



# Civil & Structural Engineering Design Services Pty. Ltd.

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21st October 2016

D-11-265205

Mr. Daniel Cheetham  
21 Waterview Street  
MONA VALE NSW 2103

Dear Sir & Madam,

Re: Flood Report – Proposed New Retaining wall within the flood flow path at 21  
Waterview Street, Mona Vale NSW

## INTRODUCTION

I, Edward A. Bennett, practicing Civil, Structural, Geotechnical & Environmental Engineer hereby confirm that I inspected the above property for the purpose of carrying out a flood report for this property in respect to flood levels for ARI 1:100 rainfall events (1%AEP).

## REPORT

The purpose for this flood report for No. 21 Waterview Street, Mona Vale, is to provide evidence that with the proposed addition of a new retaining wall and raised rear yard levels, its construction being in close proximity of the predicted flow path for the 1%AEP flood, through the property, these flood levels will not rise to affect the neighboring property at No. 19 Waterview Street, Mona Vale or any other properties downstream.

We have relied upon the "Flood information request - common", provided by Northern Beaches Council dated 14<sup>th</sup> February 2017 refer **Appendix "A"**, the survey details provided by Sydney Surveyors dated 20/12/2016, refer **Appendix "B"**, HEC-RAS 5.0.1<sub>2</sub> computations, refer **Appendix "C"** and concluded with the Proposed Retaining Wall design, refer Drg. No. C-11-265205, refer **Appendix "D"**

### Flood Information:

Site Plan: See Appendix B.

Probable Maximum Flood (PMF): 21.25m AHD

1% AEP Maximum Water Level: 20.55 AHD (Appendix A)

### An Approximate Discharge:

The discharge through the property was calculated using the rational method. The assumed catchment area (A) and the rainfall intensity (I) used for the calculation is shown in Fig 1 and Fig 2.

Where,  $C = 0.9$ ,  $I = 261 \text{ mm/hr}$  &  $A = 46 \text{ ha}$  (approx.)

$Q = CIA/360 = 0.9 \times 261 \times 70 / 360 = 30 \text{ m}^3/\text{s}$  (approx.)

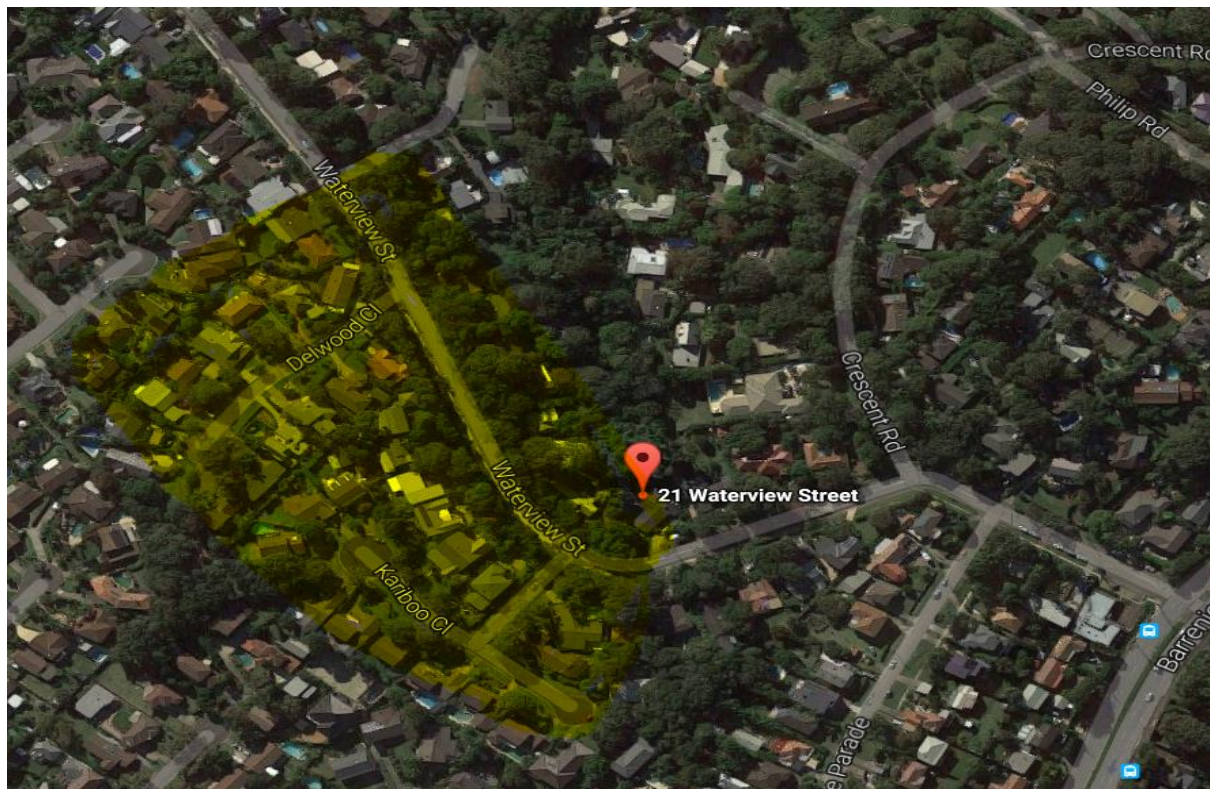


Fig : Assumed Catchment Area

Home	IFD Table	IFD Chart	Coefficients	ARI	Print IFD table	Help IFD table
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### Intensity-Frequency-Duration Table

Location: 33.675S 151.300E Issued: 22/3/2017

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

Duration	Average Recurrence Interval						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	98.5	126	159	178	203	236	261
6Mins	92.2	118	149	167	191	221	245
10Mins	75.6	96.9	123	138	158	185	204
20Mins	55.3	71.2	91.6	104	119	140	155
30Mins	44.9	58.1	75.2	85.3	98.4	116	129
1Hr	30.6	39.6	51.7	58.9	68.2	80.5	89.8
2Hrs	20.4	26.4	34.4	39.2	45.4	53.5	59.8
3Hrs	16.0	20.7	26.9	30.6	35.3	41.6	46.4
6Hrs	10.5	13.6	17.5	19.9	22.9	26.9	29.9
12Hrs	6.87	8.86	11.4	12.9	14.9	17.5	19.4
24Hrs	4.39	5.68	7.39	8.40	9.72	11.5	12.8
48Hrs	2.70	3.51	4.64	5.33	6.21	7.38	8.28
72Hrs	1.98	2.58	3.44	3.96	4.63	5.52	6.20

(Raw data: 39.75, 8.9, 2.58, 81.34, 17.48, 5.52, skew=0.00, F2=4.3, F50=15.88)

© Australian Government, Bureau of Meteorology

Copy Table

Fig : Rainfall Intesity

From HEC-RAS model in Appendix "C", which includes the new proposed retaining in the cross-sections, the maximum flood water level for the flow of 30 m<sup>3</sup>/s was found to be RL 20.62 m at Station 33.5m.

It should be noted that the survey information shows that, at the Waterview Street frontage, the N.G.L is RL is 23.16. At the rear boundary, the N.G.L is RL is 16.13. This indicates that the fall from the front boundary to the rear boundary is approx. 7m over. The length of the block is approx. 49 m, making the land sloping at approx. 15%.

This is a substantial slope that will reduce the 1% AEP flood levels substantially over the length of the creek. It is likely that RL 20.55, represents the TWL just inside the boundary such that at Station 33.5, at the overt of the creek, only approx. 2m from the front street boundary alignment.

**CONCLUSIONS:**

From the drawings, we can confirm that the new addition (retaining wall) is affected by the Flood category 1 but the existing property is not affected by any flood activity. Whereas, the addition of the retaining wall can affect the existing flood level to some extent.

The construction of the proposed new wall at the location shown in Site Plan results in negligible difference in water level, say not greater than 100mm which will not affect the neighboring property.

Yours faithfully,



E.A. Bennett M.I.E. Aust. Cp Eng. NPER 198230, Member AGS, BPB 0820

# NORTHERN BEACHES COUNCIL

## FLOOD INFORMATION REQUEST – COMMON

**Property:** 21 Waterview Street, Mona Vale

**Lot DP:** H//396772

**Issue Date:** 14 February 2017

**Flood Study Reference:** 2016 Draft McCarrs Creek, Mona Vale and Bayview Flood Study

A property can be impacted by more than one Category of flooding.

**Flood Categories defined by the Pittwater 21 Development Control Plan include:**

- **Flood Category 1 Areas-** Properties identified on the Flood Hazard Maps and located within Primary Floodplain Areas where the lowest point of the property is affected by the Flood Planning Level (FPL) (1% AEP flood level plus 500mm Freeboard). Flood Category 1 areas are further defined under flood hazard subcategories of high hazard and low hazard.
- **Flood Category 2 Areas-** Properties identified on the Flood Hazard Maps where the lowest point of the property lies above the Flood Planning Level but below the level of the Probable Maximum Flood.
- **Flood Category 3 Areas-** Properties generally located outside or adjacent to the Primary Floodplain Areas that are affected by flooding hazards associated with major stormwater drainage systems, local overland flow paths or drainage easements. Flood Category 3 Areas are further defined under the subcategories of Overland Flow Path – Major and Overland Flow Path – Minor.

### Flood Information for lot:

#### Flood Life Hazard Category – See Map A

Minimum life hazard category: H1-H2

Maximum life hazard category: H3-H4

#### Flood Category 1 (Mainstream Flooding) – See Flood Map C

1% Annual Exceedance Probability (1%AEP): See Flood Map B

1% AEP Maximum Water Level<sup>3</sup>: 20.55m AHD

1% AEP Maximum Peak Depth from natural ground level<sup>3</sup>: 0.9m

1% AEP Maximum Velocity: 1.5-2.0m/s

Flood Planning Level (FPL)<sup>1,2, 3 & 4</sup>: 21.5m AHD (maximum FPL – due to the slopping block the FPL level may be lower at other areas of the property)



**1% AEP Provisional Flood Hazard: High**

**1% AEP Hydraulic Categorisation: Floodway**

**Flood Category 3 (Overland Flow) – See Flood Map E**

**1% AEP Overland Flow Maximum Water Level<sup>3&4</sup>: 20.5m AHD**

**1% AEP Overland Flow Maximum Depth from Natural Ground Level<sup>3&4</sup>: 0.9m**

**Flood Category 2 (PMF) – See Flood Map D**

**Probable Maximum Flood (PMF) Level<sup>2</sup>: 21.25m AHD (See Flood Map D)**

**PMF Maximum Depth from natural ground level: 1.2m**

**PMF Maximum Velocity: 2.-2.5m/s**

<sup>1</sup>Intensification of development requires the consideration of climate change impacts which may result in higher planning levels than those indicated on this flood advice.

<sup>2</sup>Special Flood Protection developments require a higher planning level using the higher of the PMF or FPL/minimum floor level.

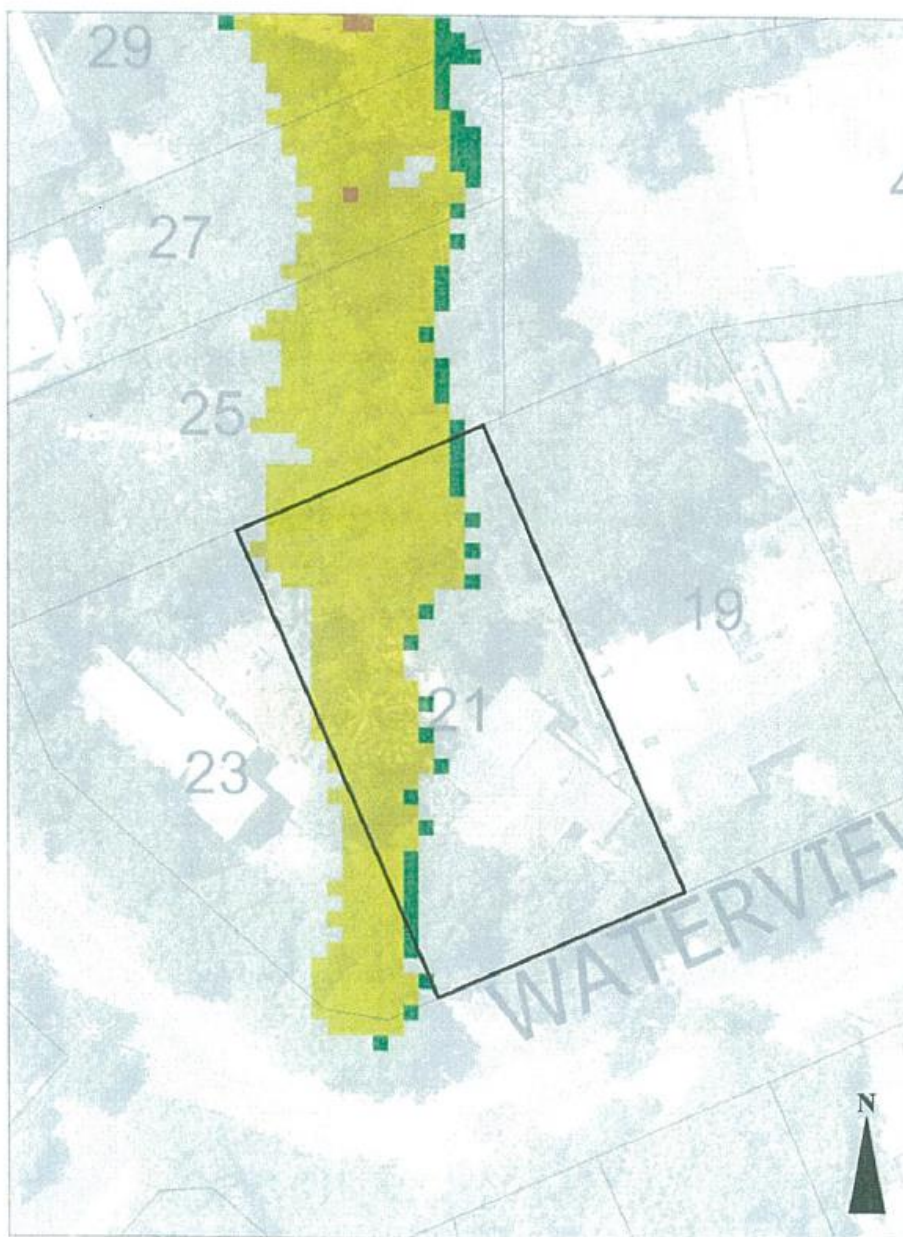
<sup>3</sup>The flood information does not take into account any local overland flow issues with a depth below 0.15m nor private stormwater drainage systems.

<sup>4</sup>Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum levels across the site.

**General Notes:**

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- The source information on this advice was obtained from numeric modelling prepared by consultants for Pittwater Council for existing site conditions at the time of the flood study. Separate review and flood model verification has not been undertaken by Council.
- The interpolated information is for the purpose of planning only. Detailed flood data for individual land areas were not determined from the exercise.
- Flood models only approximate flood behaviour. Site specific ground and building survey levels should be used to relate flood levels and to assess the impact of flooding. A site specific flood study/risk assessment may be required for any future development. Care and expertise is required in the interpretation of these flood levels. Engage a suitably qualified engineer to assist you in this matter.
- You need to refer to the Pittwater 21 DCP flood development controls, if you are planning to lodge a Development Application. The advice may be reviewed and amended by Northern Beaches Council in the course of assessment of a specific development application.
- While this advice is periodically updated, it is possible that the Council holds further information dealing with the flooding which has not been incorporated into the above advice.
- Estuarine/coastal inundation has not been taken into account in the flood information.

## FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



Flood Life Hazard Categories



Map not to Scale

### Notes:

- Refer to Pittwater 21DCP for 'Flood Emergency Response Planning for Development in Pittwater Policy (Appendix 15) for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.25.
- Cadastral Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: Near Map 2014) are indicative only.

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## FLOOD MAP B: FLOODING - 1% AEP EXTENT



### Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source: Near Map 2014) are indicative only.



## FLOOD MAP C: MAINSTREAM FLOODING – FPL EXTENT



Mainstream Extent

Lot Boundary

Map not to Scale

### Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Mainstream FPL – Mainstream Flood Planning Level includes the 0.5m freeboard on the 1% AEP extent for planning purposes.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source Near Map 2014) are indicative only.



## FLOOD MAP D: PROBABLE MAXIMUM FLOOD EXTENT



### Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source Near Map 2014) are indicative only.

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## FLOOD MAP E: OVERLAND FLOW EXTENT



Overland Flow flowpath

Lot Boundary

Map not to Scale

### Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Overland Flow Path Major includes a fixed 5m horizontal planning buffer on the 1% AEP extent for planning purposes.
- Extent does not include climate change.
- Areas not identified on the above Flood Map are likely to experience inundation of depths up to 0.14m.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Flood study reference) and aerial photography (Source Near Map 2014) are indicative only.



## Appendix "B"

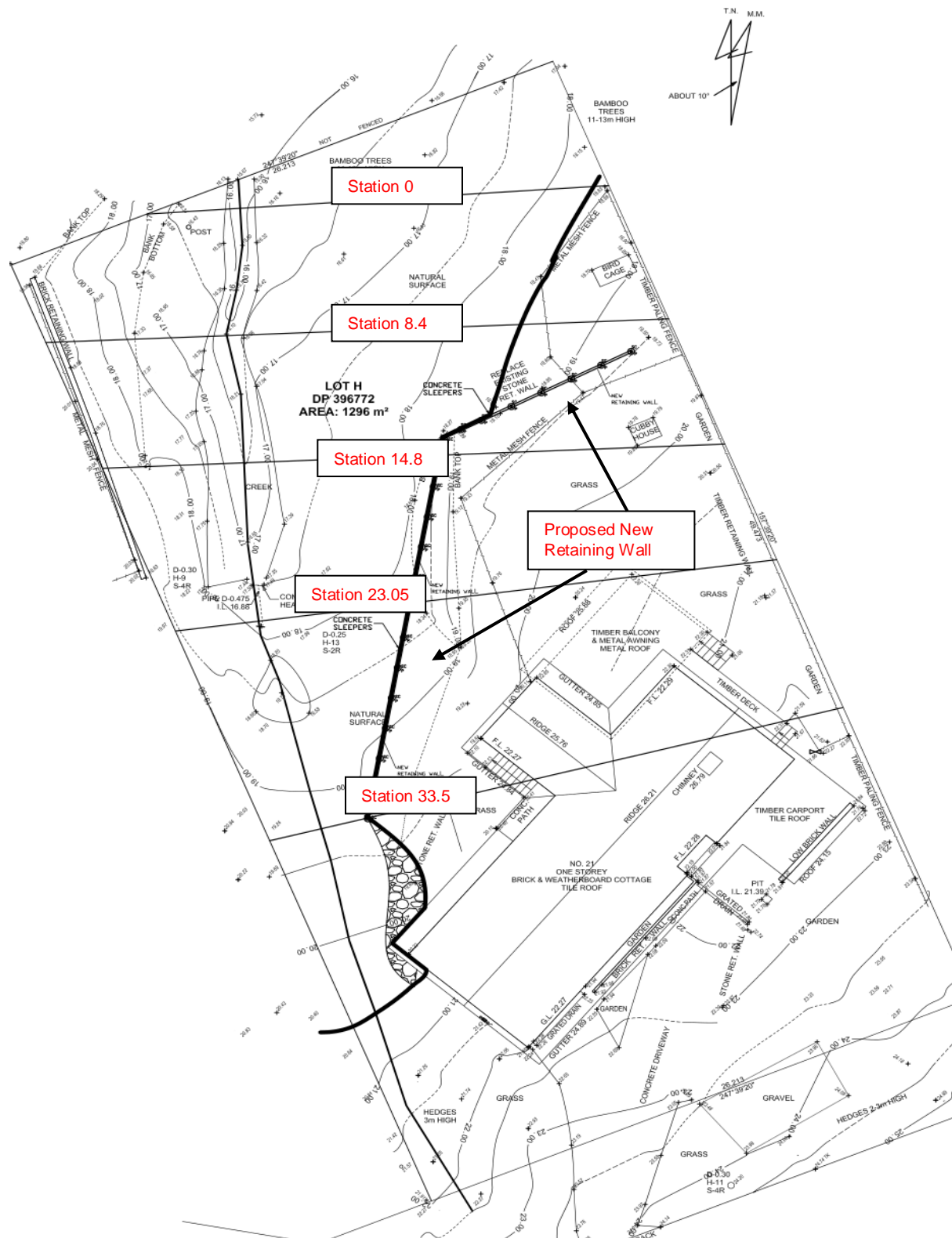


Fig: Site Plan



## Appendix "C"

### HEC-RAS 5.0.1:

HEC-RAS 5.0.1 was used to predict the flood levels for ARI 1:100 (1%AEP) rainfall events. Cross sections in the creek are shown in Appendix "B" and are interpolations of survey levels at certain intervals over a 33.5m reach within the property, for two different cases with and without retaining wall, starting at Station 0 near the rear boundary and working backwards to Station 33.5 which is approx. 2/3rds from the front boundary. These survey level interpolations were used in the HEC-RAS model. The reach profile summaries for these two cases are shown in the table below.

### Without wall:

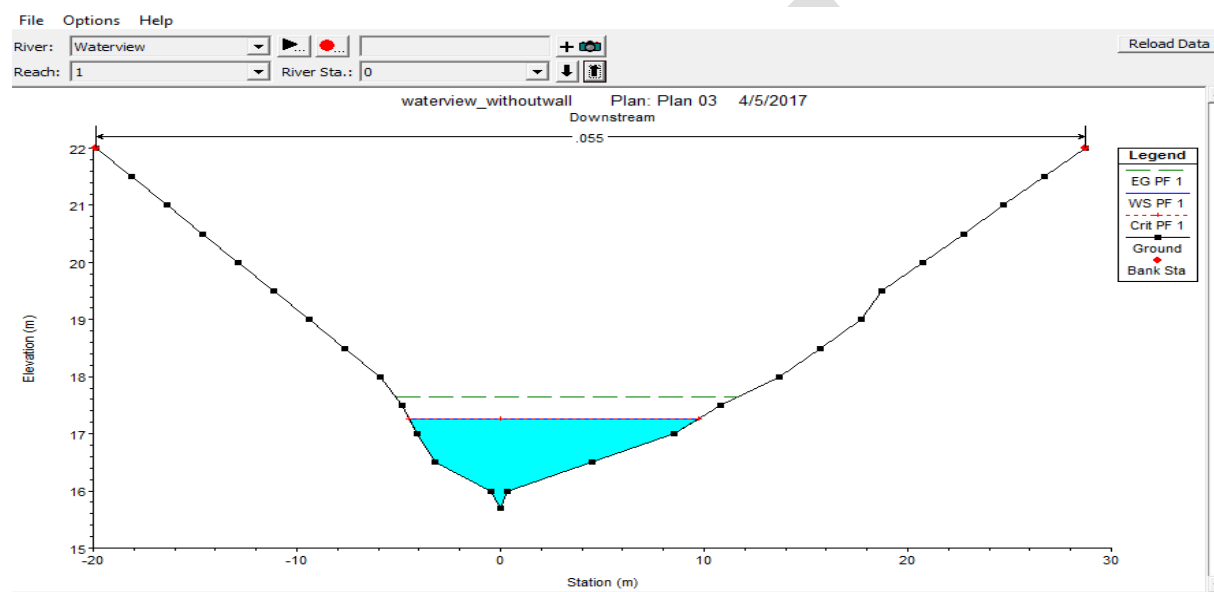


Fig: River Station 0 m

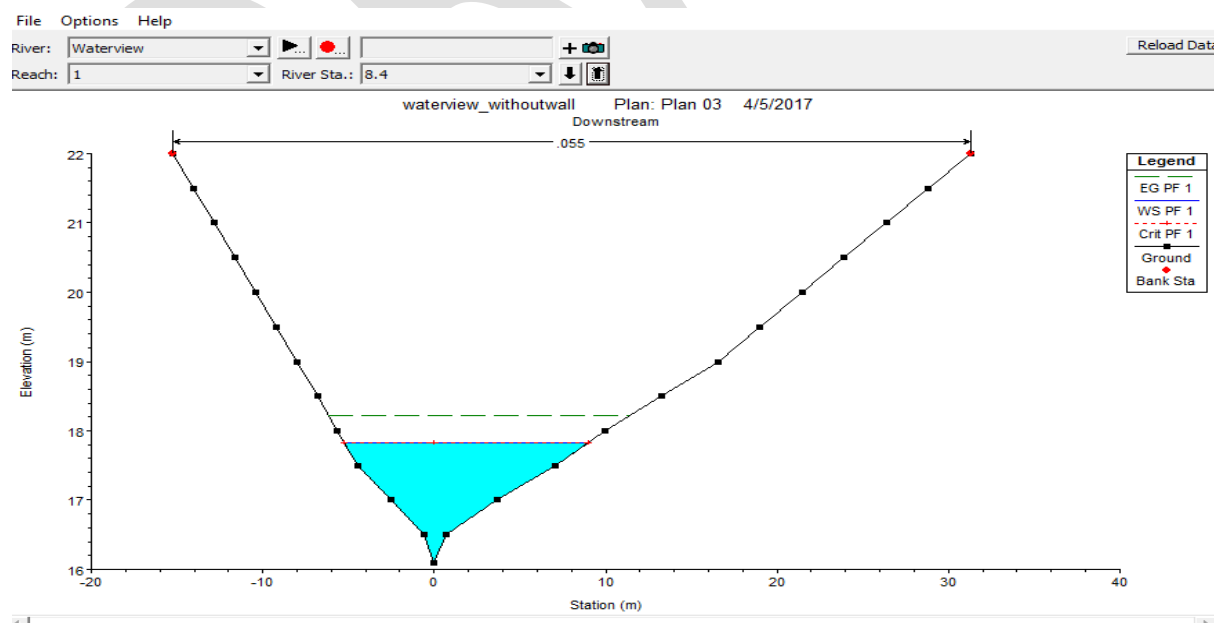


Fig: River Station 8.4 m

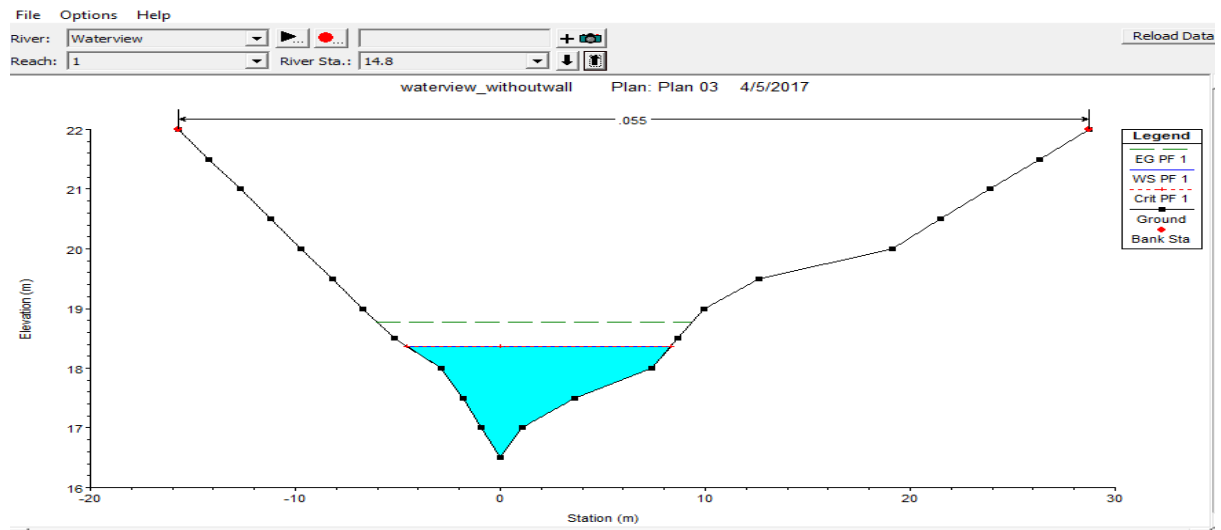


Fig: River Station 14.8 m

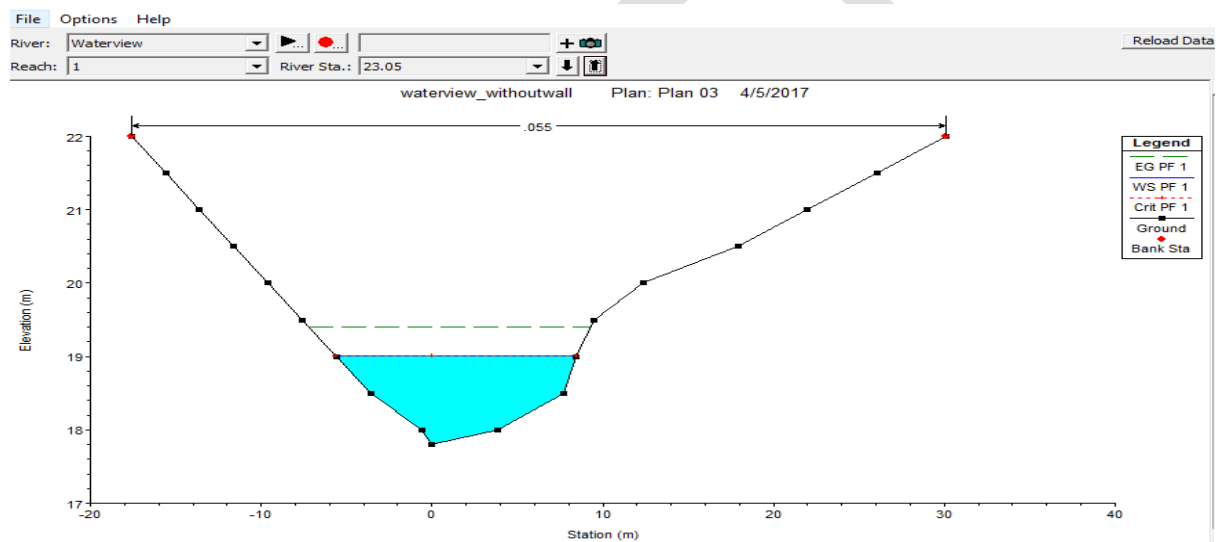


Fig: River Station 23.05 m

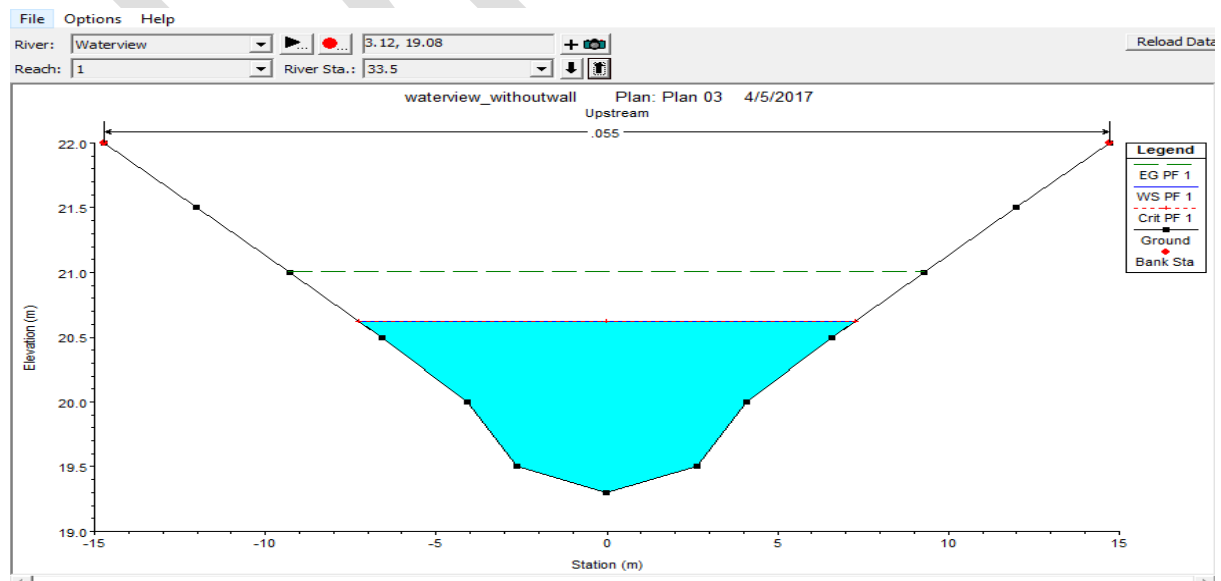


Fig: River Station 33.5 m

HEC-RAS Plan: Plan 03 River: Waterview Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
1	33.5	PF 1	30.00	19.30	20.62	20.62	21.00	0.034022	2.74	10.95	14.52	1.01
1	23.05	PF 1	30.00	17.80	19.01	19.01	19.40	0.033991	2.77	10.82	14.05	1.01
1	14.8	PF 1	30.00	16.50	18.37	18.37	18.78	0.034271	2.85	10.54	12.88	1.01
1	8.4	PF 1	30.00	16.10	17.83	17.83	18.22	0.035093	2.77	10.82	14.21	1.01
1	0	PF 1	30.00	15.70	17.26	17.26	17.65	0.034274	2.75	10.90	14.19	1.00

Table: Profile summary (without wall)

### With Wall:

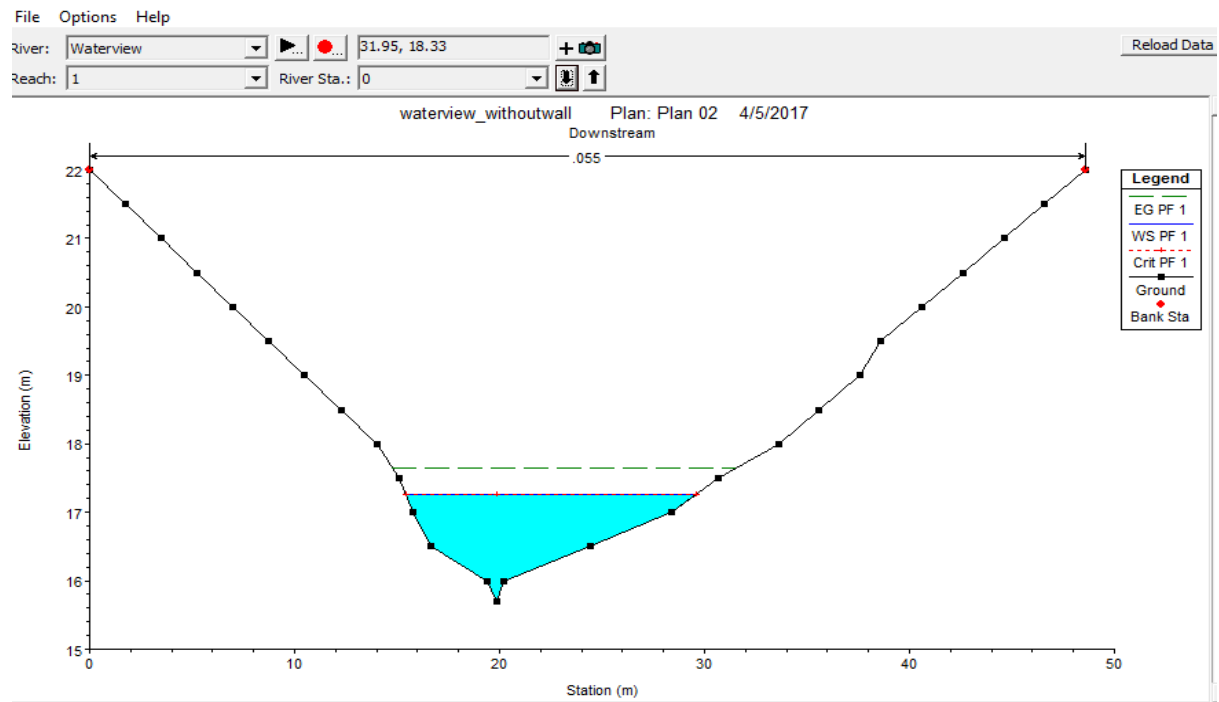


Fig: River Station 0 m

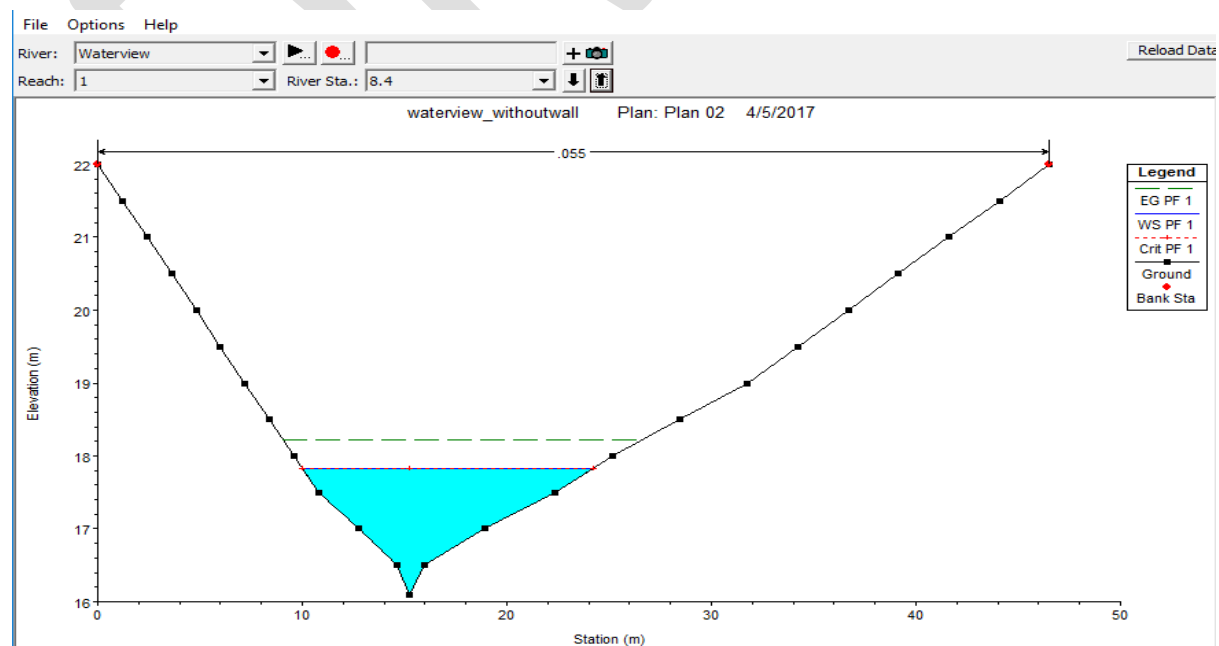


Fig: River Station 8.4 m



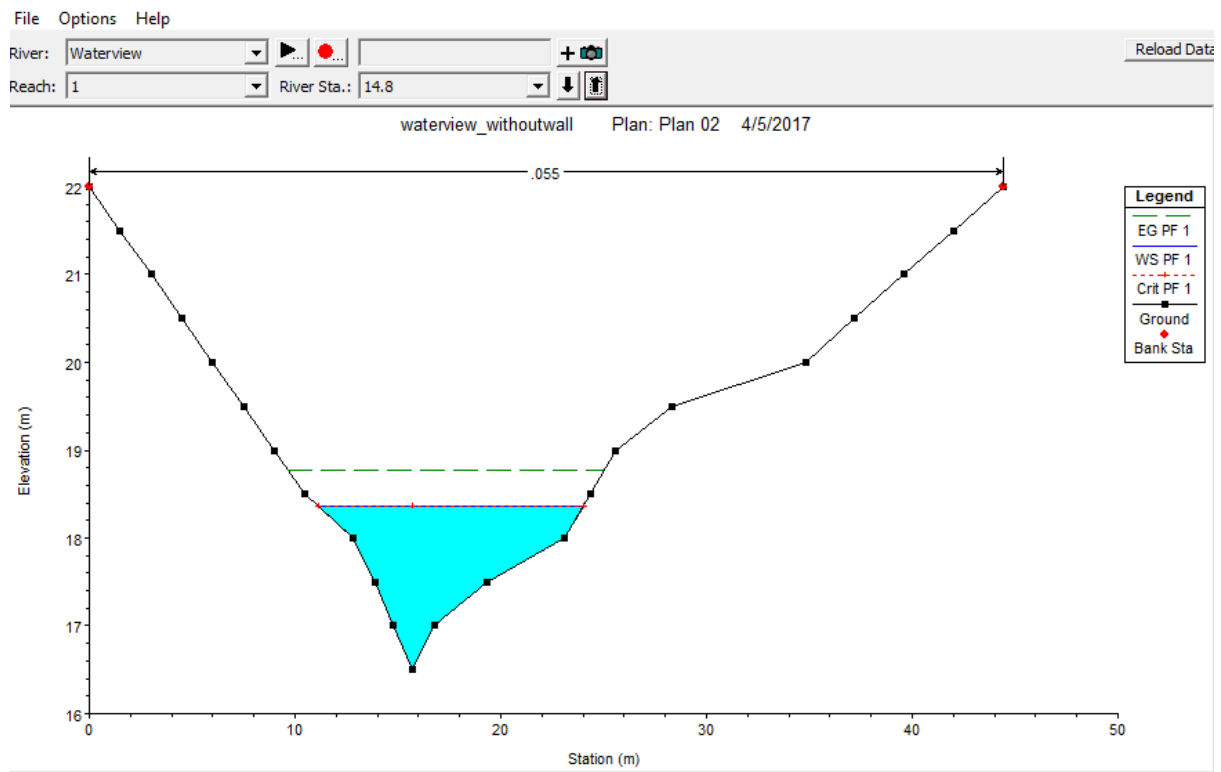


Fig: River Station 14.8 m

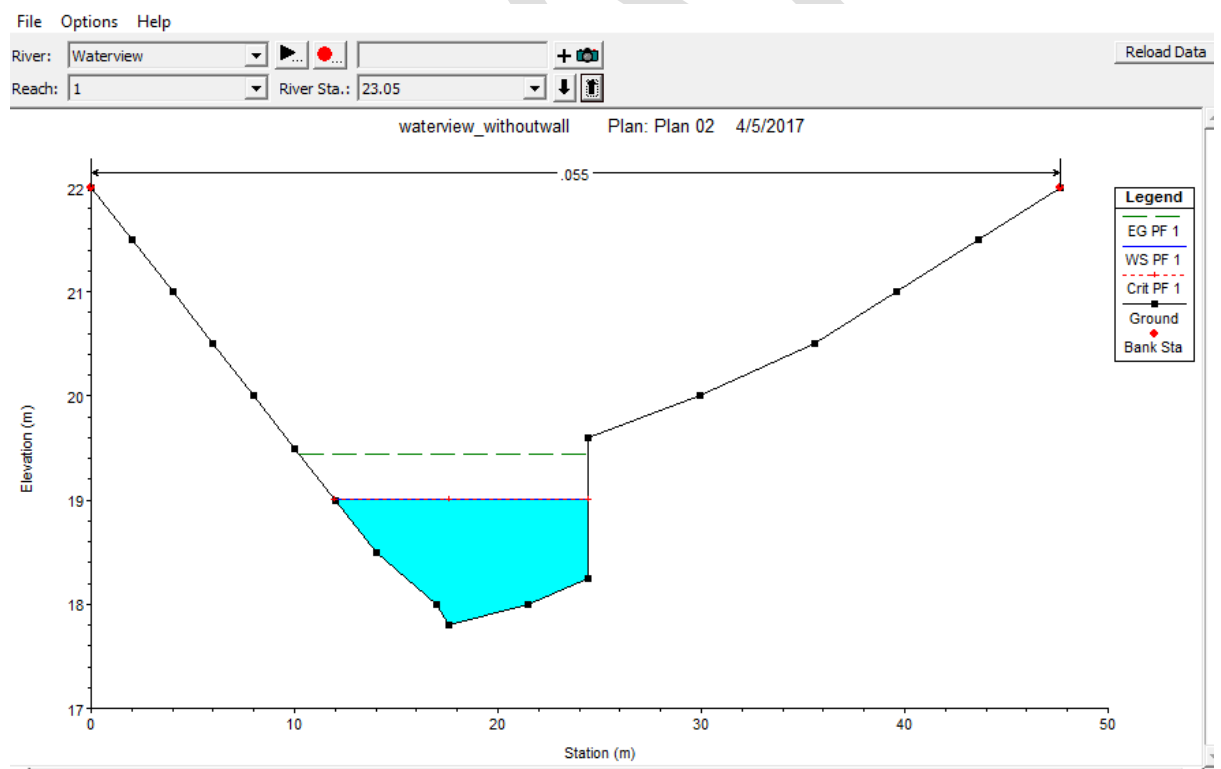


Fig: River Station 23.05 m

