sussex Corner, as shown on Drawings 4/11, 5/11, 6/11 in Appendix D. The proposed channel will be designed to mitigate future flood damages along Trout Creek by diverting flood flows from Trout Creek directly to the Kennebecasis River. The new channel will start at Trout Creek (in the sharp bend south-east of Bryant Drive), will run parallel with Cougle Road towards the Kennebecasis River, eventually crossing Leonard Drive, Route 1, and Adam Lane, and discharge to the Kennebecasis River flood plain. Flow in the diversion channel will be controlled using a weir constructed at the start of the diversion channel within the existing bank of Trout Creek.

Conceptual design information for the East Town Limit Flood Flow Diversion Channel is shown in Table 8.

Table 8: East Town Limit Flood Flow Diversion Channel Design Details

Description	Design Details
Bottom of Channel Width	14.0 – 20.0 m
Side Slopes	3:1
Channel Depth	± 3.1 m
Channel Length	1,525 m
Leonard Dr./Route1 - Crossing Combined Length	± 90 m
Leonard Dr./Route1 - Crossing Opening Width	20.0 m
Leonard Dr./Route1 - Crossing Opening Height (m)	2.4 m

3.3.2 Construction Quantities & Cost

The following table provides a summary of conceptual estimated quantities and costs associated with the construction of the East Town Limit Flood Flow Diversion channel:

Table 9: East Town Limit Flood Flow Diversion Channel - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Cost
Channel Construction	65,000	m^3	$2,300,000
Access Trail	1320	m	$150,000
Leonard Dr/Route 1 - Crossing	90	m	$6,700,000
Landscape Finish	37,000	m^2	$250,000
Traffic Control Allowance	1	LS	$750,000
	Total Capital Construction Cost		**$10,200,000**

3.3.3 Project Costs

The property purchase costs were estimated using unit land cost ($ per m^2) from the property assessment information available on GeoNB and multiplied by the total area required for the project. For undeveloped properties the unit land costs were calculated using the listed property assessment value, while for developed properties the unit land costs were estimated assuming the land value represented 20% of the total property assessment value. The following tables provide a summary of estimated property acquisition costs associated with the East Town Limit Flood Flow Diversion Channel project:

Table 10: East Town Limit Flood Flow Diversion Channel – Estimated Property Acquisition Cost Summary

Item	Cost
Property Purchase Cost	$445,000
Legal & Real Estate Fees (@ ≈10.0%)	$45,000
Total Property Acquisition Cost	**$490,000**

Table 11: East Town Limit Flood Flow Diversion Channel - Estimated Project Cost Summary

Description	Cost
Capital Construction	$10,200,000
Contingency (≈25%)	$2,500,000
Engineering (≈15%)	$1,500,000
Permitting	$10,000
Property Acquisition	$490,000
Inflation – Projected Year of Completion - 2024 (4 yr. @ ≈2.0%/year)	$1,200,000
Total Project Cost (excl. GST)	**$16,000,000**

3.3.4 Benefits/Risks

The East Town Limit Flood Flow Diversion Channel will mitigate flood risk along Trout Creek during extreme flood events by transferring flows from Trout Creek to the Kennebecasis River. A conceptual model of the Kennebecasis River was developed using PCSWMM professional 2D to evaluate the optimal flow transfer from Trout Creek to the Kennebecasis River. This flow was determined to be approximately 91 m^3/s, and would reduce the 100-year storm event down to a 20-year event in Trout Creek with a minor water level increase in the Kennebecasis River between the discharge point of the East Town Limit Flood Flow Diversion Channel and the confluence of Trout Creek and the Kennebecasis River. The conceptual results demonstrate a reduction in water level within Trout Creek and a minimal increase in water levels within the Kennebecasis River flood plain. Risk will need to be quantified more precisely with detailed modelling of the Kennebecasis River. Channel profiles and water levels details for the new East Town Limit Flood Flow Diversion Channel are shown on Drawing 7/11 in Appendix D.

The reduction in flood risks along Trout Creek resulting from the East Town Limit Flood Flow Diversion Channel may be large enough to negate the need for the Trout Creek flood mitigation berm project near Main Street. This should be confirmed using detailed modelling of Trout Creek using PCSWMM Professional 2D.

The conceptual model of the Kennebecasis River identified increases in flood risk at the crossings of CN Rail, Route 890 (an old wooden cover bridge and a concrete bridge built in 1985) and Route 1 due to the flow transfer from Trout Creek. The increase in flood risk at the Route 890 crossings was found to be particularly significant as the structural spans under Route 890 are half the length of the spans under the CN Rail and Route 1 bridges. To fully understand the flow transfer dynamics and better quantify the hydraulic performance (and increases in flood risks) of the bridge crossings at CN Rail, Route 890 and Route 1, additional detailed modelling is required.

3.4 Parson Brook Flood Flow Diversion Channel

3.4.1 Project Description

The Parson Brook Flood Flow Diversion Channel will be located between Dutch Valley Road and Trout Creek, adjacent to the Sussex Corner Elementary School within the Village of Sussex Corner. The connection of the channel to Parson Brook will be located upstream of New Line Road. Flow will cross Dutch Valley Road through a new culvert with a weir control structure and continue in the direction of an existing access road, eventually discharging into Trout Creek. The proposed channel will be designed to mitigate future flood damages along Parsons Brook by diverting flood flows from Parsons Brook to Trout Creek upstream of the Village of Sussex Corner/Town of Sussex and is shown on Drawing 8/11 in Appendix E.

Conceptual design information for the Parson Brook Flood Flow Diversion Channel is shown in Table 12.

Table 12: Parson Brook Flood Flow Diversion Channel Design Details

Description	Design Details
Bottom of Channel Width	2.5 m
Side Slopes	3:1
Channel Depth	± 1.9 m
Channel Length	± 580 m
Dutch Valley Road - Crossing Length	± 25 m
Dutch Valley Road - Crossing Opening Width	4.0 m
Dutch Valley Road - Crossing Opening Height	1.8 m

3.4.2 Construction Quantities & Cost

The following table provides a summary of conceptual estimated quantities and costs associated with the construction of the Parson Brook Flood Flow Diversion Channel:

Table 13: Parson Brook Flood Flow Diversion Channel - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Cost
Channel Construction	10,000	m^3	$300,000
Erosion Control	6420	m^2	$150,000
Dutch Valley Rd. & Ballfield - Crossing	30	m	$550,000
Access Road	340	m^2	$50,000
Landscaping Finish	3000	m^2	$50,000
	Total Capital Construction Cost		**$1,100,000**

3.4.3 Project Costs

The property purchase costs were estimated using unit land cost ($ per m^2) from the property assessment information available on GeoNB and multiplied by the total area required for the project. For undeveloped properties the unit land costs were calculated using the listed property assessment value, while for developed properties the unit land costs were estimated assuming the land value represented 20% of the total property assessment value. The following tables provides a summary of estimated property acquisition costs associated with the Parson Brook Flood Flow Diversion Channel project:

Table 14: Parson Brook Flood Flow Diversion Channel - Estimated Property Acquisition Cost Summary

Item	Cost
Property Purchase Cost	$85,000
Legal & Real Estate Fees (@ ≈10.0%)	$10,000
Total Property Acquisition Cost	**$95,000**

Table 15: Parson Brook Flood Flow Diversion Channel - Estimated Project Cost Summary

Description	Cost
Capital Construction	$1,100,000
Contingency (≈25%)	$280,000
Engineering (≈15%)	$170,000
Permitting	$5,000
Property Acquisition	$100,000
Inflation – Projected Year of Completion - 2023 (3 yr. @ ≈2.0%/year)	$100,000
Total Project Cost (excl. GST)	**$1,800,000**

3.4.4 Benefits/Risks

The Parson Brook Flood Flow Diversion Channel will provide flood mitigation along Parson Brook during extreme flooding events by diverting flows from Parson Brook to Trout Creek. A conceptual model was developed using PCSWMM Professional 2D to evaluate the risk of transferring approximately 16 m^3/s from Parson Brook to Trout Creek. The results demonstrate a water level reduction within Parson Brook and a minimal water level increase in Trout Creek. Risk will need to be confirmed during detail design. This would reduce the 100-year storm event down to a 20-year event in Parsons Brook and result in a minor water level increase in Trout Creek between the end of the Parson Brook Flood Flow Diversion Channel and the confluence of Parson Brook and Trout Creek. Details for water levels in the new Parsons Brook diversion channel are shown on Drawing 9/11 in Appendix E.

3.5 Stormwater Infrastructure Upgrades (NW)

3.5.1 Project Description

Stormwater (SW) Infrastructure Upgrades (NW) will be located in the subdivision at the intersection of Main Street and Creighton Drive in the Village of Sussex Corner. These upgrades will include installation of a new shallow storm sewer system on the following streets:

- Creighton Drive,
- Skyline Avenue,
- Campbell Street,
- Phillips Street, and
- Stockton Street

The storm sewers will range in size from 200mm to 600mm and have a total length of approximately 1,375 metres. In addition, the work will include the supply and installation of storm laterals, catchbasins, manholes, and site restoration. This stormwater upgrade will be designed to mitigate localized flooding during minor storm events. Layout of this system is shown on drawing 10/11 in Appendix F.

3.5.2 Construction Quantities & Cost

The following table provides a summary of conceptual estimated quantities and costs associated with the construction of the Stormwater Infrastructure Upgrades:

Table 16:SW Infrastructure Upgrades (NW) - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Cost
Shallow Storm Sewer System	1375	m	$600,000
Structures (Catchbasins/Maholes)	42	Units	$200,000
Site/Road Restoration	57	properties	$300,000
	Total Capital Construction Cost		**$1,100,000**

3.5.3 Project Costs

The property purchase cost was estimated using the property assessment information available on Geonb. It is noted that properties with buildings, the property cost was assumed to be 20% of the assessment value. The following tables provides a summary of estimated property acquisition costs associated with the Stormwater Infrastructure Upgrades (NW) project:

Table 17: SW Infrastructure Improvements - Estimated Property Acquisition Cost Summary

Item	Cost
Property Purchase Cost	$8,000
Legal & Real Estate Fees (@ ≈10.0%)	$1,000
Total Property Acquisition Cost	**$9,000**

Table 18: SW Infrastructure Upgrades (NW) - Estimated Project Cost Summary

Description	Cost
Capital Construction	$1,100,000
Contingency (≈25%)	$280,000
Engineering (≈15%)	$170,000
Permitting	$1,000
Property Acquisition	$9,000
Inflation – Projected Year of Completion - 2020 (1 yr. @ ≈2.0%/year)	$40,000
Total Project Cost (excl. GST)	**$1,600,000**

3.5.4 Benefits/Risks

The Stormwater Infrastructure Upgrades will be designed to reduce localized surface flooding during minor storm events. It should be noted the flat topography in this area will surcharge the proposed stormwater infrastructure upgrades (minor drainage system) during major storm events and will minimize the benefit of the proposed stormwater infrastructure upgrades related to overland flooding.

3.6 Stormwater Infrastructure Upgrades (NE)

3.6.1 Project Description

Stormwater (SW) Infrastructure Upgrades (NE) will be located in the subdivision at the intersection of Post Road and Meredith Drive in the Village of Sussex Corner. These upgrades will include installation of a new shallow storm sewer system on the following streets:

- Meredith Drive,
- Jacob Street,
- Buchanan Drive,
- Connolly Drive, and
- Michael Street

The storm sewers will range in size from 200mm to 600mm and have a total length of approximately 1,480 metres. In addition, the work will include the supply and installation of storm laterals, catchbasins, manholes, and site restoration. This stormwater upgrade will be designed to mitigate localized flooding during minor storm events. Layout of this system is shown on drawing 11/11 in Appendix F.

3.6.2 Construction Quantities & Cost

The following table provides a summary of conceptual estimated quantities and costs associated with the construction of the Stormwater Infrastructure Upgrades (NE) project:

Table 19:SW Infrastructure Upgrades (NE) - Estimated Quantities & Construction Cost Summary

Item Description	Quantity	Unit	Cost
Shallow Storm Sewer System	1480	m	$680,000
Structures (Catchbasins/Maholes)	44	Units	$200,000
Site/Road Restoration	57	properties	$220,000
	Total Capital Construction Cost		**$1,100,000**

3.6.3 Project Costs

The property purchase cost was estimated using the property assessment information available on Geonb. It is noted that properties with buildings, the property cost was assumed to be 20% of the assessment value. The following tables provides a summary of estimated property acquisition costs associated with the Stormwater Infrastructure Upgrades (NE) project:

Table 20: SW Infrastructure Upgrades (NE) - Estimated Property Acquisition Cost Summary

Item	Cost
Property Purchase Cost	$8,000
Legal & Real Estate Fees (@ ≈10.0%)	$1,000
Total Property Acquisition Cost	**$9,000**

Table 21: SW Infrastructure Upgrades (NE) - Estimated Project Cost Summary

Description	Cost
Capital Construction	$1,100,000
Contingency (≈25%)	$280,000
Engineering (≈15%)	$170,000
Permitting	$1,000
Property Acquisition	$9,000
Inflation – Projected Year of Completion - 2020 (1 yr. @ ≈2.0%/year)	$40,000
Total Project Cost (excl. GST)	**$1,600,000**

3.6.4 Benefits/Risks

The Stormwater Infrastructure Upgrades will be designed to reduce localized surface flooding during minor storm events. It should be noted the flat topography in this area will surcharge the proposed stormwater infrastructure upgrades (minor drainage system) during major storm events and will minimize the benefit of the proposed stormwater infrastructure upgrades related to overland flooding.

4.0 CLOSING SUMMARY

The following table provide a conceptual cost summary for the six flood risk mitigation projects proposed by the Town of Sussex and Village of Sussex Corner. As noted above, all of the calculations, design, and cost estimates contained in this report have been performed at a conceptual level and will need to be confirmed and refined through detailed design.

Table 22: Overall Conceptual Project Cost Summary

Project Title	Project Cost
Gateway Mall Flood Mitigation Berm	$1,600,000
Trout Creek Flood Mitigation Berm	$2,500,000
East Town Limit Flood Flow Diversion Channel	$16,000,000
Parson Brook Flood Flow Diversion Channel	$1,800,000
Stormwater Infrastructure Upgrades (NW)	$1,600,000
Stormwater Infrastructure Upgrades (NE)	$1,600,000
Total Project Cost (excl. GST)	**$25,100,000**

We trust the information presented in this report will be sufficient to assist the Town and Village in developing its stormwater risk management program. If you have any questions or require additional information, please contact us at your convenience.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

Hans Arisz, M.Sc.E., P.Eng., FCSCE
Principal

APPENDIX A

OVERVIEW OF PROJECT SITES

N

Meters

600 0 600 1200

1:15000

NB WATERCOURSE

No.	Description	By	YY.MM.DD

File Z:\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074...

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

R.V.Anderson Associates Limited
engineering • environment • infrastructure

FLOOD RISK
MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:15,000	Drawn	A.M.

CIVIL/MUNICIPAL
OVERVIEW
PROJECT SITE LOCATIONS

DWG NO. 1/11

REV. -

APPENDIX B

GATEWAY MALL FLOOD MITIGATION BERM

N

Meters
20 0 20 40
1:500

NB WATERCOURSE
PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg
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TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

R.V.Anderson Associates Limited
engineering • environment • infrastructure

FLOOD RISK MITIGATION PLAN

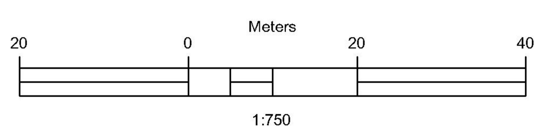
Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:500	Drawn	A.M.

CIVIL/MUNICIPAL
GATEWAY MALL
FLOOD MITIGATION BERM

DWG NO. 2/11
REV. -

APPENDIX C

TROUT CREEK FLOOD MITIGATION BERM



NB WATERCOURSE
PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg
Plot: Dec. 2019, - 09:39:12 AM

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

R.V.Anderson Associates Limited
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FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:750	Drawn	A.M.

CIVIL/MUNICIPAL
TROUT CREEK
FLOOD MITIGATION BERM

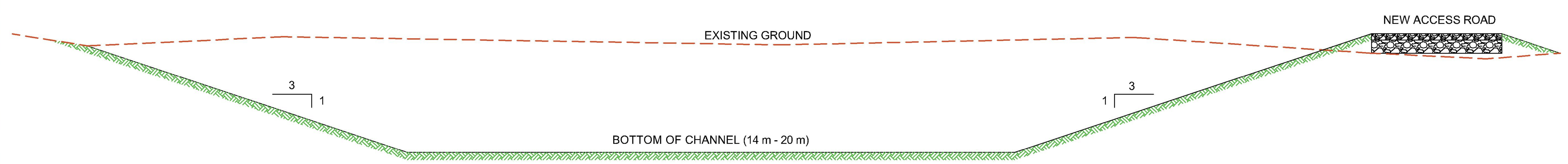
DWG NO. 3/11
REV. -

APPENDIX D

EAST TOWN LIMIT FLOOD FLOW CHANNEL

TYPICAL CHANNEL CROSS-SECTION

SCALE: 1:75



Meters

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1:1000

NB WATERCOURSE

PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

R.V.Anderson Associates Limited
engineering • environment • infrastructure

FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL

EAST TOWN LIMIT

FLOOD FLOW DIVERSION CHANNEL (ST 0+000 - 0+800)

DWG NO. 4/11

REV. -

Meters

40 0 40 80

1:1000

NB WATERCOURSE

PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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FLOOD RISK
MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL
EAST TOWN LIMIT
FLOOD FLOW DIVERSION CHANNEL (ST 0+800 - 1+450)

DWG NO. 5/11

REV. -

Meters

40 0 40 80

1:1000

NB WATERCOURSE

PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL

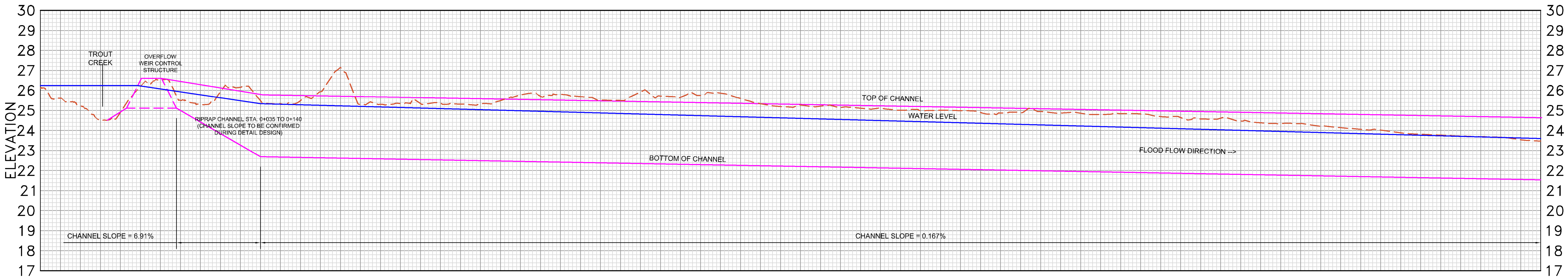
EAST TOWN LIMIT

FLOOD FLOW DIVERSION CHANNEL (ST 1+450 - 1+615)

DWG NO. 6/11

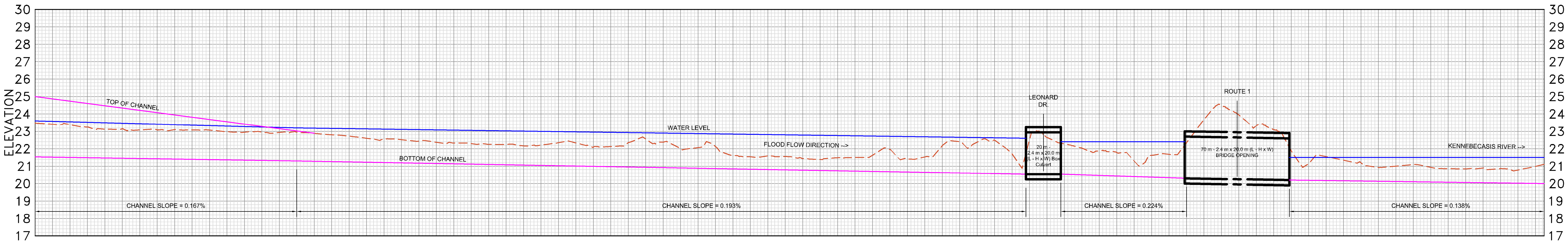
REV. -

EAST TOWN LIMIT FLOW DIVERSION CHANNEL PROFILE



STATION	EXISTING GRADE
0+000	26.13
0+010	25.61
0+020	25.23
0+030	24.50
0+040	24.91
0+050	26.20
0+060	26.52
0+070	25.50
0+080	25.30
0+090	25.93
0+100	26.16
0+110	25.48
0+120	25.34
0+130	25.49
0+140	25.93
0+150	27.15
0+160	25.30
0+170	25.31
0+180	25.34
0+190	25.34
0+200	25.37
0+210	25.31
0+220	25.32
0+230	25.49
0+240	25.78
0+250	25.70
0+260	25.79
0+270	25.69
0+280	25.52
0+290	25.50
0+300	25.92
0+310	25.72
0+320	25.65
0+330	25.74
0+340	25.86
0+350	25.59
0+360	25.33
0+370	25.19
0+380	25.27
0+390	25.21
0+400	25.14
0+410	25.11
0+420	25.12
0+430	25.01
0+440	24.99
0+450	25.00
0+460	24.99
0+470	24.90
0+480	24.87
0+490	24.89
0+500	24.94
0+510	24.87
0+520	24.86
0+530	24.79
0+540	24.83
0+550	24.82
0+560	24.69
0+570	24.65
0+580	24.57
0+590	24.61
0+600	24.47
0+610	24.38
0+620	24.35
0+630	24.34
0+640	24.21
0+650	24.14
0+660	24.06
0+670	24.02
0+680	23.88
0+690	23.81
0+700	23.77
0+710	23.72
0+720	23.69
0+730	23.66
0+740	23.54
0+750	23.47

EAST TOWN LIMIT FLOW DIVERSION CHANNEL PROFILE



STATION	EXISTING GRADE
0+750	23.47
0+760	23.41
0+770	23.39
0+780	23.25
0+790	23.12
0+800	23.14
0+810	23.08
0+820	23.08
0+830	23.10
0+840	23.08
0+850	23.07
0+860	22.98
0+870	22.95
0+880	22.96
0+890	22.93
0+900	22.94
0+910	22.89
0+920	22.80
0+930	22.73
0+940	22.60
0+950	22.56
0+960	22.52
0+970	22.44
0+980	22.37
0+990	22.33
1+000	22.30
1+010	22.25
1+020	22.24
1+030	22.17
1+040	22.20
1+050	22.34
1+060	22.33
1+070	22.09
1+080	22.13
1+090	22.35
1+100	22.56
1+110	22.38
1+120	21.99
1+130	22.07
1+140	22.13
1+150	21.61
1+160	21.55
1+170	21.59
1+180	21.55
1+190	21.44
1+200	21.38
1+210	21.48
1+220	21.50
1+230	21.63
1+240	21.96
1+250	21.41
1+260	21.53
1+270	22.17
1+280	22.41
1+290	22.38
1+300	22.49
1+310	21.71
1+320	22.51
1+330	22.65
1+340	22.28
1+350	22.04
1+360	21.89
1+370	21.79
1+380	21.30
1+390	21.62
1+400	21.68
1+410	22.35
1+420	23.67
1+430	24.49
1+440	23.94
1+450	23.32
1+460	23.10
1+470	21.89
1+480	21.15
1+490	21.55
1+500	21.34
1+510	21.20
1+520	20.92
1+530	21.01
1+540	21.09
1+550	20.94
1+560	20.86
1+570	20.85
1+580	20.90
1+590	20.87
1+600	20.79
1+610	20.99
1+615	21.12

Meters
50 0 50 100
1:1250

EXISTING GROUND
WATER LEVEL

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1250	Drawn	A.M.

CIVIL/MUNICIPAL
EAST TOWN LIMIT
FLOOD FLOW DIVERSION CHANNEL PROFILE (ST 0+000 - 1+1615)

DWG NO. 7/11
REV. -

APPENDIX E

PARSON BROOK FLOOD FLOW CHANNEL

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg
Plot: Dec. 2019, - 10:07:34 AM

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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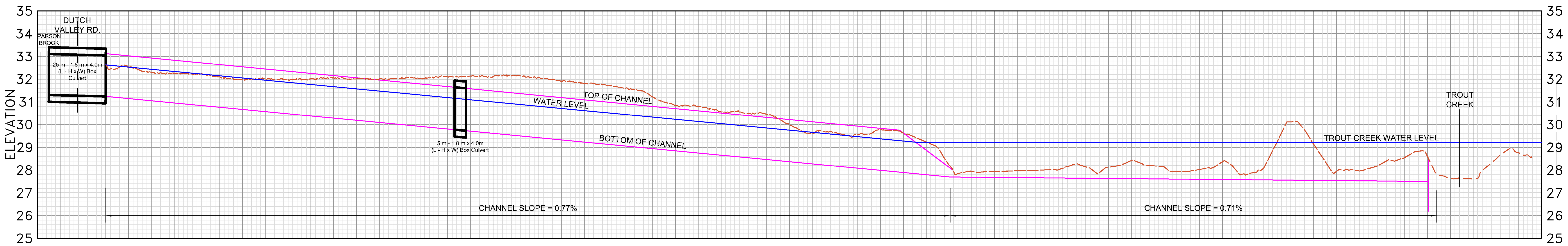
FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL
PARSON BROOK
FLOOD FLOW DIVERSION CHANNEL (ST 0+000 - 0+580)

DWG NO. 8/11
REV. -

PARSON BROOK FLOW DIVERSION CHANNEL PROFILE



STATION			0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140
EXISTING GRADE			32.67	32.52	32.30	32.25	32.21	32.09	31.97	32.02	31.99	32.00	32.06	32.02	32.00	32.06	32.05

STATION	0+150	0+160	0+170	0+180	0+190	0+200	0+210	0+220	0+230	0+240	0+250	0+260	0+270	0+280	0+290	0+300
EXISTING GRADE	32.10	32.14	32.10	32.14	32.07	31.91	31.79	31.72	31.56	31.21	30.85	30.81	30.58	30.51	30.45	30.00

STATION	0+310	0+320	0+330	0+340	0+350	0+360	0+370	0+380	0+390	0+400	0+410	0+420	0+430	0+440	0+450	0+460
EXISTING GRADE	29.63	29.65	29.56	29.77	29.62	29.24	28.23	27.94	27.94	27.97	28.00	28.08	28.15	28.13	28.42	28.19

STATION	0+470	0+480	0+490	0+500	0+510	0+520	0+530	0+540	0+550	0+560	0+570	0+580	0+590	0+600	0+610	0+620	0+630
EXISTING GRADE	27.94	28.03	28.37	27.79	28.45	30.12	29.14	27.94	27.96	28.29	28.56	28.60					

Meters

40 0 40 80

1:1000

EXISTING GROUND

WATER LEVEL

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\6.0 CADD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

R.V. Anderson Associates Limited

FLOOD RISK MITIGATION MASTER PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL

PARSON BROOK

FLOOD FLOW DIVERSION CHANNEL PROFILE (ST 0+000 - 0+580)

DWG NO. 9/11

REV. -

APPENDIX F

STORMWATER INFRASTRUCTURE UPGRADES (NW) & (NE)

N

Meters

40 0 40 80

1:1000

NB WATERCOURSE

PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

Plot

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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FLOOD RISK
MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL
STORMWATER INFRASTRUCTURE
UPGRADES (NW)

DWG NO. 10/11

REV. -

Meters

40 0 40 80

1:1000

NB WATERCOURSE

PROPERTY LINE

No.	Description	By	YY.MM.DD
1	ISSUED FOR REVIEW	AM	19.04.18

File \\FREDERICTONFS01\Files\Projects\2015\153074- Sussex Flood Study\153074.02 - Sussex Flood Risk Mitigation Master Plan\FRMMP - CAD\153074.02-20190418-Sussex FRMMP - Project Sites All.dwg

Plot: Dec. 2019, - 10:20:30 AM

TOWN OF SUSSEX / VILLAGE OF SUSSEX CORNER

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FLOOD RISK MITIGATION PLAN

Project No:	153074	Designed	A.M.
Date:	JUNE-2019	Checked	H.A.
Scale:	1:1000	Drawn	A.M.

CIVIL/MUNICIPAL

STORMWATER INFRASTRUCTURE UPGRADES (NE)

DWG NO. 11/11

REV. -