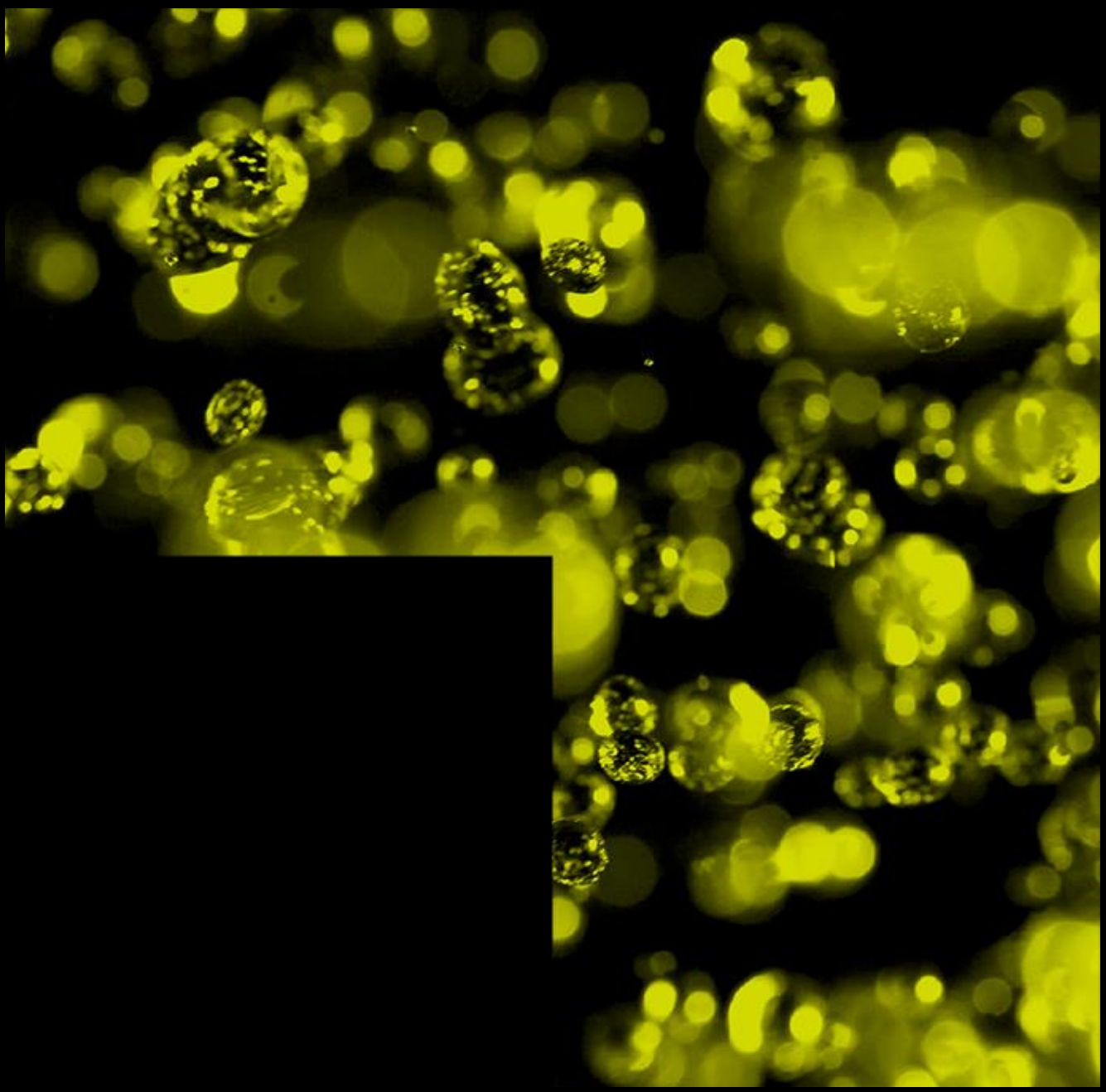
# DONEGAL GLEN STAGE 15 A&C

Stormwater

Minimum Floor Levels Report

Hugh Green Limited



# DOCUMENT CONTROL RECORD

| | |
|---|---|
| **CLIENT** | Hugh Green Limited |
| **PROJECT** | Donegal Glen Stage 15 A&C |
| **HG PROJECT NO.** | 1050-146689-01 |
| **HG DOCUMENT NO.** | R001v1-146689-01-MFL |
| **DOCUMENT** | Stormwater Report – Minimum Floor Levels |

# ISSUE AND REVISION RECORD

| | |
|---|---|
| **DATE OF ISSUE** | 18 February 2022 |
| **STATUS** | Final |
| **ORIGINATOR** | Will Kirk – Graduate Civil Engineer |
| **REVIEWED** | Daniel Scott – Technical Manager |
| **APPROVED FOR ISSUE** | Daniel Scott – Technical Manager |
| **OFFICE OF ORIGIN** | Parnell |
| **TELEPHONE** | +64 9 917 5000 |
| **EMAIL** | w.kirk@harrisongrierson.com |

# CONTENTS

# 1.0 INTRODUCTION

This Stormwater Report has been prepared to fulfil the requirements of the Auckland Council Condition of Consent 65 – Minimum Floor Levels (BUN60356333-B) for Donegal Glen Stage 15 A&C.

The purpose of the report is to satisfy the requirements set out under Condition 65 as follows:

(i) The 1% AEP flood level for the site and the surrounding road reserves;

(ii) A layout plan of the overland flow paths for the site and the adjacent land along the boundary in accordance with the approved EPA before Section 223 approval;

(iii) The overland flow path plan shall include as built cross sections of all roads including the ponding areas with levels before overtopping;

(iv) As built longitudinal plan and cross sections for shall be provided for overland flow path locations;

(v) The minimum floor level of all habitable buildings must be at least 150mm for flows below 2m³ per second and 100 mm deep and where flows exceed this, the minimum floor level of habitable buildings must be increased to at least 500mm. This may be enforced through a consent notice on the property unless the building consents have already been issued; and

(vi) Where either existing or proposed overland flow paths cross lot boundaries, the consent holder is to provide the Council with plans to accompany easement(s) to be registered in favour of the Council.

# 2.0 RESPONSE TO REQUIREMENTS

## 2.1 IDENTIFICATION OF 1% AEP FLOOD LEVEL

### 1% AEP – Road Flows

The secondary flows, up to and including the 1% AEP storm event, are contained within the road (i.e. kerb to kerb), as shown in overland flow path as-built plans and cross-section drawings AB455-456 and AB 466 in Appendix 1 & 2 for Koromeke Street, Uru Drive, Crossgar Drive, Brackloon Lane, and Ballyalton Crescent.

### 1% AEP – Flows outside the Road Reserve

All flows are contained within the road reserve.

## 2.2 OLFP LAYOUT PLAN

A layout plan of the as-built OLFPs for this site and adjacent land along the boundary can be seen in as-built drawings AB466 in Appendix 1.

## 2.3 AS-BUILT CROSS SECTIONS

The as-built cross-sections of all roads with levels, depth, width, and velocity of flow can be seen in as-built drawings AB455 & AB456 in Appendix 2.

## 2.4 MINIMUM FLOOR LEVELS

Where flows exceed 2 $m^3/s$, the minimum floor level of any habitable buildings must be 500mm above the 1% AEP flood level to comply with Chapter 4 of the Code of Practice for Land Development and Subdivision 2015. Overland flows generated from this subdivision are less than 2 $m^3/s$, so a minimum of 150 mm freeboard must be provided.

In this residential subdivision there are no private lots that require a specified minimum floor level, due to the flows being less than 2 $m^3/s$ and the overland flow (1% AEP) being contained within the carriageways.

# 3.0 SUMMARY

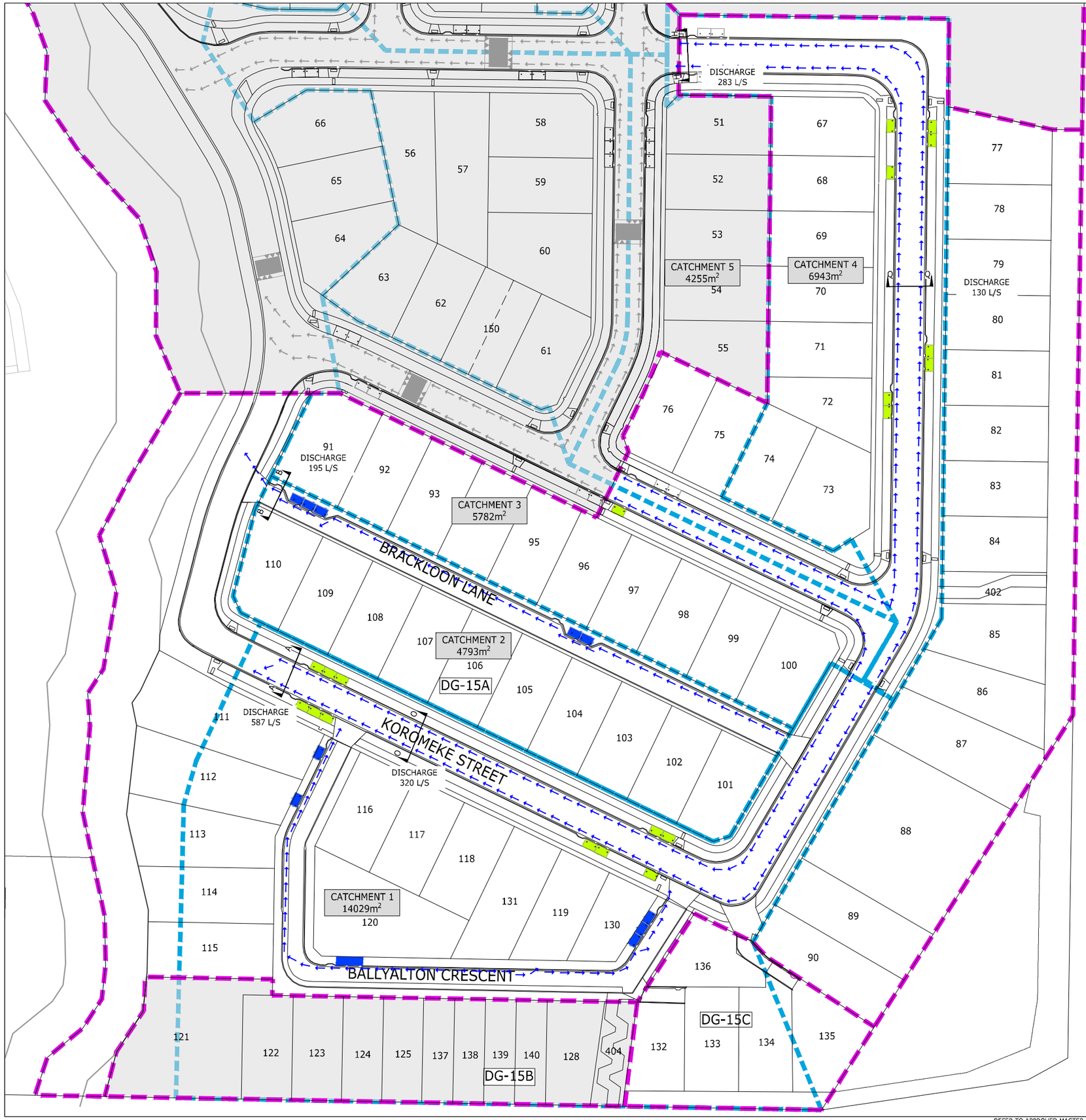
This stormwater report for Minimum Floor Levels was prepared to satisfy Auckland Council Resource Consent (BUN60356333-B), specifically condition 65. This report addresses how this condition is met on the Donegal Glen Stage 15 A&C residential subdivision.

The 1% AEP flood event is entirely contained within the road reserve. The overall layout plan in Appendix 1 and cross-sections in Appendix 2 show both the flow directions and the depths of the overland flow through the road sections. Appendix 3 is the calculations for the overland flows.

N:\1050\146689_01\500 Del\550 Compliance\224c Application - Stage 15\06. 224c Application\04. Appendices\Appendix 15 - Condition 106 - Stormwater Report\DG15 - MFL Report.docx

# APPENDICES

# APPENDIX 1
# OVERLAND FLOW PATH & 1% AEP AS-BUILT PLANS




ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED



## NOTES:

1. REFER TO FLOWPATH CALCULATIONS AND HYRDAFLOW EXPRESS REPORTS FOR DETAILS ON EXTENT OF FLOWPATHS WITHIN ROADS.
2. ALL FLOWPATHS ARE WITHIN THE LEGAL ROAD WIDTH.

## LEGEND:

- STAGE BOUNDARIES
- CATCHMENT BOUNDARIES
- OVERLAND FLOWPATHS
- EXISTING WATERCOURSE

**ENGINEERING APPROVAL**
**ENG-60363080**

I CERTIFY THAT THESE ASBUILT PLANS ARE AN ACCURATE RECORD OF THE WORKS UNDERTAKEN AND THAT:

- THE COORDINATES (X,Y) ARE IN TERMS OF NZTM ON NZGD (2000), AND ARE WITHIN ±50mm.
- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: .....
CHARTERED PROFESSIONAL ENGINEER

Date: 24/01/2022

Name: DANIEL ALEXANDER HOWARD SCOTT

Phone: 09-917-5000

Email: d.scott@harrisongrierson.com

AUCKLAND OFFICE
LEVEL 4, 96 ST GEORGES BAY ROAD
PARNELL AUCKLAND 1052
T +64 9 917 5000
W www.harrisongrierson.com

| REF | REVISIONS | BY | DATE |
|---|---|---|---|
| A | AS-BUILT | WXK | 21.12.21 |

PROJECT:

HUGH GREEN LIMITED
DONEGAL STAGE 15
36 TIR CONAILL AVENUE, FLATBUSH

TITLE:

100 YEAR OVERLAND FLOWPATH
AS-BUILT PLAN

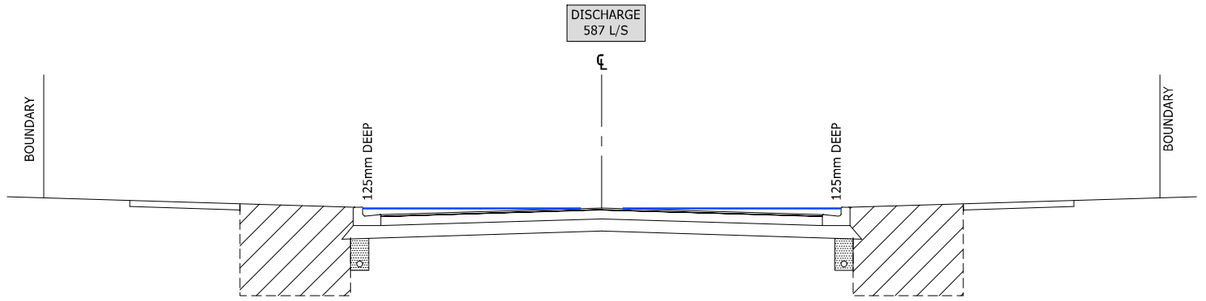
| | | | |
|---|---|---|---|
| ORIGINATOR: WXK | DATE: 31.05.21 | SIGNED: | PLOT BY: WXK |
| DRAWN: LAL | DATE: 15.09.21 | SIGNED: | PLOT DATE: 03.02.22 |
| CHECKED: WXK | DATE: 01.2022 | SIGNED: | SURVEY BY: DEMPSEY WOOD |
| APPROVED: DAS | DATE: 24.01.22 | SIGNED: | SURVEY DATE: 05.2021 |

ISSUE STATUS: AS-BUILT

| PROJECT No: | SCALES: | |
|---|---|---|
| 1050-146689-01 | 1:500-A1<br>1:1000-A3 | A1 |

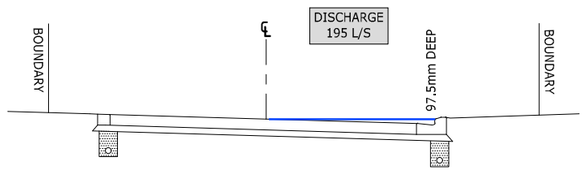
DRAWING No: 146689-15-AB466 REV A

# APPENDIX 2
# OVERLAND FLOW AS-BUILT CROSS SECTIONS



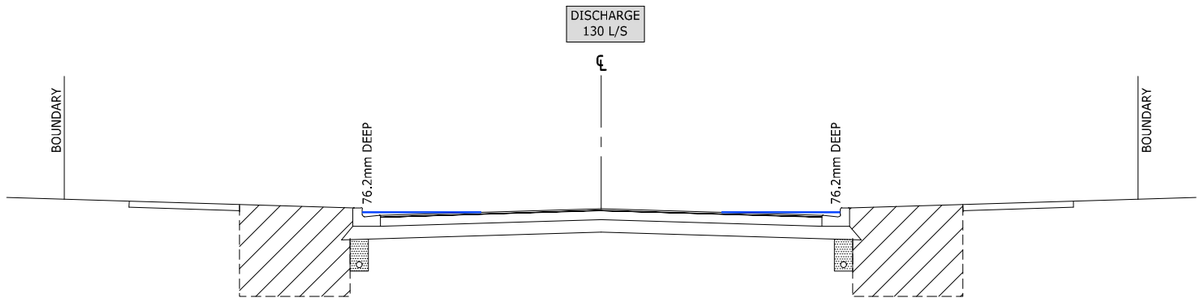

A 466 ROAD 1 OLFP CROSS SECTION A-A

SCALE 1:50-A1
1:100-A3




B 466 JOAL 1 OLFP CROSS SECTION B-B

SCALE 1:50-A1
1:100-A3




Q 466 ROAD 3 OLFP CROSS SECTION Q-Q

SCALE 1:50-A1
1:100-A3

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED



## NOTES:

1. LEVELS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946

   ORIGIN OF LEVELS
   SS 66 SO 48643
   RL 54.50

2. CATCHMENT AREAS AND DISCHARGE FLOWS INCORPORATE FUTURE OVERLAND FLOWPATH GENERATION FROM UPSTREAM DEVELOPMENT.

3. ALL FLOWPATHS ARE WITHIN THE LEGAL ROAD WIDTH.

## LEGEND

OVERLAND FLOWPATH LEVEL IN 1% AEP STORM EVENT

ENGINEERING APPROVAL
ENG-60363080

I CERTIFY THAT THESE ASBUILT PLANS ARE AN ACCURATE RECORD OF THE WORKS UNDERTAKEN AND THAT:

- THE COORDINATES (X,Y) ARE IN TERMS OF NZTM ON NZGD (2000), AND ARE WITHIN ±50mm.
- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: .....
CHARTERED PROFESSIONAL ENGINEER

Date: 24/01/2022

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Phone: 09-917-5000

Email: d.scott@harrisongrierson.com

AUCKLAND OFFICE
LEVEL 4, 96 ST GEORGES BAY ROAD
PARNELL AUCKLAND 1052
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W www.harrisongrierson.com

| REF | REVISIONS | BY | DATE |
|---|---|---|---|
| A | AS-BUILT | WXK | 10.12.21 |

PROJECT:

HUGH GREEN LIMITED
DONEGAL STAGES 15
36 TIR CONAILL AVENUE, FLAT BUSH

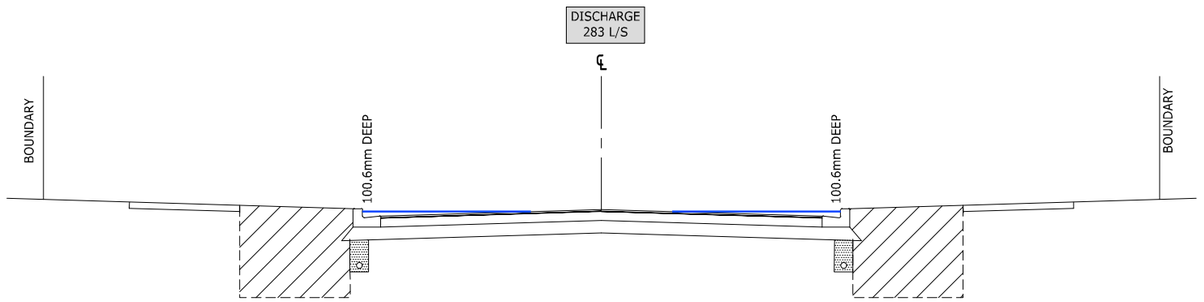
TITLE:

OVERLAND FLOW PATH
AS-BUILT CROSS SECTIONS
SHEET 1 OF 2

| | | | |
|---|---|---|---|
| ORIGINATOR: DXK | DATE: 01.2020 | SIGNED: | PLOT BY: WXK |
| DRAWN: LAL | DATE: 10.12.21 | SIGNED: | PLOT DATE: 03.02.22 |
| CHECKED: WXK | DATE: 01.2022 | SIGNED: | SURVEY BY: |
| APPROVED: DAS | DATE: 24.01.22 | SIGNED: | SURVEY DATE: |

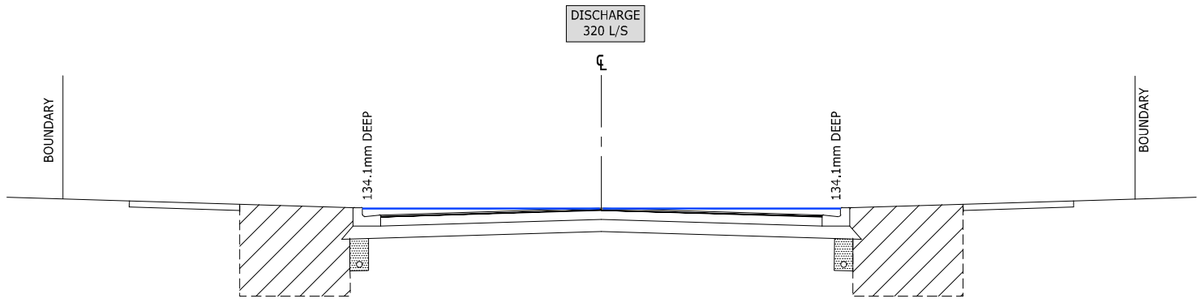
ISSUE STATUS: AS-BUILT

| | | |
|---|---|---|
| PROJECT No: 1050-146689-01 | SCALES: AS SHOWN | A1 |
| DRAWING No: 146689-15-AB455 | | REV A |




H / 466 ROAD 1 OLFP CROSS SECTION H-H

SCALE 1:50-A1
1:100-A3




O / 466 ROAD 4 OLFP CROSS SECTION O-O

SCALE 1:50-A1
1:100-A3

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ISO 9001 QUALITY ASSURED



## NOTES:

1. LEVELS ARE IN TERMS OF AUCKLAND VERTICAL DATUM 1946

   ORIGIN OF LEVELS
   SS 66 SO 48643
   RL 54.50

2. CATCHMENT AREAS AND DISCHARGE FLOWS INCORPORATE FUTURE OVERLAND FLOWPATH GENERATION FROM UPSTREAM DEVELOPMENT.

3. ALL FLOWPATHS ARE WITHIN THE LEGAL ROAD WIDTH.

## LEGEND

OVERLAND FLOWPATH LEVEL IN 1% AEP STORM EVENT

**ENGINEERING APPROVAL**
**ENG-60363080**

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- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: .....
CHARTERED PROFESSIONAL ENGINEER

Date: 24/01/2022

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| REF | REVISIONS | BY | DATE |
|---|---|---|---|
| A | AS-BUILT | WXK | 10.12.21 |

PROJECT:

HUGH GREEN LIMITED
DONEGAL STAGES 15
36 TIR CONAILL AVENUE, FLAT BUSH

TITLE:

OVERLAND FLOW PATH
AS-BUILT CROSS SECTIONS
SHEET 2 OF 2

| | | | |
|---|---|---|---|
| ORIGINATOR: DXK | DATE: 01.2020 | SIGNED: | PLOT BY: WXK |
| DRAWN: LAL | DATE: 10.12.21 | SIGNED: | PLOT DATE: 03.02.22 |
| CHECKED: WXK | DATE: 01.2022 | SIGNED: | SURVEY BY: |
| APPROVED: DAS | DATE: 24.01.22 | SIGNED: | SURVEY DATE: |

ISSUE STATUS: AS-BUILT

| | | |
|---|---|---|
| PROJECT No: 1050-146689-01 | SCALES: AS SHOWN | A1 |
| DRAWING No: 146689-15-AB456 | | REV A |

# APPENDIX 3
# OVERLAND FLOW CALCULATIONS

# 36 Tir Conaill Av. - Donegal 14, 15A & 15B

HG PROJECT NUMBER: 1050-146689-01
DATE: 2/04/2020

| | | |
|---|---|---|
| Runoff Coefficient - **C** | 0.8 | |
| Rainfall Intensity (100year) - **I** | 183 | mm/hour |
| Total Catchment Area | 6.14 | ha |

**Q = CIA X 2.78/1000**

| CATCHMENT | AREA (ha) |
|---|---|
| 1 | 1.4427 |
| 2 | 0.4793 |
| 3 | 0.5782 |
| 4 | 0.6218 |
| | |
| 6 | 0.0639 |
| | |
| 7 | 0.6943 |
| 8 | 0.4255 |
| 9 | 0.632 |
| 10 | 1.116 |
| | |
| 12 | 0.0833 |
| | |

| CROSS SECTION | CATCHMENT | AREA (Ha) | Q ($m^3/s$) | EXISTING DISCHARGE | CUMALATIVE FLOW | Notes: |
|---|---|---|---|---|---|---|
| A | 1 | 1.443 | 0.587 | | | |
| B | 2 | 0.479 | 0.195 | | | |
| C | 3 | 0.578 | 0.235 | | | |
| D | 4 | 0.622 | 0.253 | | | |
| | | | | | | |
| F | 6 | 0.064 | 0.026 | 1.040 | 1.066 | |
| G | | | | | 1.066 | Discharge Point |
| H | 7 | 0.694 | 0.283 | | | |
| I | 8 | 0.426 | 0.173 | | | |
| J | 9 | 0.632 | 0.257 | | 0.713 | |
| K | 10 | 1.116 | 0.454 | | | |
| | | | | | | |
| M | 12 | 0.083 | 0.034 | 1.040 | 1.074 | |
| N | | | | | 1.074 | Discharge Point |

*OLF Path & Catchment plans refer to drawings:
146689-465
146689-466
146689-467
146689-468

***CROSS SECTIONS AT SPEED TABLES***

| | |
|---|---|
| | 0.785 |
| | 0.451 |
| | 0.319 |

| | | | | | |
|---|---|---|---|---|---|
| O | | 0.785 | 0.319 | | |
| P | | 0.451 | 0.184 | | |
| Q | | 0.319 | 0.130 | | |

# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 22 2020

## Section A-A

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 64.2900 |
| Slope (%) | = 5.3000 |
| N-Value | = 0.013 |

**Calculations**

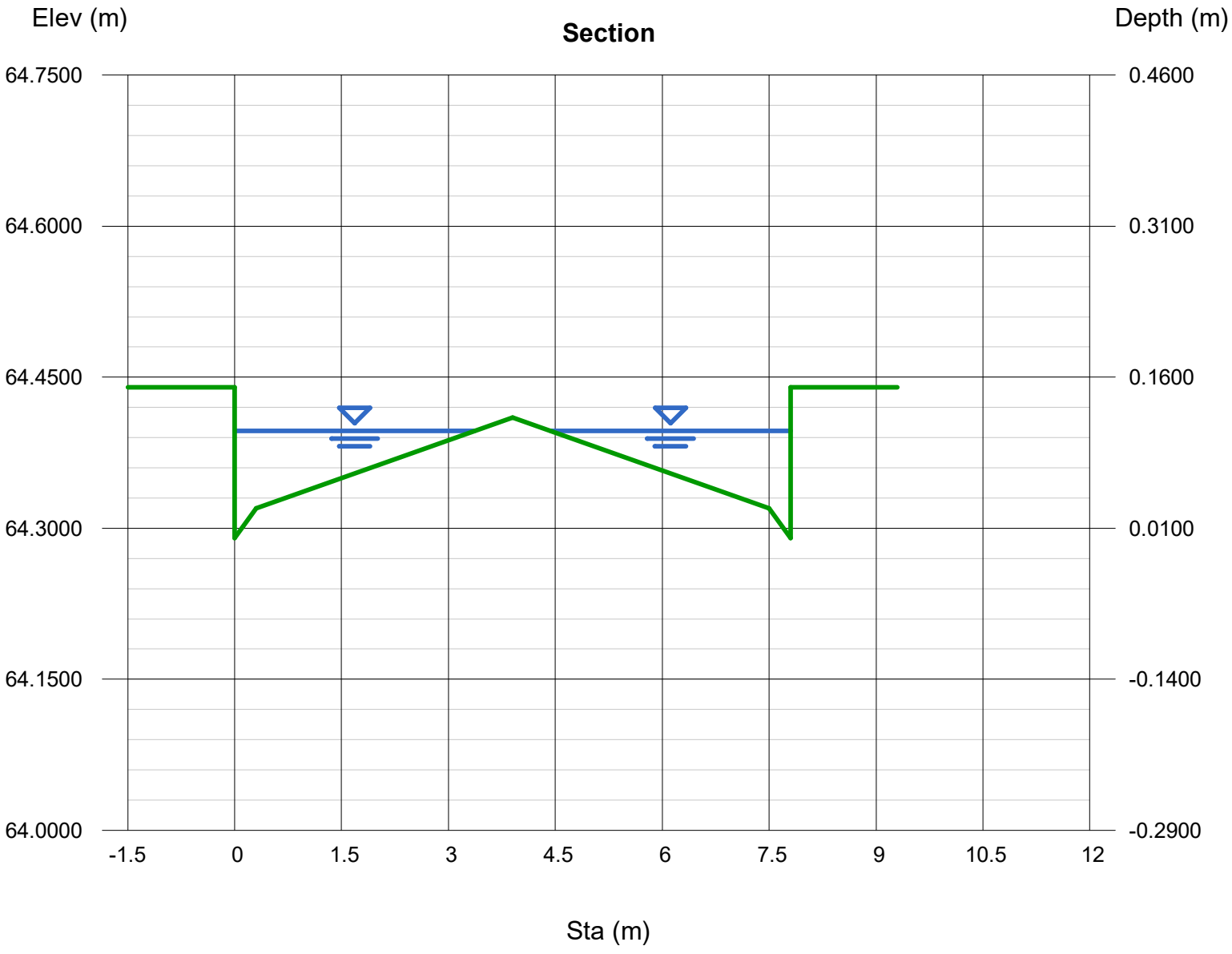
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.5870 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1067 |
| Q (cms) | = 0.5870 |
| Area (sqm) | = 0.2902 |
| Velocity (m/s) | = 2.0226 |
| Wetted Perim (m) | = 6.9527 |
| Crit Depth, Yc (m) | = 0.1500 |
| Top Width (m) | = 6.7344 |
| EGL (m) | = 0.3154 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 64.4400) -(0.3000, 64.3200, 0.013) -(3.9000, 64.4100, 0.013) -(7.5000, 64.3200, 0.013) -(7.8000, 64.2900, 0.013) -(7.8000, 64.4400, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section B-B

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 61.4900 |
| Slope (%) | = 6.1000 |
| N-Value | = 0.013 |

**Calculations**

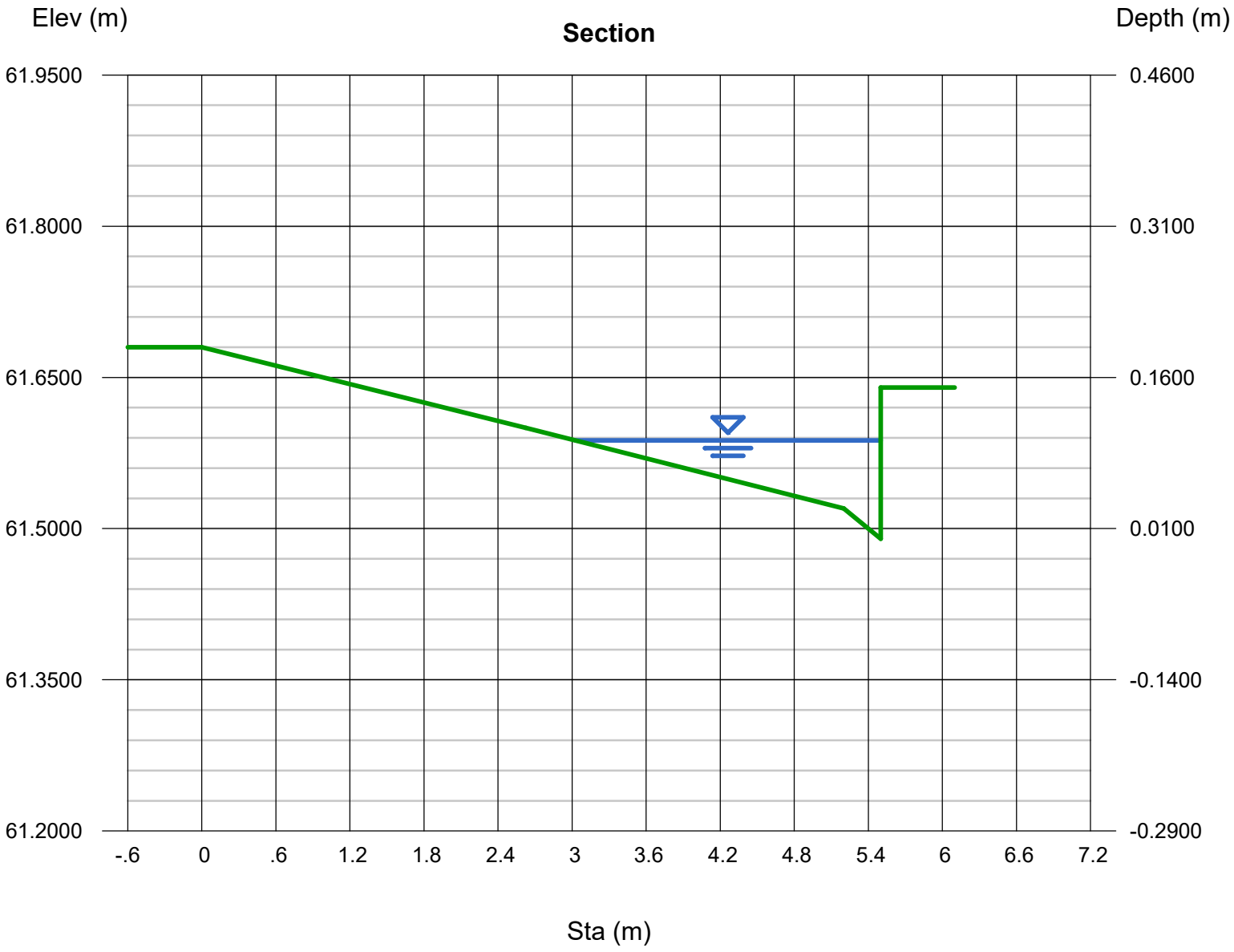
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.1950 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.0975 |
| Q (cms) | = 0.195 |
| Area (sqm) | = 0.0982 |
| Velocity (m/s) | = 1.9862 |
| Wetted Perim (m) | = 2.5740 |
| Crit Depth, Yc (m) | = 0.1463 |
| Top Width (m) | = 2.4740 |
| EGL (m) | = 0.2988 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 61.6800)-(2.6250, 61.6000, 0.013)-(5.2000, 61.5200, 0.013)-(5.5000, 61.4900, 0.013)-(5.5000, 61.6400, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section C-C

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 61.4000 |
| Slope (%) | = 5.7000 |
| N-Value | = 0.013 |

**Calculations**

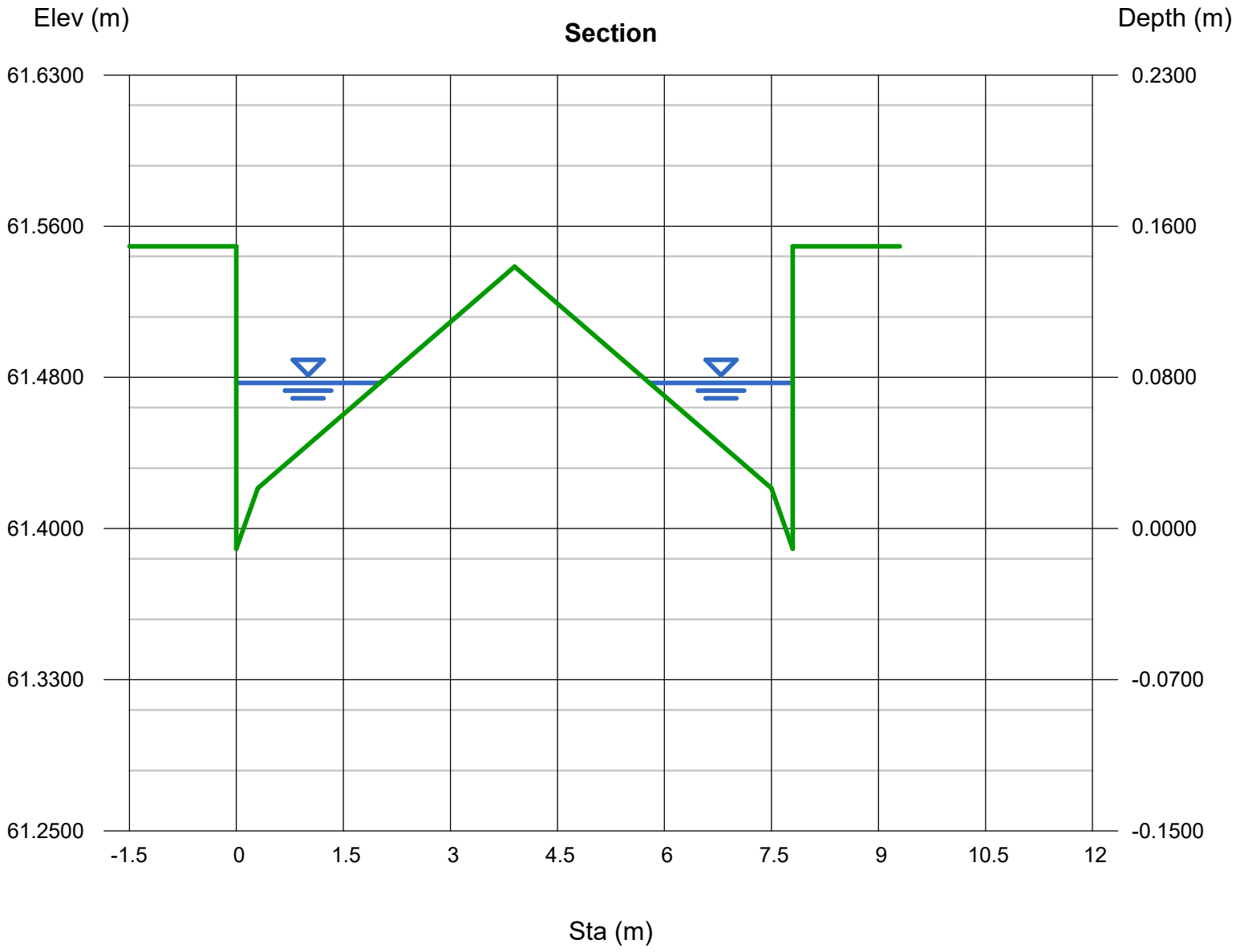
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.2350 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.0823 |
| Q (cms) | = 0.235 |
| Area (sqm) | = 0.1299 |
| Velocity (m/s) | = 1.8092 |
| Wetted Perim (m) | = 4.1923 |
| Crit Depth, Yc (m) | = 0.1219 |
| Top Width (m) | = 4.0231 |
| EGL (m) | = 0.2493 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 61.5500)-(0.3000, 61.4300, 0.013)-(3.9000, 61.5400, 0.013)-(7.5000, 61.4300, 0.013)-(7.8000, 61.4000, 0.013)-(7.8000, 61.5500, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section D-D

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 58.0000 |
| Slope (%) | = 1.0000 |
| N-Value | = 0.013 |

**Calculations**

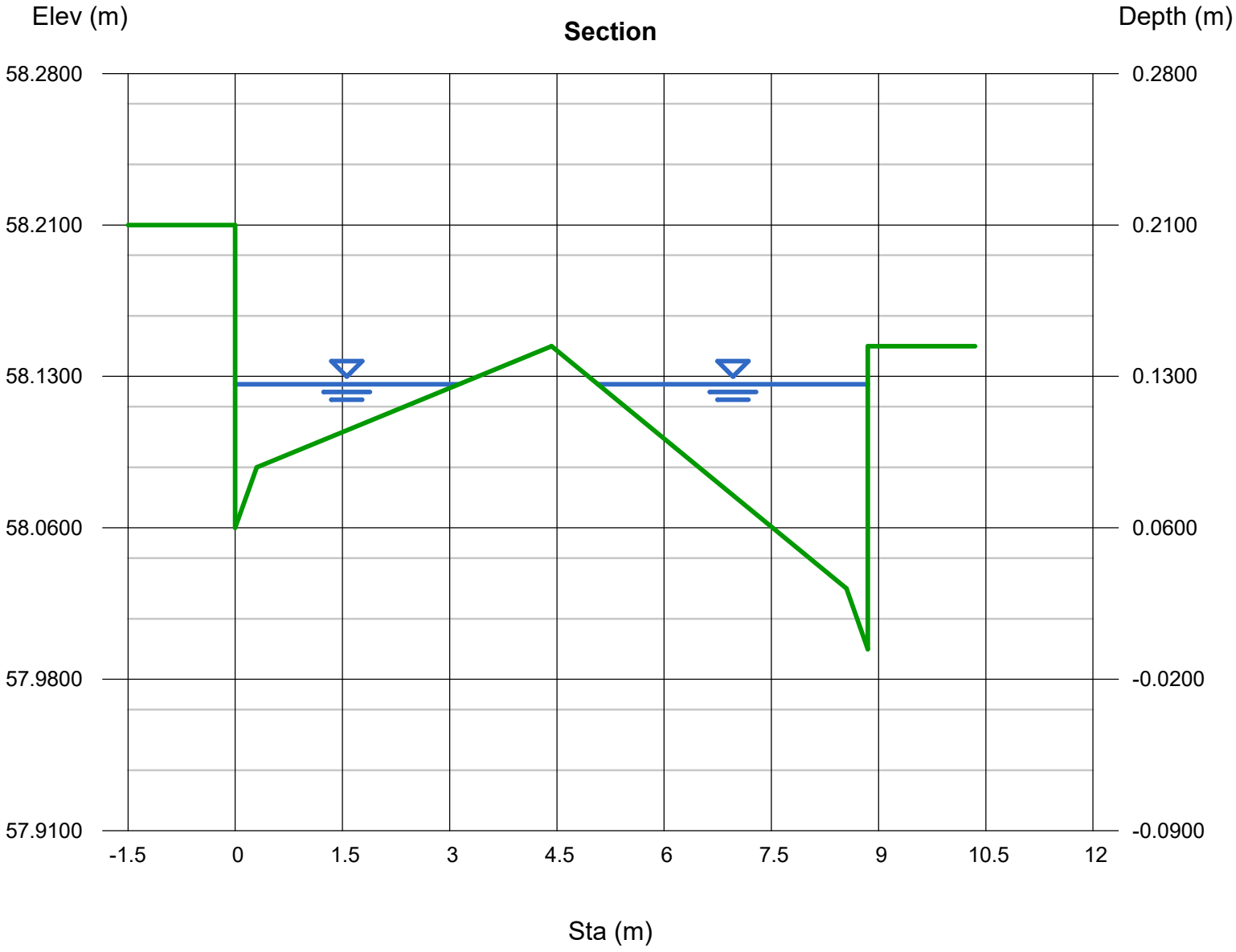
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.2530 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1311 |
| Q (cms) | = 0.253 |
| Area (sqm) | = 0.2851 |
| Velocity (m/s) | = 0.8873 |
| Wetted Perim (m) | = 7.1039 |
| Crit Depth, Yc (m) | = 0.1433 |
| Top Width (m) | = 6.8970 |
| EGL (m) | = 0.1712 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 58.2100)-(0.3000, 58.0900, 0.013)-(4.4250, 58.1500, 0.013)-(8.5500, 58.0300, 0.013)-(8.8500, 58.0000, 0.013)-(8.8500, 58.1500, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section F-F

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 47.7300 |
| Slope (%) | = 2.7000 |
| N-Value | = 0.013 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 1.0660 |

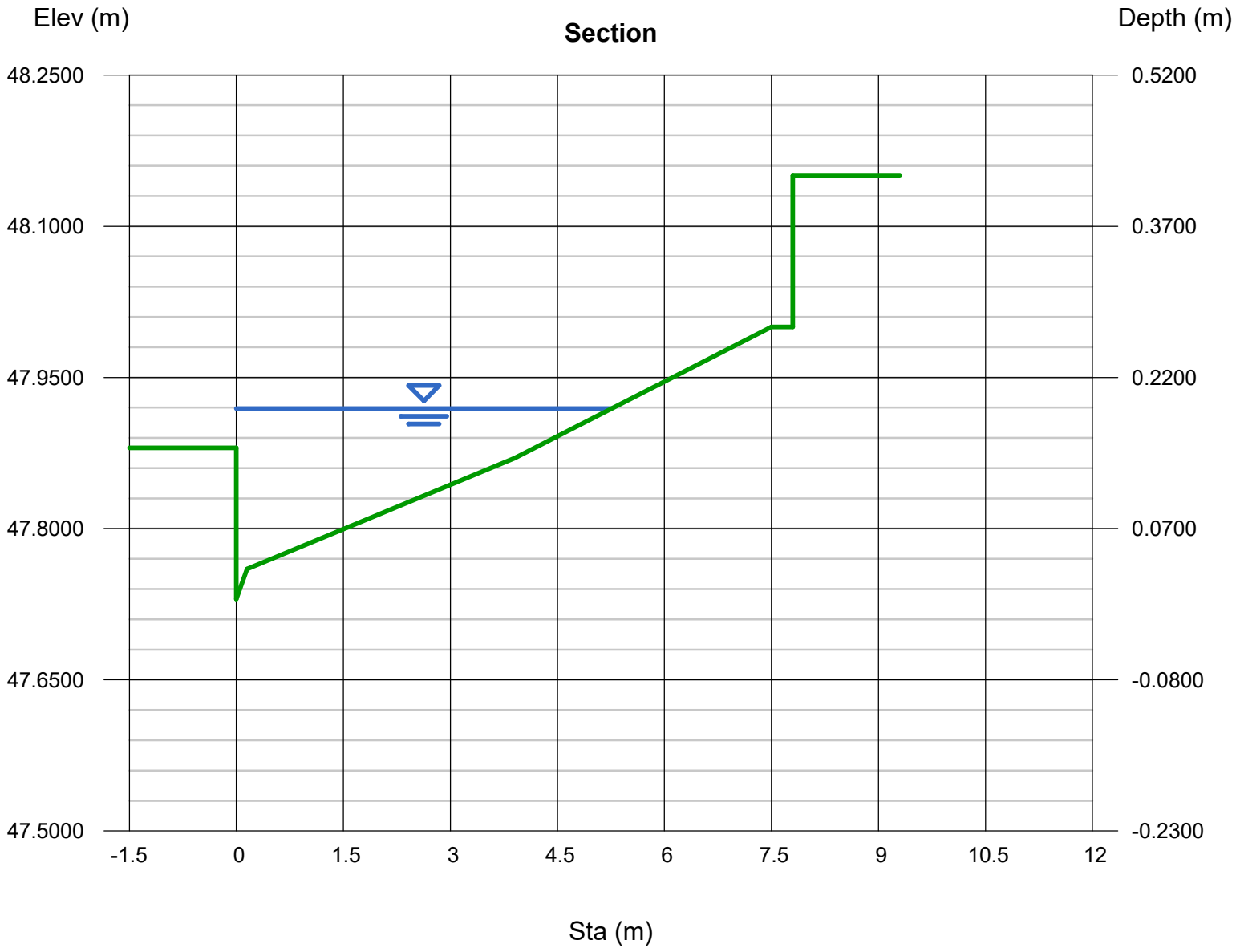
**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1890 |
| Q (cms) | = 1.0660 |
| Area (sqm) | = 0.4492 |
| Velocity (m/s) | = 2.3730 |
| Wetted Perim (m) | = 5.4117 |
| Crit Depth, Yc (m) | = 0.2682 |
| Top Width (m) | = 5.2562 |
| EGL (m) | = 0.4762 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 47.8800)-(0.1500, 47.7600, 0.013)-(3.9000, 47.8700, 0.013)-(7.5000, 48.0000, 0.013)-(7.8000, 48.0000, 0.013)-(7.8000, 48.1500, 0.013)

looks like over toopping the kerb
and goign into the stream



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section H-H

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 59.3700 |
| Slope (%) | = 2.2000 |
| N-Value | = 0.013 |

**Calculations**

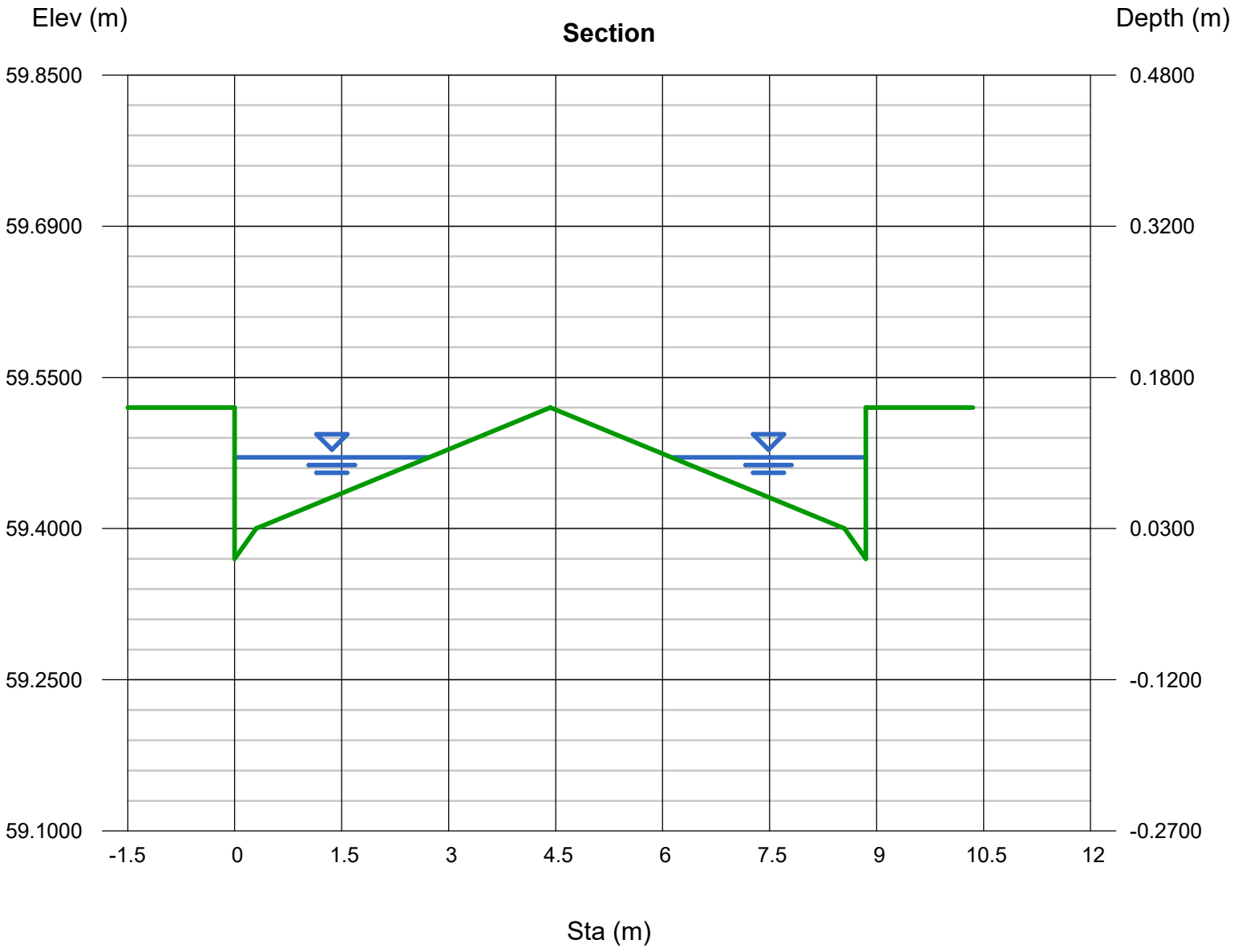
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.2830 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1006 |
| Q (cms) | = 0.283 |
| Area (sqm) | = 0.2226 |
| Velocity (m/s) | = 1.2713 |
| Wetted Perim (m) | = 5.6588 |
| Crit Depth, Yc (m) | = 0.1280 |
| Top Width (m) | = 5.4526 |
| EGL (m) | = 0.1830 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 59.5200)-(0.3000, 59.4000, 0.013)-(4.4250, 59.5200, 0.013)-(8.5500, 59.4000, 0.013)-(8.8500, 59.3700, 0.013)-(8.8500, 59.5200, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section I-I

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 60.2000 |
| Slope (%) | = 4.9000 |
| N-Value | = 0.013 |

**Calculations**

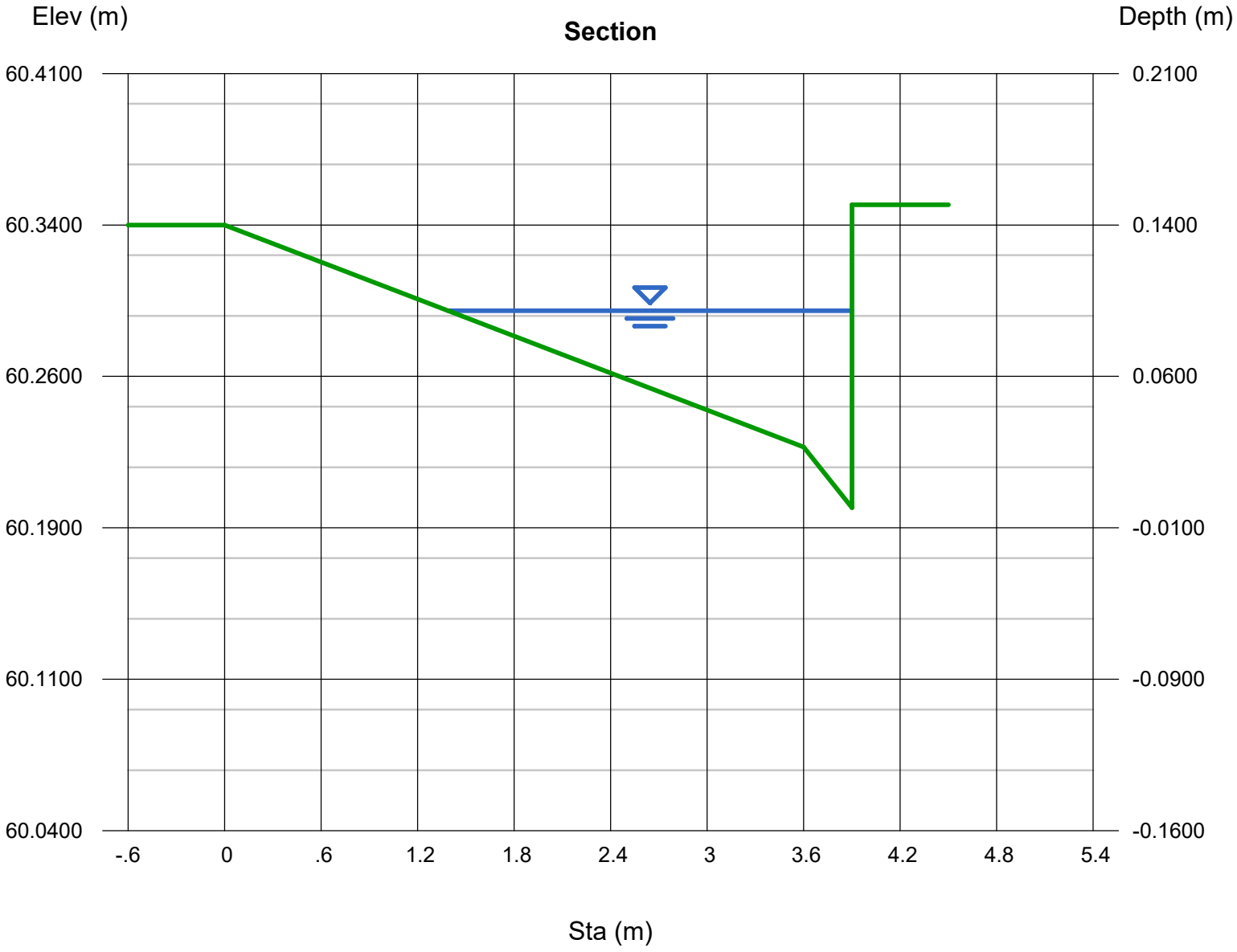
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.1730 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.0975 |
| Q (cms) | = 0.173 |
| Area (sqm) | = 0.0994 |
| Velocity (m/s) | = 1.7403 |
| Wetted Perim (m) | = 2.6104 |
| Crit Depth, Yc (m) | = 0.1402 |
| Top Width (m) | = 2.5104 |
| EGL (m) | = 0.2520 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 60.3400)-(3.6000, 60.2300, 0.013)-(3.9000, 60.2000, 0.013)-(3.9000, 60.3500, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section J-J

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 51.7000 |
| Slope (%) | = 4.9000 |
| N-Value | = 0.013 |

**Calculations**

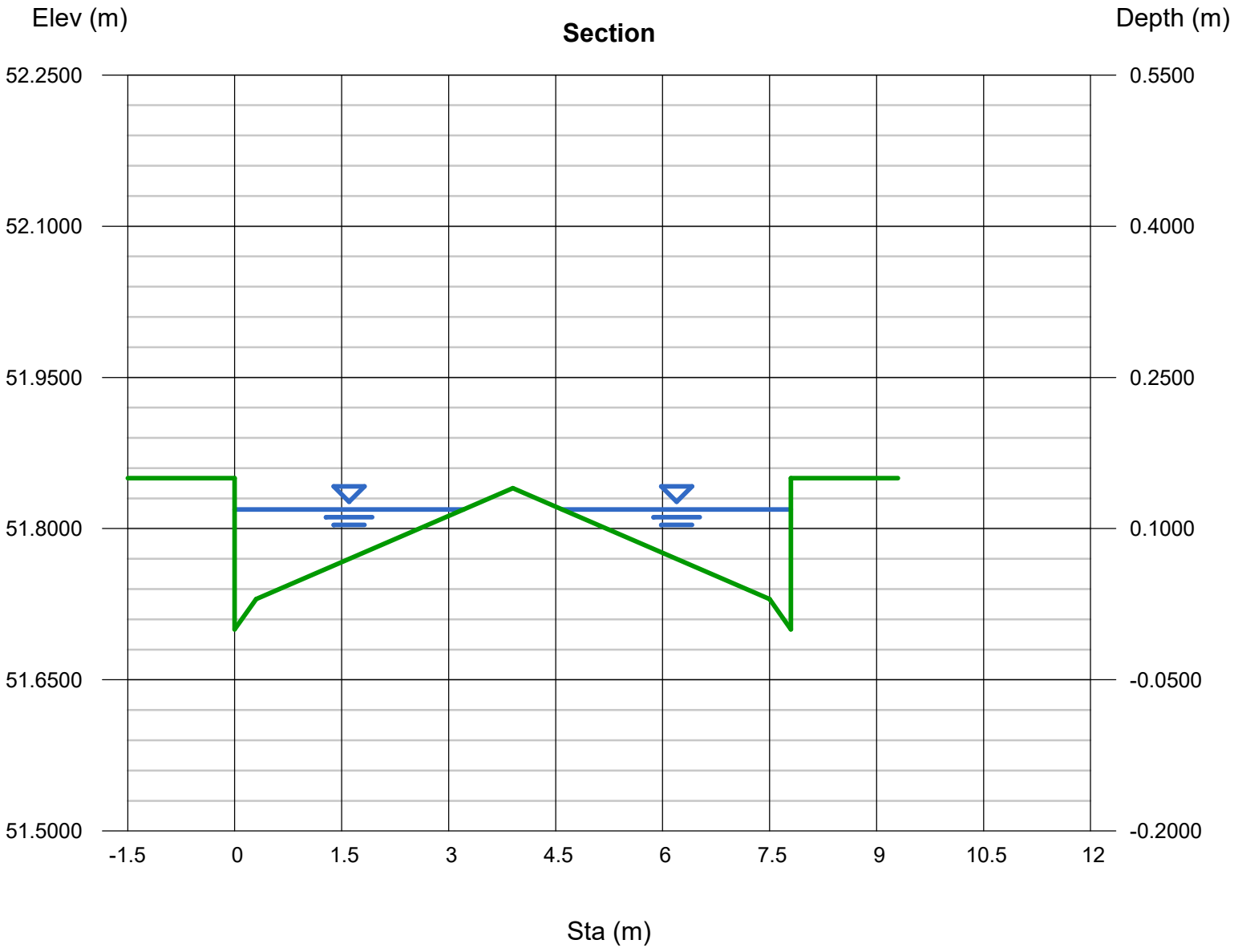
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.7130 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1189 |
| Q (cms) | = 0.7130 |
| Area (sqm) | = 0.3208 |
| Velocity (m/s) | = 2.2224 |
| Wetted Perim (m) | = 6.6607 |
| Crit Depth, Yc (m) | = 0.1500 |
| Top Width (m) | = 6.4173 |
| EGL (m) | = 0.3708 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 51.8500)-(0.3000, 51.7300, 0.013)-(3.9000, 51.8400, 0.013)-(7.5000, 51.7300, 0.013)-(7.8000, 51.7000, 0.013)-(7.8000, 51.8500, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 8 2020

## Section K-K

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 49.8300 |
| Slope (%) | = 3.0000 |
| N-Value | = 0.013 |

**Calculations**

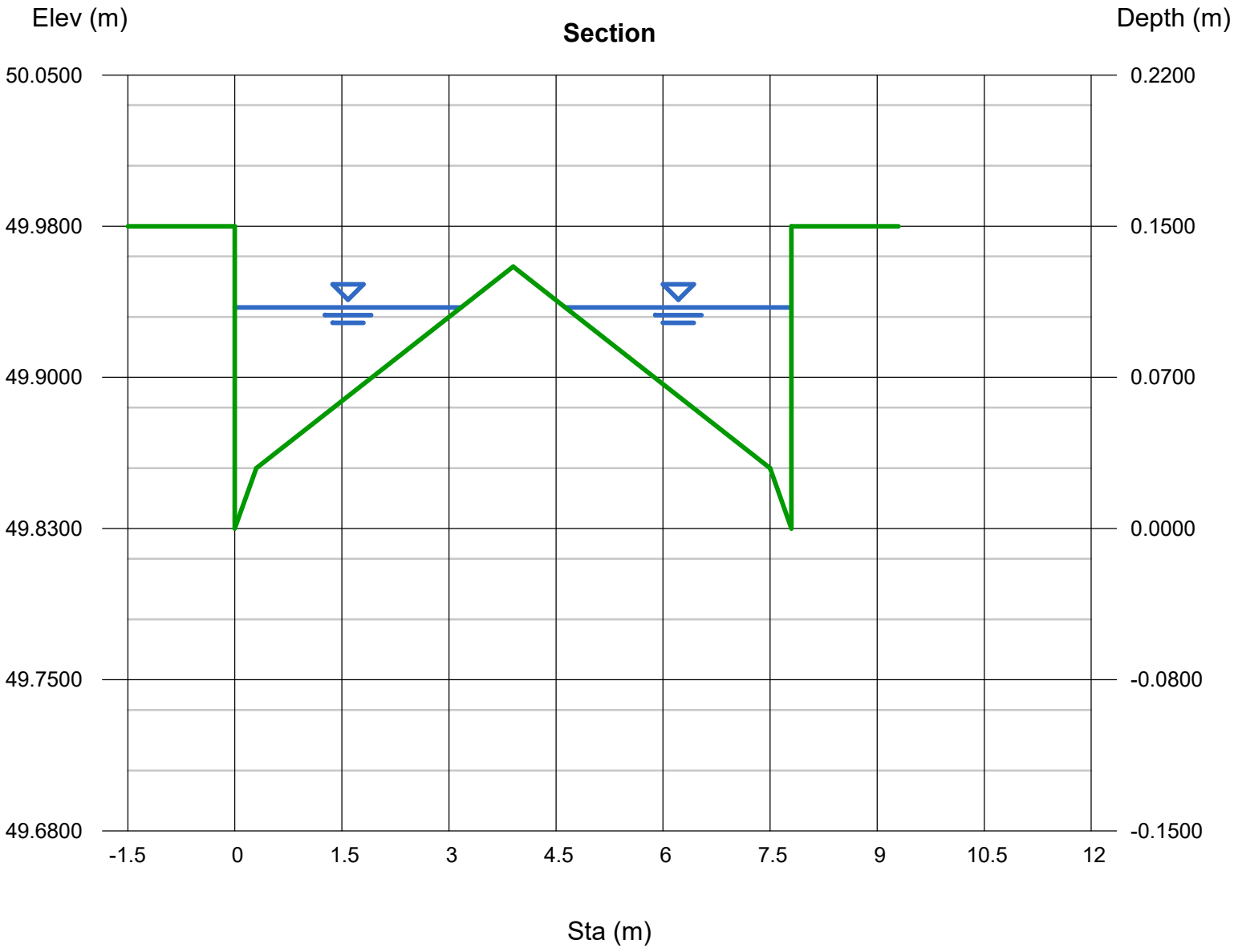
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.4540 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1097 |
| Q (cms) | = 0.4540 |
| Area (sqm) | = 0.2857 |
| Velocity (m/s) | = 1.5891 |
| Wetted Perim (m) | = 6.5653 |
| Crit Depth, Yc (m) | = 0.1463 |
| Top Width (m) | = 6.3406 |
| EGL (m) | = 0.2385 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 49.9800)-(0.3000, 49.8600, 0.013)-(3.9000, 49.9600, 0.013)-(7.5000, 49.8600, 0.013)-(7.8000, 49.8300, 0.013)-(7.8000, 49.9800, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Apr 15 2020

## Section M-M

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 48.1100 |
| Slope (%) | = 0.9000 |
| N-Value | = 0.013 |

**Calculations**

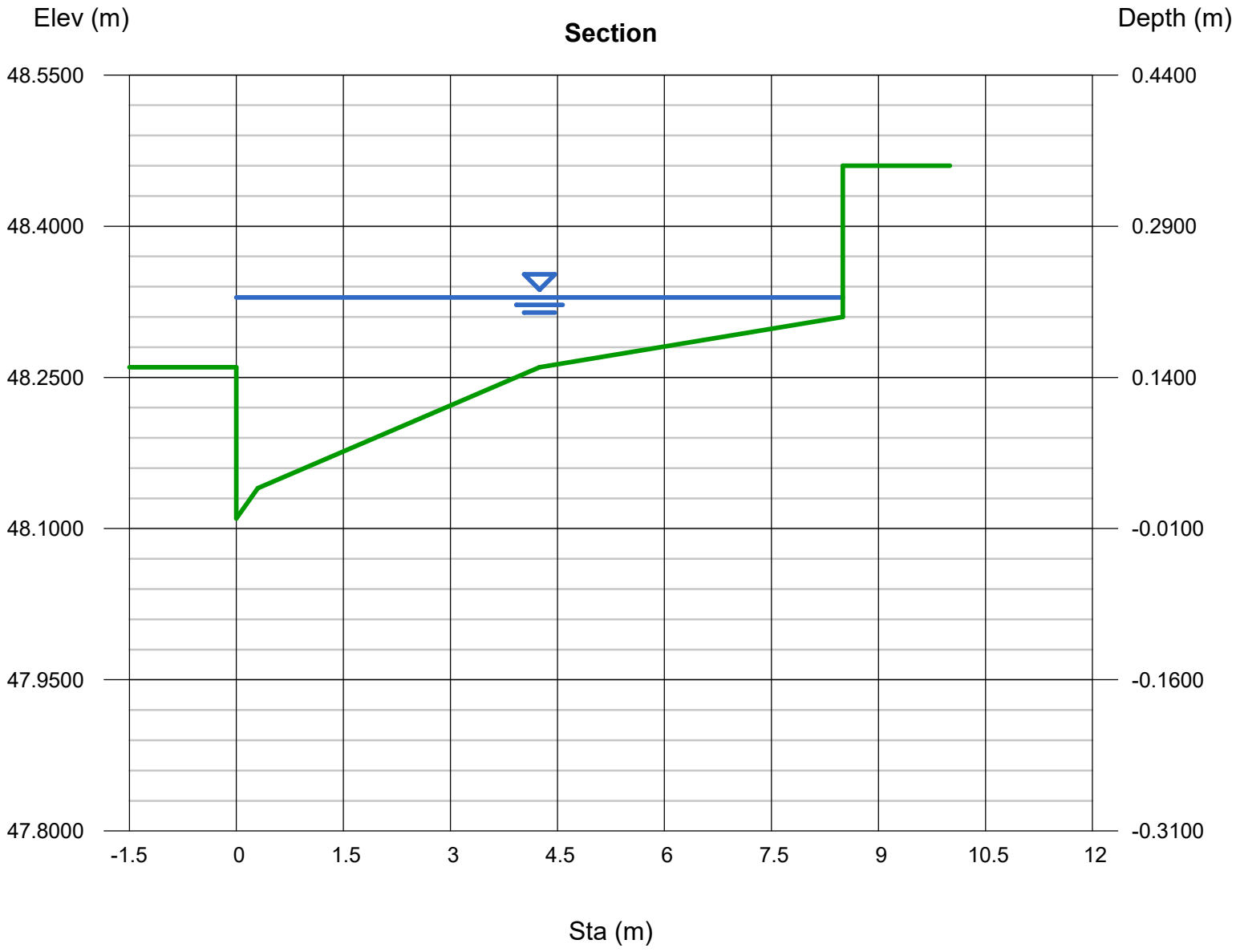
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 1.0740 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.2195 |
| Q (cms) | = 1.0740 |
| Area (sqm) | = 0.7616 |
| Velocity (m/s) | = 1.4101 |
| Wetted Perim (m) | = 8.6731 |
| Crit Depth, Yc (m) | = 0.2499 |
| Top Width (m) | = 8.5000 |
| EGL (m) | = 0.3209 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 48.2600)-(0.3000, 48.1400, 0.013)-(4.2500, 48.2600, 0.013)-(8.5000, 48.3100, 0.013)-(8.5000, 48.4600, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 22 2020

## Section O-O

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 66.7600 |
| Slope (%) | = 5.0000 |
| N-Value | = 0.013 |

**Calculations**

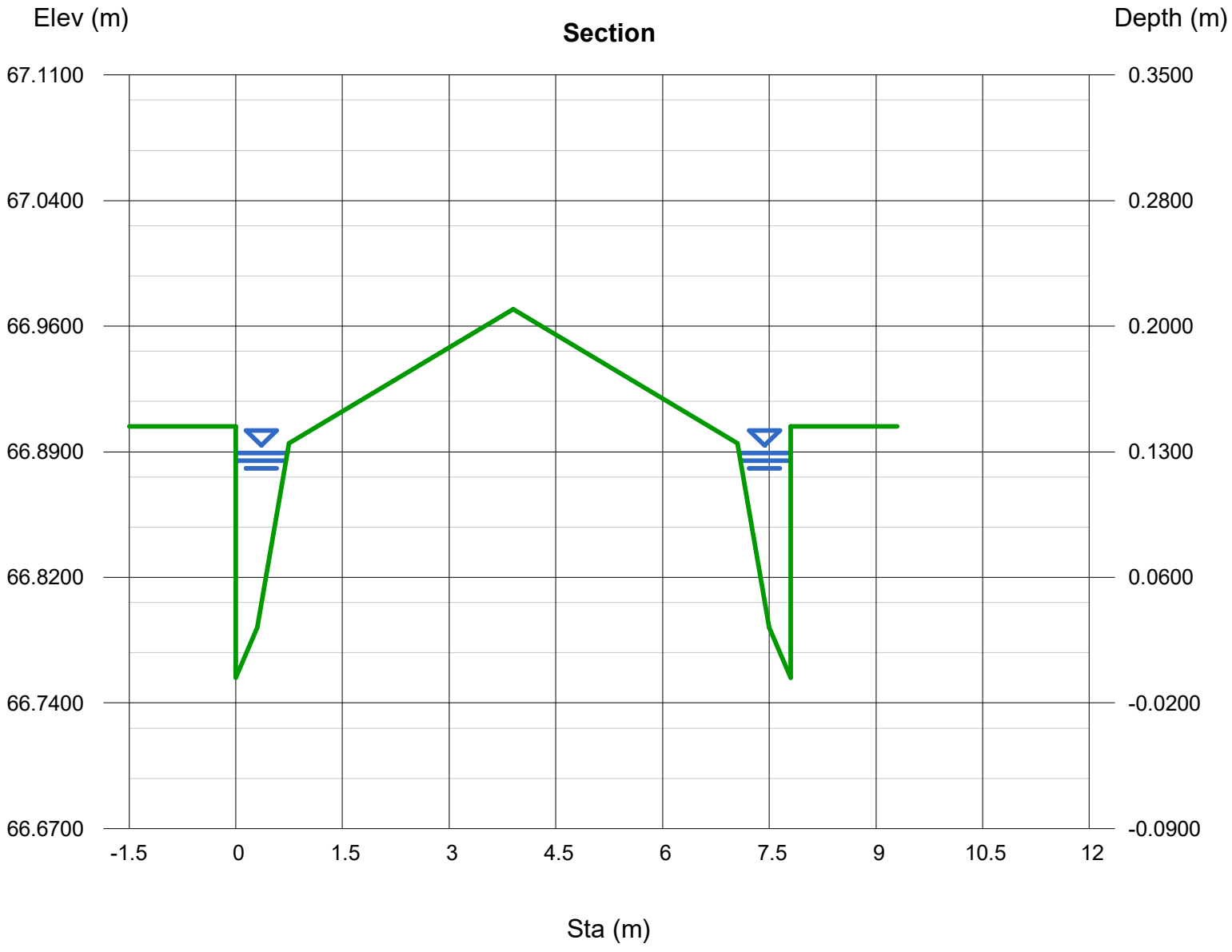
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.3200 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.1341 |
| Q (cms) | = 0.3200 |
| Area (sqm) | = 0.1158 |
| Velocity (m/s) | = 2.7632 |
| Wetted Perim (m) | = 1.7481 |
| Crit Depth, Yc (m) | = 0.2103 |
| Top Width (m) | = 1.4518 |
| EGL (m) | = 0.5236 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 66.9100) -(0.3000, 66.7900, 0.013) -(0.7500, 66.9000, 0.013) -(3.9000, 66.9800, 0.013) -(7.0500, 66.9000, 0.013) -(7.5000, 66.7900, 0.013) -(7.8000, 66.7
-(7.8000, 66.9100, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 22 2020

## Section P-P

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 62.0800 |
| Slope (%) | = 5.7000 |
| N-Value | = 0.013 |

**Calculations**

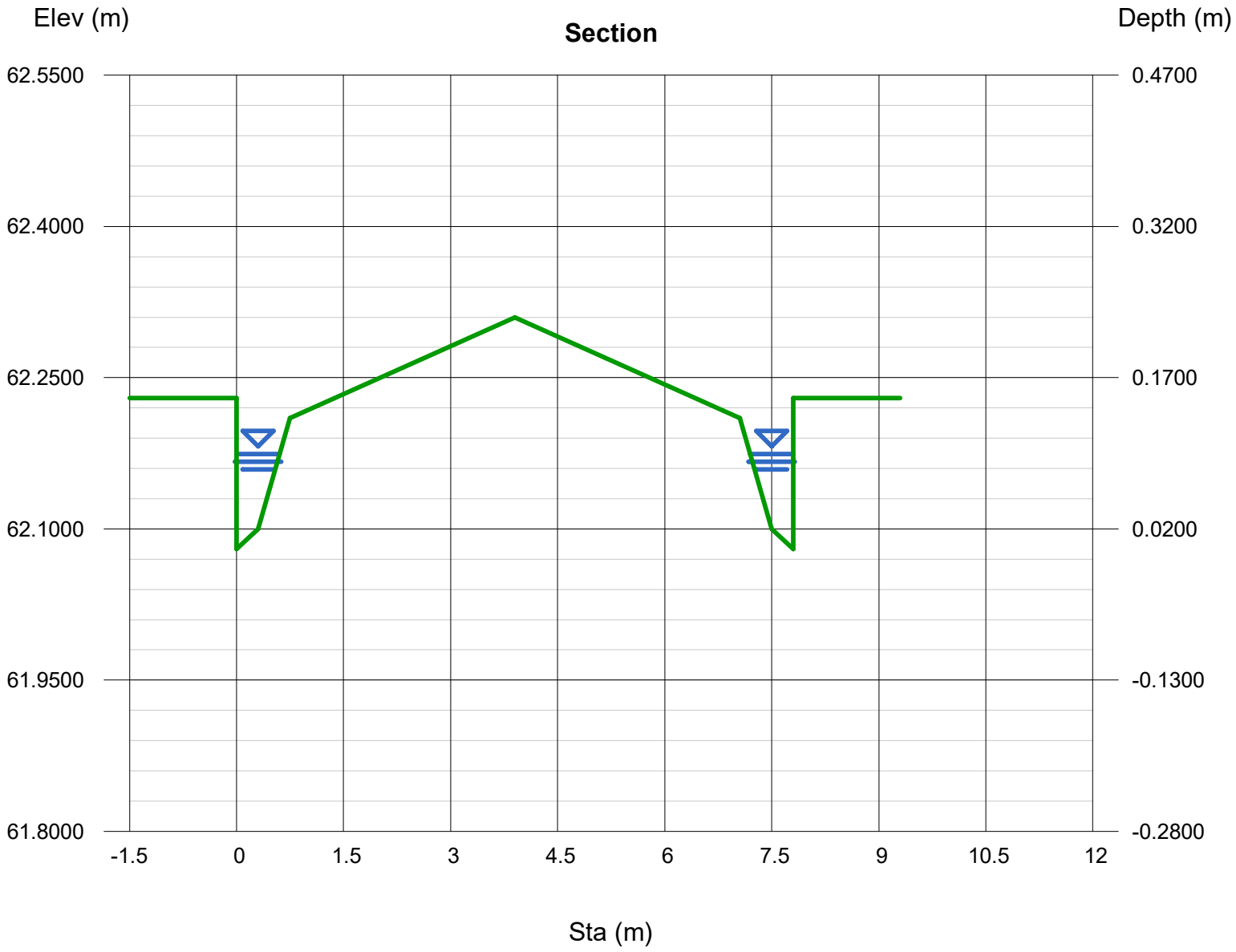
| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.1840 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.0945 |
| Q (cms) | = 0.184 |
| Area (sqm) | = 0.0734 |
| Velocity (m/s) | = 2.5070 |
| Wetted Perim (m) | = 1.4177 |
| Crit Depth, Yc (m) | = 0.1737 |
| Top Width (m) | = 1.2095 |
| EGL (m) | = 0.4151 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 62.2300) -(0.3000, 62.1000, 0.013) -(0.7500, 62.2100, 0.013) -(3.9000, 62.3100, 0.013) -(7.0500, 62.2100, 0.013) -(7.5000, 62.1000, 0.013) -(7.8000, 62.0
-(7.8000, 62.2300, 0.013)



# Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Jul 22 2020

## Section Q-Q

**User-defined**

| | |
|---|---|
| Invert Elev (m) | = 63.0200 |
| Slope (%) | = 8.1000 |
| N-Value | = 0.013 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cms) | = 0.1300 |

**Highlighted**

| | |
|---|---|
| Depth (m) | = 0.0762 |
| Q (cms) | = 0.130 |
| Area (sqm) | = 0.0526 |
| Velocity (m/s) | = 2.4695 |
| Wetted Perim (m) | = 1.2271 |
| Crit Depth, Yc (m) | = 0.1554 |
| Top Width (m) | = 1.0598 |
| EGL (m) | = 0.3873 |

**(Sta, El, n)-(Sta, El, n)...**

( 0.0000, 63.1700) -(0.3000, 63.0400, 0.013) -(0.7500, 63.1500, 0.013) -(3.9000, 63.2400, 0.013) -(7.0500, 63.1500, 0.013) -(7.5000, 63.0400, 0.013) -(7.8000, 63.0
-(7.8000, 63.1700, 0.013)