CROZIER
CONSULTING ENGINEERS

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MEMO

DATE	June 21, 2019	**PROJECT NO.**	1419-4679
RE	Hydraulic Assessment Memo 66 Thomas Street City of Mississauga		

TO	Maricris Marinas, M.Sc., Planner
FROM	Jurgen Koehler, P.Eng.
CC	Sandro De Zen (De Zen Realty Company) James Lethbridge (Lethbridge Planning)

1.0 Introduction and Background

Crozier Consulting Engineers ("Crozier") was retained by De Zen Realty Company Ltd. to complete a Hydraulic Assessment for the site located at 66 Thomas Street, in the City of Mississauga. A section of Mullet Creek flows from north to south along the eastern portion of the property. The subject property is located within the existing Regional floodplain associated with Mullet Creek and is therefore regulated by Credit Valley Conservation (CVC).

The subject land covers an area of approximately 2.8 ha and currently supports mixed industrial and commercial uses. The property is located in a mature mixed-use area within the City of Mississauga and is bound by Joymar Drive to the west, Thomas Street to the south, Tannery Street to the north, and Mullet Creek to the east.

This memo was prepared to summarize current floodplain and natural hazard conditions, correspondence with CVC and potential opportunities to regularize and re-naturalize the floodplain. As a result, the ultimate constraints limit creates a preliminary development limit for the site.

2.0 Natural Hazards Assessment

A preliminary floodplain assessment was completed by Crozier in September 2017. A meeting took place with Crozier and the CVC in February 2018 to discuss the findings of this assessment and the required next steps. It was discussed that the existing floodplain hazard was just one of the existing natural hazards on the site, and that additional natural hazards would have to be assessed. It was determined that the Top of Bank, Dripline, and Long Term Stable Top of Slope would need to be established.

A Top of Bank and Dripline staking took place on April 4th, 2018 on the site. A geotechnical and slope stability investigation was then carried out by Sirati & Partners Consultants Limited to assess the Long-Term Stable Slope. This report is provided under a separate cover. The Top of Bank,

Dripline, and Long-Term Stable Slope (Sirati & Partners, 2018), and associated setbacks, are illustrated on Figure 1.

3.0 Hydraulic Analysis

3.1 Existing Conditions

The CVC HEC-2 model for Mullet Creek was obtained by Crozier and converted into a HEC-RAS file. An updated existing conditions model (CFCA HEC-RAS Existing) was created by updating the existing cross sections within the site with a detailed topographic survey of the site (D. Searles, August 2017). Additional cross sections (XS 43.5, XS 44.3 and XS 44.6) were also added within the model to accurately capture changes in site conditions and add additional detail to the hydraulic assessment.

Under existing conditions, the average depth of water during the Regional flood event along the eastern portion of the site is approximately 0.4 m. Similarly, during the Regional flood event, the average depth of water on Thomas Street to the south of the site is approximately 0.5 m. It is expected that water will spill up Joymar Drive approximately 80 m north from the intersection of Thomas Street and Joymar Drive during the Regional flood event. The existing conditions flooding limits within and surrounding the subject property are delineated and illustrated on Figure 1.

The CVC HEC-2 and the CFCA HEC-RAS Existing conditions flood elevations for Mullet Creek are summarized in Table 1 (refer to Section 3.2). Model output cross sections and summary tables are also attached to this memo.

3.2 Proposed Conditions

The proponent wishes to re-develop the site into a townhouse complex. The existing buildings, structures and debris on the site, including the buildings currently within or abutting the existing floodplain limits, are to be removed. The existing asphalt within the site that currently extends to the top of bank of Mullet Creek will also be removed.

A proposed cut/fill plan and associated proposed conditions HEC-RAS model was created to regularize the floodline and create preliminary development limits for the site while maintaining existing flooding conditions to the greatest extent possible. All cross-sections within the property limits were modified from the existing conditions model to represent the proposed conditions scenario. Below is a list of criteria that was considered when developing the proposed conditions scenario:

- A 5.0 m setback from the proposed conditions Regulatory floodline to the development limits of the site
- Freeboard depth of 0.30 m from the proposed condition Regulatory floodplain elevation
- A net cut / fill balance within the floodplain. Note, at this stage we have 8 m^3 of excess floodplain cut versus fill
- The proposed cut and fill must occur at similar elevations
- No impacts to floodplain elevations or velocities upstream or downstream of the site
- Safe access / egress can be provided for the site from Joymar Drive and Tannery Street

The proposed conditions scenario is illustrated on Figure 1. Cross-sections have also been prepared for each modelled cross-section within the site. These cross-sections illustrate the CFCA existing conditions cross-section, the staked Top of Bank and Dripline, Long Term Stable Slope, proposed cut / fill scenario, and proposed development limits. These cross sections are provided as Figure 2, 3 and 4.

As illustrated on the figures, the proposed cut / fill scenario involves a small amount of cut adjacent to the top of bank. This is necessary to maintain positive drainage towards the creek while maintaining a cut / fill balance within the floodplain area. The depth of cut at the top of bank also corresponds with the approximate thickness of the existing asphalt that currently extends to the top of bank. This asphalt will be removed and the floodplain area will be re-instated and re-naturalized in the proposed development scenario. Through discussions with the geotechnical engineer, this small amount of cut at the top of bank could also decrease the erosion potential of the existing steep slope along Mullet Creek and could be supported from a geotechnical standpoint.

Filling of the site is proposed to floodproof future development and to create a landform to ensure that the development area adjacent to the floodplain is a minimum of 0.30 m above the proposed Regulatory flood elevations.

3.2.1 Water Surface Elevations

The CVC HEC-2 Existing Conditions, CFCA HEC-RAS Existing Conditions, and CFCA HEC-RAS Proposed Conditions Regulatory flood elevations are highlighted in Table 1. The Regulatory flood elevations are the greater of the Regional, 100-year and 50-year flood events. A detailed list of the Regional, 100-year and 50-year flood elevations are included within a table in the attachments. As noted within this detailed list some elevations were interpolated from upstream and downstream cross sections due to modelling anomalies to be more conservative and representative of physical water surface elevations.

Table 1: Mullet Creek Regulatory Flood Elevations

Location Description	Cross Section	River Station	Regulatory Flood Event			
			CVC HEC-2 Existing (m)	CFCA HEC-RAS Existing (m)	CFCA HEC-RAS Proposed (m)	Net Change - Ex. to Pr. CFCA (m)
	50	6+660	157.50	157.56	157.56	Nil
	49	6+480	157.48	157.55	157.55	Nil
Tannery Street	48	6+468	157.38	157.45	157.45	Nil
Site	47	6+455	156.53	157.28	156.01	-1.27
	46	6+380	156.24	156.33	155.77	-0.56
	45	6+330	155.60	155.89	155.63	-0.26
	44.6*	6+290	N/A	155.68	155.47	-0.21
	44.3*	6+250	N/A	155.47	155.34	-0.13
	44	6+210	154.90	155.14	155.06	-0.08
	43.5*	6+173	N/A	154.84	154.80	-0.04
	43	6+136	154.61	154.60	154.60	Nil
Thomas Street	42	6+116	154.30	154.43	154.43	Nil
	41	6+060	153.78	153.73	153.73	Nil

Notes: * denotes additional cross-section cut along reach

As illustrated in Table 1, there are no impacts to Regulatory floodplain elevations upstream or downstream of the site. Within the site, all Regulatory floodplain elevations decrease or remain the same within the proposed condition. Additionally, the cut and fill at each cross-section occurs at similar elevations, and a cut surplus within the floodplain of 150 m^3 is proposed.

3.2.2 Floodway Velocities

An evaluation of floodway velocities was also undertaken. Based on the model results, floodway velocities in the 100-year and Regional storm events are generally 3 to 5 metres per second, and remain in this range upon development. It is also noted that based on the model results there are no changes in velocity within the Creek up to and including the 10-year storm event. Hence, we do not anticipate any adverse impacts as a result of floodway velocity changes.

4.0 Proposed Development Limit

Due to the infill nature of the site it is proposed to provide a 5 m development setback from the most constraining natural hazard (ie. Floodplain or Long Term Stable Top of Slope) to the proposed development property line. An additional internal 5 m development setback is also incorporated within the proposed Site Plan. It is proposed to place restrictions on the 5 m buffer within the development site that does not allow any permanent or temporary structures and requires the maintenance of vegetation by the condominium corporation; passive recreation/use would be allowed. A freeboard depth of 0.30 m is also provided from the proposed Regulatory flood elevation to the proposed grade at the limit of the development.

5.0 Conclusions and Recommendations

The proposed cut and fill solution was developed using hydraulic information and consultation with the CVC. Current topographic survey of the site and creek was provided by David B. Searles Surveying Ltd. to confirm the existing topographic elevations and prepare additional model cross-sections on the site. The proposed cut and fill scenario meets the required CVC Technical Guidelines for Floodproofing and policies where relevant to the nature of the subject property.

Through this analysis, we have sufficiently demonstrated that the proposed cut and fill will not cause adverse flooding impacts. Cut / fill works within the floodplain can be completed to provide post- to-pre-development levels of flood storage in the Regulatory event, while allowing for a regularized development limit. This is consistent with the City of Mississauga's policies and vision for this site within the above-mentioned engineering parameters.

As such, we recommend that the proposed approach be accepted for use in establishing the development limits for the subject property.

Should you have any questions, or require further information, please do not hesitate to contact the undersigned.

Sincerely,

C.F. CROZIER & ASSOCIATES INC.

Lucas Parsons, EIT
Water Resources

C.F. CROZIER & ASSOCIATES INC.

Jurgen Koehler, P.Eng.
Project Engineer

/lp

Attachments:

Figure 1: Regulatory Floodplain and Natural Hazard Assessment, dated June 20th, 2019
Figure 2, 3 and 4: HEC-RAS Cross Sections, dated June 20th, 2019
66 Thomas Street, Mullet Creek, Flood Elevations table dated June 12th, 2019
Detailed Hydraulic Assessment: Cut/Fill Volume Calculations, dated June 12th, 2019
HEC-RAS Existing and Proposed Conditions Output Table
HEC-RAS Existing and Proposed Conditions Model Cross Sections
HEC-RAS Existing and Proposed Conditions Water Surface Profiles
CVC Mullet Creek Flood Risk Map (3 of 12) dated March 1997

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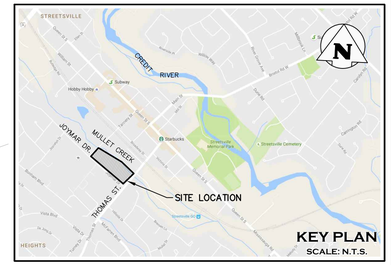
CUT/FILL TABLE	
CUT VOLUME WITHIN FLOODPLAIN (m³)	-248
FILL VOLUME WITHIN FLOODPLAIN (m³)	240
NET CUT/FILL VOLUME WITHIN FLOODPLAIN (m³)	-8

NOTE: APPROXIMATE VOLUME BASED ON PRELIMINARY CUT/FILL ANALYSIS



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- x 215.00 EXISTING GRADE
- x215.00 PROPOSED GRADE
- x215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- EXISTING REGIONAL FLOODLINE (CFCA 2019)
- PROPOSED REGIONAL FLOODLINE (CFCA 2019)
- PROPOSED REGIONAL FLOODLINE – 5.0m SETBACK (CFCA 2019)
- LONG-TERM STABLE TOP OF SLOPE (SIRATI 2018)
- LONG-TERM STABLE TOP OF SLOPE – 5.0m SETBACK (SIRATI 2018)
- STAKED TOP OF BANK (CVC 2018)
- STAKED DRIPLINE (CVC 2018)
- PROPOSED DEVELOPMENT LIMIT
- XS ID (216.45) CROSS-SECTION I.D. (CVC) / EXISTING REGIONAL FLOOD WSEL (m) (CFCA 2019) / PROPOSED REGIONAL FLOOD WSEL (m) (CFCA 2019)
- XS ID* 216.45 NEW CROSS-SECTION I.D. (BY CROZIER) / EXISTING REGIONAL FLOOD WSEL (m) (CFCA 2019) / PROPOSED REGIONAL FLOOD WSEL (m) (CFCA 2019)
- PROPOSED 3:1 SLOPE
- PROPOSED GRADING LIMIT

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1	RE-ISSUED FOR CVC DISCUSSION	2018/FEB/21
0	ISSUED FOR CVC DISCUSSION	2018/FEB/20

ELEVATION NOTE:

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ELEVATION = 162.08m

SURVEY NOTES:

SURVEY COMPLETED BY DAVID B. SEARLES SURVEYING LTD. (2017/AUG/11) REFERENCE No.: 116-0-16. TOP OF BANK AND CANOPY LINE AS DEFINED BY SITE WALK WITH CVC STAFF (2018/APR/4). SURVEY BY DAVID B. SEARLES (2018/APR/5)

BEARINGS ARE GRID BEARINGS DERIVED FROM GPS OBSERVATIONS USING THE SMARTNET NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81°00' WEST), NAD83 (CSRS 2010)

BEARINGS ON PLAN SURVEY BY B.J. STASSEN, O.L.S., DATED JUNE 8, 1990 (PI) AND PLAN 43R-16616 (P6) HAVE BEEN ROTATED 01°01'10" COUNTERCLOCKWISE TO MAKE COMPARISONS.

BEARINGS ON PLAN BY C. PEAT O.L.S., DATED OCTOBER 4, 1967 (P3) HAVE BEEN ROTATED 00°53'20" COUNTERCLOCKWISE TO MAKE COMPARISONS

BEARINGS ON TOPO SURVEY BY TONY STAUSKAS, O.L.S., DATED JUNE 9, 2009 (P4) HAVE BEEN ROTATED 00°52'20" COUNTERCLOCKWISE TO MAKE COMPARISONS.

DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.9997255.

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

NOTE: ALL EXISTING BUILDINGS TO BE REMOVED

Stamp

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

66 THOMAS STREET
CITY OF MISSISSAUGA

Drawing

REGULATORY FLOODPLAIN AND NATURAL HAZARDS FIGURE

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
L.P.	L.P.		1419-4679
Check	Check	Scale	Dwg
S.C.	N.M./J.R.K.	1:500	FIGURE 1

SCALE: 1:500

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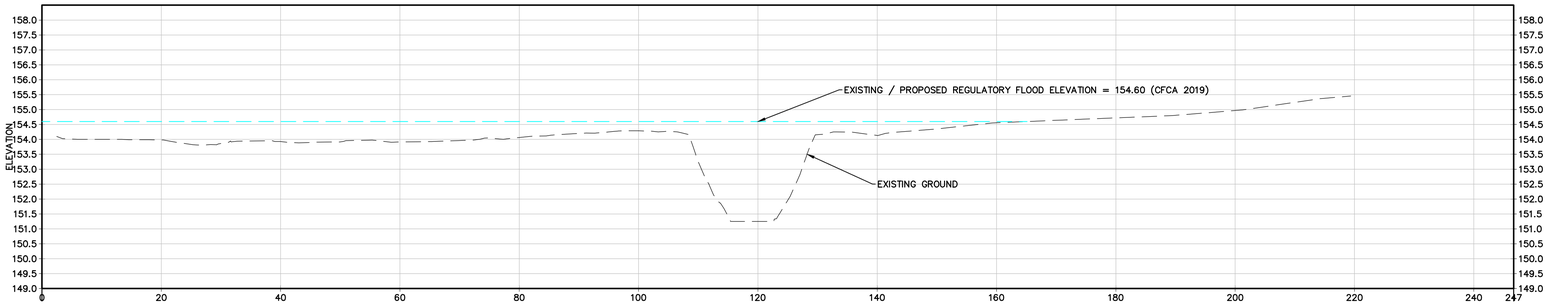
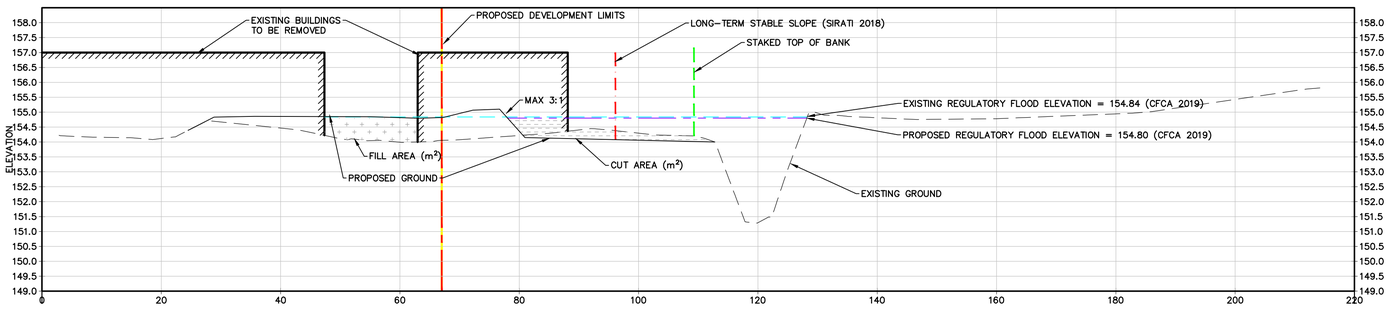
XS43

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100



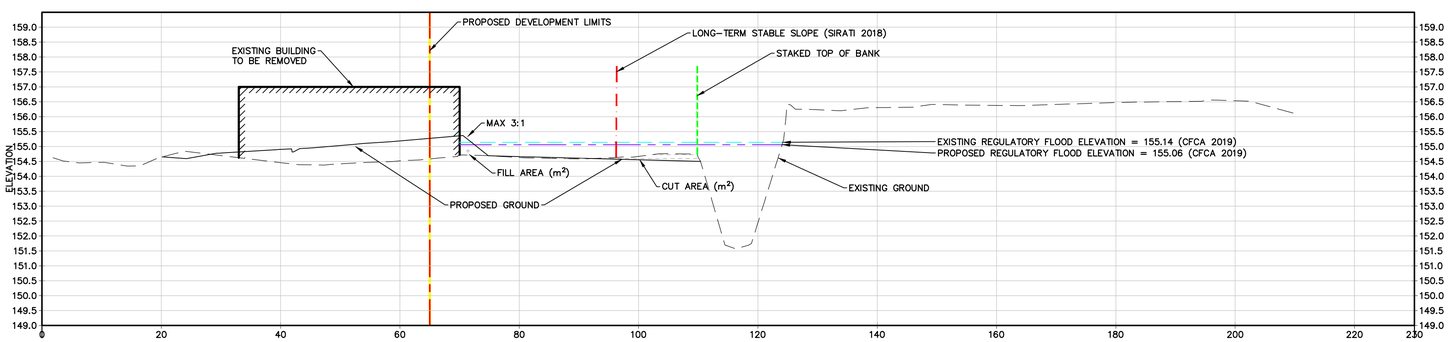
XS43.5

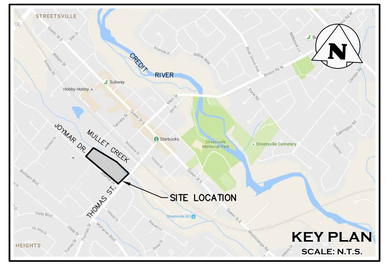
HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100



XS44

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100





LEGEND

- PROPERTY LINE
- EXISTING REGIONAL FLOODLINE (CFCA 2019)
- PROPOSED REGIONAL FLOODLINE (CFCA 2019)
- LONG-TERM STABLE TOP OF SLOPE (SIRATI 2018)
- STAKED TOP OF BANK OR DRIPLINE (CVC 2018)
- CUT AREA (CROZIER 2019)
- FILL AREA (CROZIER 2019)

XS 43.5 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m²)	−11.47
FILL AREA WITHIN FLOODPLAIN (m²)	11.52
NET CUT/FILL AREA WITHIN FLOODPLAIN (m²)	0.05
DISTANCE TO U/S CROSS SECTION (m)	32

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS

XS 44 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m²)	−2.56
FILL AREA WITHIN FLOODPLAIN (m²)	1.69
NET CUT/FILL AREA WITHIN FLOODPLAIN (m²)	−0.87
DISTANCE TO U/S CROSS SECTION (m)	40

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS

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Project

66 THOMAS STREET
CITY OF MISSISSAUGA

Drawing

HEC-RAS CROSS SECTIONS

Stamp

PRELIMINARY
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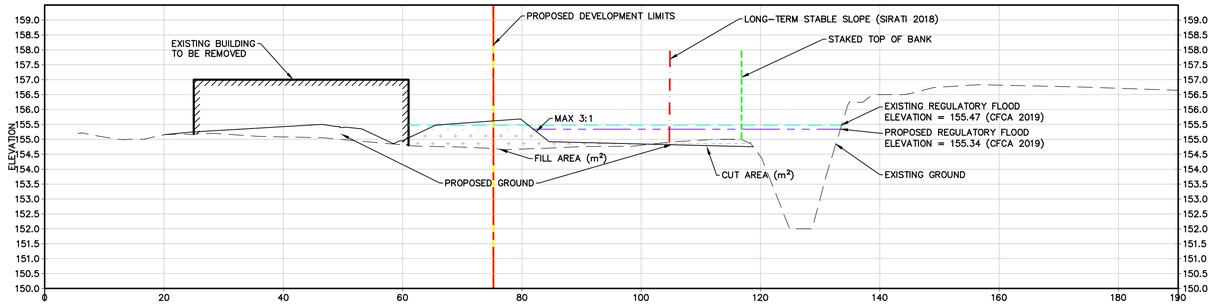
CROZIER & ASSOCIATES
Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
L.P.	L.P.	1419-4679	
Check	Check	Scale	Dwg
S.C.	N.M./J.R.K.	1:500	FIGURE 2

I:\1400\1419-De Zen Realty Co Ltd\4679-66 Thomas St\CAD\Civil\Sheets\4679_XS.dwg, XS-1, 6/21/2019 1:36:30 PM, lparsons

XS44.3

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100

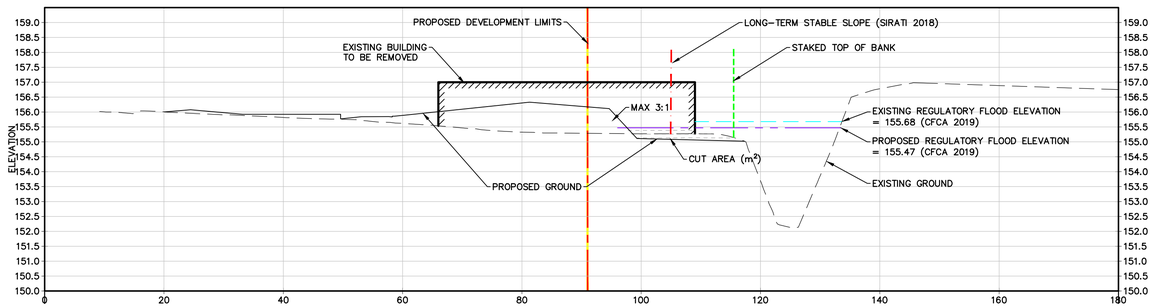


XS 44.3 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m²)	-2.63
FILL AREA WITHIN FLOODPLAIN (m²)	16.15
NET CUT/FILL AREA WITHIN FLOODPLAIN (m²)	13.52
DISTANCE TO U/S CROSS SECTION (m)	40

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS

XS44.6

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100

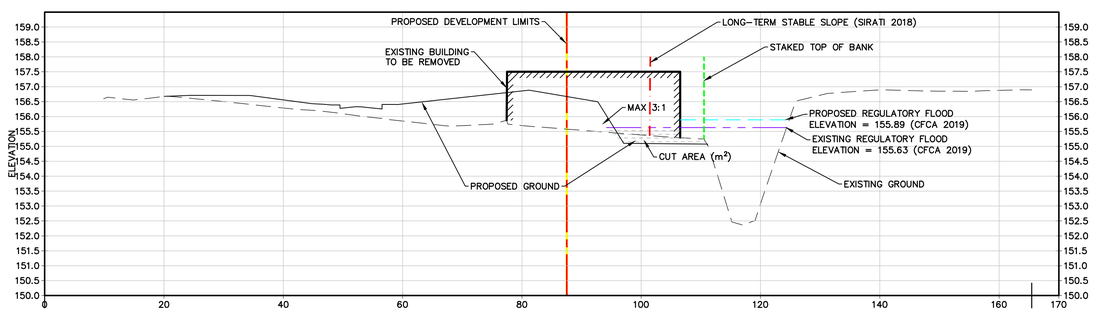


XS 44.6 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m²)	-5.50
FILL AREA WITHIN FLOODPLAIN (m²)	0.00
NET CUT/FILL AREA WITHIN FLOODPLAIN (m²)	-5.50
DISTANCE TO U/S CROSS SECTION (m)	40

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS

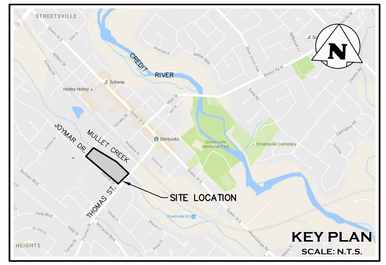
XS45

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100



XS 45 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m²)	-6.65
FILL AREA WITHIN FLOODPLAIN (m²)	0.00
NET CUT/FILL AREA WITHIN FLOODPLAIN (m²)	-6.65
DISTANCE TO U/S CROSS SECTION (m)	50

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS



LEGEND

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- PROPOSED REGIONAL FLOODLINE (CFCA 2019)
- LONG-TERM STABLE TOP OF SLOPE (SIRATI 2018)
- STAKED TOP OF BANK OR DRIPLINE (CVC 2018)
- CUT AREA (CROZIER 2019)
- FILL AREA (CROZIER 2019)

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BEARINGS ON PLAN BY C. PEAT O.L.S., DATED OCTOBER 4, 1967 (P3) HAVE BEEN ROTATED 00°53'20" COUNTERCLOCKWISE TO MAKE COMPARISONS

BEARINGS ON TOPO SURVEY BY TONY STAUSKAS, O.L.S., DATED JUNE 9, 2009 (P4) HAVE BEEN ROTATED 00°52'20" COUNTERCLOCKWISE TO MAKE COMPARISONS.

DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.9997255.

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

66 THOMAS STREET
CITY OF MISSISSAUGA

Drawing

HEC-RAS CROSS SECTIONS

Stamp

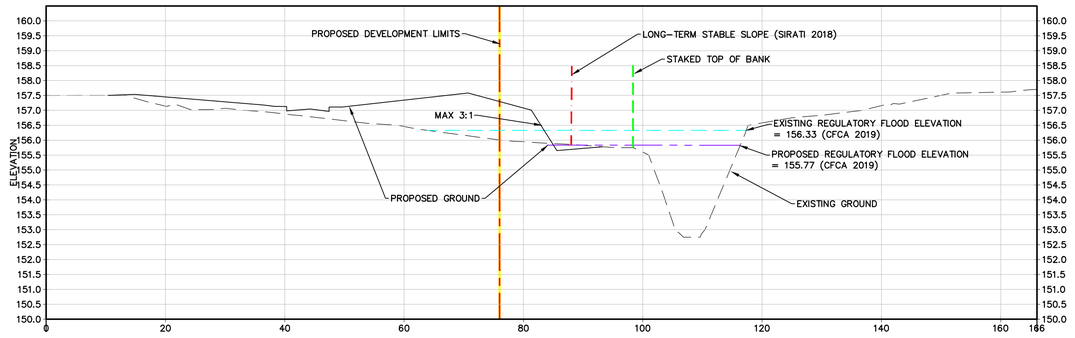
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
L.P.	L.P.	1419-4679	
Check	Check	Scale	Dwg.
N.M.	J.R.K.	1:500	FIGURE 3

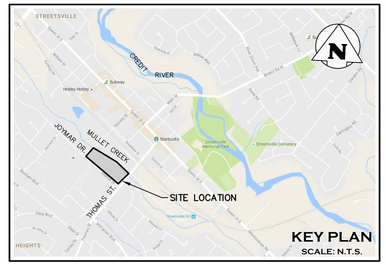
XS46

HORIZANTAL SCALE: 1:500
VERTICAL SCALE: 1:100



XS 46 CUT/FILL TABLE	
CUT AREA WITHIN FLOODPLAIN (m^2)	0.00
FILL AREA WITHIN FLOODPLAIN (m^2)	0.00
NET CUT/FILL AREA WITHIN FLOODPLAIN (m^2)	0.00
DISTANCE TO U/S CROSS SECTION (m)	55

NOTE: APPROXIMATE AREA BASED ON PRELIMINARY CUT/FILL ANALYSIS



KEY PLAN
SCALE: N.T.S.

LEGEND

- PROPERTY LINE
- EXISTING REGIONAL FLOODLINE (CFCA 2019)
- PROPOSED REGIONAL FLOODLINE (CFCA 2019)
- LONG-TERM STABLE TOP OF SLOPE (SIRATI 2018)
- STAKED TOP OF BANK OR DRIPLINE (CVC 2018)
- CUT AREA (CROZIER 2019)
- FILL AREA (CROZIER 2019)

No.	ISSUE / REVISION	YYYY/MMM/DD
3	ISSUED FOR OPA AND ZBA APPLICATION	2019/JUN/21
2	RE-ISSUED FOR CVC DISCUSSION	2018/AUG/17
1	NOT ISSUED WITH THIS SUBMISSION	2018/FEB/21
0	NOT ISSUED WITH THIS SUBMISSION	2018/FEB/20

ELEVATION NOTE:

ELEVATIONS ARE REFERRED TO THE CITY OF MISSISSAUGA BENCHMARK No. 257 LOCATED ON THE SOUTH FACE, 0.61 METRE WEST OF THE EAST CORNER OF THE RED BRICK BUILDING AT THE NORTHWEST CORNER OF THOMAS STREET AND QUEEN STREET, HAVING AN ELEVATION OF 162.08m. CANADIAN GEODETIC VERTICAL DATUM 1928: PRE 1978 ADJUSTMENT.

ELEVATION = 162.08m

SURVEY NOTES:

SURVEY COMPLETED BY DAVID B. SEARLES SURVEYING LTD. (2017/AUG/11) REFERENCE No.: 116-0-16. TOP OF BANK AND CANOPY LINE AS DEFINED BY SITE WALK WITH CVC STAFF (2018/APR/4). SURVEY BY DAVID B. SEARLES (2018/APR/5)

BEARINGS ARE GRID BEARINGS DERIVED FROM GPS OBSERVATIONS USING THE SMARTNET NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81°00' WEST), NAD83 (CSRS 2010)

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Project

66 THOMAS STREET
CITY OF MISSISSAUGA

Drawing

HEC-RAS CROSS SECTIONS

Stamp

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

CROZIER & ASSOCIATES
Consulting Engineers
2800 High Point Drive
Suite 100
Milton, ON L9T 6P4
905 875-0026 T
905 875-4915 F
www.cfcrozier.ca

Drawn	Design	Project No.	
L.P.	L.P.		1419-4679
Check	Check	Scale	Dwg
N.M.	J.R.K.	1:500	FIGURE 4

CROZIER
CONSULTING ENGINEERS

Project: 66 Thomas Street
Project No.: 1419-4679
Created By: LP
Reviewed By: JRK
Date: 2019-06-12

66 Thomas Street - Mullet Creek - Flood Elevations

Location Description	Cross Section	River Station	Regional Flood Elevations (m)			100-Yr Flood Elevation (m)		50-Yr Flood Elevation (m)		Regulatory Flood Elevation[4] (m)	
			CVC HEC - 2 Existing	CFCA HEC-RAS Existing	CFCA HEC-RAS Proposed	CFCA HEC-RAS Existing	CFCA HEC-RAS Proposed	CFCA HEC-RAS Existing	CFCA HEC-RAS Proposed	CFCA HEC-RAS Existing	CFCA HEC-RAS Proposed
	50	6660	157.50	157.56	157.56	157.45	157.45	157.32	157.32	157.56	157.56
	49	6480	157.48	157.55	157.55	157.44	157.44	157.31	157.30	157.55	157.55
Tannery St.	48	6468	157.38	157.45	157.45	157.34	157.34	157.22	157.22	157.45	157.45
Site	47	6455	156.53	**157.28**	156.01	**157.17**	155.86	**157.04**	155.75	157.28	156.01
	46	6380	156.24	156.33	155.77	156.16	155.72	155.98	155.65	156.33	155.77
	45	6330	155.60	155.55	155.63	**155.89**	155.52	**155.69**	**155.55**	155.89	155.63
	44.6*	6290	N/A	**155.49**	155.33	**155.68**	155.35	**155.46**	155.47	155.68	155.47
	44.3*	6250	N/A	155.42	155.27	155.47	155.34	155.23	154.69	155.47	155.34
	44	6210	154.90	155.01	154.99	**155.14**	**155.06**	**154.95**	**154.60**	155.14	155.06
	43.5*	6173	N/A	**154.81**	**154.80**	**154.84**	**154.80**	**154.70**	**154.52**	154.84	154.80
	43	6136	154.61	154.60	154.60	154.54	154.54	154.44	154.44	154.60	154.60
Thomas St.	42	6116	154.30	154.43	154.43	154.32	154.32	154.16	154.16	154.43	154.43
	41	6060	153.78	153.73	153.73	153.61	153.61	153.57	153.57	153.73	153.73

NOTES: 1. Cross sections highlighted in green are within property boundary

2. * denotes additional cross-section cut along reach within HEC-RAS model

3. Due to modelling anomolies, **bolded** elevations were interpolated from upstream and downstream cross sections to be more conservative and representative of physical water surface elevations

4. Greatest of the Regional, 100-year amd 50-year flood elevations form the CFCA Existing Regulatory Flood Elevations

CROZIER CONSULTING ENGINEERS

Project: 66 Thomas Street
Project No.: 1419-4679
Created By: LP
Reviewed By: JRK
Date: 2019-06-20

66 Thomas Street - Mullet Creek - Hydraulic Assessment

Cross Section	Cut Area (m^2)	Fill Area (m^2)	Net Cut/Fill Area (m^2)	Distance to U/S Cross-Section (m)	Cut/Fill Volume (m^3)
43	0.00	0.00	0.00	32	0.00
43.5	-11.47	11.52	0.05	32	0.80
44	-2.56	1.69	-0.87	40	-13.12
44.3	-2.63	16.15	13.52	40	253.00
44.6	-5.50	0.00	-5.50	40	160.40
45	-6.65	0.00	-6.65	50	-243.00
46	-2.60	0.00	0.00	55	-166.25
47	0.00	0.00	0.00	0	0.00

Total Cut Volume	-248 m^3
Total Fill Volume	240 m^3
Net Volume	**-8 m^3 (Cut)**

Notes:

1. Negative value denotes cut and positive value denotes fill

2. Cut/Fill volumes are within the floodplain area only and are based off flood elevations developed by C.F. Crozier HEC-RAS modelling (June 2019)

HEC-RAS CFCA Existing and Proposed Conditions Output Table

HEC-RAS River: RIVER-1 Reach: Reach-4

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-4	50	Regional	CFCA_Ex	113.00	154.00	157.56		157.62	0.000223	1.29	123.21	59.19	0.23
Reach-4	50	Regional	CFC_Pr	113.00	154.00	157.56		157.61	0.000223	1.30	123.07	59.18	0.23
Reach-4	50	100-year	CFCA_Ex	103.00	154.00	157.45		157.50	0.000216	1.25	116.72	58.40	0.22
Reach-4	50	100-year	CFC_Pr	103.00	154.00	157.45		157.50	0.000216	1.25	116.72	58.40	0.22
Reach-4	50	50-year	CFCA_Ex	92.40	154.00	157.32		157.37	0.000210	1.19	109.19	57.47	0.22
Reach-4	50	50-year	CFC_Pr	92.40	154.00	157.32		157.37	0.000211	1.20	109.08	57.46	0.22
Reach-4	50	25-year	CFCA_Ex	79.60	154.00	157.13		157.18	0.000209	1.14	98.55	56.13	0.22
Reach-4	50	25-year	CFC_Pr	79.60	154.00	157.14		157.18	0.000208	1.14	98.60	56.13	0.22
Reach-4	50	10-year	CFCA_Ex	59.60	154.00	156.24		156.34	0.000714	1.64	51.22	49.72	0.38
Reach-4	50	10-year	CFC_Pr	59.60	154.00	156.24		156.34	0.000714	1.64	51.22	49.72	0.38
Reach-4	50	5-year	CFCA_Ex	54.70	154.00	156.10		156.22	0.000882	1.73	44.19	48.69	0.41
Reach-4	50	5-year	CFC_Pr	54.70	154.00	156.10		156.22	0.000882	1.73	44.19	48.69	0.41
Reach-4	50	2-year	CFCA_Ex	36.30	154.00	155.56		155.75	0.001948	2.02	21.70	32.52	0.58
Reach-4	50	2-year	CFC_Pr	36.30	154.00	155.56		155.75	0.001948	2.02	21.70	32.52	0.58
Reach-4	49	Regional	CFCA_Ex	113.00	153.75	157.55		157.58	0.000132	1.10	159.61	72.01	0.18
Reach-4	49	Regional	CFC_Pr	113.00	153.75	157.55		157.58	0.000132	1.10	159.43	72.00	0.18
Reach-4	49	100-year	CFCA_Ex	103.00	153.75	157.44		157.47	0.000127	1.06	151.69	71.40	0.18
Reach-4	49	100-year	CFC_Pr	103.00	153.75	157.44		157.47	0.000127	1.06	151.69	71.40	0.18
Reach-4	49	50-year	CFCA_Ex	92.40	153.75	157.31		157.33	0.000123	1.02	142.44	70.69	0.17
Reach-4	49	50-year	CFC_Pr	92.40	153.75	157.30		157.33	0.000124	1.02	142.30	70.68	0.17
Reach-4	49	25-year	CFCA_Ex	79.60	153.75	157.12		157.14	0.000122	0.98	129.25	69.65	0.17
Reach-4	49	25-year	CFC_Pr	79.60	153.75	157.12		157.15	0.000121	0.98	129.31	69.66	0.17
Reach-4	49	10-year	CFCA_Ex	59.60	153.75	156.19		156.24	0.000359	1.35	70.13	55.97	0.28
Reach-4	49	10-year	CFC_Pr	59.60	153.75	156.19		156.24	0.000359	1.35	70.13	55.97	0.28
Reach-4	49	5-year	CFCA_Ex	54.70	153.75	156.03		156.09	0.000427	1.40	61.69	53.51	0.30
Reach-4	49	5-year	CFC_Pr	54.70	153.75	156.03		156.09	0.000427	1.40	61.69	53.51	0.30
Reach-4	49	2-year	CFCA_Ex	36.30	153.75	155.39		155.48	0.000940	1.66	32.32	37.75	0.42
Reach-4	49	2-year	CFC_Pr	36.30	153.75	155.39		155.48	0.000940	1.66	32.32	37.75	0.42
Reach-4	48	Regional	CFCA_Ex	113.00	153.50	157.45	156.01	157.55	0.000360	1.58	80.17	52.92	0.25
Reach-4	48	Regional	CFC_Pr	113.00	153.50	157.45	156.01	157.55	0.000362	1.58	80.02	52.80	0.25
Reach-4	48	100-year	CFCA_Ex	103.00	153.50	157.34	155.85	157.44	0.000350	1.53	74.80	48.49	0.25
Reach-4	48	100-year	CFC_Pr	103.00	153.50	157.34	155.85	157.44	0.000350	1.53	74.80	48.49	0.25
Reach-4	48	50-year	CFCA_Ex	92.40	153.50	157.22	155.69	157.31	0.000334	1.46	69.12	43.32	0.24
Reach-4	48	50-year	CFC_Pr	92.40	153.50	157.22	155.69	157.31	0.000335	1.46	69.02	43.22	0.24
Reach-4	48	25-year	CFCA_Ex	79.60	153.50	157.04	155.48	157.12	0.000305	1.35	62.04	35.84	0.23
Reach-4	48	25-year	CFC_Pr	79.60	153.50	157.04	155.48	157.13	0.000304	1.35	62.08	35.88	0.23
Reach-4	48	10-year	CFCA_Ex	59.60	153.50	155.60	155.14	156.10	0.003253	3.12	19.11	17.55	0.69
Reach-4	48	10-year	CFC_Pr	59.60	153.50	155.60	155.14	156.10	0.003253	3.12	19.11	17.55	0.69
Reach-4	48	5-year	CFCA_Ex	54.70	153.50	155.50	155.04	155.96	0.003249	3.01	18.16	17.12	0.68
Reach-4	48	5-year	CFC_Pr	54.70	153.50	155.50	155.04	155.96	0.003249	3.01	18.16	17.12	0.68
Reach-4	48	2-year	CFCA_Ex	36.30	153.50	155.06	154.68	155.39	0.003261	2.56	14.18	15.37	0.65
Reach-4	48	2-year	CFC_Pr	36.30	153.50	155.06	154.68	155.39	0.003261	2.56	14.18	15.37	0.65
Reach-4	47.5			Bridge									
Reach-4	47	Regional	CFCA_Ex	113.00	153.50	156.11	156.01	157.26	0.005705	4.77	23.71	20.42	0.94
Reach-4	47	Regional	CFC_Pr	113.00	153.50	156.01	156.01	157.26	0.006471	4.95	22.83	19.25	1.00
Reach-4	47	100-year	CFCA_Ex	103.00	153.50	156.04	155.86	157.05	0.005176	4.46	23.09	19.60	0.89
Reach-4	47	100-year	CFC_Pr	103.00	153.50	155.86	155.86	157.03	0.006623	4.80	21.44	18.57	1.00
Reach-4	47	50-year	CFCA_Ex	92.40	153.50	155.95	155.69	156.83	0.004694	4.15	22.28	18.94	0.85
Reach-4	47	50-year	CFC_Pr	92.40	153.50	155.75	155.69	156.79	0.006219	4.51	20.47	18.14	0.96
Reach-4	47	25-year	CFCA_Ex	79.60	153.50	155.75	155.48	156.52	0.004600	3.88	20.49	18.15	0.83
Reach-4	47	25-year	CFC_Pr	79.60	153.50	155.71	155.48	156.51	0.004934	3.97	20.07	17.97	0.85
Reach-4	47	10-year	CFCA_Ex	59.60	153.50	155.39	155.14	156.00	0.004642	3.47	17.18	16.69	0.81
Reach-4	47	10-year	CFC_Pr	59.60	153.50	155.39	155.14	156.00	0.004643	3.47	17.18	16.69	0.81
Reach-4	47	5-year	CFCA_Ex	54.70	153.50	155.29	155.04	155.87	0.004631	3.35	16.33	16.32	0.80
Reach-4	47	5-year	CFC_Pr	54.70	153.50	155.29	155.04	155.87	0.004631	3.35	16.33	16.32	0.80
Reach-4	47	2-year	CFCA_Ex	36.30	153.50	154.89	154.67	155.31	0.004795	2.87	12.64	14.69	0.78
Reach-4	47	2-year	CFC_Pr	36.30	153.50	154.89	154.67	155.31	0.004795	2.87	12.64	14.69	0.78
Reach-4	46	Regional	CFCA_Ex	113.00	152.75	156.33	155.65	156.64	0.002356	2.56	52.76	53.61	0.56
Reach-4	46	Regional	CFC_Pr	113.00	152.75	155.77	155.65	156.50	0.007241	3.80	29.79	22.00	0.94
Reach-4	46	100-year	CFCA_Ex	103.00	152.75	156.16	155.47	156.50	0.002808	2.65	44.11	46.81	0.60
Reach-4	46	100-year	CFC_Pr	103.00	152.75	155.72	155.47	156.37	0.006439	3.57	28.86	17.37	0.88
Reach-4	46	50-year	CFCA_Ex	92.40	152.75	155.98		156.35	0.003232	2.71	36.35	39.43	0.64
Reach-4	46	50-year	CFC_Pr	92.40	152.75	155.65	155.33	156.22	0.005542	3.33	27.76	16.53	0.82
Reach-4	46	25-year	CFCA_Ex	79.60	152.75	155.70		156.09	0.003935	2.79	28.48	17.09	0.69
Reach-4	46	25-year	CFC_Pr	79.60	152.75	155.63		156.06	0.004191	2.90	27.44	16.28	0.71
Reach-4	46	10-year	CFCA_Ex	59.60	152.75	155.27		155.64	0.003883	2.70	22.09	13.74	0.68
Reach-4	46	10-year	CFC_Pr	59.60	152.75	155.27		155.64	0.003883	2.70	22.09	13.74	0.68
Reach-4	46	5-year	CFCA_Ex	54.70	152.75	155.16		155.52	0.003948	2.66	20.60	13.31	0.68
Reach-4	46	5-year	CFC_Pr	54.70	152.75	155.16		155.52	0.003948	2.66	20.60	13.31	0.68
Reach-4	46	2-year	CFCA_Ex	36.30	152.75	154.69		155.00	0.004262	2.45	14.79	11.45	0.69
Reach-4	46	2-year	CFC_Pr	36.30	152.75	154.69		155.00	0.004262	2.45	14.79	11.45	0.69
Reach-4	45	Regional	CFCA_Ex	113.00	152.36	155.55	155.55	156.40	0.006662	4.11	28.75	18.85	0.91
Reach-4	45	Regional	CFC_Pr	113.00	152.36	155.63	155.63	156.15	0.004516	3.43	39.69	35.68	0.75
Reach-4	45	100-year	CFCA_Ex	103.00	152.36	155.42	155.42	156.24	0.006890	4.05	26.21	18.58	0.92
Reach-4	45	100-year	CFC_Pr	103.00	152.36	155.52	155.52	156.05	0.004655	3.40	36.09	34.86	0.76
Reach-4	45	50-year	CFCA_Ex	92.40	152.36	155.16	155.16	156.05	0.008405	4.18	22.12	12.77	1.00

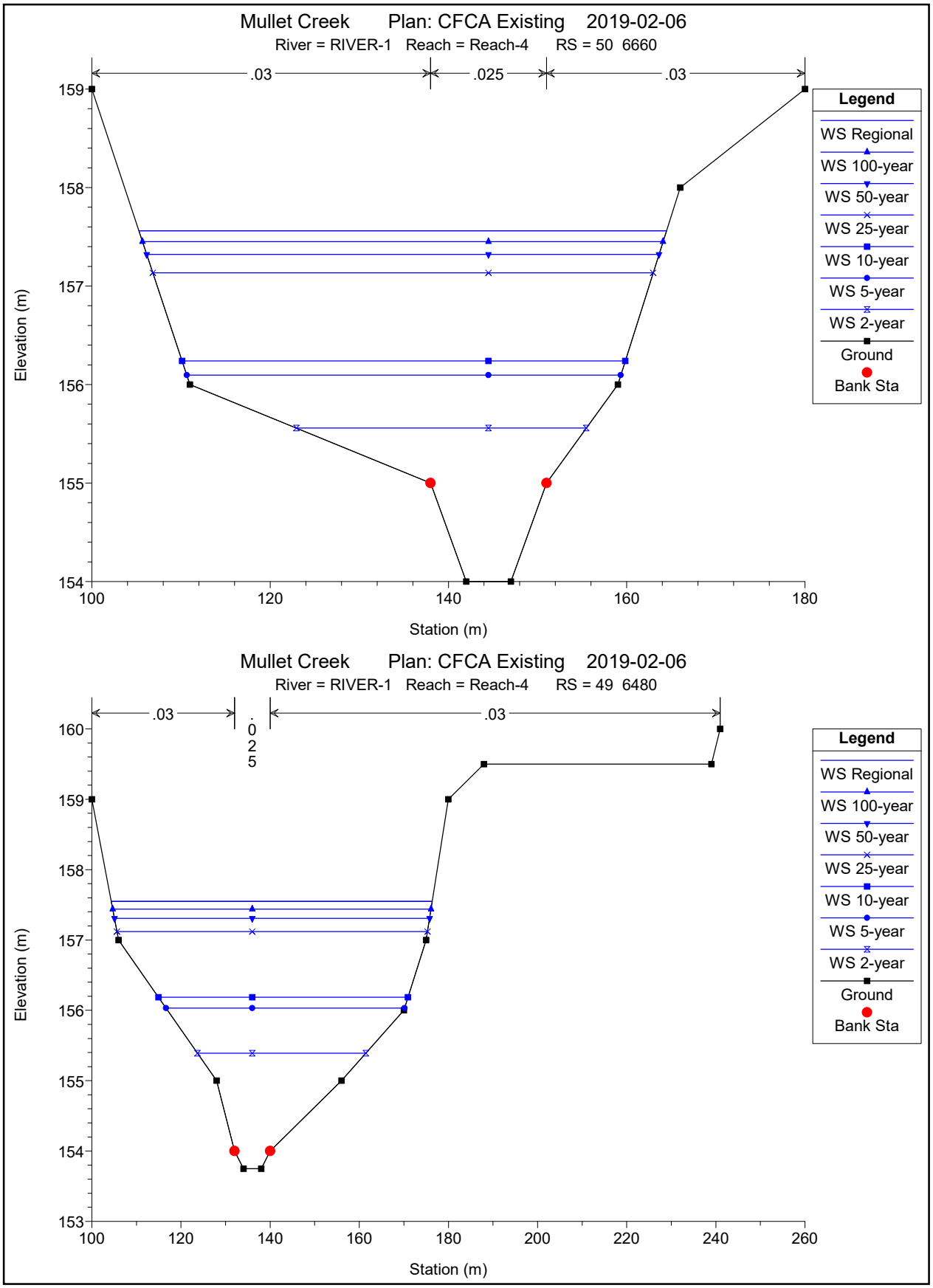
HEC-RAS River: RIVER-1 Reach: Reach-4 (Continued)

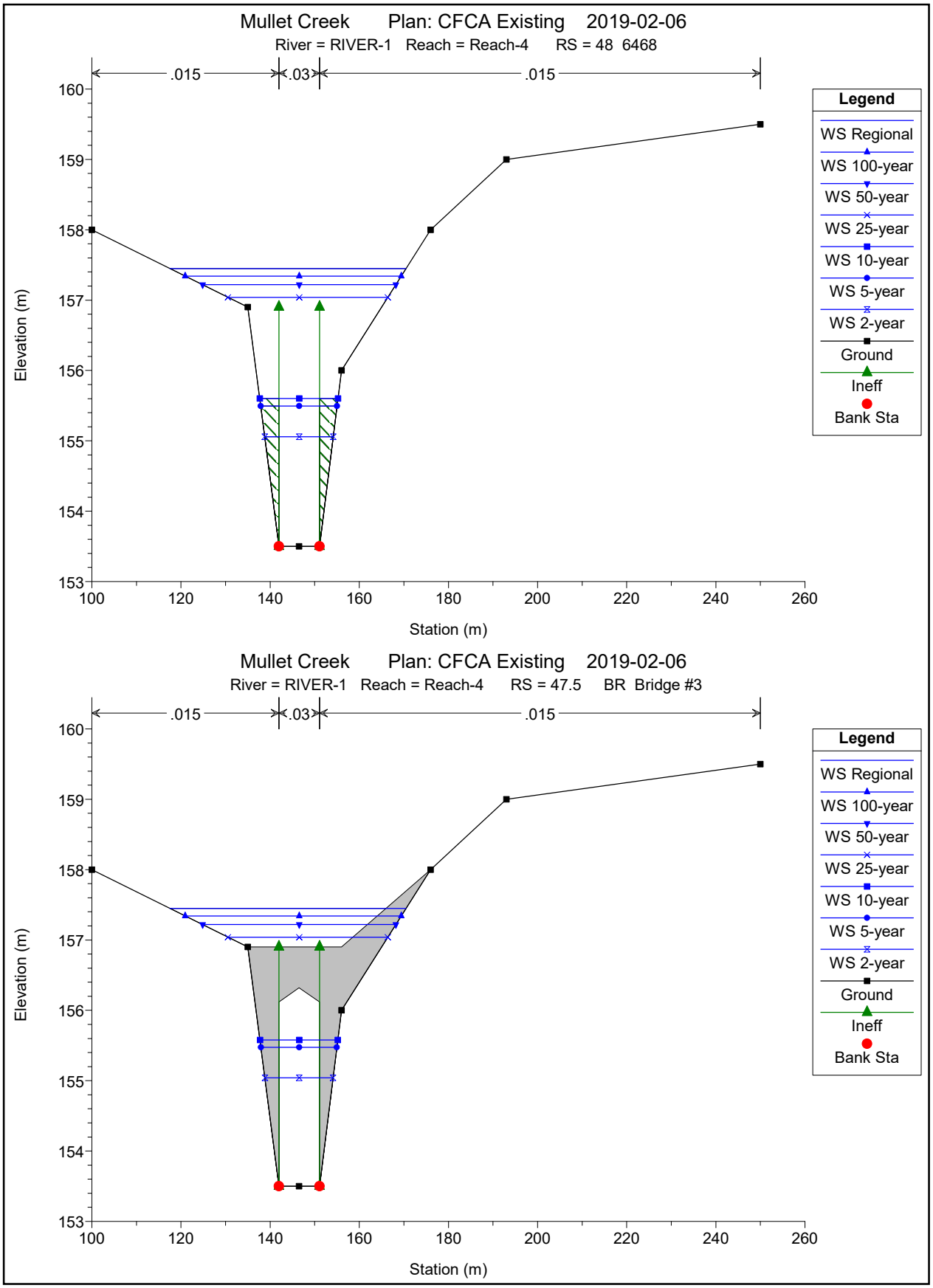
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-4	45	50-year	CFC_Pr	92.40	152.36	155.49	155.42	155.95	0.003998	3.13	35.04	34.62	0.70
Reach-4	45	25-year	CFCA_Ex	79.60	152.36	155.15	154.96	155.82	0.006397	3.63	21.93	12.70	0.87
Reach-4	45	25-year	CFC_Pr	79.60	152.36	155.18	154.96	155.80	0.005886	3.51	24.55	32.09	0.83
Reach-4	45	10-year	CFCA_Ex	59.60	152.36	154.81		155.37	0.006352	3.33	17.88	11.39	0.85
Reach-4	45	10-year	CFC_Pr	59.60	152.36	154.81		155.37	0.006352	3.33	17.88	11.39	0.85
Reach-4	45	5-year	CFCA_Ex	54.70	152.36	154.71		155.25	0.006361	3.26	16.77	11.06	0.85
Reach-4	45	5-year	CFC_Pr	54.70	152.36	154.71		155.25	0.006361	3.26	16.77	11.06	0.85
Reach-4	45	2-year	CFCA_Ex	36.30	152.36	154.28		154.72	0.006414	2.94	12.35	9.66	0.83
Reach-4	45	2-year	CFC_Pr	36.30	152.36	154.28		154.72	0.006414	2.94	12.35	9.66	0.83
Reach-4	44.6	Regional	CFCA_Ex	113.00	152.10	155.09	155.04	155.96	0.007535	4.12	27.51	16.19	0.97
Reach-4	44.6	Regional	CFC_Pr	113.00	152.10	155.33	155.30	155.93	0.004648	3.48	36.21	34.46	0.77
Reach-4	44.6	100-year	CFCA_Ex	103.00	152.10	155.24	154.93	155.85	0.004820	3.47	30.12	19.29	0.78
Reach-4	44.6	100-year	CFC_Pr	103.00	152.10	155.35	154.93	155.83	0.003738	3.14	36.76	34.53	0.69
Reach-4	44.6	50-year	CFCA_Ex	92.40	152.10	155.12		155.68	0.004791	3.31	27.97	16.70	0.77
Reach-4	44.6	50-year	CFC_Pr	92.40	152.10	155.47	154.79	155.79	0.002329	2.57	41.14	35.14	0.55
Reach-4	44.6	25-year	CFCA_Ex	79.60	152.10	155.17		155.57	0.003227	2.77	28.91	17.71	0.64
Reach-4	44.6	25-year	CFC_Pr	79.60	152.10	155.19	154.60	155.56	0.003078	2.70	31.49	33.78	0.62
Reach-4	44.6	10-year	CFCA_Ex	59.60	152.10	154.79		155.13	0.003477	2.58	23.06	14.09	0.64
Reach-4	44.6	10-year	CFC_Pr	59.60	152.10	154.79		155.13	0.003477	2.58	23.06	14.09	0.64
Reach-4	44.6	5-year	CFCA_Ex	54.70	152.10	154.68		155.01	0.003516	2.54	21.56	13.66	0.64
Reach-4	44.6	5-year	CFC_Pr	54.70	152.10	154.68		155.01	0.003516	2.54	21.56	13.66	0.64
Reach-4	44.6	2-year	CFCA_Ex	36.30	152.10	154.22		154.49	0.003678	2.32	15.64	11.77	0.64
Reach-4	44.6	2-year	CFC_Pr	36.30	152.10	154.22		154.49	0.003678	2.32	15.64	11.77	0.64
Reach-4	44.3	Regional	CFCA_Ex	113.00	152.00	155.42		155.61	0.002049	2.25	67.79	71.44	0.51
Reach-4	44.3	Regional	CFC_Pr	113.00	152.00	155.27	155.27	155.71	0.003802	3.18	45.32	50.59	0.69
Reach-4	44.3	100-year	CFCA_Ex	103.00	152.00	155.47	155.16	155.61	0.001471	1.93	71.61	71.52	0.43
Reach-4	44.3	100-year	CFC_Pr	103.00	152.00	155.34	155.20	155.65	0.002678	2.71	48.89	51.18	0.58
Reach-4	44.3	50-year	CFCA_Ex	92.40	152.00	155.23	155.11	155.45	0.002393	2.31	54.27	71.15	0.54
Reach-4	44.3	50-year	CFC_Pr	92.40	152.00	154.69	154.69	155.57	0.008921	4.16	22.20	13.22	1.02
Reach-4	44.3	25-year	CFCA_Ex	79.60	152.00	154.51	154.51	155.32	0.008859	4.00	19.89	12.40	1.01
Reach-4	44.3	25-year	CFC_Pr	79.60	152.00	154.52	154.52	155.32	0.008731	3.98	20.00	12.45	1.00
Reach-4	44.3	10-year	CFCA_Ex	59.60	152.00	154.15	154.15	154.88	0.009116	3.78	15.76	10.95	1.01
Reach-4	44.3	10-year	CFC_Pr	59.60	152.00	154.15	154.15	154.88	0.009116	3.78	15.76	10.95	1.01
Reach-4	44.3	5-year	CFCA_Ex	54.70	152.00	154.06	154.06	154.76	0.009209	3.71	14.73	10.61	1.01
Reach-4	44.3	5-year	CFC_Pr	54.70	152.00	154.06	154.06	154.76	0.009209	3.71	14.73	10.61	1.01
Reach-4	44.3	2-year	CFCA_Ex	36.30	152.00	153.65	153.65	154.24	0.009683	3.40	10.69	9.21	1.01
Reach-4	44.3	2-year	CFC_Pr	36.30	152.00	153.65	153.65	154.24	0.009683	3.40	10.69	9.21	1.01
Reach-4	44	Regional	CFCA_Ex	113.00	151.57	155.01	155.01	155.48	0.003401	3.22	45.20	53.98	0.66
Reach-4	44	Regional	CFC_Pr	113.00	151.57	154.99	154.99	155.46	0.003441	3.22	44.85	51.10	0.66
Reach-4	44	100-year	CFCA_Ex	103.00	151.57	154.46	154.46	155.41	0.008579	4.33	23.81	12.69	1.01
Reach-4	44	100-year	CFC_Pr	103.00	151.57	154.46	154.46	155.41	0.008579	4.33	23.81	12.69	1.01
Reach-4	44	50-year	CFCA_Ex	92.40	151.57	154.32	154.32	155.21	0.008531	4.20	22.02	12.25	1.00
Reach-4	44	50-year	CFC_Pr	92.40	151.57	154.32	154.32	155.21	0.008521	4.20	22.03	12.25	1.00
Reach-4	44	25-year	CFCA_Ex	79.60	151.57	154.15	154.11	154.96	0.008235	3.98	19.98	11.74	0.98
Reach-4	44	25-year	CFC_Pr	79.60	151.57	154.15	154.11	154.96	0.008216	3.98	20.00	11.74	0.97
Reach-4	44	10-year	CFCA_Ex	59.60	151.57	153.81	153.76	154.50	0.008195	3.68	16.18	10.72	0.96
Reach-4	44	10-year	CFC_Pr	59.60	151.57	153.81	153.76	154.50	0.008195	3.68	16.18	10.72	0.96
Reach-4	44	5-year	CFCA_Ex	54.70	151.57	153.67	153.66	154.37	0.008970	3.72	14.70	10.30	0.99
Reach-4	44	5-year	CFC_Pr	54.70	151.57	153.67	153.66	154.37	0.008970	3.72	14.70	10.30	0.99
Reach-4	44	2-year	CFCA_Ex	36.30	151.57	153.25	153.25	153.84	0.009533	3.40	10.66	9.03	1.00
Reach-4	44	2-year	CFC_Pr	36.30	151.57	153.25	153.25	153.84	0.009533	3.40	10.66	9.03	1.00
Reach-4	43.5	Regional	CFCA_Ex	113.00	151.28	154.50	154.50	154.98	0.003948	3.22	43.23	51.32	0.71
Reach-4	43.5	Regional	CFC_Pr	113.00	151.28	154.49	154.49	154.95	0.003863	3.18	44.10	48.47	0.70
Reach-4	43.5	100-year	CFCA_Ex	103.00	151.28	154.39	154.39	154.89	0.004192	3.24	37.71	47.45	0.73
Reach-4	43.5	100-year	CFC_Pr	103.00	151.28	154.41	154.41	154.86	0.003861	3.12	40.27	47.89	0.70
Reach-4	43.5	50-year	CFCA_Ex	92.40	151.28	154.23	153.91	154.77	0.004773	3.32	30.62	37.92	0.77
Reach-4	43.5	50-year	CFC_Pr	92.40	151.28	154.23	153.91	154.77	0.004653	3.28	32.02	46.63	0.76
Reach-4	43.5	25-year	CFCA_Ex	79.60	151.28	154.13	153.72	154.60	0.004302	3.07	27.35	31.62	0.72
Reach-4	43.5	25-year	CFC_Pr	79.60	151.28	154.12	153.72	154.60	0.004345	3.08	27.16	37.56	0.73
Reach-4	43.5	10-year	CFCA_Ex	59.60	151.28	153.75		154.18	0.004614	2.90	20.54	12.94	0.74
Reach-4	43.5	10-year	CFC_Pr	59.60	151.28	153.75		154.18	0.004614	2.90	20.54	12.94	0.74
Reach-4	43.5	5-year	CFCA_Ex	54.70	151.28	153.58		154.03	0.005183	2.96	18.47	12.33	0.77
Reach-4	43.5	5-year	CFC_Pr	54.70	151.28	153.58		154.03	0.005183	2.96	18.47	12.33	0.77
Reach-4	43.5	2-year	CFCA_Ex	36.30	151.28	153.00	152.90	153.47	0.007452	3.04	11.96	10.18	0.89
Reach-4	43.5	2-year	CFC_Pr	36.30	151.28	153.00	152.90	153.47	0.007452	3.04	11.96	10.18	0.89
Reach-4	43	Regional	CFCA_Ex	113.00	151.17	154.60	154.14	154.65	0.000321	1.19	124.18	213.34	0.22
Reach-4	43	Regional	CFC_Pr	113.00	151.17	154.60	154.14	154.65	0.000321	1.19	124.18	213.34	0.22
Reach-4	43	100-year	CFCA_Ex	103.00	151.17	154.54	153.30	154.59	0.000330	1.19	114.24	202.11	0.22
Reach-4	43	100-year	CFC_Pr	103.00	151.17	154.54	153.30	154.59	0.000330	1.19	114.24	202.11	0.22
Reach-4	43	50-year	CFCA_Ex	92.40	151.17	154.44	153.17	154.50	0.000390	1.26	97.97	188.56	0.24
Reach-4	43	50-year	CFC_Pr	92.40	151.17	154.44	153.17	154.50	0.000390	1.26	97.97	188.56	0.24
Reach-4	43	25-year	CFCA_Ex	79.60	151.17	154.29	153.00	154.37	0.000523	1.41	74.89	164.86	0.28
Reach-4	43	25-year	CFC_Pr	79.60	151.17	154.29	153.00	154.37	0.000523	1.41	74.89	164.86	0.28
Reach-4	43	10-year	CFCA_Ex	59.60	151.17	153.82	152.71	153.97	0.001063	1.76	33.87	23.92	0.38
Reach-4	43	10-year	CFC_Pr	59.60	151.17	153.82	152.71	153.97	0.001063	1.76	33.87	23.92	0.38
Reach-4	43	5-year	CFCA_Ex	54.70	151.17	153.63	152.64	153.83	0.001226	1.98	27.70	19.14	0.42
Reach-4	43	5-year	CFC_Pr	54.70	151.17	153.63	152.64	153.83	0.001226	1.98	27.70	19.14	0.42

HEC-RAS River: RIVER-1 Reach: Reach-4 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-4	43	2-year	CFCA_Ex	36.30	151.17	153.07	152.33	153.23	0.001389	1.74	20.86	17.10	0.43
Reach-4	43	2-year	CFC_Pr	36.30	151.17	153.07	152.33	153.23	0.001389	1.74	20.86	17.10	0.43
Reach-4	42.5			Bridge									
Reach-4	42	Regional	CFCA_Ex	113.00	151.00	154.43	153.31	154.48	0.000324	1.18	129.37	208.17	0.22
Reach-4	42	Regional	CFC_Pr	113.00	151.00	154.43	153.31	154.48	0.000324	1.18	129.37	208.17	0.22
Reach-4	42	100-year	CFCA_Ex	103.00	151.00	154.32	153.18	154.39	0.000410	1.29	107.82	191.58	0.25
Reach-4	42	100-year	CFC_Pr	103.00	151.00	154.32	153.18	154.39	0.000410	1.29	107.82	191.58	0.25
Reach-4	42	50-year	CFCA_Ex	92.40	151.00	154.16	153.05	154.26	0.000587	1.49	79.30	151.19	0.29
Reach-4	42	50-year	CFC_Pr	92.40	151.00	154.16	153.05	154.26	0.000587	1.49	79.30	151.19	0.29
Reach-4	42	25-year	CFCA_Ex	79.60	151.00	153.96	152.88	154.09	0.000775	1.62	54.73	82.35	0.33
Reach-4	42	25-year	CFC_Pr	79.60	151.00	153.96	152.88	154.09	0.000775	1.62	54.73	82.35	0.33
Reach-4	42	10-year	CFCA_Ex	59.60	151.00	153.51	152.59	153.74	0.001458	2.16	27.58	21.55	0.46
Reach-4	42	10-year	CFC_Pr	59.60	151.00	153.51	152.59	153.74	0.001458	2.16	27.58	21.55	0.46
Reach-4	42	5-year	CFCA_Ex	54.70	151.00	153.42	152.52	153.64	0.001391	2.06	26.56	21.17	0.45
Reach-4	42	5-year	CFC_Pr	54.70	151.00	153.42	152.52	153.64	0.001391	2.06	26.56	21.17	0.45
Reach-4	42	2-year	CFCA_Ex	36.30	151.00	153.05	152.21	153.19	0.001147	1.65	22.01	19.40	0.39
Reach-4	42	2-year	CFC_Pr	36.30	151.00	153.05	152.21	153.19	0.001147	1.65	22.01	19.40	0.39
Reach-4	41	Regional	CFCA_Ex	113.00	151.20	153.73	153.00	154.28	0.005083	4.41	51.28	44.58	0.89
Reach-4	41	Regional	CFC_Pr	113.00	151.20	153.73	153.00	154.28	0.005082	4.41	51.28	44.58	0.89
Reach-4	41	100-year	CFCA_Ex	103.00	151.20	153.61	153.00	154.18	0.005359	4.39	46.08	43.51	0.90
Reach-4	41	100-year	CFC_Pr	103.00	151.20	153.61	153.00	154.18	0.005359	4.39	46.08	43.51	0.90
Reach-4	41	50-year	CFCA_Ex	92.40	151.20	153.57	153.00	154.06	0.004743	4.08	44.09	43.10	0.85
Reach-4	41	50-year	CFC_Pr	92.40	151.20	153.57	153.00	154.06	0.004743	4.08	44.09	43.10	0.85
Reach-4	41	25-year	CFCA_Ex	79.60	151.20	153.49	153.00	153.91	0.004080	3.70	41.06	42.26	0.78
Reach-4	41	25-year	CFC_Pr	79.60	151.20	153.49	153.00	153.91	0.004079	3.70	41.06	42.26	0.78
Reach-4	41	10-year	CFCA_Ex	59.60	151.20	153.26		153.59	0.003529	3.21	32.57	31.44	0.71
Reach-4	41	10-year	CFC_Pr	59.60	151.20	153.26		153.59	0.003529	3.21	32.57	31.44	0.71
Reach-4	41	5-year	CFCA_Ex	54.70	151.20	153.19		153.50	0.003402	3.08	30.35	27.92	0.70
Reach-4	41	5-year	CFC_Pr	54.70	151.20	153.19		153.50	0.003402	3.08	30.35	27.92	0.70
Reach-4	41	2-year	CFCA_Ex	36.30	151.20	152.90		153.08	0.002452	2.35	24.07	18.71	0.58
Reach-4	41	2-year	CFC_Pr	36.30	151.20	152.90		153.08	0.002452	2.35	24.07	18.71	0.58
Reach-4	40	Regional	CFCA_Ex	134.00	151.00	153.48	153.43	153.83	0.003077	3.09	80.25	98.73	0.67
Reach-4	40	Regional	CFC_Pr	134.00	151.00	153.48	153.43	153.83	0.003077	3.09	80.25	98.73	0.67
Reach-4	40	100-year	CFCA_Ex	113.00	151.00	153.32	153.32	153.70	0.003359	3.07	64.64	96.49	0.69
Reach-4	40	100-year	CFC_Pr	113.00	151.00	153.32	153.32	153.70	0.003359	3.07	64.64	96.49	0.69
Reach-4	40	50-year	CFCA_Ex	102.00	151.00	153.24	153.24	153.62	0.003397	3.00	57.22	95.40	0.69
Reach-4	40	50-year	CFC_Pr	102.00	151.00	153.24	153.24	153.62	0.003397	3.00	57.22	95.40	0.69
Reach-4	40	25-year	CFCA_Ex	88.00	151.00	153.11	152.91	153.51	0.003685	2.99	44.68	93.54	0.71
Reach-4	40	25-year	CFC_Pr	88.00	151.00	153.11	152.91	153.51	0.003685	2.99	44.68	93.54	0.71
Reach-4	40	10-year	CFCA_Ex	65.50	151.00	152.84	152.64	153.20	0.003931	2.77	29.17	31.64	0.71
Reach-4	40	10-year	CFC_Pr	65.50	151.00	152.84	152.64	153.20	0.003931	2.77	29.17	31.64	0.71
Reach-4	40	5-year	CFCA_Ex	59.70	151.00	152.77	152.56	153.11	0.003897	2.68	27.00	30.17	0.70
Reach-4	40	5-year	CFC_Pr	59.70	151.00	152.77	152.56	153.11	0.003897	2.68	27.00	30.17	0.70
Reach-4	40	2-year	CFCA_Ex	40.20	151.00	152.49	152.25	152.75	0.003845	2.31	19.38	24.29	0.67
Reach-4	40	2-year	CFC_Pr	40.20	151.00	152.49	152.25	152.75	0.003845	2.31	19.38	24.29	0.67

HEC-RAS CFCA Existing Conditions Model Cross Sections

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.015
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Station (m)
Legend
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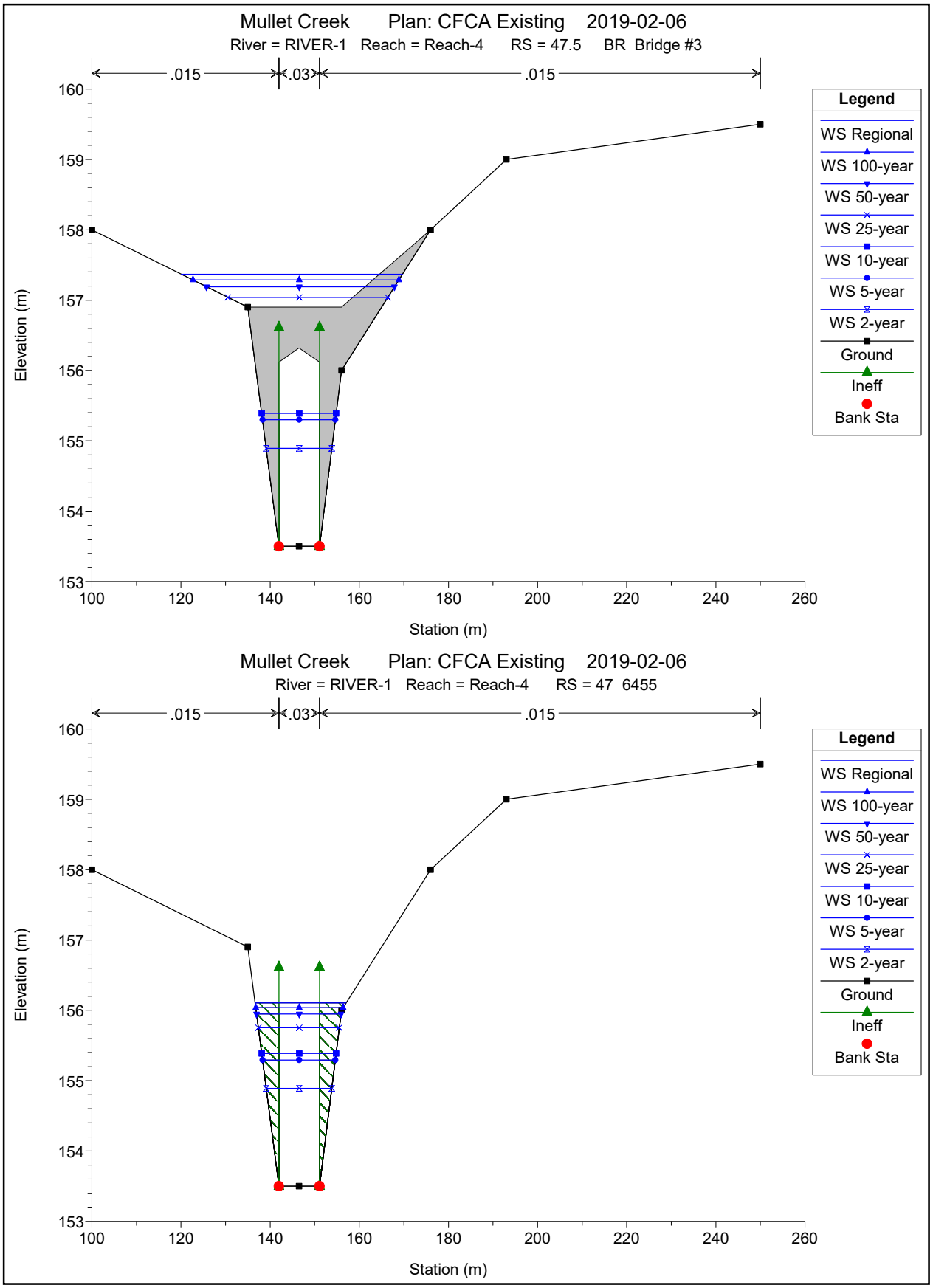
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 47.5 BR Bridge #3
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta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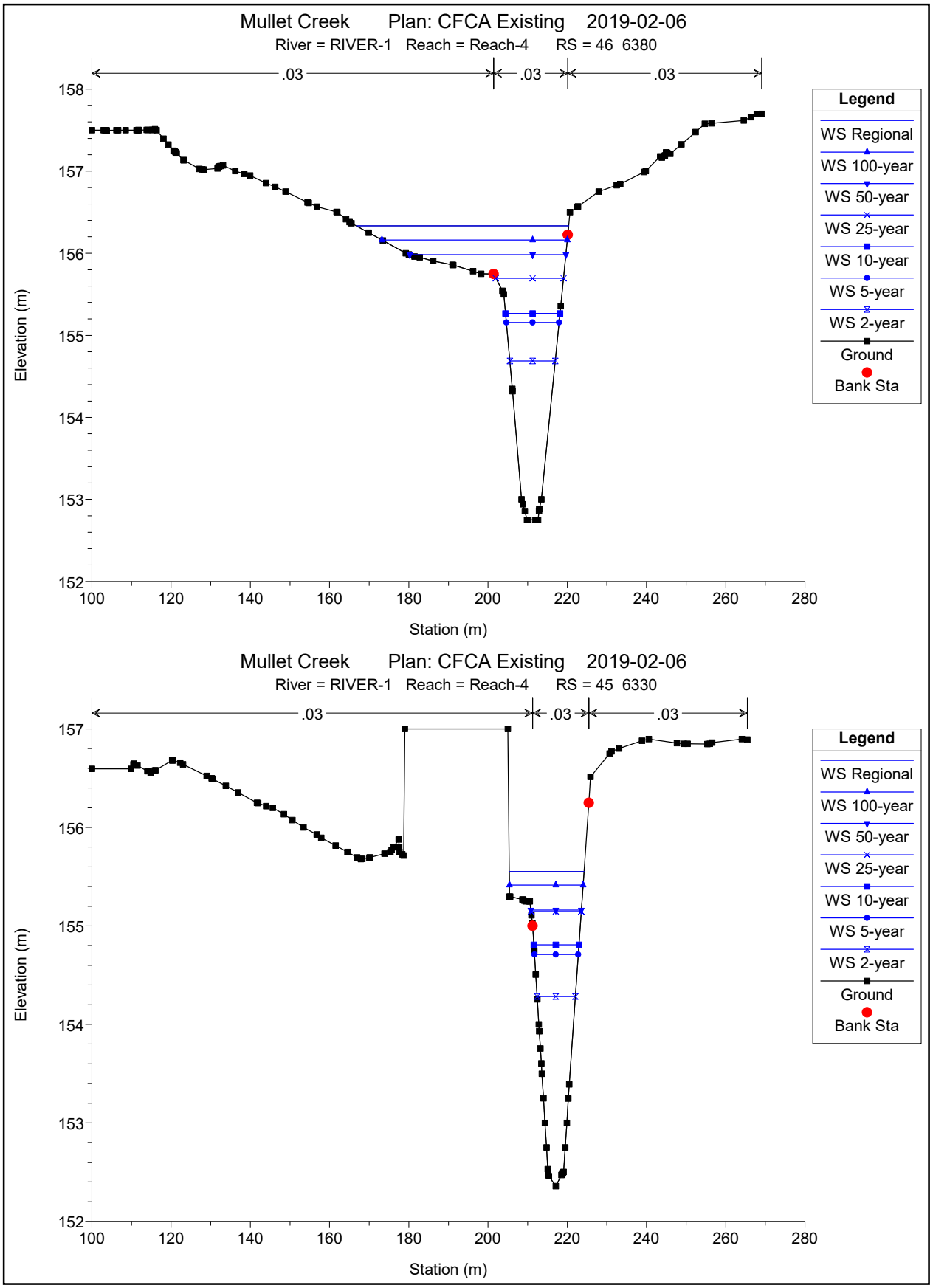
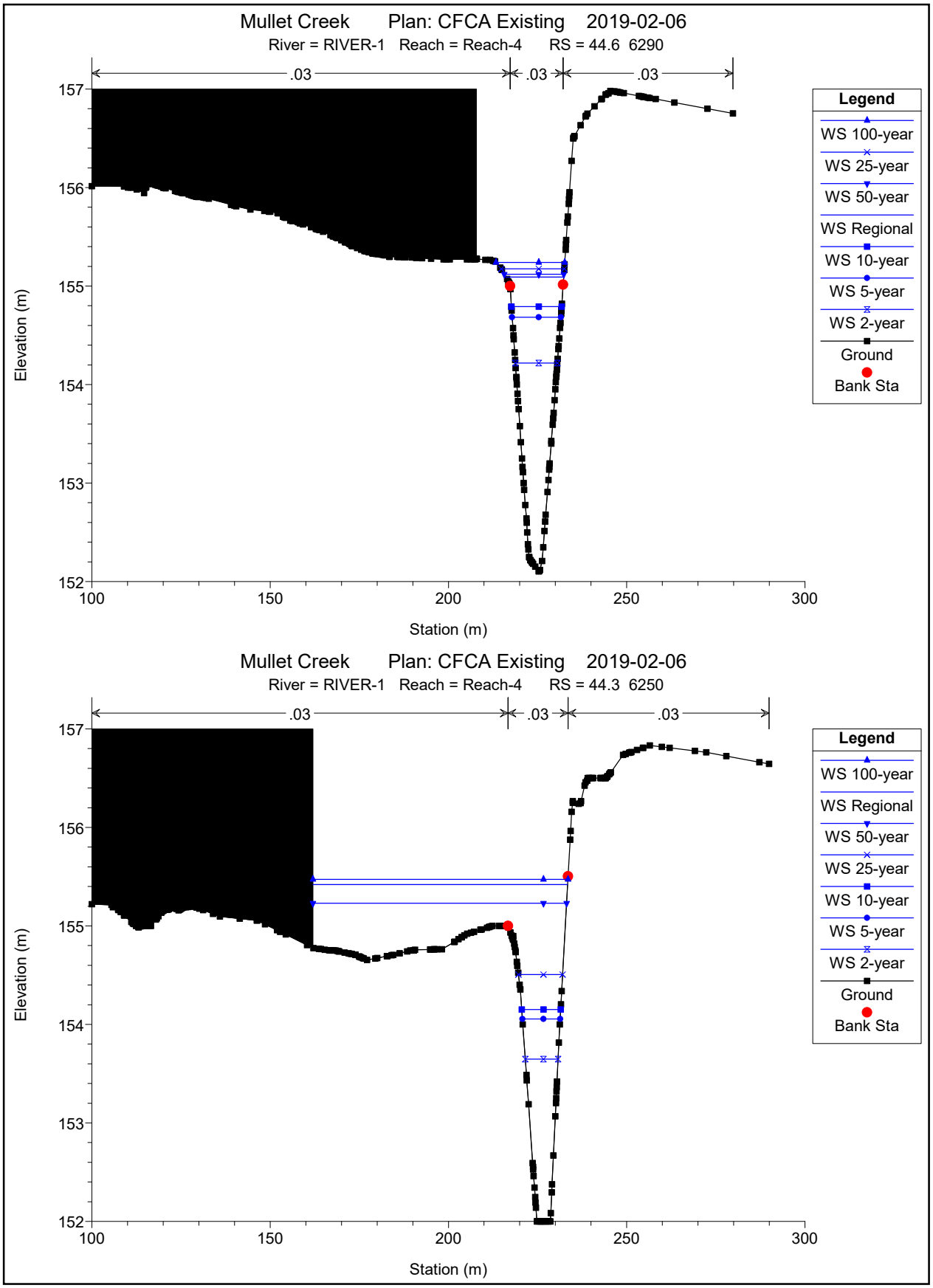
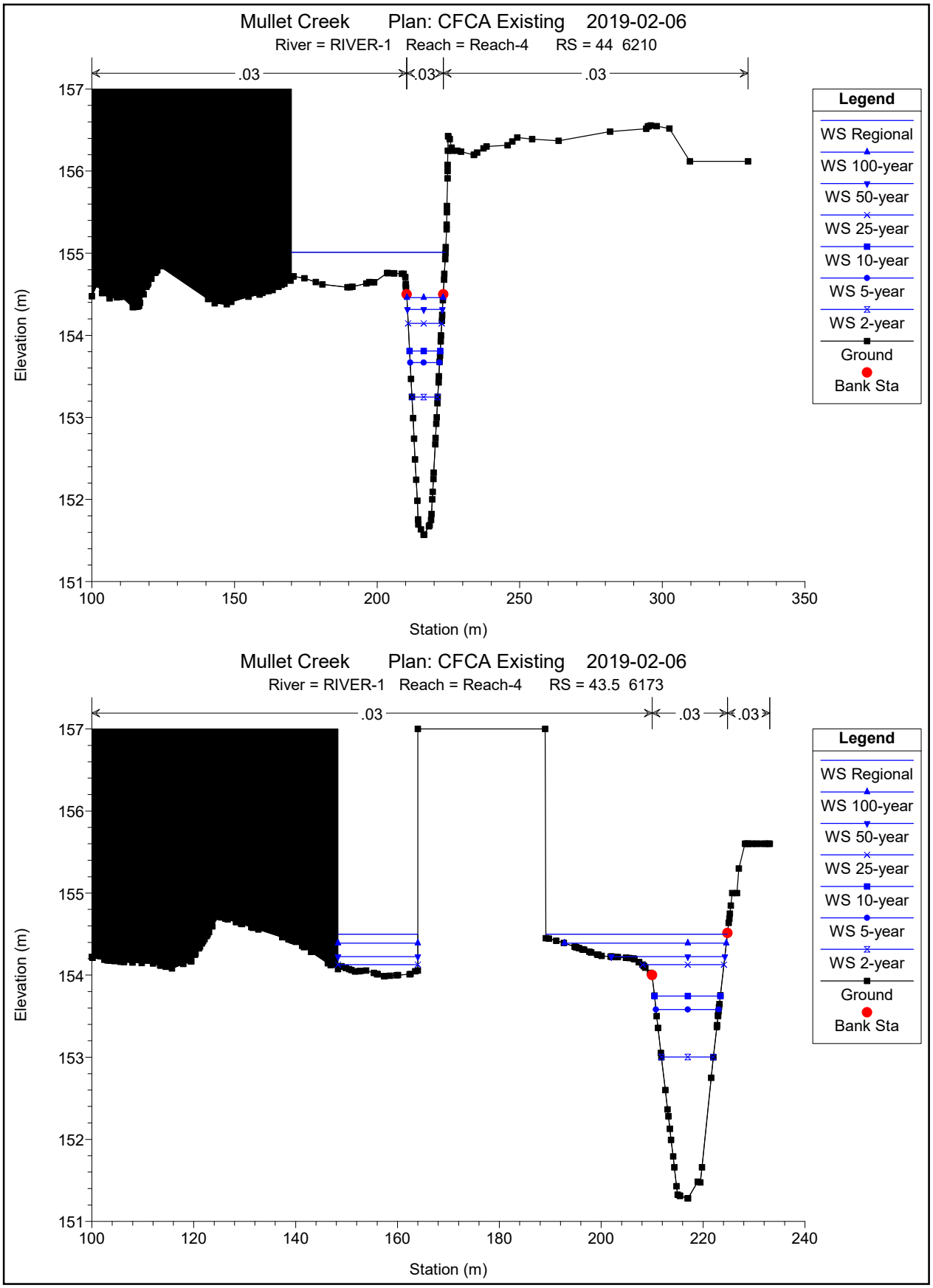
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 47 6455
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta


Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 46 6380
.03
.03
.03
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 45 6330
.03
.03
.03
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta


Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 44.6 6290
.03
.03
.03
157
156
155
154
153
152
Elevation (m)
100
150
200
250
300
Station (m)
Legend
WS 100-year
WS 25-year
WS 50-year
WS Regional
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 44.3 6250
.03
.03
.03
157
156
155
154
153
152
Elevation (m)
100
150
200
250
300
Station (m)
Legend
WS 100-year
WS Regional
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta


Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 44 6210
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.03
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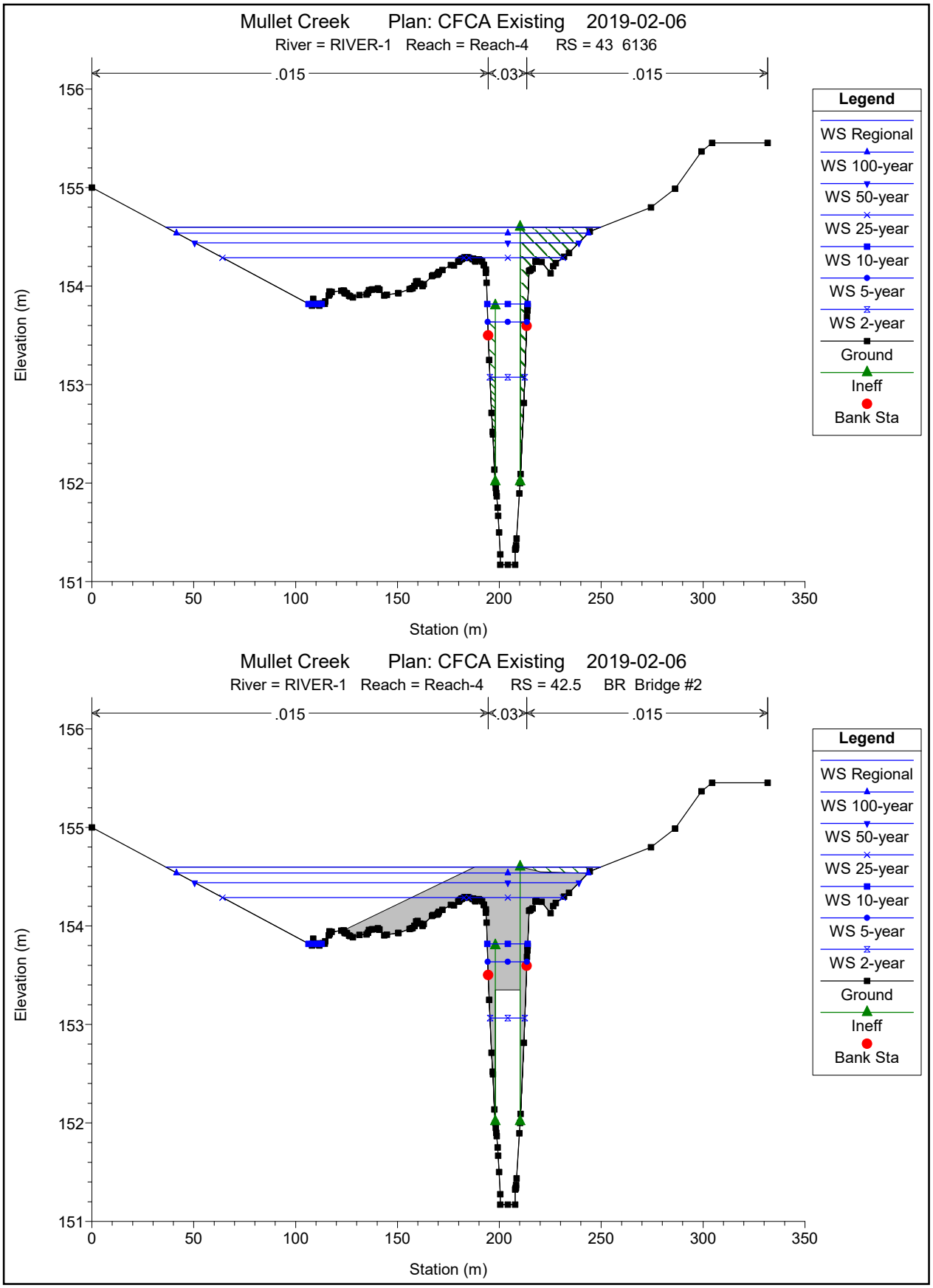
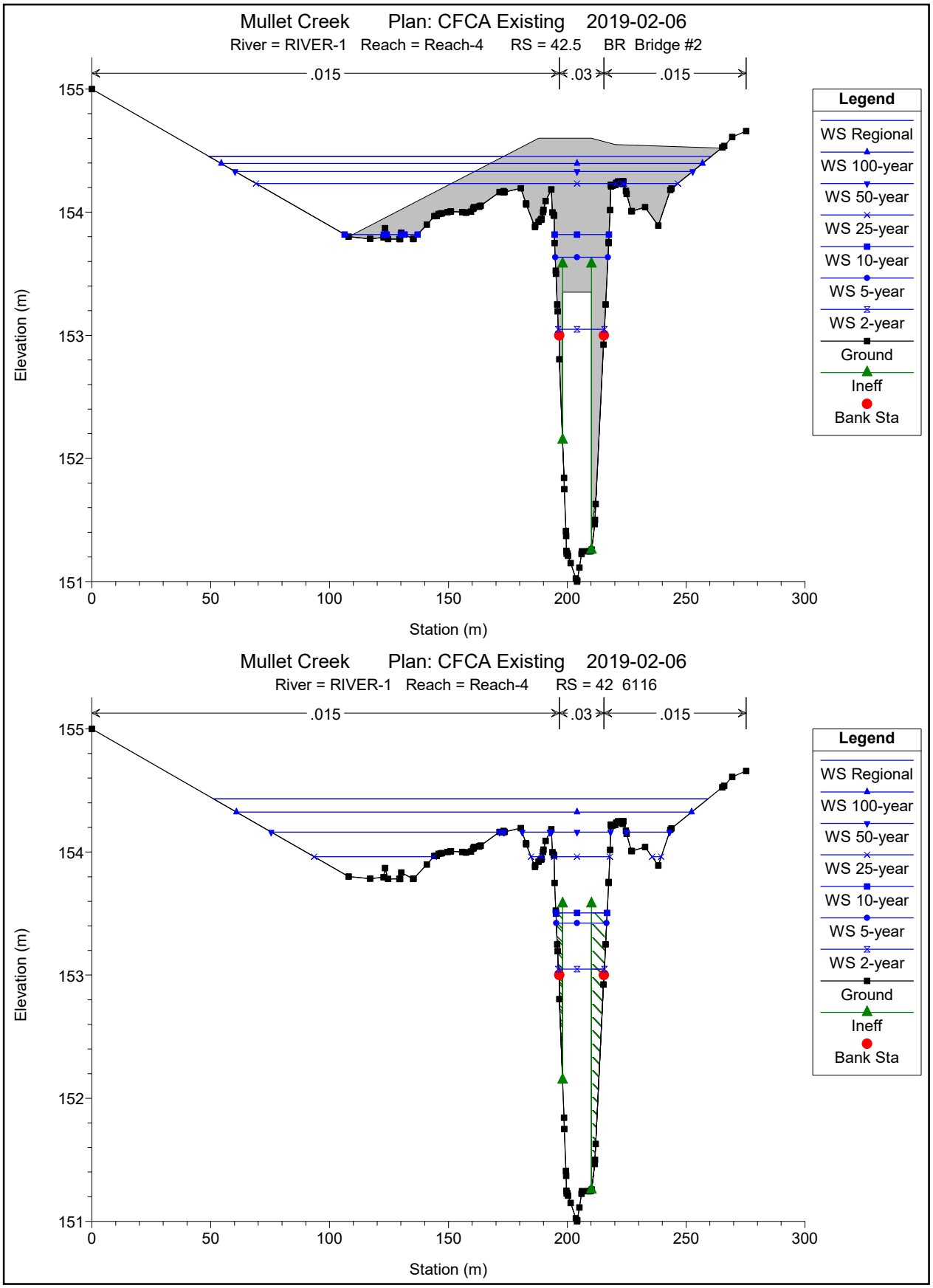
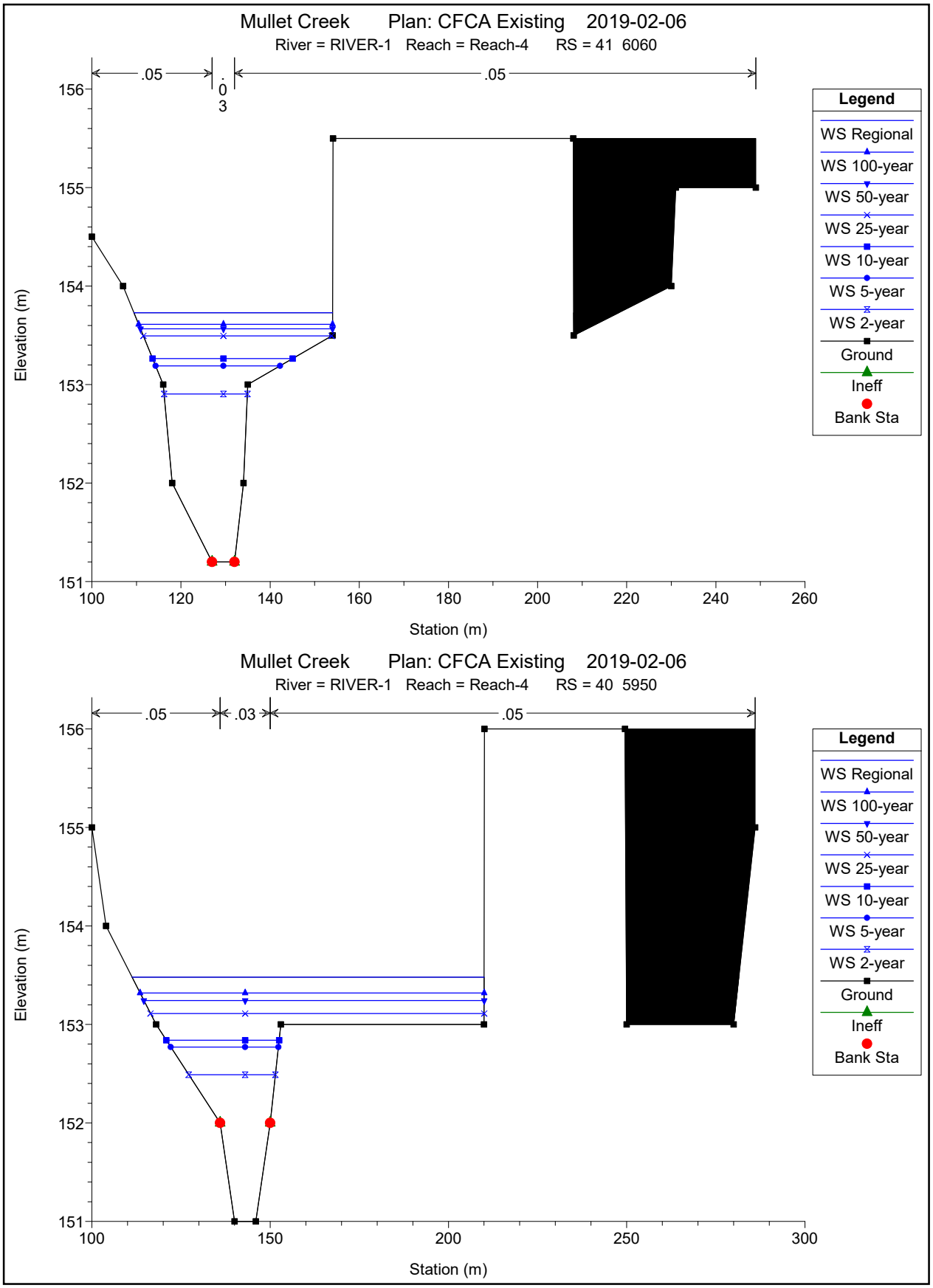
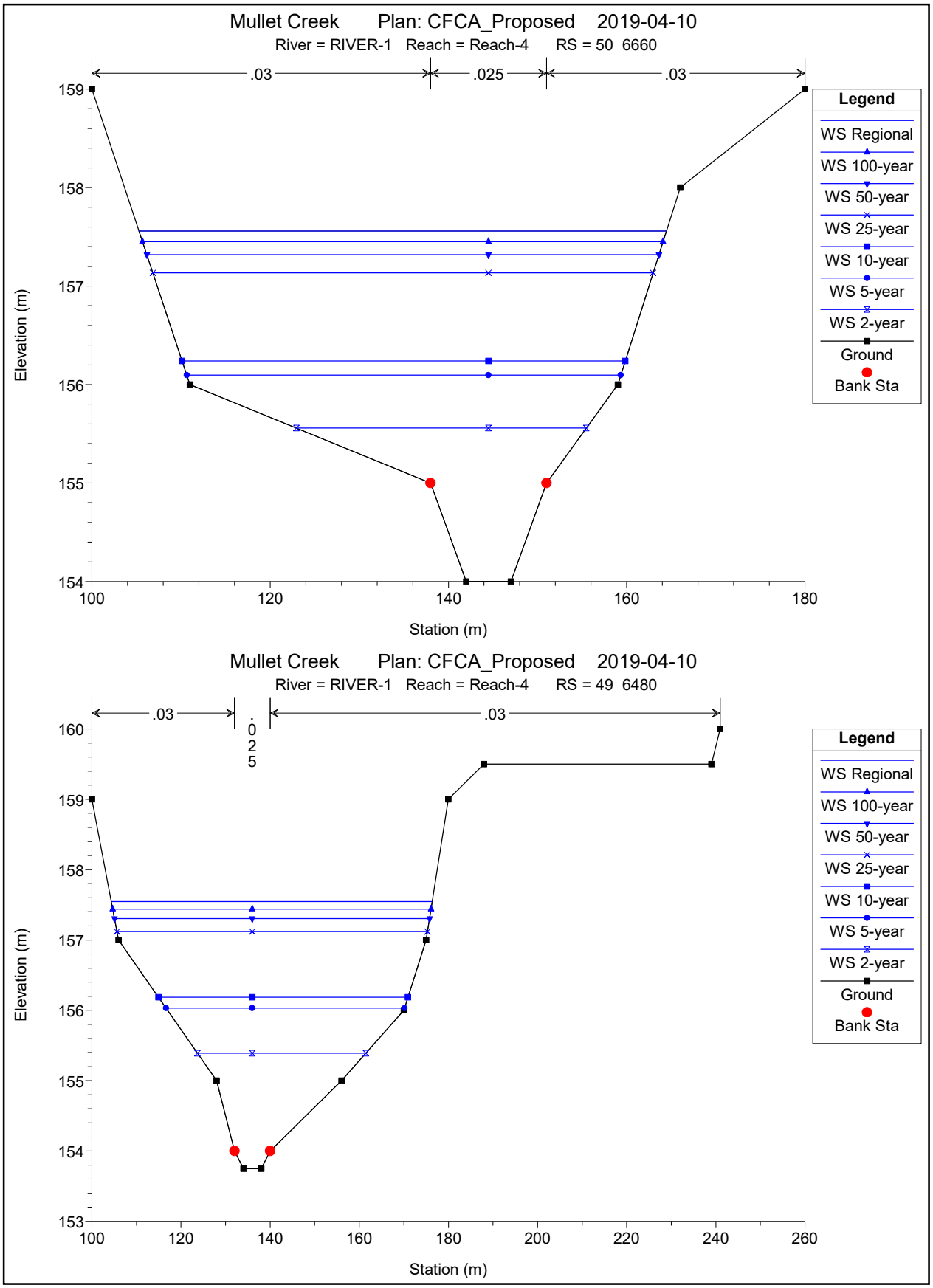
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 43.5 6173
.03
.03
.03
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta

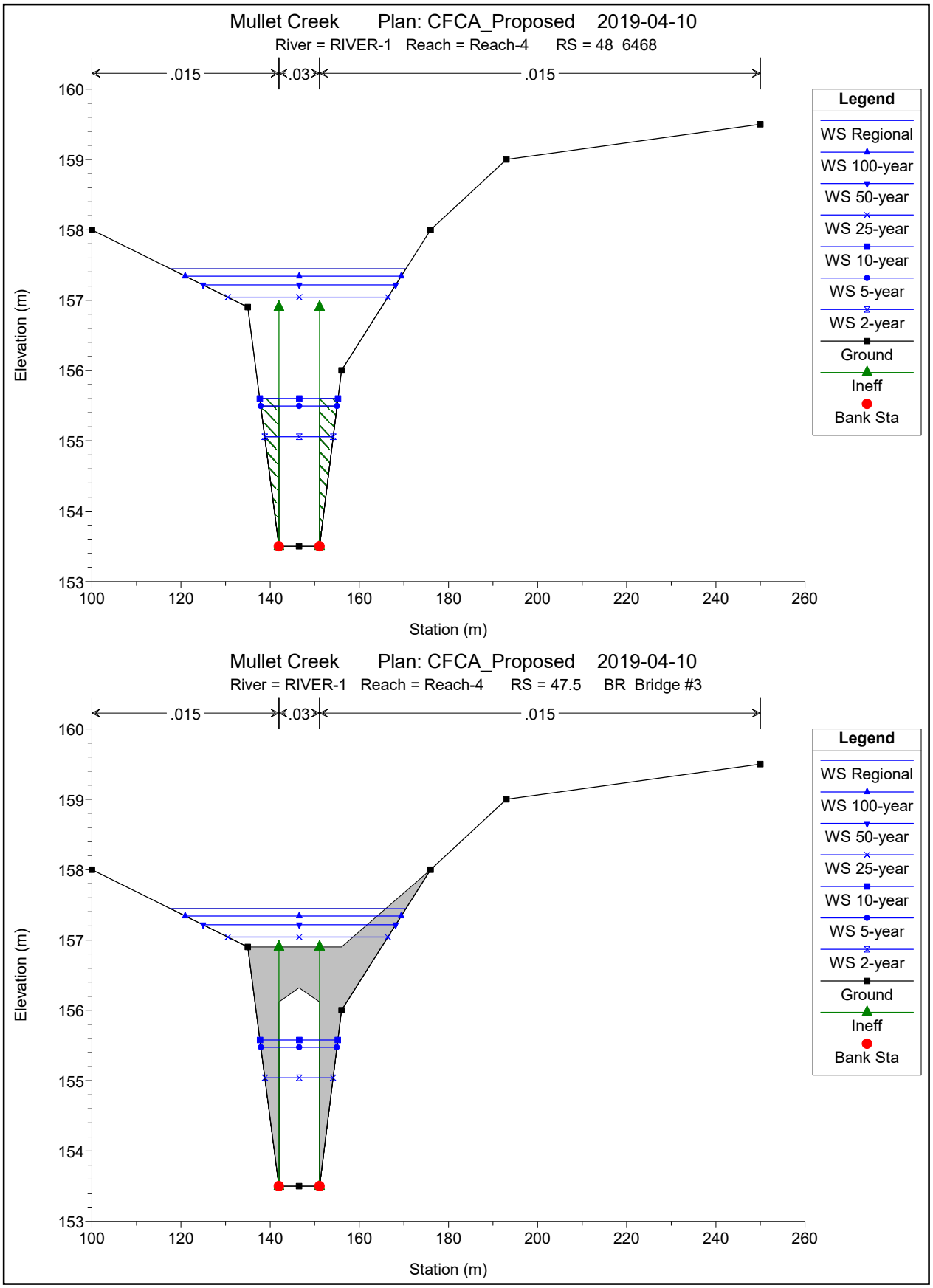

Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 43 6136
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 42.5 BR Bridge #2
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta

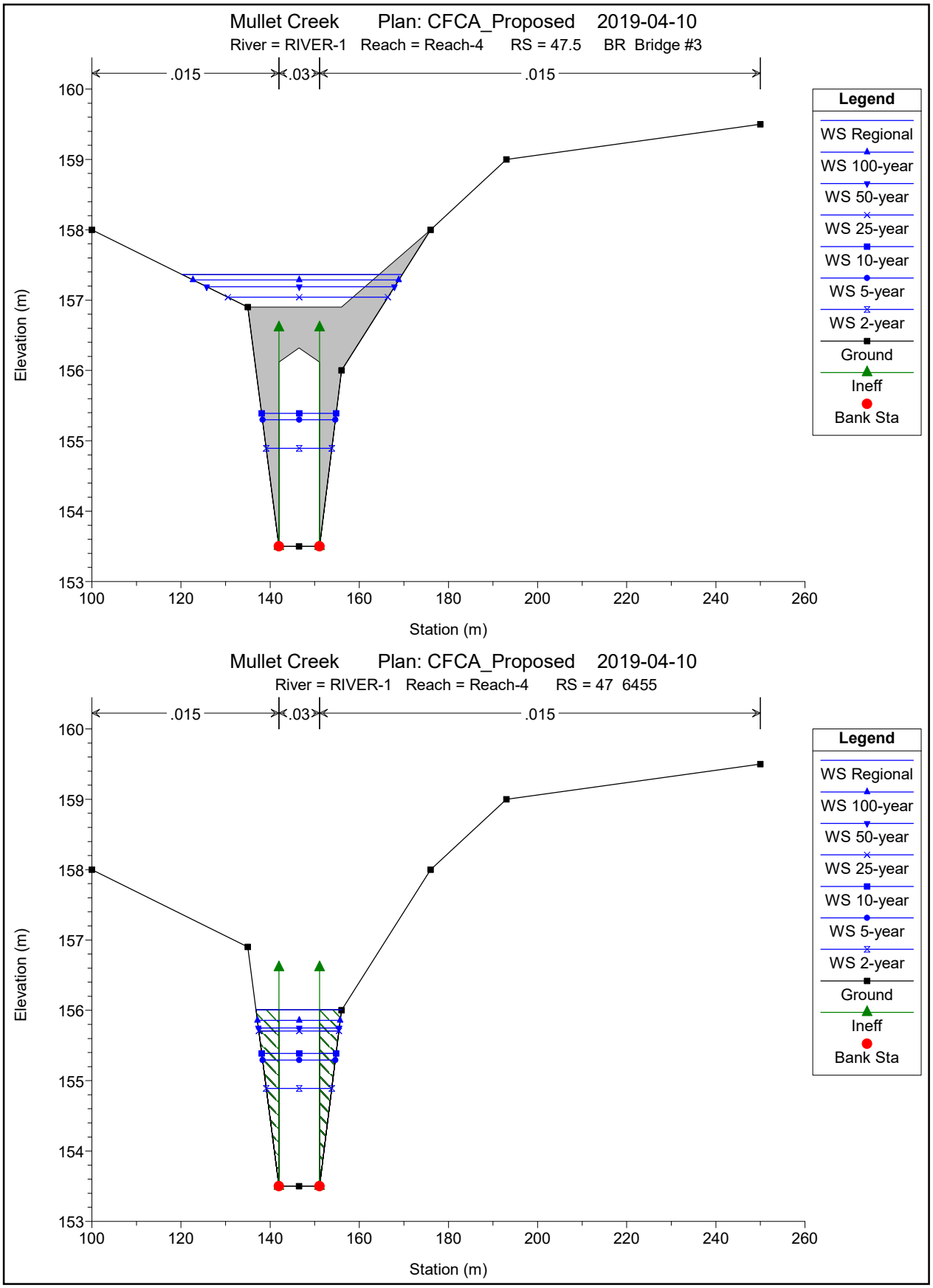

Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 42.5 BR Bridge #2
.015
.03
.015
Elevation (m)
155
154
153
152
151
0
50
100
150
200
250
300
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 42 6116
.015
.03
.015
Elevation (m)
155
154
153
152
151
0
50
100
150
200
250
300
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta

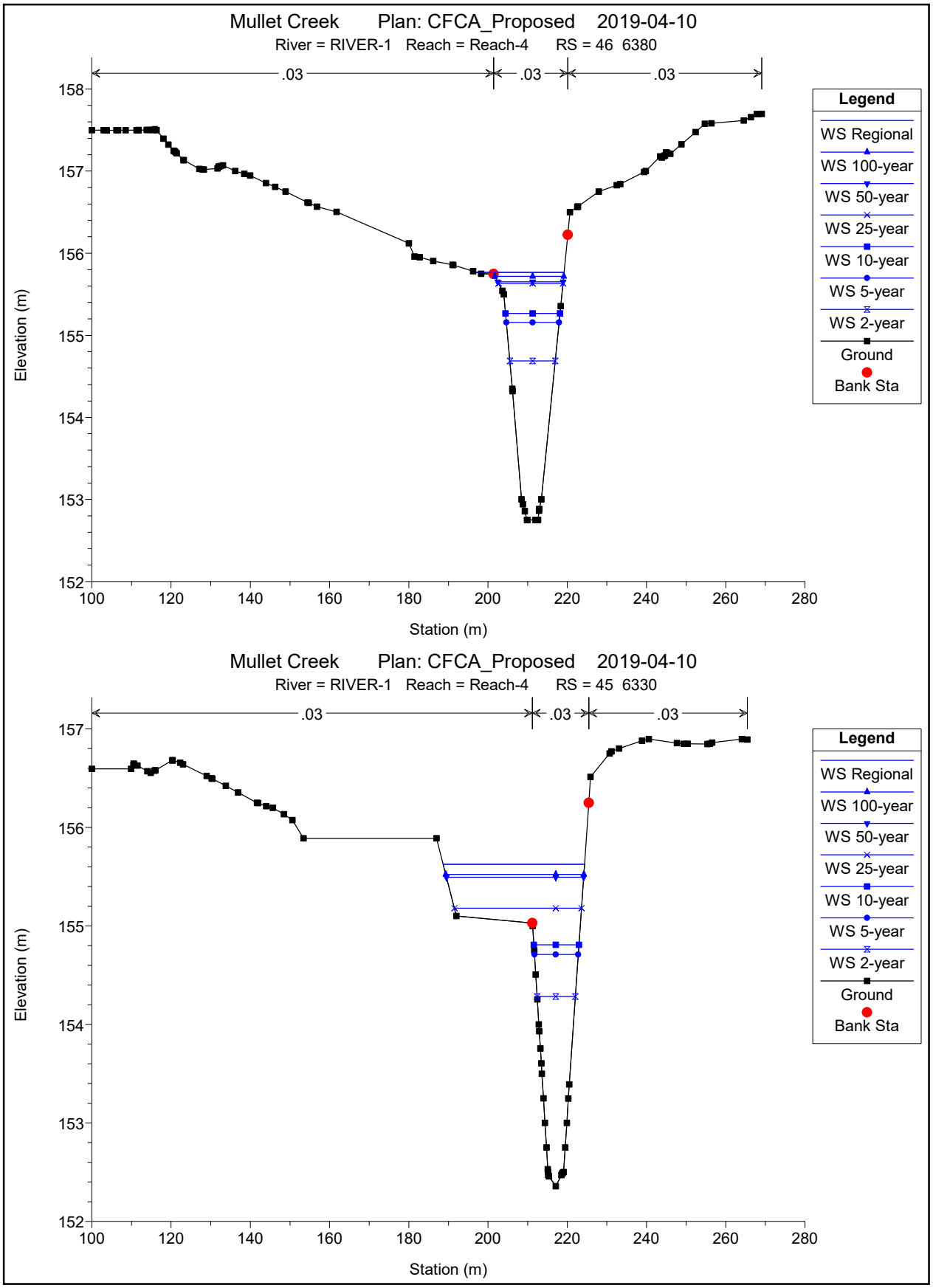

Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 41 6060
.05
.03
.05
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA Existing 2019-02-06
River = RIVER-1 Reach = Reach-4 RS = 40 5950
.05
.03
.05
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta

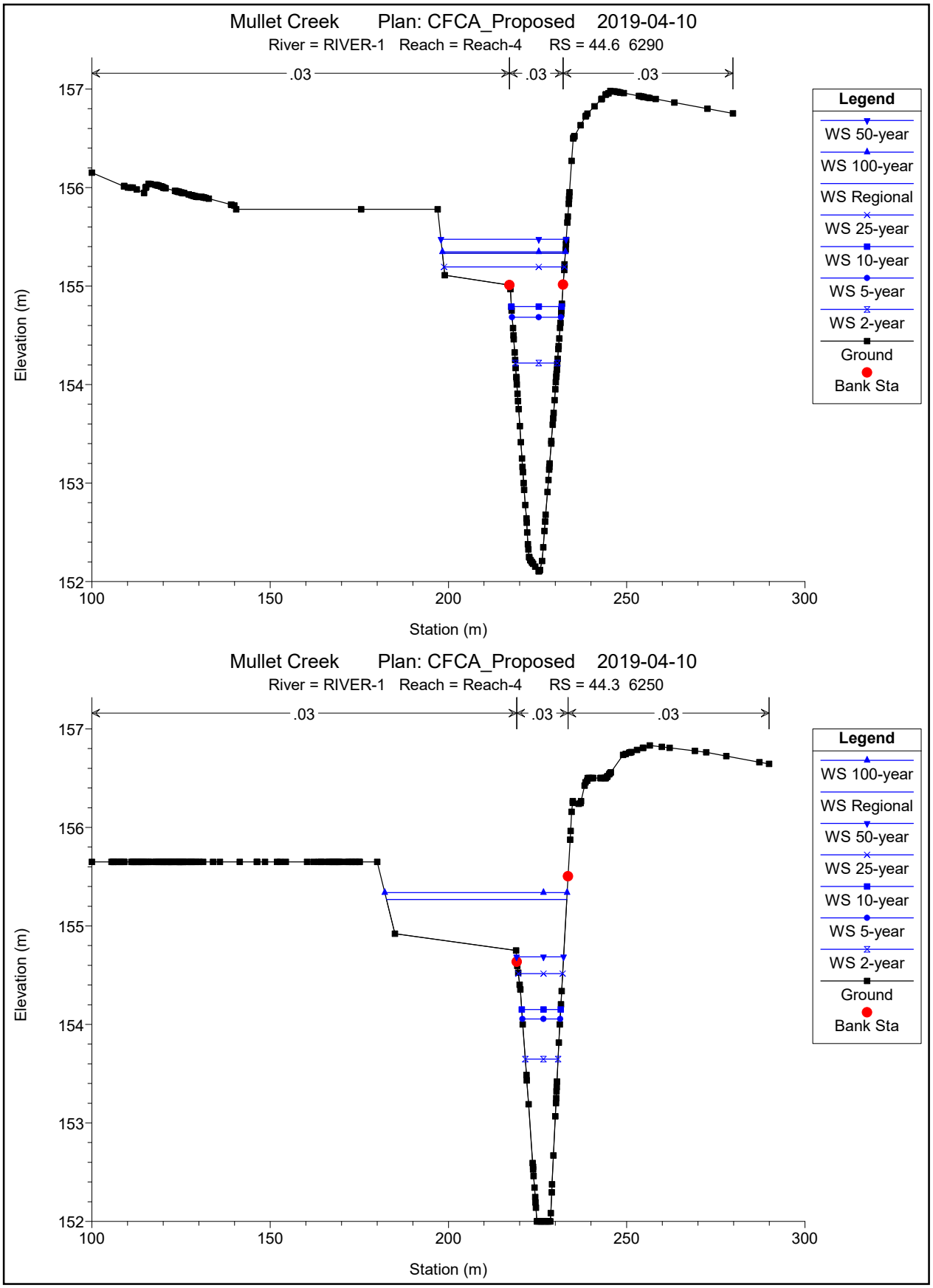
HEC-RAS CFCA Proposed Conditions Model Cross Sections




Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 48 6468
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 47.5 BR Bridge #3
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta


Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 47.5 BR Bridge #3
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 47 6455
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta


Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 46 6380
.03
.03
.03
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 45 6330
.03
.03
.03
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta


Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 44.6 6290
.03
.03
.03
Elevation (m)
157
156
155
154
153
152
100
150
200
250
300
Station (m)
Legend
WS 50-year
WS 100-year
WS Regional
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 44.3 6250
.03
.03
.03
Elevation (m)
157
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155
154
153
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100
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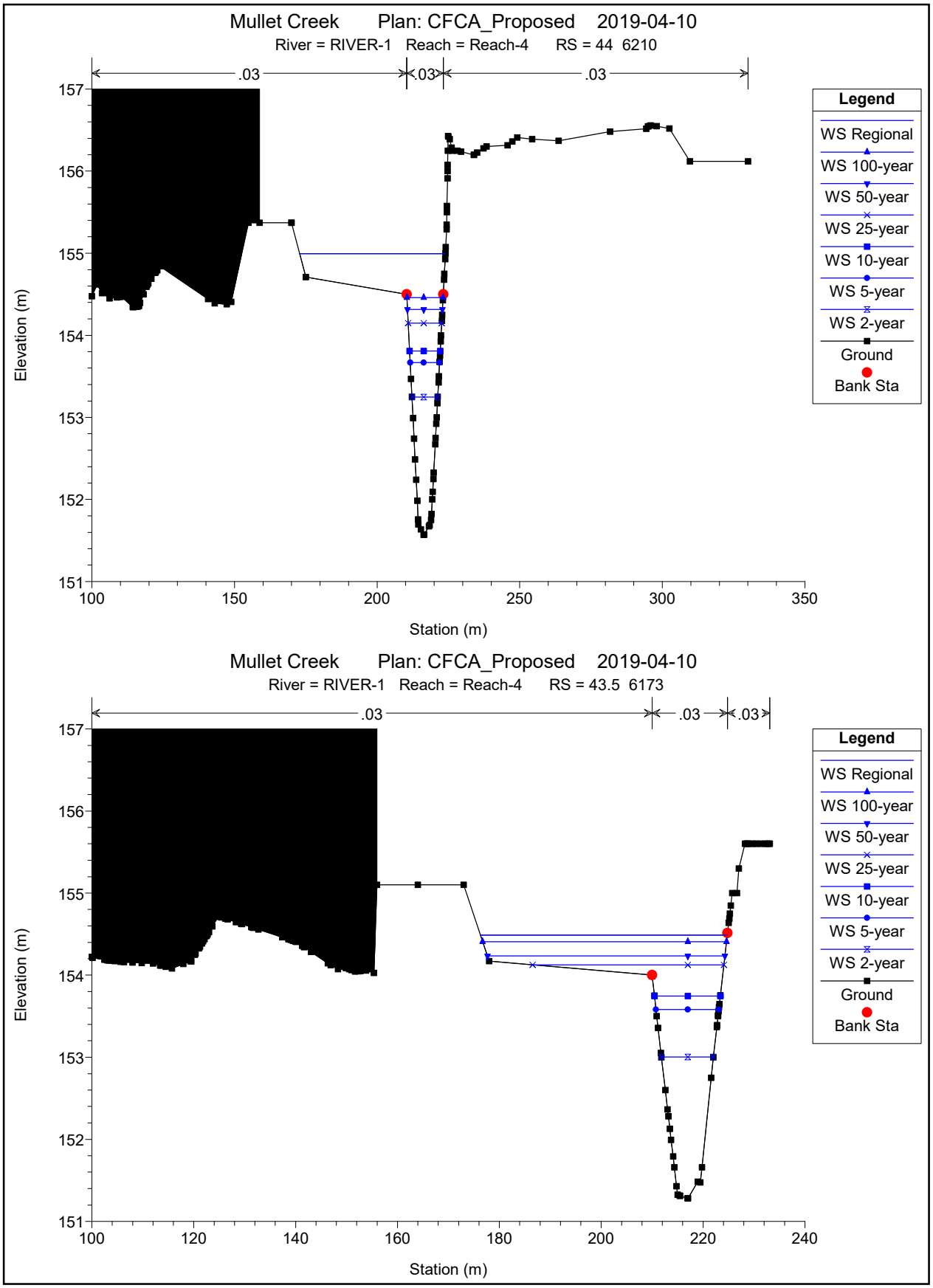
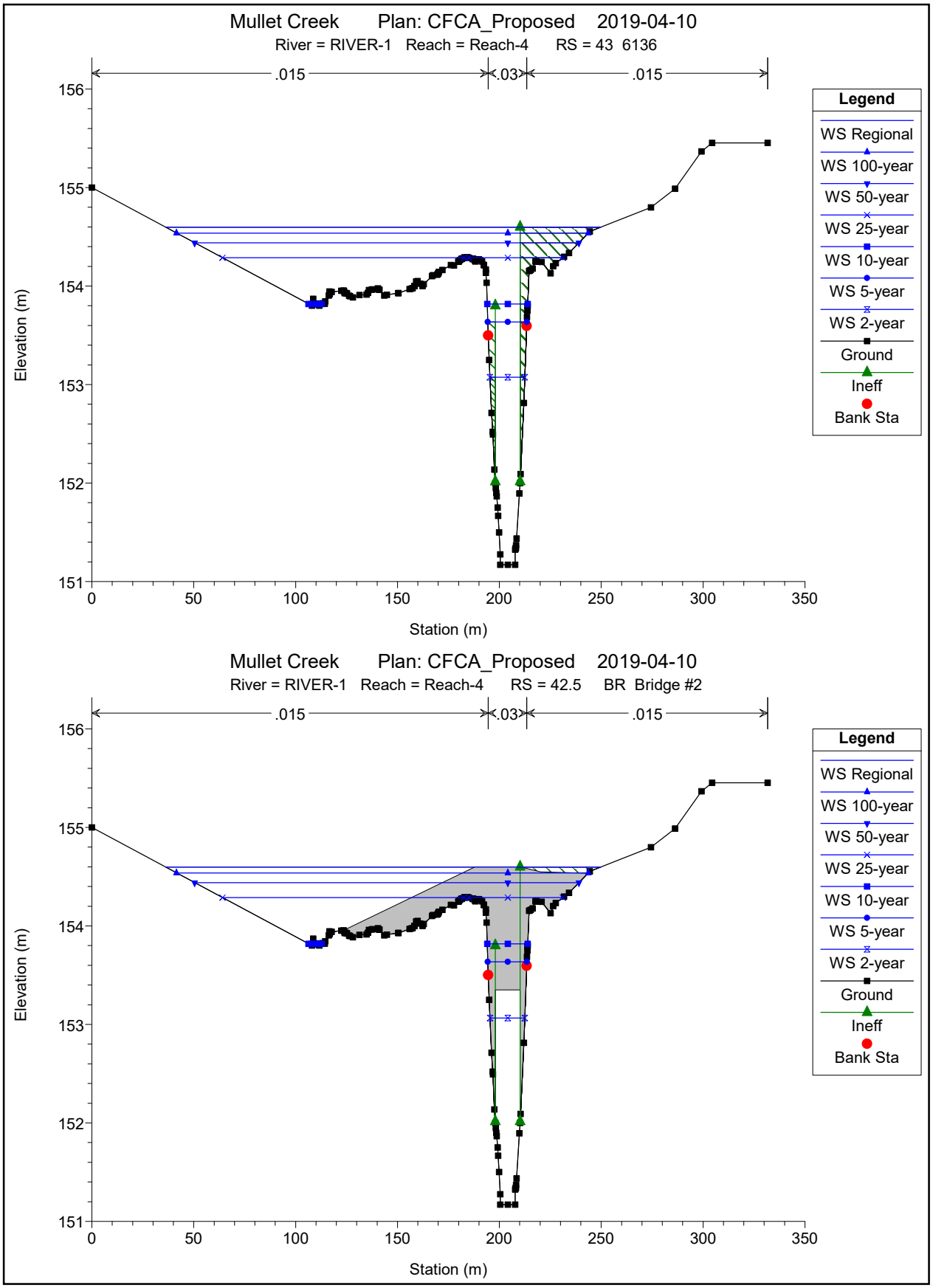
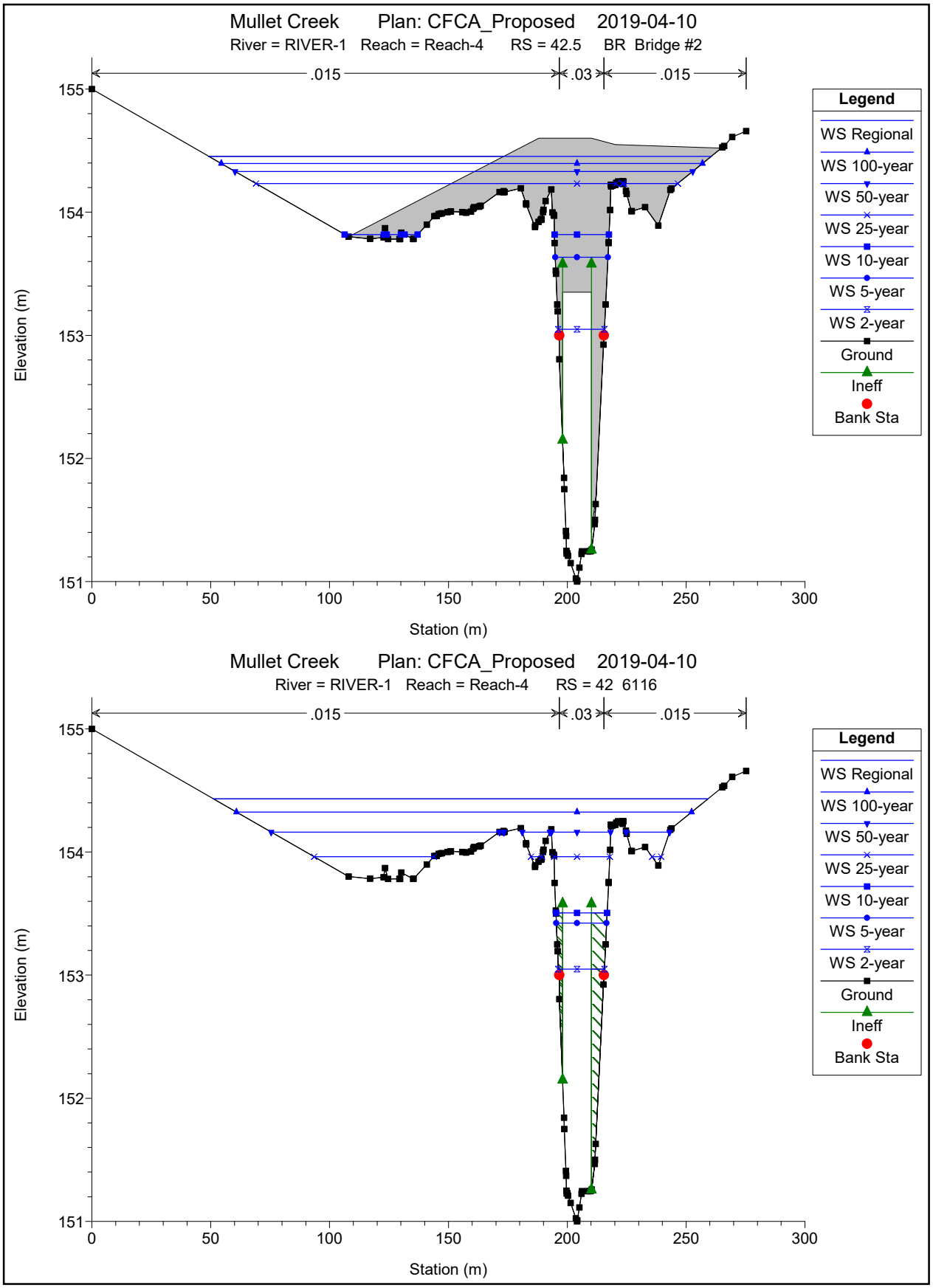
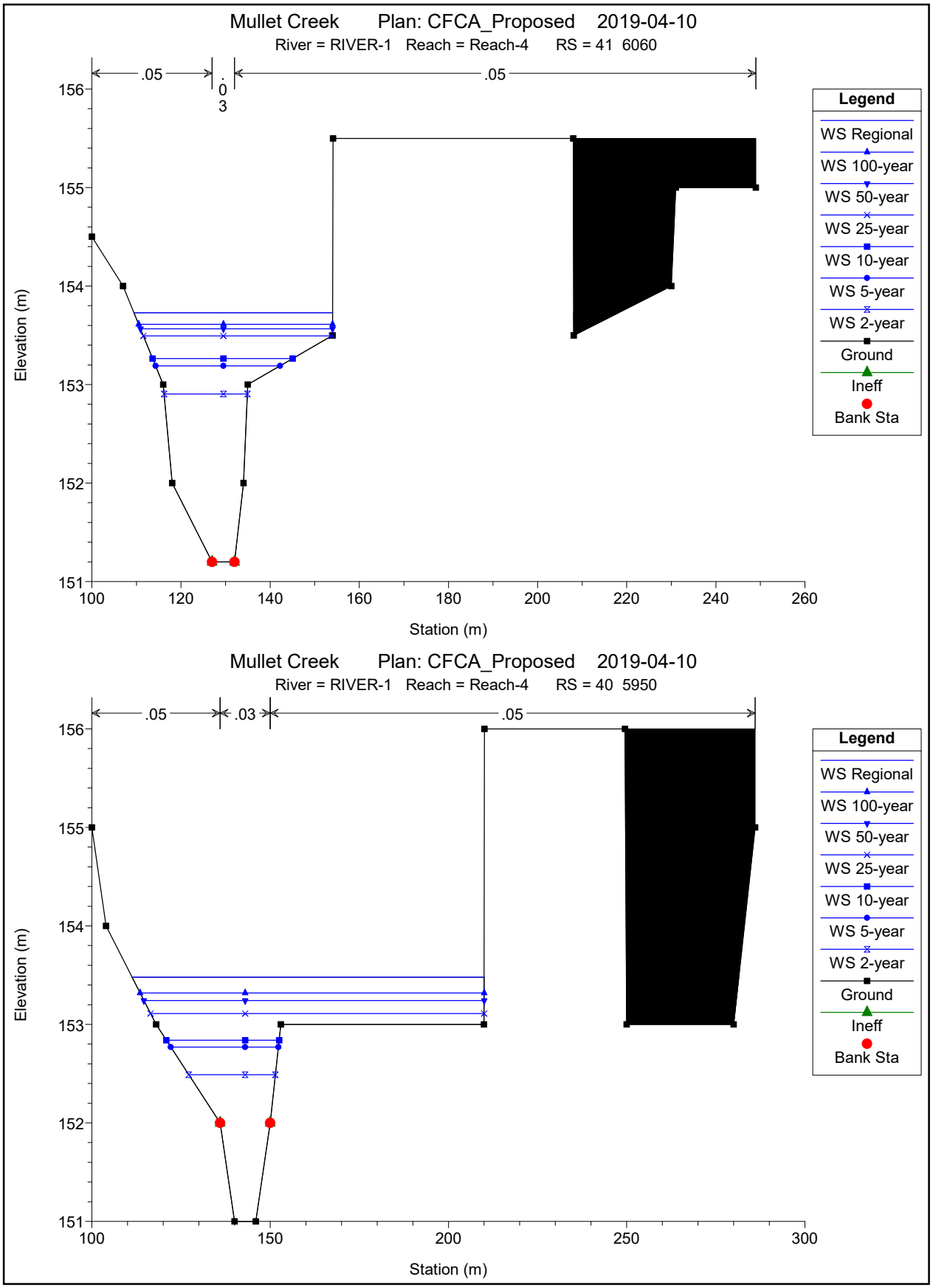
200
250
300
Station (m)
Legend
WS 100-year
WS Regional
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta

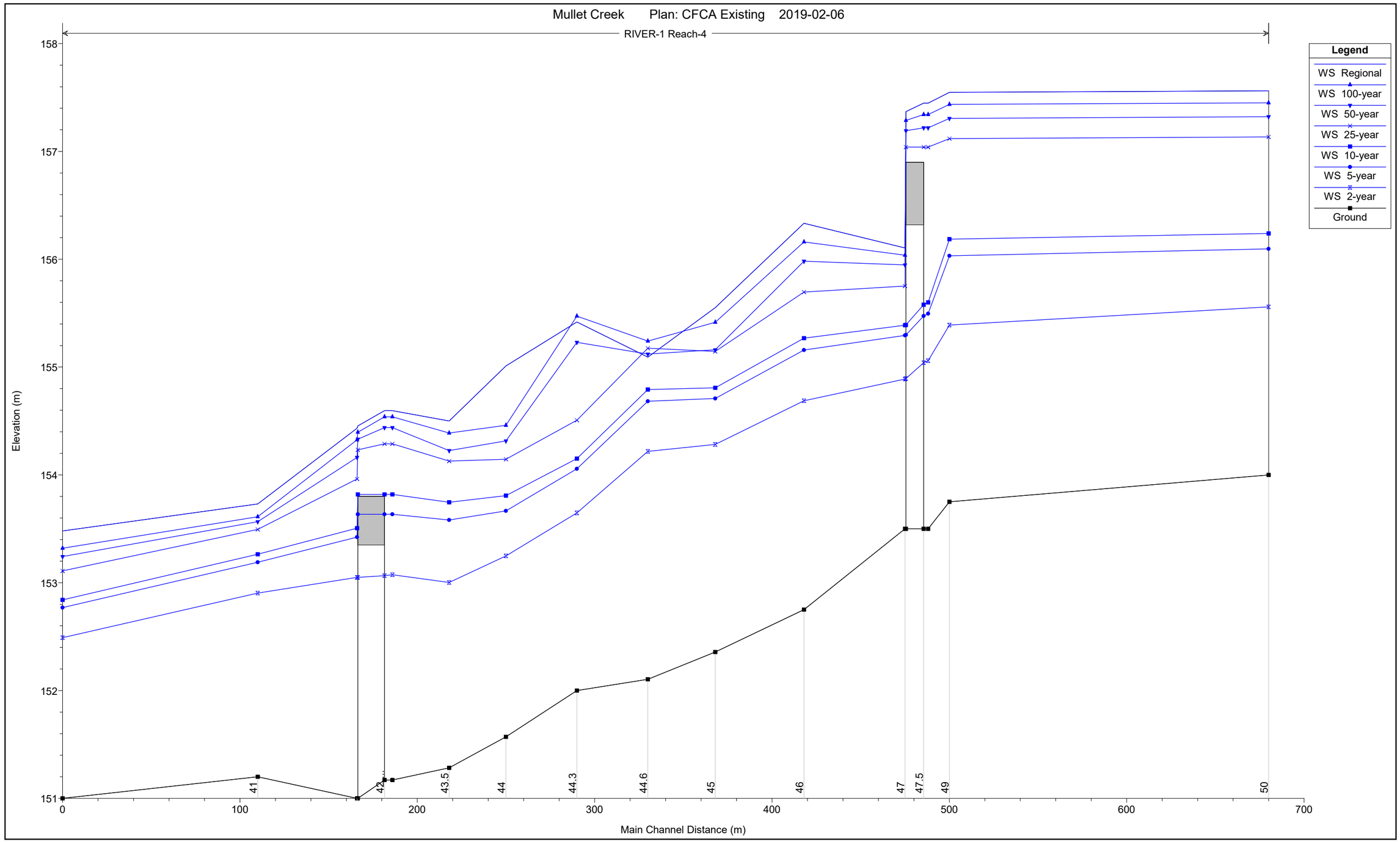

Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 44 6210
.03
.03
.03
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Elevation (m)
Station (m)
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 43.5 6173
.03
.03
.03
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Bank Sta
Elevation (m)
Station (m)


Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 43 6136
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 42.5 BR Bridge #2
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta

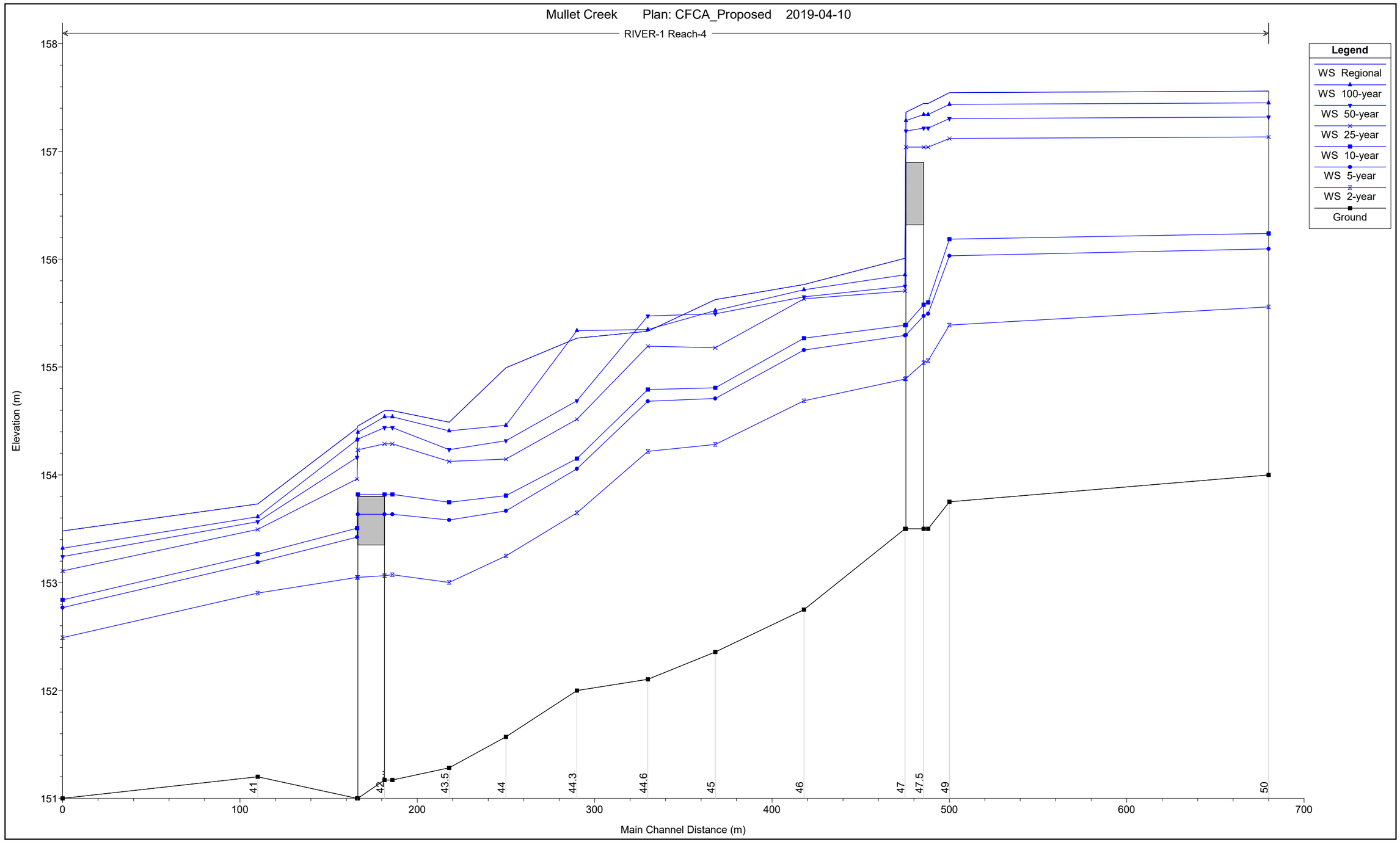

Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 42.5 BR Bridge #2
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 42 6116
.015
.03
.015
Elevation (m)
Station (m)
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta

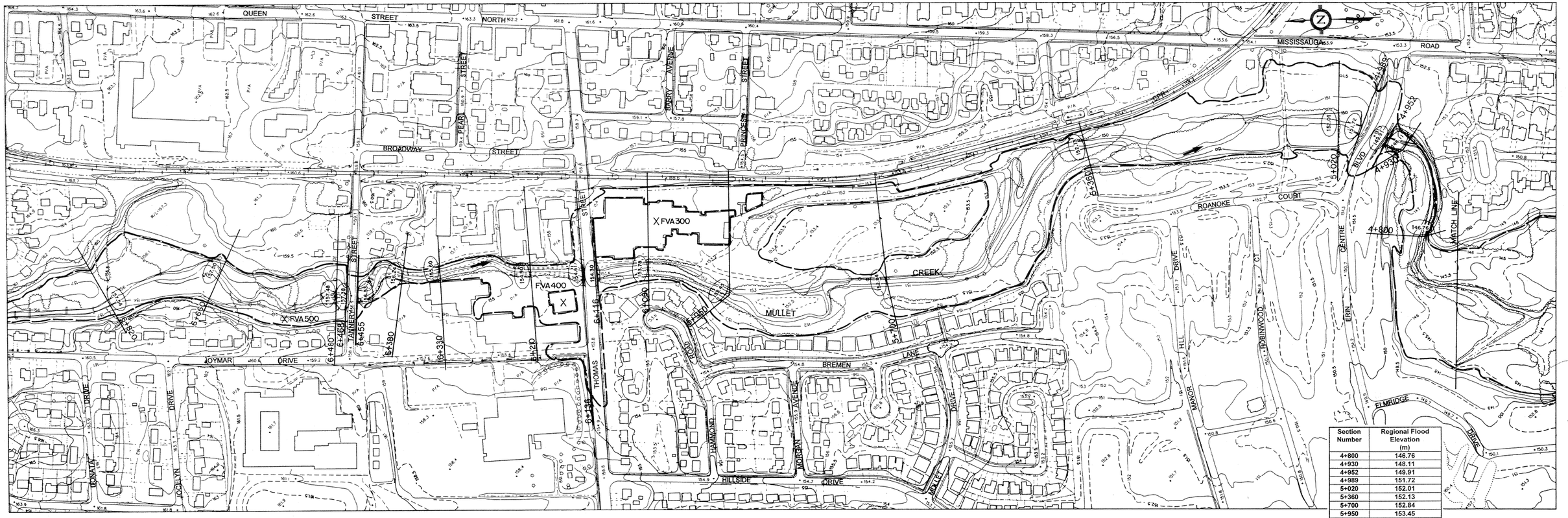

Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 41 6060
.05
.03
.05
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
Mullet Creek Plan: CFCA_Proposed 2019-04-10
River = RIVER-1 Reach = Reach-4 RS = 40 5950
.05
.03
.05
Legend
WS Regional
WS 100-year
WS 50-year
WS 25-year
WS 10-year
WS 5-year
WS 2-year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

HEC-RAS CFCA Existing Conditions Model Profile



HEC-RAS CFCA Proposed Conditions Model Profile





Section Number	Regional Flood Elevation (m)
4+800	146.76
4+930	148.11
4+952	149.91
4+989	151.72
5+020	152.01
5+360	152.13
5+700	152.84
5+950	153.45
6+060	153.78
6+116	154.30
6+136	154.61
6+210	154.90
6+330	155.60
6+380	156.24
6+455	156.53
6+468	157.38
6+480	157.48
6+660	157.50
6+820	157.54

CVC CREDIT VALLEY CONSERVATION

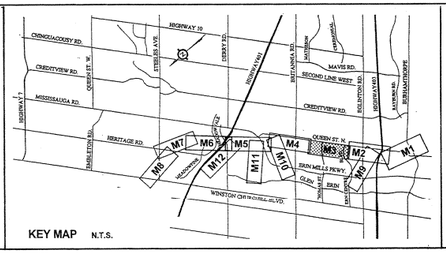
MISSISSAUGA

COSBURN PATTERSON MATHER LIMITED
CONSULTING ENGINEERS
7270 WOODBINE AVE., SUITE 300, MARKHAM, ONT. L3R 4B9
TELEPHONE (905) 474-0455

LICENSED PROFESSIONAL ENGINEER
G. A. SKEETHAM
PROVINCE OF ONTARIO

LEGEND:

- Intermediate Contour — 174 —
- Index Contour — 175 —
- Auxiliary Contour - - - 173.5 - - -
- Indefinite Contour - - - - - - -
- Depression Contour
- Dam — Dam
- Dyke
- Ditch — D —
- Culvert
- Falls (double Line River) — Falls
- Fence, Hedge Wall — X — W —
- Flooded Land — Flooded
- Lake, Pond
- Marsh or Swamp
- Double Line River with Multiple Rapids
- River, Stream, Canal
- River, Stream, Canal (Approx. Seasonal)
- Direction of Flow
- Spot Elevation (Lake Elevation) — 172.8
- Wooded Area
- Regional Floodline
- HEC-2 Cross-Section (Location by CPM) — 2+290
- HEC-2 Cross-Section (Location by others) — 5.00
- Regional Flood Elevation (metres) — 172.39
- Flood Vulnerable Area — XFVA700



KEY MAP N.T.S.

GENERAL INFORMATION:

Vertical Datum	-	Mean Sea Level
Horizontal Datum	-	North American 1983
Map Projection	-	Transverse Mercator
Central Meridian	-	81 West Longitude
Aerial Photography	-	

SCALE 1: 2000

40 0 100 200 METRES

100 0 100 200 300 400 500 600 700 800 FEET

CONTOUR INTERVAL/AUXILIARY - CONTOUR INTERVAL eg. 1m 6 1/2 m RESP.

SOURCE: City of Mississauga Digital Data.

MULLET CREEK FLOOD RISK MAP

SHEET 3 of 12