REVISED OVERLAND FLOW PATH ASSESSMENT REPORT

Proposed Development at

Lot 7, D.P. 23583, (H/No.602) Warringah Road, Forestville

NORTHERN BEACHES COUNCIL

Our Ref: 5230 – FS – Rev A
15 April 2020

J & F DESIGNS

CONSULTING HYDRAULIC, STRUCTURAL AND CIVIL ENGINEERS
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1. Introduction /Available Information

J & F Designs Consulting Engineers (J&F) have been commissioned to carry out a hydrological and Hydraulic investigation as part of the development application for the proposed development at 602 Warringah Road, Forestville. The architetural plans (Site Plan) were altered subsequantly a revised flood study is required as part of development application. Revised flood assessment report (Revison A) reflects the changes in the revised architetural plans (Appendix 3).

Northern Beaches Council's records indicate that the subject property is burdened by a Council stormwater pipeline. As outlined in the Development Application Checklist, the applicant is required to demonstrate compliance with Council's Policy PAS-PL 130 Building Over or Adjacent to Constructed Drainage Systems and Easements. This consists of accurately locating, confirming the dimensions of and plotting Council's stormwater pipelines and associated infrastructure to scale on the DA plans which show the proposed works. This should be carried out by a service locating contractor and registered surveyor. Appendix 1- Survey report shows the details on the Council's stormwater pipelines at the subject property.

Council has requested an overland flow study to determine the extent of 1 in 100 year ARI water level traversing the development site. Furthermore, the study is to consider the potential overland flows from the floodwaters on Warringah Road. The site is adjacent to a surcharge pit that can be found next to an existing footpath in Warringah Road that carries a substantial amount of upstream stormwater. Cross-sections detailing the 1 in 100 year ARI water surface level are to be provided at appropriate intervals. It must be noted that the Finished Floor Levels for the development are to have a freeboard of 500mm above the 1 in 100 year ARI water surface level. This freeboard also applies to any entry points both vehicular and pedestrian that lead to the dwelling. The flood levels of the receiving water (if applicable) must be indicated on the drainage layout plan. Water surface profiles are to be detailed for the existing and proposed conditions for the development site as well as both upstream and downstream of the development site. The Hec-Ras computer program is preferred for this application. Details of the flows from the upstream surcharge pits can be obtained from Council's Development Engineer. Runoff from the developed site must not cause a detrimental effect on any property. This may require the retention (and possible expansion) of existing surface flow paths. Any measures proposed to protect the development from overland flow inundation must be clearly detailed on the architectural plans.

A plan outlining the indicative locations of Council's stormwater infrastructure is obtained from Northern Beaches /Warringah Council's website and standard LiDAR survey undertaken by the NSW Land Property Information (LPI) have been purchased from Kustom Engineering Pty Ltd. This Flood Investigation Report has been prepared in accordance with NSW Floodplain Development Manual (2015), Australian Rainfall and Runoff, Northern Beaches Council's Guidelines & Policies.

The purpose of the report is primarily to quantify the 1% AEP peak discharges and determine the flood/flow behaviour of the local catchment surrounding the property. The report also aims at determining the 1% AEP water level, overland flow path depth for the

development and subsequently the floor levels for the proposed building at 602 Warringah Road, Forestville.

Site inspections were carried out on 8 March 2017, during which general drainage patterns of the catchment, existing gully pits and drainage infrastructures on Warringah Road, Greenfield Place, Walkom Avenue and the catchment areas were observed and recorded.

The following information has been supplied by the Council, Surveyor and builder:

- Drainage infrastructure plans from the Council's web site;
- Survey report - Council's stormwater pipelines within the easement (Appendix 1);
- Site Survey plan (Appendix 2);
- Site plan (Appendix 3);

2. Existing Site / Catchment Description

The 820m^2 site is located on the western side of Warringah Road, Forestville. There was an existing single storey residence building, shed at the rear and brick fence in front of the property. At the time of the inspection, all existing structures had been demolished and removed from the site. The proposal is to replace the old house with a two-storey single residence. At the southern side of the property, there is a 600-mm diameter RCP burdened by the 2.44 meter wide Council drainage easement. The exact location and pipe dimension was confirmed via registered surveyor (Appendix 1)

The lot has a natural fall from the front of the site (approximately 118.10m AHD) to the rear of the property (approximate 116.60m AHD). The average decline of the land is about 1.50m. Refer to survey and site plans in Appendices 2 & 3.

The site is located within the Carroll Creek catchment. The total sub-catchment areas draining through and affecting the site are approximately 5.20 hectares of highly urbanised land. The total catchment has been divided into 23 sub-catchment areas for the purpose of modeling in DRAINS. Refer to the catchment plan in Appendix 4.

Figure 1. 1943 Sydney suburbs - Ausimage © Sinclair Knight Merz 2007

Figure 2. Aerial photos (High Resolution) – NSW Imagery

Figure 3. There was an existing single storey residence building, shed at the rear and brick fence in front of the property. At the time of the inspection, all existing structures had been demolished and removed from the site. (Screenshot from Google Street view Sep. 2013)

Figure 4. At the time of the inspection, all existing structures had been demolished and removed from the site. (Screenshot from Google Street view Dec. 2016)

Figure 5. Frontal view of no. 602 Warringah Road, Forestville. The lot has a natural fall from the Eastern side (front) to the Western side (rear) of the property.

Figure 6. Existing footpath and nature strip in front of number 602 Warringah Road can be seen.

3. Drainage Description

The drainage system of pits and pipes in the catchment is generally designed for the 1 in 5 year ARI storms to 1 in 20 year ARI storms with larger storms overflowing to the street towards the low point in the catchment area.

Surface runoff is collected via drainage lines throughout the catchments which are connected to the drainage lines in Warringah Road. From Warringah Road, a 600 diameter RCP traverses through an existing drainage system on the southern side of no. 602 Warringah Road toward Walkom Avenue. (Figure 7 to 11).

Drainage infrastructure information (Figure 7) has been obtained from the Northern Beaches Council's Online Planning Maps. However, after the site inspection and details survey report of the existing pipe within the Council's easement, the stormwater drainage system was modified for a DRAINS modeling purpose (Figures 8 to 11).

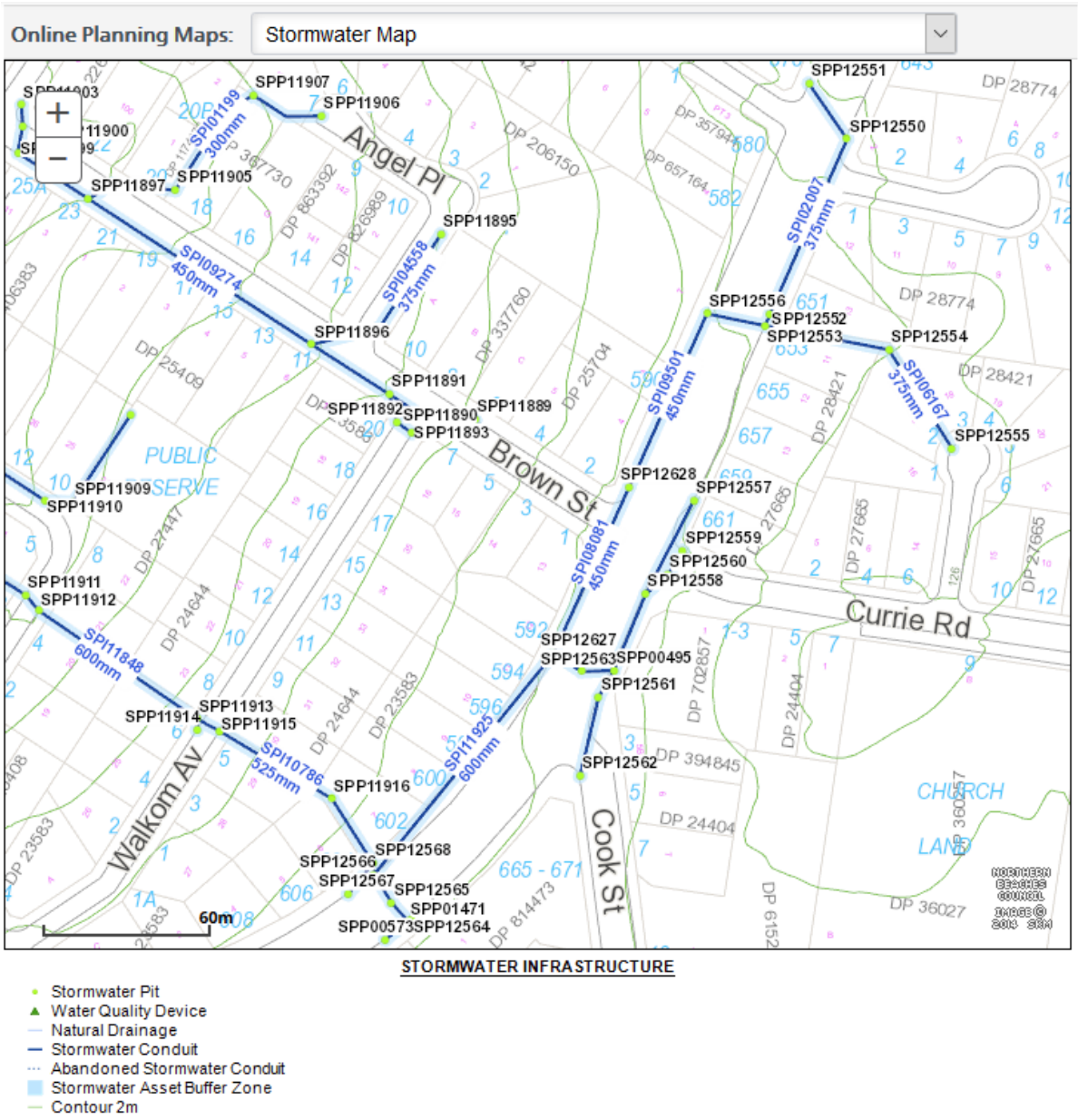


Figure 7. Council's Online Planning Maps – Stormwater Map

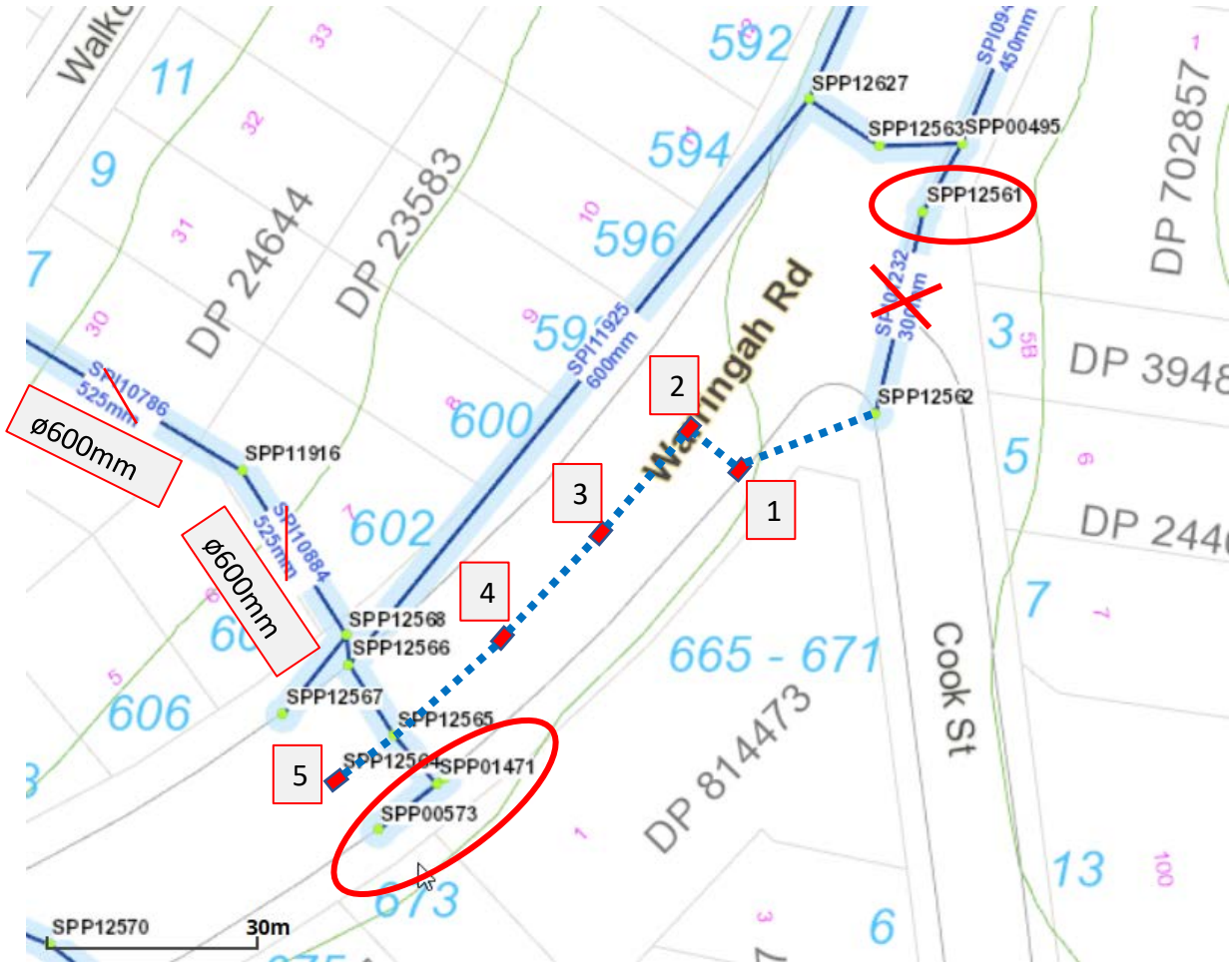


Figure 8. Council Stormwater Map – Site inspection and Google Street view revealed that the Pit SPP12561, Pit SPP00573 and Pit SPP01471 do not exist (Figure 3). There is an existing stormwater grated pit (Pit 1) in Warringah Road near Cook Street (Figure 4). Furthermore, there are a few median kerb inlets (Pit 2 to Pit 5) along the median island in Warringah Road (Figure 5). it is assumed that these kerb inlets are connected via ø375mm RCP and discharged to Pit SPP12565 in Warringah Road. Furthermore, the detail survey report on the existing pipe within the Council's drainage easement revealed that the existing pipe is 600mm diameter (Appendix 1).

Figure 9. Site inspection and Google Street view revealed that the Pit SPP00573 and Pit SPP01471 do not exist.

Figure 10. Existing Stormwater Pit 1 in Warringah Road near Cook Street (LHS) and Median Kerb Inlet along the median island in Warringah Road (RHS).

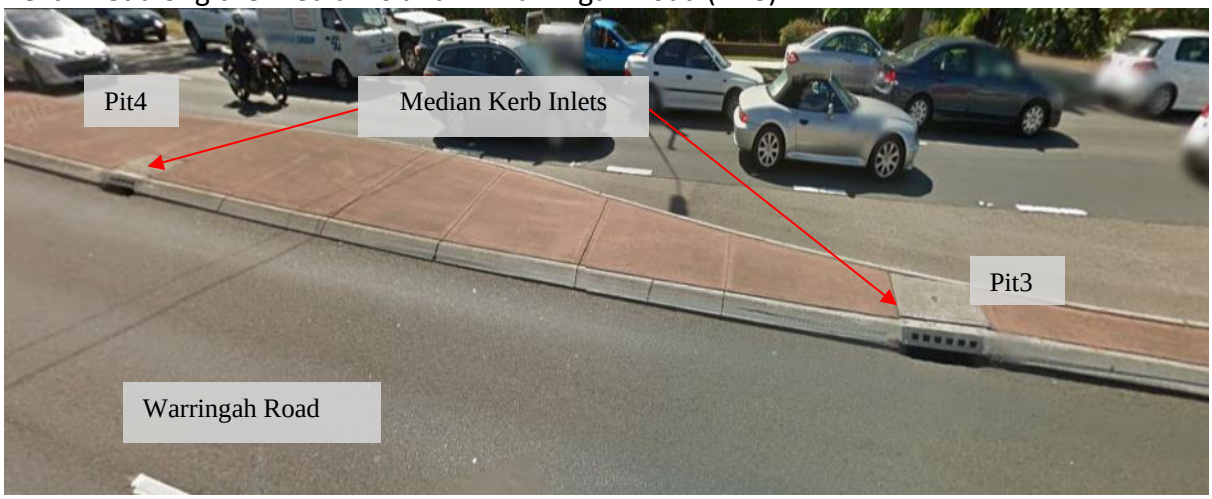


Figure 11. Median Kerb Inlets along the median island in Warringah Road (Pit3 & Pit4).

Runoff from the road and surrounding areas travel via the gutters into the pipe system. Once the pipe flows at capacity and gutter reaches its storage limit or the drainage system gets blocked the flows spills over the kerb and gutter crossing the layback into the properties and travels toward Walkom Avenue (Figures 12 and 13).

Figure 12. Driveway access and approximately 100mm high layback in front of No. 600 Warringah Road can be seen. Once gutter flow reaches 100mm it spills over the kerb and gutter crossing the layback into the property.

Figure 13. Existing stormwater gully pit in Warringah Road can be seen in front of the site.

Figure 14 & 15. Existing surcharge pit next to the existing footpath can be seen in front of the site. There is an opening on top of the existing 600mm diameter pipe in the surcharge pit.

4. Hydrology Analysis (DRAINS)

Rainfall Intensity, frequency and Duration (IFD) data was taken from Australian Government, Bureau of Meteorology web site:

Location: 33.750S 151.225E NEAR.. Warringah Rd, Forestville Issued: 24/3/2017

List of coefficients to equations of the form

$\log_e(I) = A + B \times (\log_e(T)) + C \times (\log_e(T))^2 + D \times (\log_e(T))^3 + E \times (\log_e(T))^4 + F \times (\log_e(T))^5 + G \times (\log_e(T))^6$

T = Time in hours and I = Intensity in millimetres per hour

YEARS	A	B	C	D	E	F	G
1	3.4522294998	-5.7587588E-1	-2.7041243E-2	8.1041586E-3	-3.2027800E-5	-2.8433150E-4	1.0458653E-5
2	3.7148022652	-5.7046086E-1	-2.8847335E-2	7.8042918E-3	1.7180790E-4	-2.6169766E-4	1.6105970E-6
5	3.9935114384	-5.5765092E-1	-3.3955123E-2	8.0576316E-3	6.2438080E-4	-3.3475220E-4	2.1601360E-6
10	4.1282377243	-5.5087024E-1	-3.6071625E-2	8.0552194E-3	7.9843860E-4	-3.4816086E-4	-1.0092600E-7
20	4.2806224823	-5.4547042E-1	-3.8254909E-2	8.1414646E-3	9.9659420E-4	-3.7428102E-4	-1.0257420E-6
50	4.451186657	-5.3905290E-1	-4.0423550E-2	8.1649469E-3	1.1767157E-3	-3.9438641E-4	-1.9267040E-6
100	4.5655641556	-5.3496373E-1	-4.2145304E-2	8.2450798E-3	1.3390662E-3	-4.1712847E-4	-2.8303380E-6

(Raw data: 41.16, 9.23, 2.86, 86.52, 20.02, 6.44, skew=0.00, F2=4.3, F50=15.87) © Australian Government, Bureau of Meteorology

Table 1. Polynomial Coefficients Table

Hydrological calculations were carried out using DRAINS software. DRAINS input layout including pits, pipes, overland routes and associated sub-catchments are illustrated below. (for more details refer to DRAINS model).

- DRAINS Model input layout and Analysis Result

The drains model was prepared using the survey information for the drainage system and catchment area. Where detailed survey was unavailable the catchment boundaries were determined using the Drainage asset data from Council, contour maps generated by LiDAR data.

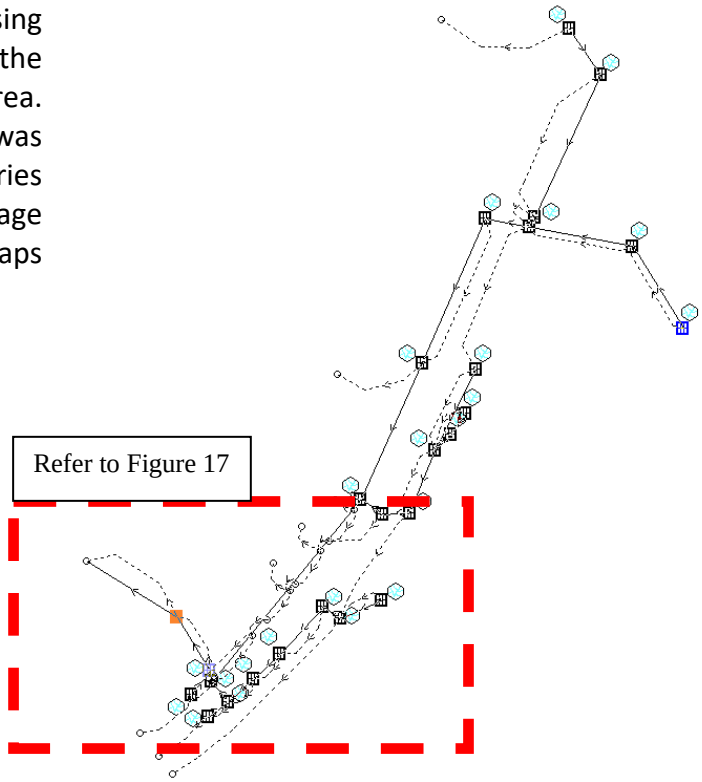


Figure 16. DRAINS Model input layout

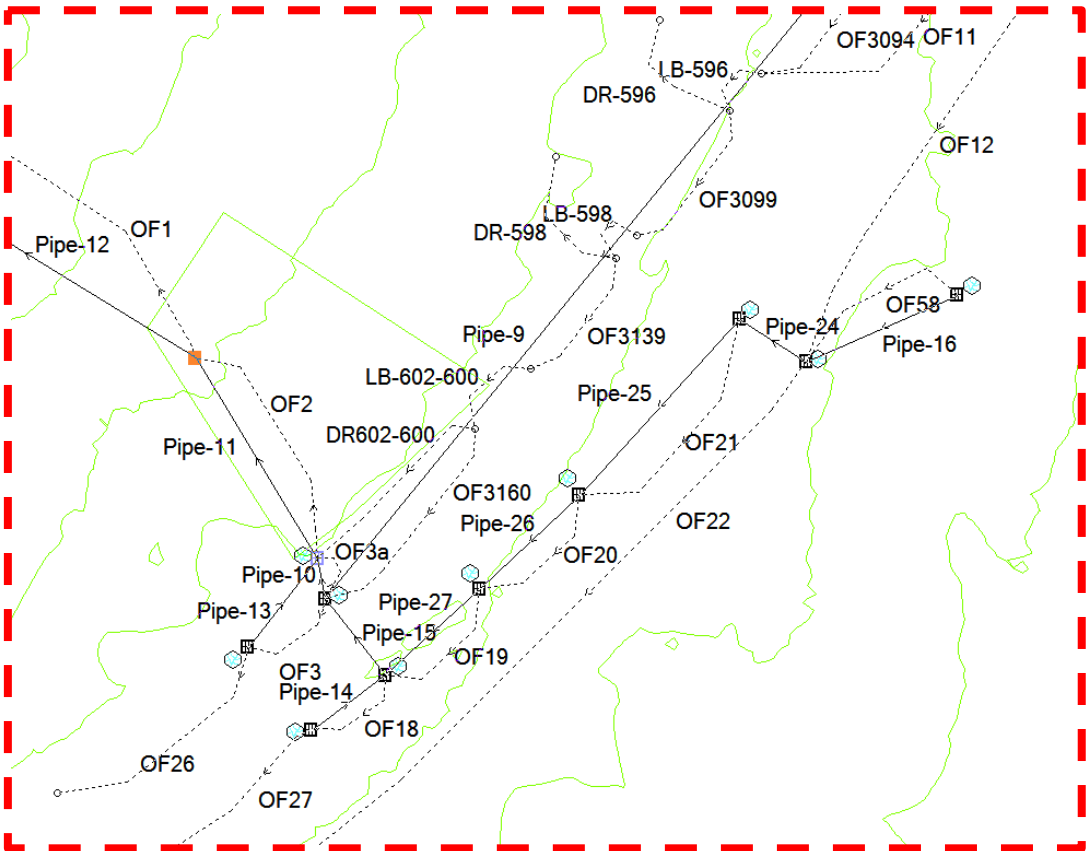


Figure 17. DRAINS Model input layout near the site

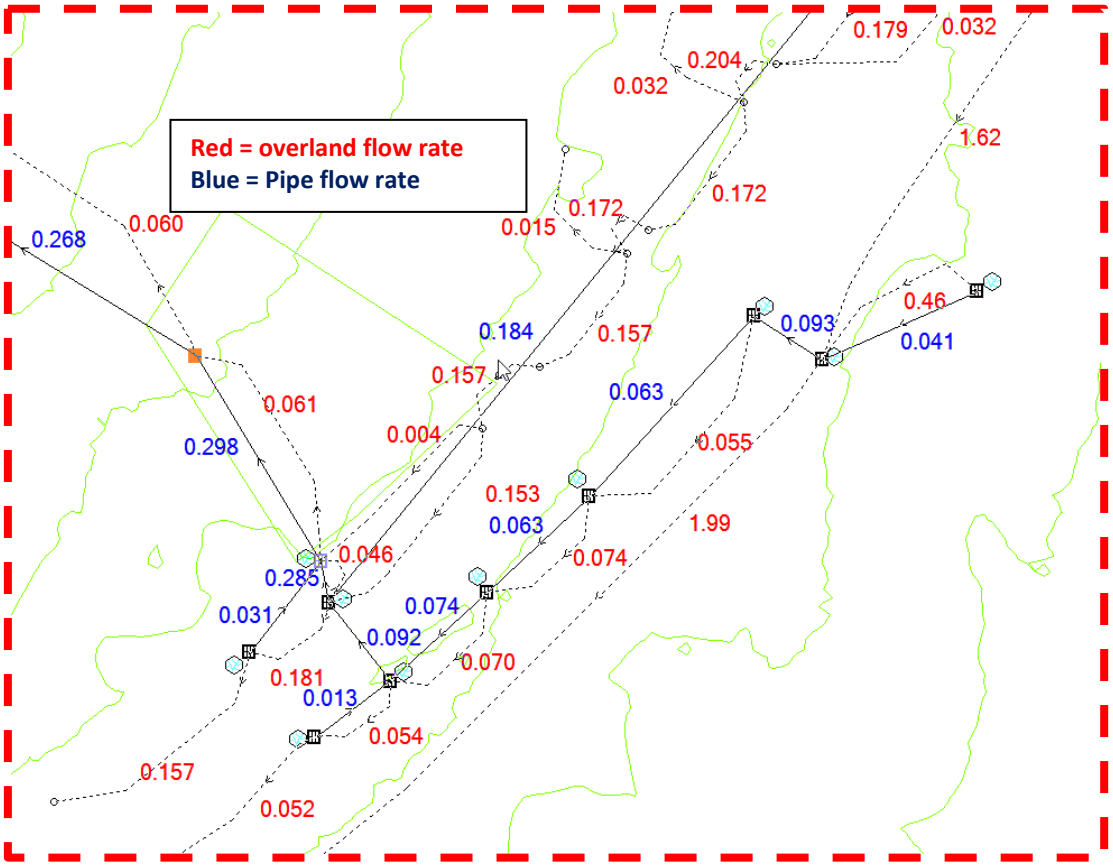


Figure 18. DRAINS Model Analysis Result - 1% AEP Worse Case Storm

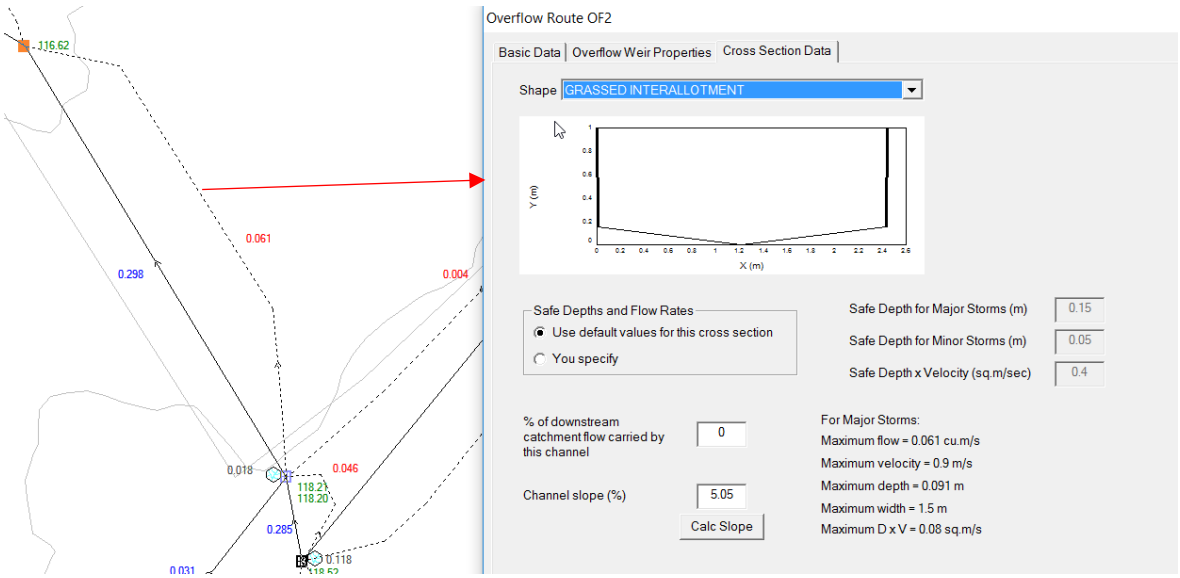


Figure 19. DRAINS Overflow Route OF2 – Proposed cross-section over the existing easement for convening of overland flow safely through the site.

The combined overland flow 61 l/s and 50% pipe flow 149 l/s used in HEC_RAS modeling in Steady Flow Data (Refer to Section 6 - Hydraulic Analysis (HEC-RAS).

5. Hydraulic Analysis

Cross-sections have been interpolated through the site over the existing drainage easement and hydraulic analysis using HEC-RAS (Ver. 5.0.6) has been performed in order to determine the theoretical 1% AEP water levels for this area.

The attached HEC-RAS Section Locality Plan (Appendix 5) shows the cross-sections used in the computer model. The same set of cross-sections is used for analysis in pre and post-development conditions. The analysis results, critical cross-sections and long section of the main channels are provided in Appendix 6 (All results obtained from HEC-RAS Program).

The overland flow path is analysed by using the mixed flow regime. We provided one main river line with main cross-sections approximately every 1m parallel to the overland flow path and contour of land over the existing drainage easement and used Q = 0.210m3/s for the surface flow rate.

The cross-sections were taken at the critical sections over the overland flow path and the dwelling, to determine the effect of the development on the flood-prone land.

The main input parameters and conditions of the model are as follow:

- Flow Rate: Q = 0.210 m3/sec
- Flow Regime: Mixed;
- Boundary Conditions: Critical Depth (for both upstream and downstream);
- Manning's n Value: 0.030
- Contraction Coefficient: 0.1; and
- Expansion Coefficient: 0.3.

The existing Structures including houses and out-buildings were modeled as obstruction blocks in respective cross-sections that cut the structures.

The analysis results including flow summary table, critical cross-sections and long-section of the main channel are presented in Appendix 6.

6. Analysis Results

The subject property is burdened by a Council stormwater easement. The existing stormwater pipe traversing the property has been accurately located and pipe size and depth confirmed by a registered surveyor (Appendix 1). A combination of the assumed 50% pipe capacity and the overland flow from Warringah Road has the potential to surcharge from the surcharge pit and inundate the street and part of the property during 1% AEP events.

Analysis of flood conditions for this development has shown that:

- In general, the change in flood conditions at neighbouring properties, upstream and downstream of the catchment due to the proposed development is insignificant.
- The proposed development will slightly improve the flooding issue at this location by providing an overland flow path over the existing drainage easement to carry runoff away from the dwelling.
- The change in flood levels at the subject site and at neighboring properties are insignificant. In fact, the flood level decreases slightly due to the proposed overland flow path/dish drain (Figure 20 – Page 12) over the easement and due to the removal of the existing building. The depth of overland flow decreases at RS14 to RS21 slightly (Refer to Table result in Appendix 6).
- The maximum depth of the overland flow during 1% AEP event through the site is less than 150mm.
- The maximum Depth x Velocity product for the proposed development is less than 0.11 m^2/s. There are no significant changes to D x V product.

7. Recommendations

The flood levels at various locations have been calculated (Appendix 5 & Appendix 6). The maximum flood level near the proposed building over the existing drainage easement (RS 24.00) has been used for the planning of floor levels for the proposed development. The maximum flood level is 117.64m AHD. The flood depth at this location is approximately 50mm to 100mm over the easement. Therefore it is recommended the minimum habitable finished floor levels be set at or above 1% AEP flood level plus 300mm freeboard and minimum non-habitable finished floor levels, garage and patio in front be set at or above 1% AEP flood level plus 150mm freeboard. In particular:

- Minimum habitable floor level for the proposed building to be set at/or above RL117.95m AHD
- Minimum non-habitable floor levels (garage and patio) to be set at/or above RL117.80m AHD.

The above FFL ensures that the proposed development is not subject to inundation as a result of ponding from upstream flows.

In addition to ensuring that the proposed dwelling is not inundated as a result of ponding from upstream flows, it is necessary to ensure that:

- There are sufficient waterway areas along both side boundaries to carry overland flow from the front of the site to the rear of the site.
- **A 1800mm wide, 90mm deep dish drain must be created over the existing easement** (**Figure 20)**

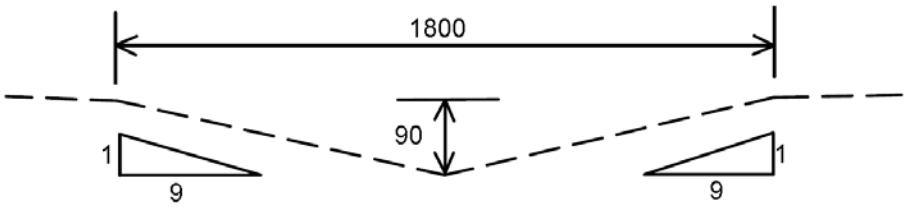


Figure 20. 1800mm wide, 90mm deep dish drain over the existing easement

- The proposed landscaped area in front of the site must slope toward the easement to ensure no water ponds in front of the proposed building.
- The existing boundary levels to remain the same.
- No permanent structures are allowed within the overland flow path over the existing stormwater easement to ensure an unobstructed overland flow path for excess stormwater runoff from upstream catchment areas.
- No brick or other masonry type fence is allowed in front of the site over the existing easement and at the rear boundaries – fences are to be replaced or altered to allow the conveyance of the flow through the site without obstruction.
- Gates and fences within the overland flow paths must be of lightweight materials and permeable to allow for free flow of water.
- The existing ground levels at the rear of the property should remain the same unless noted as part of the overland flow paths.
- All new structures are to have flood compatible building components/ materials (e.g. concrete, timber, steel and brickwork) below 1% AEP flood level plus 300mm freeboard.
- Waterproofing of electrical equipment, wiring and any other services should be undertaken in accordance with the Australian Standard.
- Provide adequate storage areas for hazardous materials and valuable goods above the flood level plus 300mm freeboard.
- All electrical connections, air conditioning units, or external power points are to be set above the minimum habitable floor level.

It should be noted that this flood study takes a conservative approach in assuming that the underground drainage system associated with the flow path is up to 50% blocked. Additionally, no allowance has been made in these calculations for the properties within the catchment that may have installed On-Site Detention systems or Rainwater re-use tanks. This conservative assessment means that it is likely that flows at the site could be potentially considerably less.

8. Flood Risk Management

Below is a summary of flood risk management information in reference to Northern Beaches Council (Warringah Council) requirements:

Land use category	Residential Development
Flood risk precincts	The site is in low risk precincts (Depth < 150mm and DxV < 0.11m^2/s
Maximum 1% AEP Flood Level (in front of the proposed dwelling)	117.64m AHD (RS 24)
Overland Flow Depth (1% AEP Flood Depth)	Less than 150mm through the site
Overland Flow Velocity (1% AEP Flood Depth)	Varies from 0 to 4.0m/s
Overland flow Depth x Velocity (1% AEP Flood Depth)	Less than 0.11 through the site (low risk)
Flood prevention	The overland flow over the existing drainage easement and through the site will not reach to the proposed building - Provide freeboard to Finished Floor Level (FFL) - 300mm freeboard for habitable and 150mm for non-habitable floor levels.
Buoyancy	Low (due to depth of flow and velocity)
Impacts of waterborne objects	Low (due to depth and velocity of flow)
Flood storage	No reduction (slightly improved)
Changes to Flood levels	Insignificant (slightly decreased)
Impact on surrounding properties	None (slightly improved)

- **Evacuation and emergency strategy and issues:**

The State Emergency Service (SES) has formal responsibility for emergency management operations in response to flooding. No procedure is recommended due to the low risk of inundation of the property and dwelling up to and including the PMF storm event. In an emergency event, residents are encouraged to contact the State Emergency Service (SES) which has formal responsibility for emergency management operations in response to flooding. Alternatively, it may be safer for residents to stay in the property as this is a local overland flow path area of low flood risk. Please note that the proposed FFL for new development is set at 1% AEP + 0.30m freeboard.

9. Conclusion

The proposed development at 602 Warringah Road, Forestville will not take up significant flood storage capacity or create obstructions to flood flows and so will not significantly increase flood risks for existing properties or elsewhere within the flood plain.

The overland flow does not reach to the line of the proposed building and due to the depth and velocity of the overland flow and a higher FFL than the flood levels, there will not be any adverse effect to the development.

10. Declaration

The undersigned has no objection of supporting the above-mentioned development, as long as all the details mentioned above are to be followed during the construction. If all details are followed, there will not be any adverse effects on the development or adjoining properties. The study demonstrates that the flow path will not be adversely affected by the proposal.

Prior to any changes, the builder should contact the Council and undersigned for a discussion. The creation of the overland flow path over the existing stormwater easement is extremely important and must be followed according to the recommendations.

This Overland Flow Path Assessment report and accompanying drawings and calculations are to be approved by Principal Certifying Authority (PCA), prior to any works commencing on site.

11. Appendix

Appendix1: Survey report - Council's stormwater pipelines within the easement
Appendix 2: Site Survey plan
Appendix 3: Site plan
Appendix 4: Catchment Plan
Appendix 5: HEC-RAS Section Locality Plan
Appendix 6: HEC-RAS Analysis Results

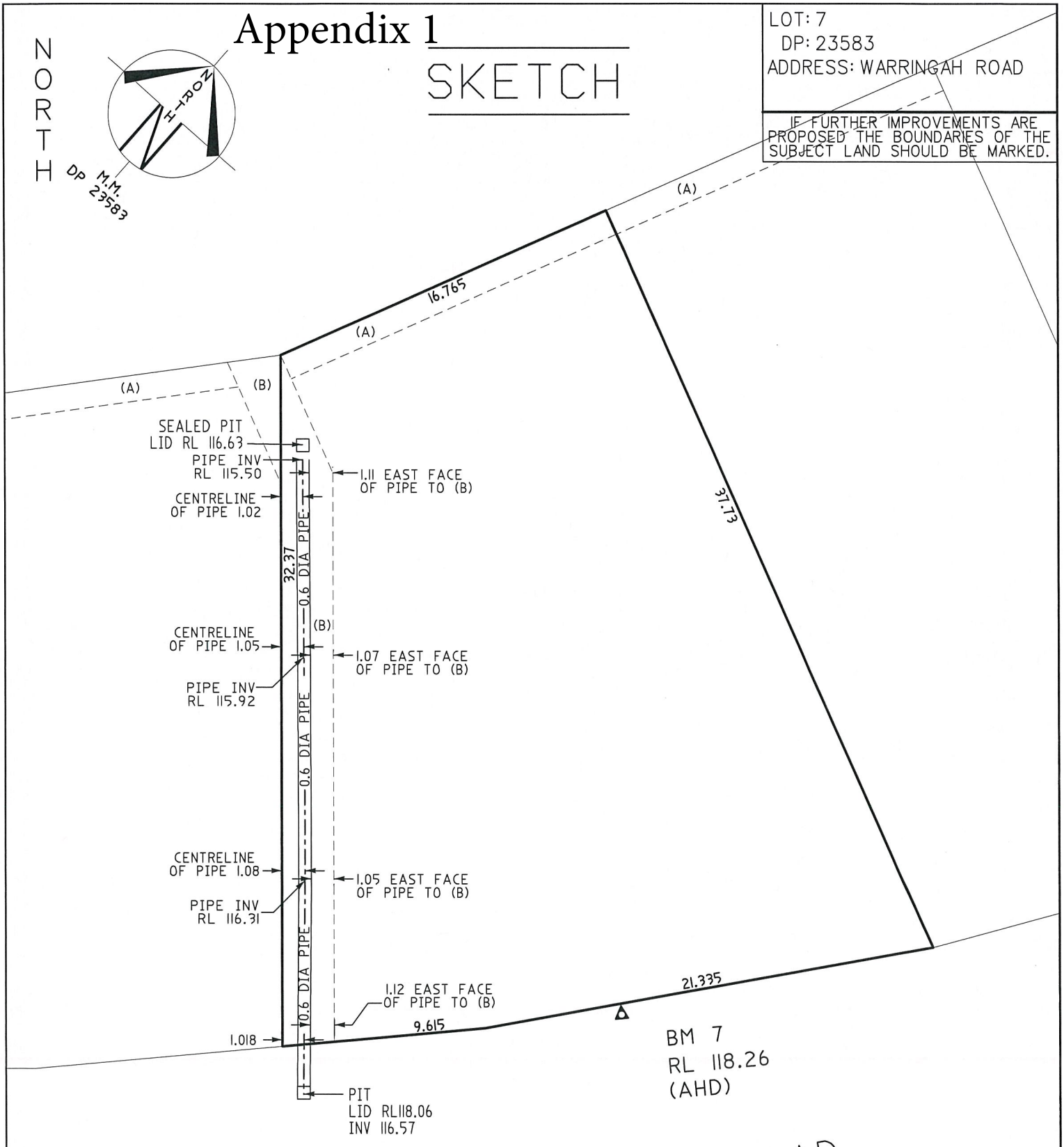
Please Note:
DRAINS and HEC-RAS files and models will be provided upon request.

Appendix 1

SKETCH

LOT: 7
DP: 23583
ADDRESS: WARRINGAH ROAD

IF FURTHER IMPROVEMENTS ARE PROPOSED THE BOUNDARIES OF THE SUBJECT LAND SHOULD BE MARKED.



David Burton B.Surv. M.I.S.N.S.W.
Surveyor Registered under the Surveying and Spatial Information Act, 2002.

(A) SITE OF DRAINAGE EASEMENT 1.22 WIDE
(B) SITE OF DRAINAGE EASEMENT 2.44 WIDE

LEVELS ARE IN TERMS OF AUSTRALIAN HEIGHT DATUM
ORIGIN OF LEVELS FROM PM2759
SOURCE OF INFORMATION SCIMS DATED 7/10/2016

ASPECT DEVELOPMENT & SURVEY PTY LTD A.C.N. 078 649 000

OUR REF: 21/1033299/217405
YOUR REF: 602 WARRINGAH ROAD

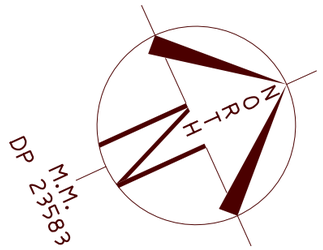
SUBURB: FORESTVILLE

SUITE 1, 103 VANESSA STREET
KINGSGROVE NSW 2208
TELE (02) 9554 8388
FAX (02) 9554 8588

DX 11392
HURSTVILLE
P.O. BOX 161
KINGSGROVE NSW 1480

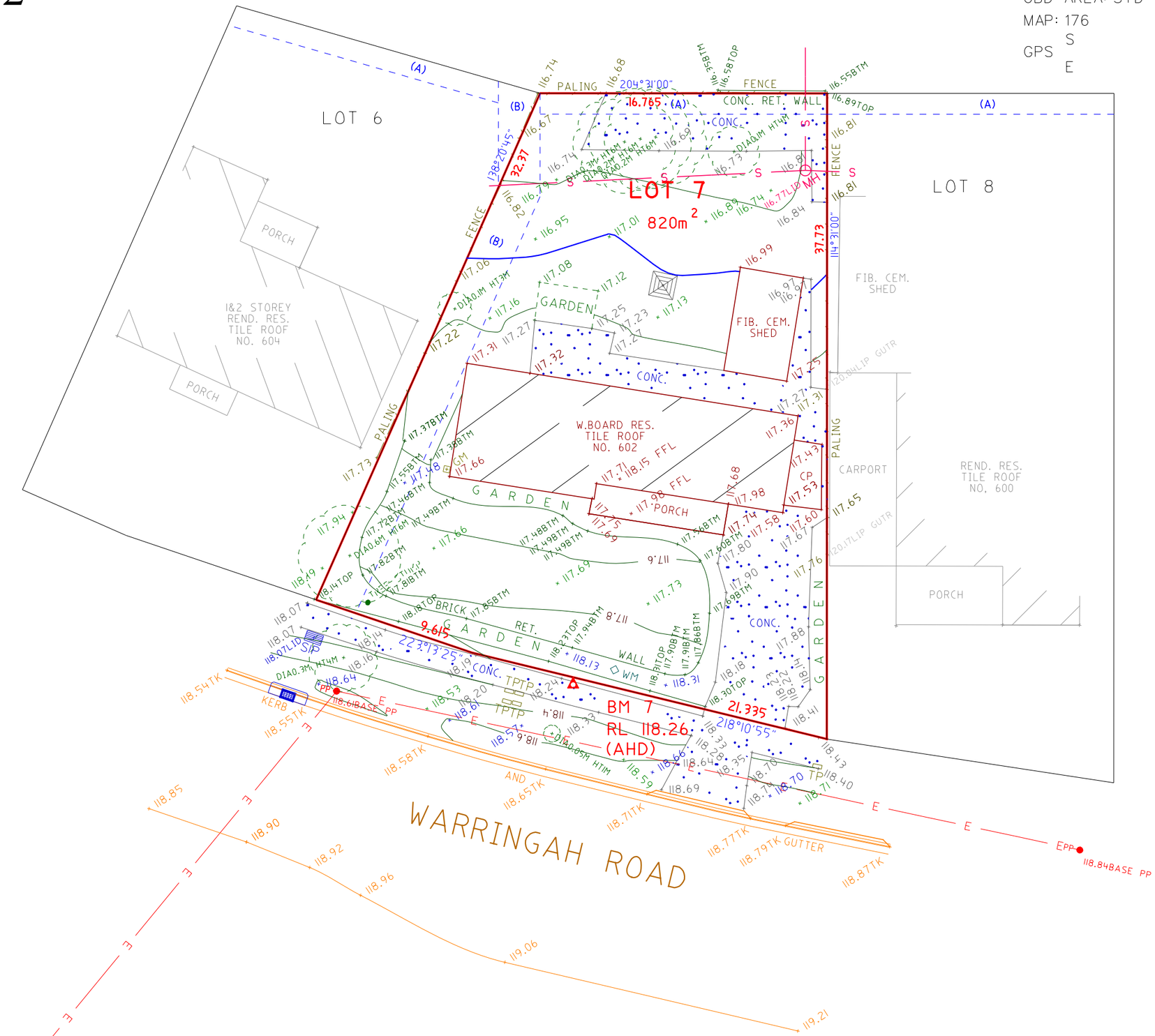
Appendix 2

NORTH



LOCALITY SKETCH

UBD AREA: SYD REVISION: 49
MAP: 176 REF: A16
GPS S
E



DIAL BEFORE YOU DIG
www.1100.com.au

ALL TREE HEIGHTS ARE APPROXIMATE ONLY AND ARE SHOWN FOR TENDER PURPOSES ONLY. ALL TREE RELATED ISSUES TO BE REFERRED TO AN ARBORIST

HOW to PROTECT SURVEY MARKS BEFORE WORKS COMMENCE

For Details refer to http://www.lpi.nsw.gov.au/ data/assets/pdf file/0007/169522/19608 Mark Preservation Flyer web.pdf
Find out if there are survey marks located in the area of interest by:
1. Viewing the survey mark layer in the Spatial Information Exchange Six Lite web page www.six.nsw.gov.au
2. Contacting Survey Services, LPI, 1300 052 637 who will advise the location and status of survey marks in the area
3. Inspecting the site, paying particular attention to survey marks located in the footpath/kerb and gutter.

IF NO SURVEY MARKS ARE AFFECTED COMMENCE WORKS

IF SURVEY MARKS ARE IN THE AREA
The locality sketch plan (Survey Mark Sketches) should be downloaded from the LPI online Shop http://shop.lands.nsw.gov.au see **Specialised Searches**

IF SURVEY MARKS ARE LIKELY TO BE DISTURBED OR DESTROYED
Avoid disturbing or destroying survey marks by:
1. Diverting works to avoid disturbing the marks or
2. Contacting a Registered Surveyor to place and survey a mark at a more suitable site nearby to maintain survey integrity.
Any survey necessary to recover the position of survey marks proposed to be destroyed may only be undertaken by a surveyor registered under the Surveying and Spatial Information Act 2002 or by survey staff authorised by the Surveyor General.

REPORT SURVEY MARKS AT RISK OF BEING DESTROYED
Look for the Survey Mark Status report at http://scims.lpi.nsw.gov.au/status report frames.htm

APPROXIMATE POSITION OF SEWER MAIN.
REFER TO SEWER DIAGRAM FOR DETAILS.
NOTE: PRIOR TO ANY DESIGN AND CONSTRUCTION, A SEWER PEGOUT MUST BE UNDERTAKEN TO DETERMINE THE EXACT LOCATION OF THE SEWER LINE.

(A) SITE OF DRAINAGE EASEMENT 1.22 WIDE
(B) SITE OF DRAINAGE EASEMENT 2.44 WIDE AND VARIABLE WIDTH

4 2 0 4 8 12 16
SCALE 1:250

GENERAL NOTES

A) THIS SURVEY IS SPECIFICALLY FOR CONTOUR PURPOSES ONLY. THE BOUNDARIES OF THE SUBJECT PROPERTY HAVE NOT BEEN INVESTIGATED AND THE POSITION SHOWN IS APPROXIMATE ONLY
B) AREAS AND DIMENSIONS ARE SUBJECT TO SURVEY
C) SERVICES SHOWN HAVE BEEN DERIVED FROM VISUAL EVIDENCE APPARENT AT THE TIME OF SURVEY. THE RELEVANT SERVICE AUTHORITY SHALL BE CONTACTED TO VERIFY THE EXISTENCE AND POSITION OF ALL SERVICES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION
D) CONTOURS ARE INDICATIVE OF SURFACE TOPOGRAPHY ONLY. SURVEYED SPOT LEVELS ARE THE ONLY VALUES TO BE RELIED ON FOR REDUCED LEVELS ON PARTICULAR FEATURES.

SYMBOLS & ABBREVIATIONS:

GP	GULLY PIT	-E-	OVERHEAD ELEC LINE
HYD	HYDRANT	-S-	SEWER LINE
SIP	SURFACE INLET PIT	GM	GAS METER
SIC	SEWER INSPECTION COVER	LP	LIGHT POLE
SMH	SEWER MANHOLE	EC	ELECTRICITY CONDUIT
W/M	WATER METER	ECT	ELEC & TELE CONDUIT
EL	ELECTRICITY BOX	TC	TELECOM CONDUIT
TP	TELECOM PIT	WC	WATER CONDUIT
VC	VEHICLE CROSSING	INV	INVERT
SV	STOP VALVE	KO	KERB OUTLET
SWMH	STORMWATER MANHOLE	TK	TOP of KERB

ASPECT DEVELOPMENT & SURVEY PTY LTD
CONSULTING REGISTERED SURVEYORS
ABN 60 078 649 000

SUITE 1
103 VANESSA STREET
KINGSGROVE NSW 2208
PHONE (02) 9554 8388
FAX (02) 9554 8588

PO BOX 161
KINGSGROVE NSW 1480

DX 11392
HURSTVILLE

PROJECT

OUR REFERENCE	21/1033299/204892	
LOT 7	DP 23583	SECTION
DATUM AHD		SOURCE SCIMS 07/10/16
ORIGIN OF LEVELS	PM 2759	REDUCED LEVEL 119.894
SURVEYED BS/DM		DATE 11/10/16
DRAWN KM		DATE 11/10/16
SCALE 1: 250	A3 SHEET	

CLIENT: MOOTHERIL
REF: LOT 7
REF: WARRINGAH ROAD
ADDRESS: 602 WARRINGAH ROAD
SUBURB FORESTVILLE

Appendix 3

(A) PROPOSED SITE OF DRAINAGE EASEMENT 1.22 WIDE
(B) SITE OF DRAINAGE EASEMENT 2.44 WIDE (F511027)

DENOTES TREES TO BE REMOVED BY OWNER PRIOR TO CONSTRUCTION

NORTH

DP M.M. 23583

LOT 7
D.P: 23583
L.G.A: NORTHERN BEACHES

SITING HAS BEEN COMPLETED IN ACCORDANCE WITH WARRINGAH DCP 2011

SITE AREA	820 m²
ROOF AREA	250.06 m²
LANDSCAPED AREA	
TOTAL LANDSCAPE AREA: (MIN. DIMENSION OF 2.0m)	337.7 m² 41.1 %
MIN. REQUIRED BY COUNCIL:	40 %
PRIVATE OPEN SPACE	
TOTAL OPEN SPACE AREA: (MIN. DIMENSION OF 5.0m)	108.5 m²
MIN. REQUIRED BY COUNCIL:	60 m²
HEIGHT RESTRICTION	
MAXIMUM RIDGE HEIGHT	8.5 m
MAXIMUM CEILING HEIGHT	7.2 m
(F.F.L. MUST BE ACCURATE. CHANGES IN LEVELS MAY NOT COMPLY WITH REQUIREMENTS)	
BUILDING ENVELOPE	
BUILDING ENVELOPE TO BE PROJECTED AT 45° FROM A HEIGHT OF 4.0m AT BOUNDARY	

SITE COVERAGE
STORMWATER CALCULATION

ROOF FOOTPRINT:	250.06m²
DRIVEWAY/ PAVED AREAS:	209.7m²
TOTAL:	459.76m² 56.1 %
MAX SITE COVERAGE FOR OSD:	40%

Maximum 1000mm CUT
DROP EDGE BEAM TO NATURAL GROUND
NO EXPOSED FILL PERMITTED OUTSIDE BUILDING PERIMETER

WIND CLASSIFICATION:	"N2"
SLAB CLASSIFICATION:	"P "

NOTE:
ALL GROUND LINES ARE APPROXIMATE. EXTENT OF FILL & BATTER WILL BE DETERMINED ON SITE. SEDIMENT BARRIERS ARE TO BE CUSTOMISED SITE SPECIFIC

STORMWATER TO EASEMENT VIA RAINWATER TANK AND O.S.D
REFER TO HYDRAULIC DETAILS

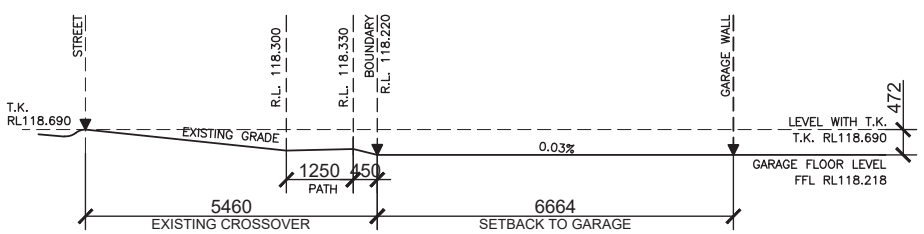
DIAL BEFORE YOU DIG
www.1100.com.au

SITE PLAN

SCALE 1:200

GENERAL NOTES

A) THIS SURVEY IS SPECIFICALLY FOR CONTOUR PURPOSES ONLY. THE BOUNDARIES OF THE SUBJECT PROPERTY HAVE NOT BEEN INVESTIGATED
B) AREAS AND DIMENSIONS ARE SUBJECT TO SURVEY
C) SERVICES SHOWN HAVE BEEN DERIVED FROM VISUAL EVIDENCE APPARENT AT THE TIME OF SURVEY. THE RELEVANT SERVICE AUTHORITY SHALL BE CONTACTED TO VERIFY THE EXISTENCE AND POSITION OF ALL SERVICES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION
D) CONTOURS ARE INDICATIVE OF SURFACE TOPOGRAPHY ONLY. SURVEYED SPOT LEVELS ARE THE ONLY VALUES TO BE RELIED ON FOR REDUCED LEVELS ON PARTICULAR FEATURES.



DRIVEWAY GRADIENT PROFILE

SCALE—1:100

CLIENT'S SIGNATURE: _____ DATE: _____

ClarendonHomes
BL No. 2298C
ABN 18 003 892 706

Clarendon Homes (NSW) P/L
21 Solent Circuit, Baulkham Hills NSW 2153
T: (02) 8851 5300

PRODUCT:
BOSTON 37 (AS DISPLAYED 44.9 SQS)
Brighton
L/H Garage

Sapphire Specifcation

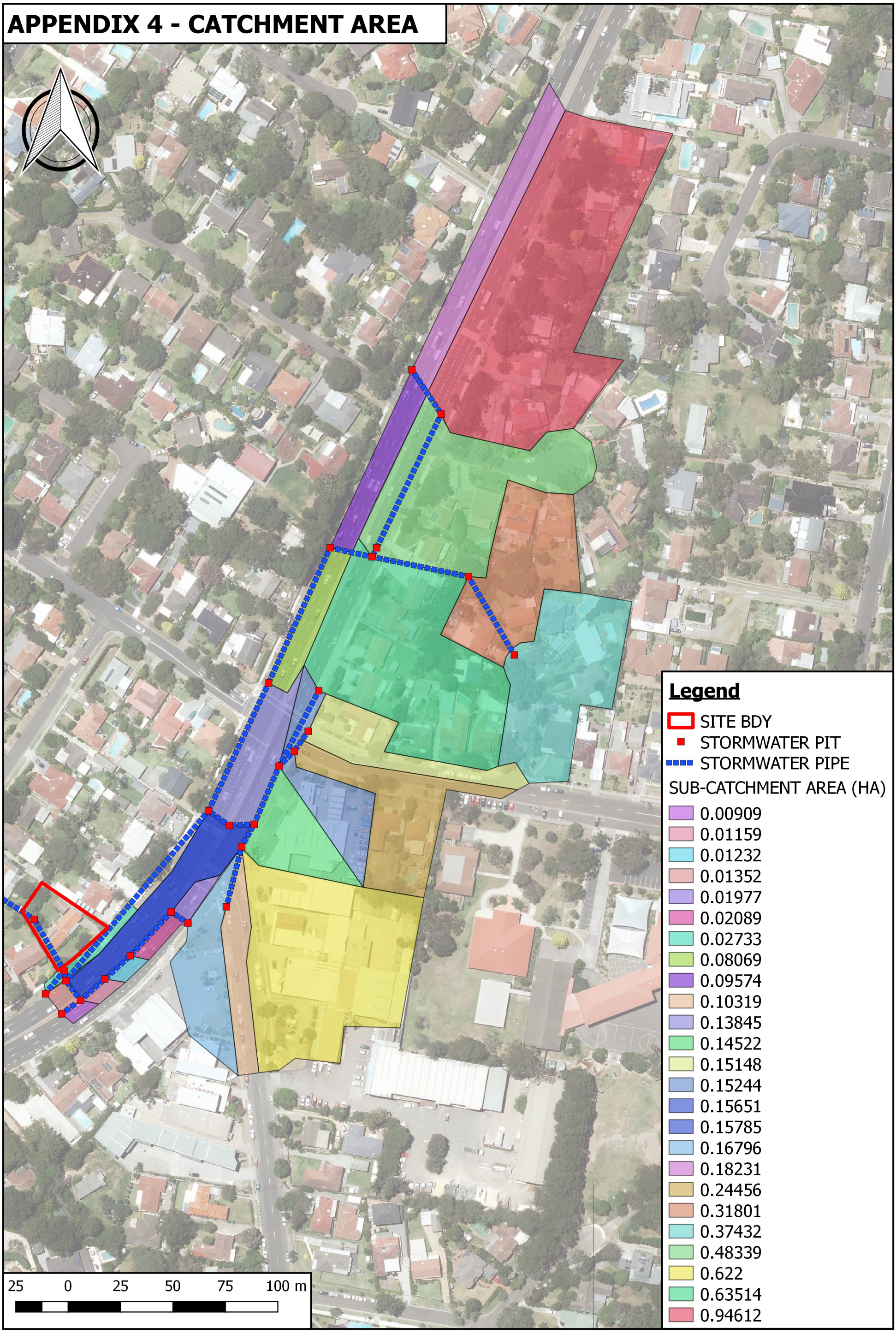
CLIENT:
Clarendon Homes

SITE ADDRESS:
Lot 7 No.602 (DP 23583)
Warringah Road
FORESTVILLE 2087

DA. Drawings

DRAWN: SMC	DATE: 10.05.19	Rev: K
RATIO @ A3: 1:200	CHECKED: Checked By	
SHEET: 2	JOB No: 29800312	NSW

APPENDIX 4 - CATCHMENT AREA



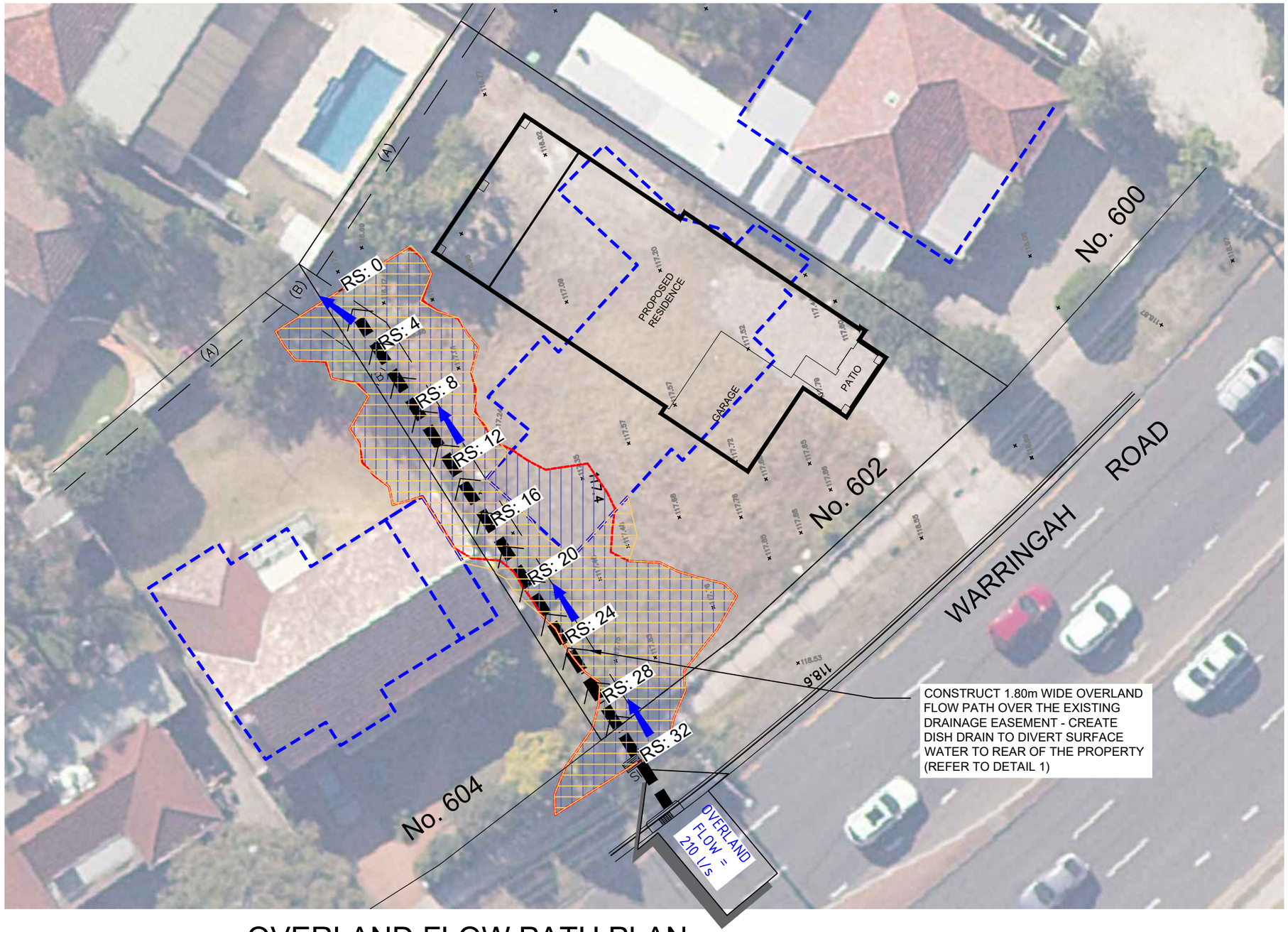
Appendix 5: Overall Site Plan - HEC-RAS Section Locality Plan

PLEASE NOTE:
THE FLOOD LEVELS AT VARIOUS LOCATIONS HAVE BEEN CALCULATED. THE MAXIMUM FLOOD LEVEL NEAR THE PROPOSED BUILDING OVER THE EXISTING DRAINAGE EASEMENT (RS 24.00) HAS BEEN USED FOR THE PLANNING OF FLOOR LEVELS FOR THE PROPOSED DEVELOPMENT. THE MAXIMUM FLOOD LEVEL IS 117.64m AHD. THE FLOOD DEPTH AT THIS LOCATION IS APPROXIMATELY 50mm TO 100mm OVER THE EASEMENT. THEREFORE IT IS RECOMMENDED THE MINIMUM HABITABLE FINISHED FLOOR LEVELS BE SET AT OR ABOVE 1% AEP FLOOD LEVEL PLUS 300mm FREEBOARD AND MINIMUM NON-HABITABLE FINISHED FLOOR LEVELS, GARAGE AND PATIO IN FRONT BE SET AT OR ABOVE 1% AEP FLOOD LEVEL PLUS 150mm FREEBOARD. IN PARTICULAR:

- MINIMUM HABITABLE FLOOR LEVEL FOR THE PROPOSED BUILDING TO BE SET AT/OR ABOVE RL117.95m AHD
- MINIMUM NON-HABITABLE FLOOR LEVELS (GARAGE AND PATIO) TO BE SET AT/OR ABOVE RL117.80m AHD.

IN ADDITION TO ENSURING THAT THE DWELLING IS NOT INUNDATED AS A RESULT OF PONDING FROM UPSTREAM FLOWS, IT IS NECESSARY TO ENSURE THAT:

- THERE ARE SUFFICIENT WATERWAY AREAS ON BOTH SIDES OF PROPERTY TO CARRY OVERLAND FLOW AWAY FROM THE DWELLING.
- THE EXISTING BOUNDARY LEVELS ON EASTERN AND NORTHERN SIDE OF THE PROPERTY TO REMAIN THE SAME.
- NO PERMANENT STRUCTURE IS ALLOWED WITHIN THE OVERLAND FLOW PATH AND OVER THE EXISTING EASEMENT TO ENSURE AN UNOBSTRUCTED OVERLAND FLOW PATH FOR EXCESS STORMWATER RUNOFF FROM UPSTREAM CATCHMENT AREAS.
- NO BRICK OR OTHER MASONRY TYPE FENCE IS ALLOWED ON BOUNDARIES - FENCE TO BE REPLACED OR ALTERED TO ALLOW THE CONVEYANCE OF THE FLOW THROUGH THE SITE WITHOUT OBSTRUCTIONS.

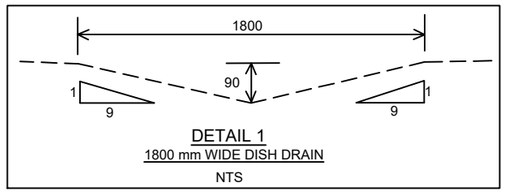


LEGEND:

- LINE OF EXISTING DWELLING / LINE OF PROPOSED DWELLING
- EXTEND OF PRE DEVELOPMENT OVERLAND FLOW PATH
- EXTEND OF POST DEVELOPMENT OVERLAND FLOW PATH

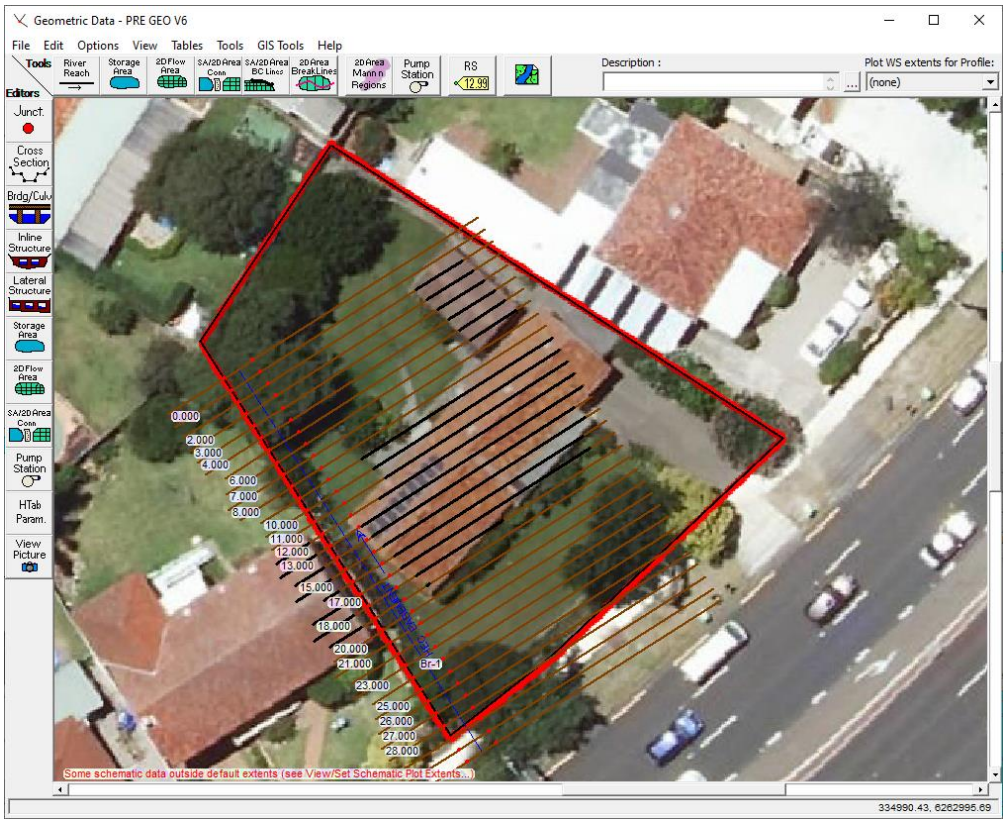
OVERLAND FLOW PATH PLAN

SCALE 1:250

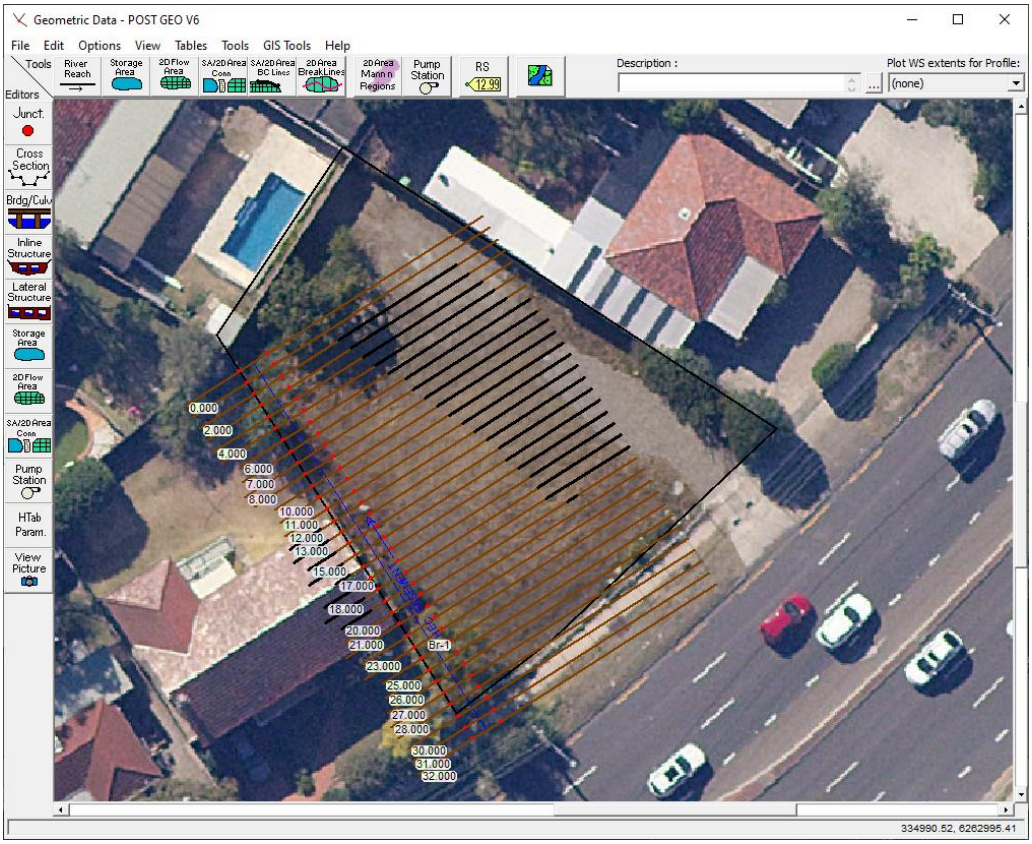


DETAIL 1
1800 mm WIDE DISH DRAIN
NTS

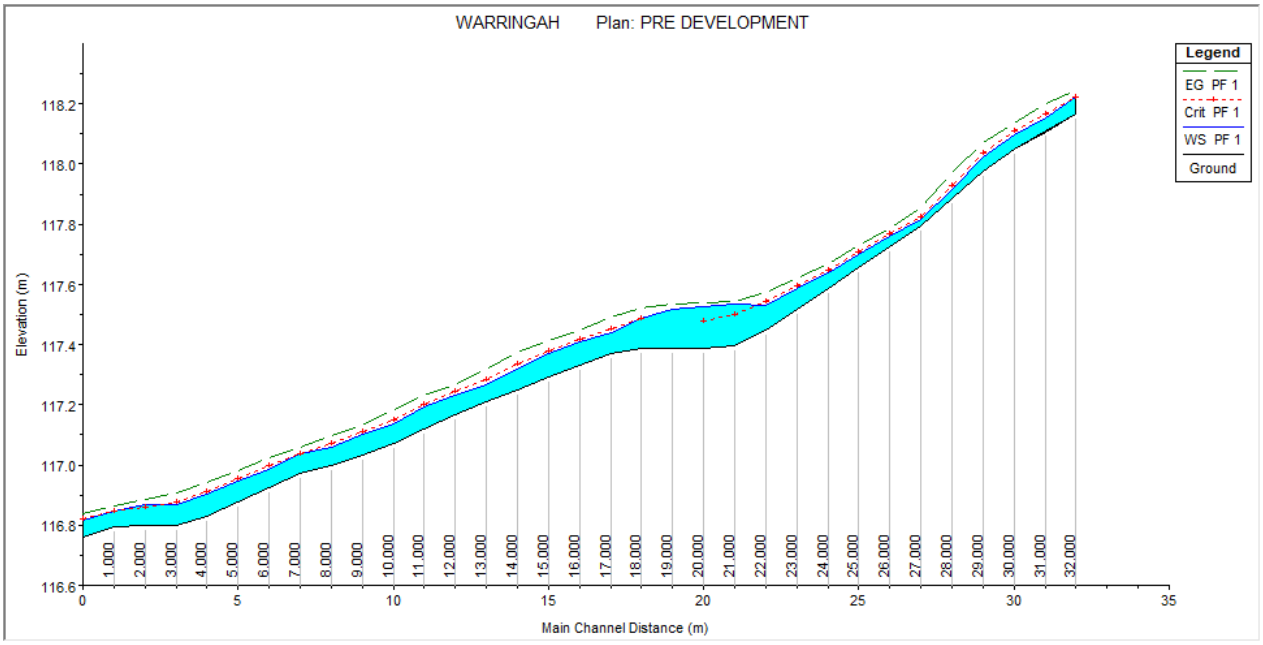
APPENDIX 6: PRE & POST HEC-RAS ANALYSIS RESULTS



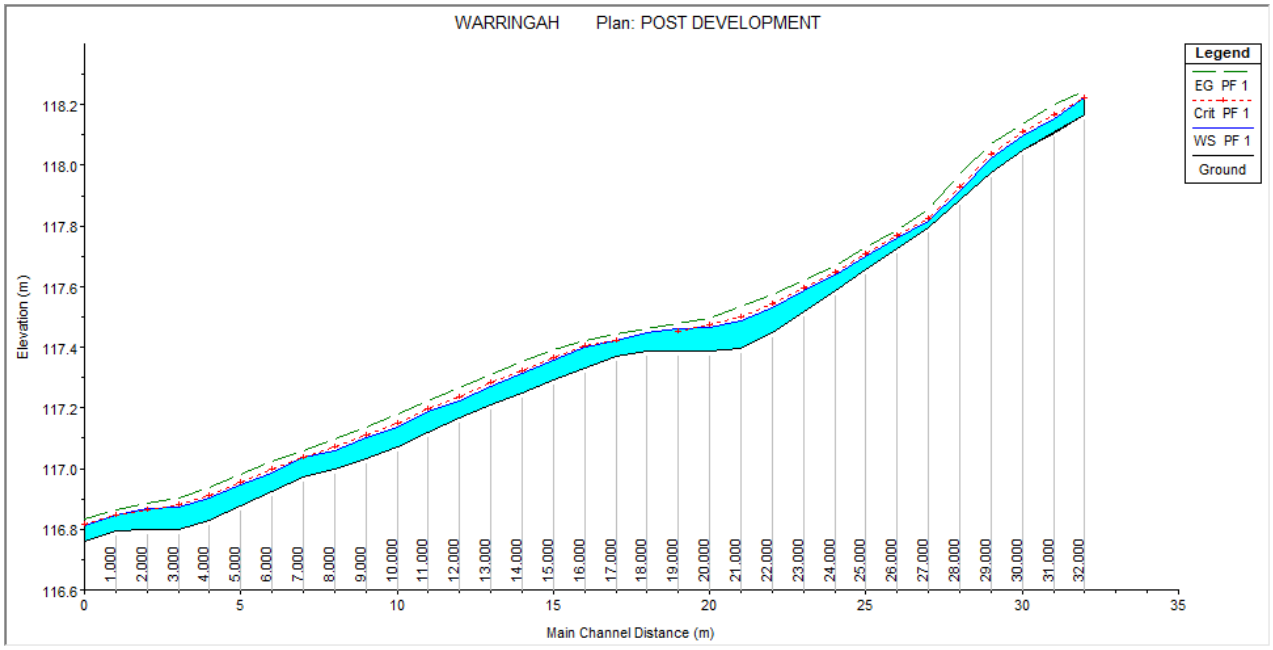
- HEC-RAS Geometric Data - Pre-Development



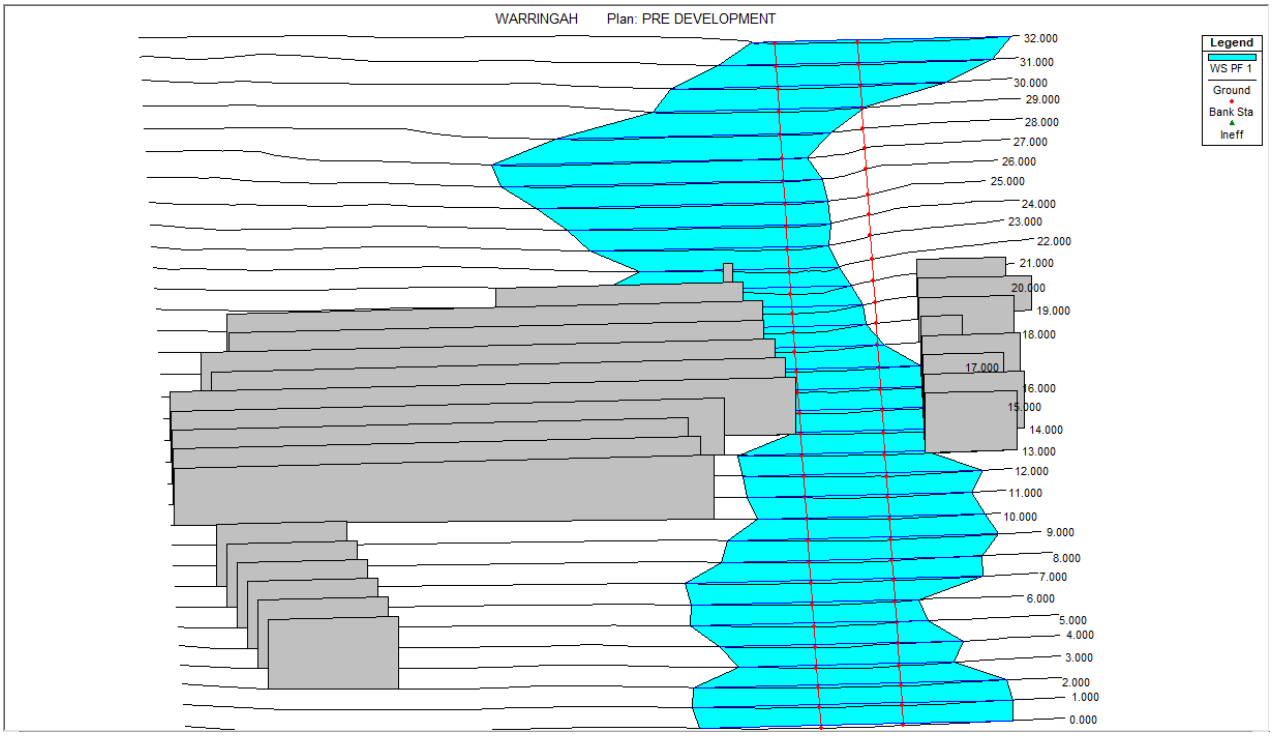
- HEC-RAS Geometric Data – Post-Development



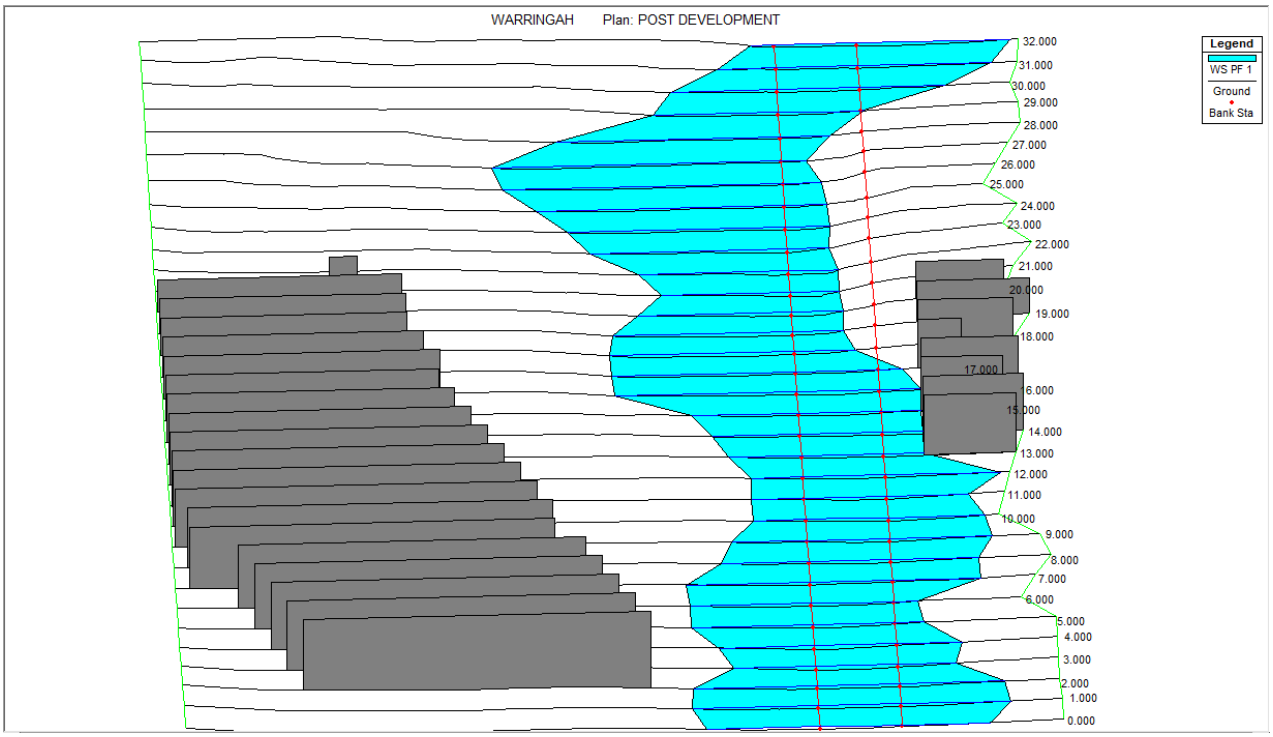
- Pre-Development Long-Section (1% AEP assuming 50% blocked pipe)



- Post Development Long-Section (1% AEP assuming 50% blocked pipe)



- Pre Development Overland Flow 3D Perspective



- Post Development Overland Flow 3D Perspective

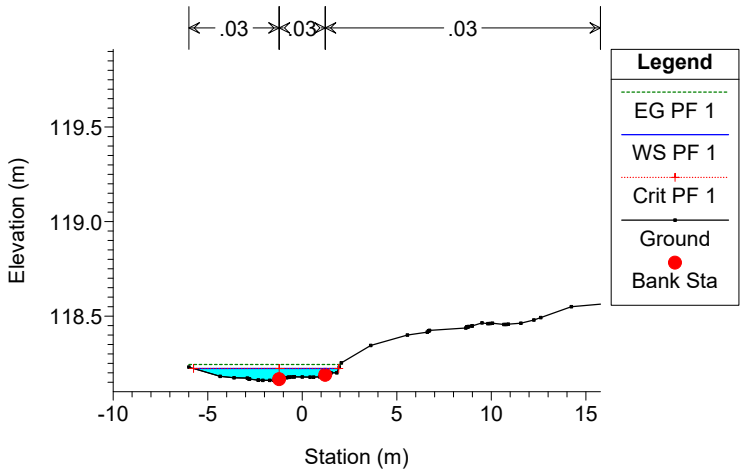
HEC-RAS River: HEC EASEMENT Reach: Br-1 Profile: PF 1

Reach	River Sta	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)	
Br-1	32.000	POST DEVELOPMENT	0.21	118.17	118.22	118.22	118.24	0.024372	0.66	0.33	7.68	0.99
Br-1	32.000	PRE DEVELOPMENT	0.21	118.17	118.22	118.22	118.24	0.024372	0.66	0.33	7.68	0.99
Br-1	31.000	POST DEVELOPMENT	0.21	118.11	118.15	118.17	118.20	0.078338	1.10	0.23	8.10	1.75
Br-1	31.000	PRE DEVELOPMENT	0.21	118.11	118.15	118.17	118.20	0.078338	1.10	0.23	8.10	1.75
Br-1	30.000	POST DEVELOPMENT	0.21	118.05	118.10	118.11	118.14	0.049854	0.98	0.26	8.12	1.43
Br-1	30.000	PRE DEVELOPMENT	0.21	118.05	118.10	118.11	118.14	0.049854	0.98	0.26	8.12	1.43
Br-1	29.000	POST DEVELOPMENT	0.21	117.98	118.02	118.04	118.07	0.081261	1.03	0.21	6.25	1.74
Br-1	29.000	PRE DEVELOPMENT	0.21	117.98	118.02	118.04	118.07	0.081261	1.03	0.21	6.25	1.74
Br-1	28.000	POST DEVELOPMENT	0.21	117.89	117.92	117.93	117.97	0.131356	0.90	0.20	8.10	2.02
Br-1	28.000	PRE DEVELOPMENT	0.21	117.89	117.92	117.93	117.97	0.131356	0.90	0.20	8.10	2.02
Br-1	27.000	POST DEVELOPMENT	0.21	117.80	117.81	117.83	117.86	0.093488	0.51	0.24	9.32	1.54
Br-1	27.000	PRE DEVELOPMENT	0.21	117.80	117.81	117.83	117.86	0.093488	0.51	0.24	9.32	1.54
Br-1	26.000	POST DEVELOPMENT	0.21	117.73	117.76	117.77	117.79	0.047413	0.57	0.29	9.46	1.23
Br-1	26.000	PRE DEVELOPMENT	0.21	117.73	117.76	117.77	117.79	0.047413	0.57	0.29	9.46	1.23
Br-1	25.000	POST DEVELOPMENT	0.21	117.65	117.70	117.71	117.73	0.064402	0.75	0.26	8.61	1.47
Br-1	25.000	PRE DEVELOPMENT	0.21	117.65	117.70	117.71	117.73	0.064402	0.75	0.26	8.61	1.47
Br-1	24.000	POST DEVELOPMENT	0.21	117.59	117.64	117.65	117.67	0.053967	0.86	0.26	7.78	1.43
Br-1	24.000	PRE DEVELOPMENT	0.21	117.59	117.64	117.65	117.67	0.053967	0.86	0.26	7.78	1.43
Br-1	23.000	POST DEVELOPMENT	0.21	117.52	117.59	117.60	117.62	0.046935	0.89	0.26	7.07	1.37
Br-1	23.000	PRE DEVELOPMENT	0.21	117.52	117.59	117.60	117.62	0.046935	0.89	0.26	7.07	1.37
Br-1	22.000	POST DEVELOPMENT	0.21	117.45	117.53	117.54	117.57	0.045746	1.12	0.24	5.90	1.43
Br-1	22.000	PRE DEVELOPMENT	0.21	117.45	117.53	117.54	117.57	0.045746	1.12	0.24	5.90	1.43
Br-1	21.000	POST DEVELOPMENT	0.21	117.39	117.49	117.50	117.53	0.039630	1.14	0.24	5.28	1.36
Br-1	21.000	PRE DEVELOPMENT	0.21	117.39	117.54	117.50	117.54	0.003681	0.44	0.57	7.40	0.44
Br-1	20.000	POST DEVELOPMENT	0.21	117.39	117.47	117.47	117.50	0.030470	0.86	0.28	6.09	1.15
Br-1	20.000	PRE DEVELOPMENT	0.21	117.39	117.53	117.48	117.54	0.004534	0.46	0.42	7.88	0.48
Br-1	19.000	POST DEVELOPMENT	0.21	117.39	117.46	117.45	117.48	0.013313	0.55	0.38	6.84	0.75
Br-1	19.000	PRE DEVELOPMENT	0.21	117.39	117.52		117.53	0.005923	0.49	0.37	3.63	0.54
Br-1	18.000	POST DEVELOPMENT	0.21	117.39	117.45		117.46	0.014178	0.46	0.38	7.29	0.74
Br-1	18.000	PRE DEVELOPMENT	0.21	117.39	117.49	117.49	117.52	0.018585	0.74	0.26	3.62	0.92
Br-1	17.000	POST DEVELOPMENT	0.21	117.37	117.42	117.42	117.44	0.024747	0.63	0.34	8.59	0.98
Br-1	17.000	PRE DEVELOPMENT	0.21	117.37	117.44	117.45	117.49	0.048758	1.07	0.21	4.61	1.45
Br-1	16.000	POST DEVELOPMENT	0.21	117.33	117.40	117.41	117.42	0.022258	0.75	0.35	9.05	0.99
Br-1	16.000	PRE DEVELOPMENT	0.21	117.33	117.41	117.42	117.45	0.028974	0.92	0.25	4.33	1.15
Br-1	15.000	POST DEVELOPMENT	0.21	117.29	117.36	117.37	117.39	0.038930	0.94	0.27	6.81	1.29
Br-1	15.000	PRE DEVELOPMENT	0.21	117.29	117.37	117.38	117.41	0.033939	0.99	0.23	4.08	1.24
Br-1	14.000	POST DEVELOPMENT	0.21	117.25	117.31	117.32	117.35	0.043339	0.96	0.25	6.71	1.35
Br-1	14.000	PRE DEVELOPMENT	0.21	117.25	117.32	117.33	117.37	0.047679	1.08	0.20	3.78	1.44
Br-1	13.000	POST DEVELOPMENT	0.21	117.21	117.27	117.28	117.31	0.035382	0.91	0.25	5.79	1.24
Br-1	13.000	PRE DEVELOPMENT	0.21	117.21	117.27	117.28	117.32	0.058601	1.07	0.21	5.51	1.55
Br-1	12.000	POST DEVELOPMENT	0.21	117.17	117.22	117.24	117.27	0.053340	1.03	0.25	7.35	1.49
Br-1	12.000	PRE DEVELOPMENT	0.21	117.17	117.23	117.24	117.27	0.040348	0.96	0.26	7.07	1.32
Br-1	11.000	POST DEVELOPMENT	0.21	117.12	117.19	117.20	117.22	0.034441	0.91	0.28	7.44	1.22
Br-1	11.000	PRE DEVELOPMENT	0.21	117.12	117.19	117.20	117.23	0.037812	0.98	0.26	6.62	1.29
Br-1	10.000	POST DEVELOPMENT	0.21	117.07	117.14	117.15	117.18	0.050375	0.98	0.24	6.87	1.44
Br-1	10.000	PRE DEVELOPMENT	0.21	117.07	117.14	117.15	117.18	0.057802	1.03	0.23	6.70	1.53
Br-1	9.000	POST DEVELOPMENT	0.21	117.03	117.10	117.11	117.14	0.037357	0.94	0.28	7.72	1.27
Br-1	9.000	PRE DEVELOPMENT	0.21	117.03	117.10	117.11	117.13	0.030335	0.88	0.30	7.98	1.16
Br-1	8.000	POST DEVELOPMENT	0.21	117.00	117.06	117.07	117.10	0.039279	0.98	0.27	7.62	1.31
Br-1	8.000	PRE DEVELOPMENT	0.21	117.00	117.06	117.07	117.10	0.038153	0.97	0.27	7.66	1.29
Br-1	7.000	POST DEVELOPMENT	0.21	116.97	117.03	117.04	117.06	0.027057	0.77	0.33	8.74	1.07
Br-1	7.000	PRE DEVELOPMENT	0.21	116.97	117.04	117.04	117.06	0.026271	0.76	0.33	8.77	1.06
Br-1	6.000	POST DEVELOPMENT	0.21	116.92	116.99	117.00	117.02	0.045360	0.97	0.25	6.72	1.38
Br-1	6.000	PRE DEVELOPMENT	0.21	116.92	116.99	117.00	117.02	0.046681	0.97	0.25	6.70	1.39
Br-1	5.000	POST DEVELOPMENT	0.21	116.88	116.95	116.96	116.98	0.038303	0.93	0.26	6.87	1.28
Br-1	5.000	PRE DEVELOPMENT	0.21	116.88	116.95	116.96	116.98	0.035424	0.91	0.27	7.03	1.23
Br-1	4.000	POST DEVELOPMENT	0.21	116.83	116.90	116.91	116.94	0.039012	0.95	0.26	7.19	1.30
Br-1	4.000	PRE DEVELOPMENT	0.21	116.83	116.90	116.91	116.94	0.039386	0.95	0.26	7.18	1.30

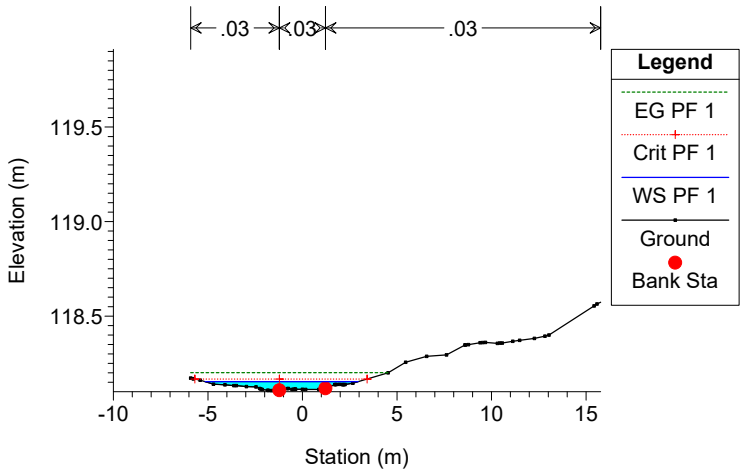
HEC-RAS River: HEC EASEMENT Reach: Br-1 Profile: PF 1 (Continued)

Reach	River Sta	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)	
Br-1	3.000	POST DEVELOPMENT	0.21	116.80	116.87	116.88	116.90	0.028236	0.91	0.28	6.57	1.13
Br-1	3.000	PRE DEVELOPMENT	0.21	116.80	116.87	116.88	116.91	0.034319	0.97	0.26	6.34	1.24
Br-1	2.000	POST DEVELOPMENT	0.21	116.80	116.87	116.86	116.88	0.013685	0.66	0.41	9.23	0.80
Br-1	2.000	PRE DEVELOPMENT	0.21	116.80	116.87	116.86	116.88	0.013777	0.66	0.41	9.22	0.80
Br-1	1.000	POST DEVELOPMENT	0.21	116.79	116.85	116.85	116.87	0.025181	0.71	0.35	9.44	1.02
Br-1	1.000	PRE DEVELOPMENT	0.21	116.79	116.85	116.85	116.87	0.025181	0.71	0.35	9.44	1.02
Br-1	0.000	POST DEVELOPMENT	0.21	116.76	116.81	116.82	116.84	0.037069	0.81	0.31	9.22	1.22
Br-1	0.000	PRE DEVELOPMENT	0.21	116.76	116.82	116.82	116.84	0.029620	0.78	0.33	9.23	1.11

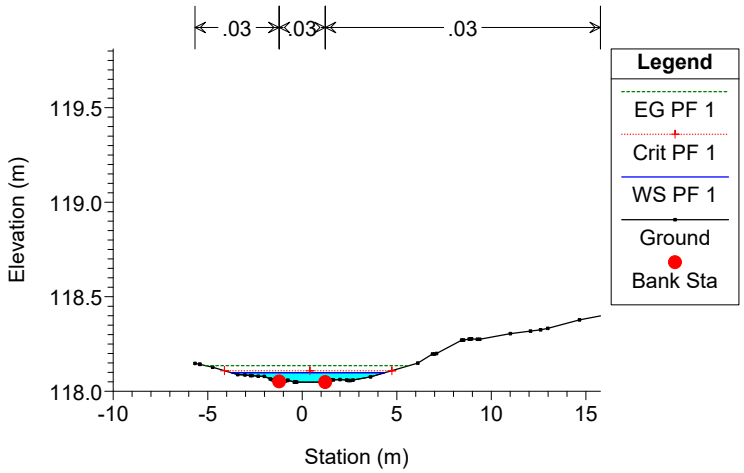
WARRINGAH Plan: PRE DEVELOPMENT
RS = 32.000



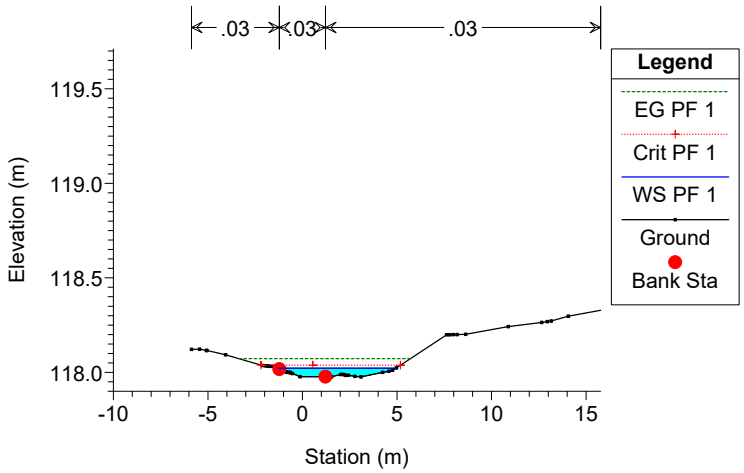
WARRINGAH Plan: PRE DEVELOPMENT
RS = 31.000



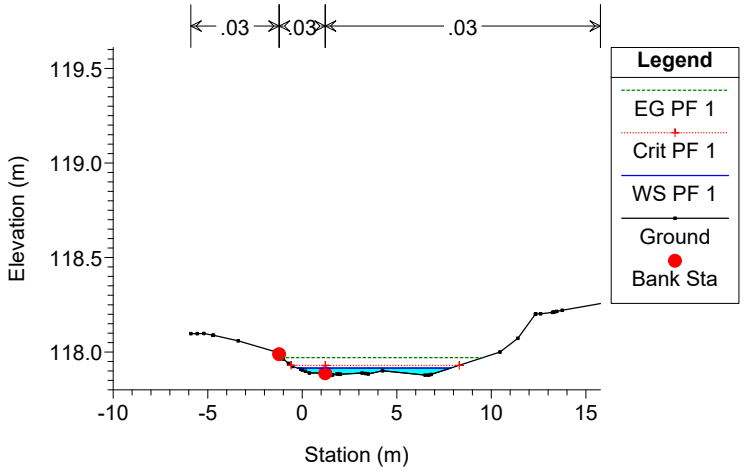
WARRINGAH Plan: PRE DEVELOPMENT
RS = 30.000



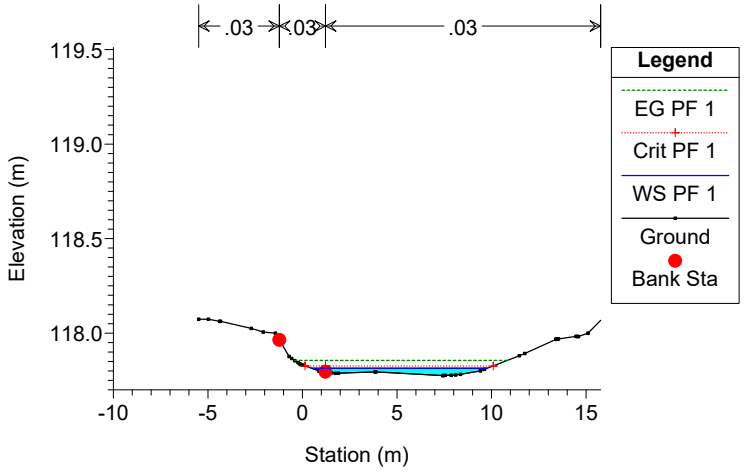
WARRINGAH Plan: PRE DEVELOPMENT
RS = 29.000



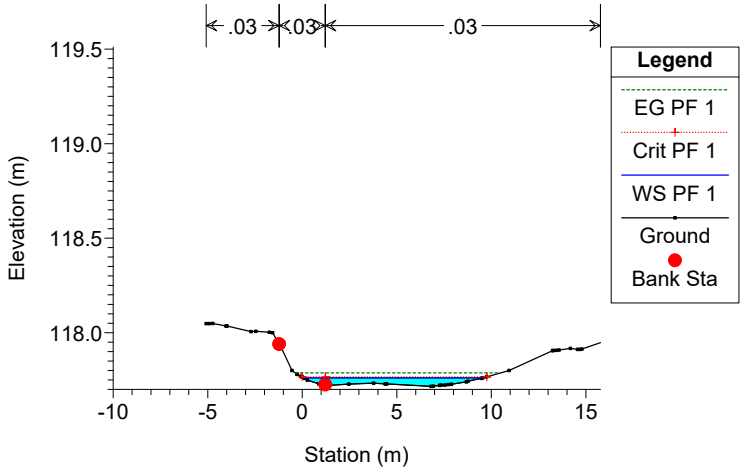
WARRINGAH Plan: PRE DEVELOPMENT
RS = 28.000



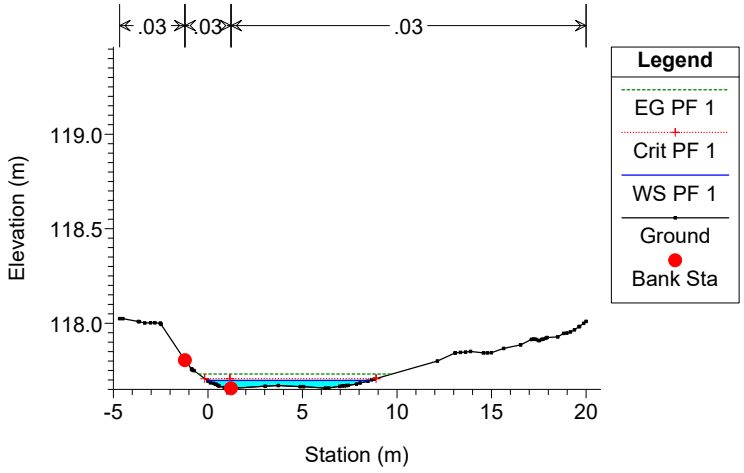
WARRINGAH Plan: PRE DEVELOPMENT
RS = 27.000



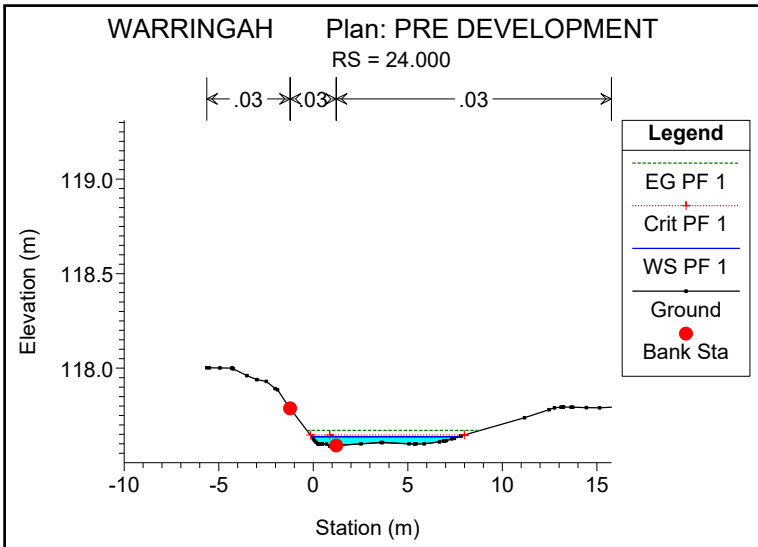
WARRINGAH Plan: PRE DEVELOPMENT
RS = 26.000

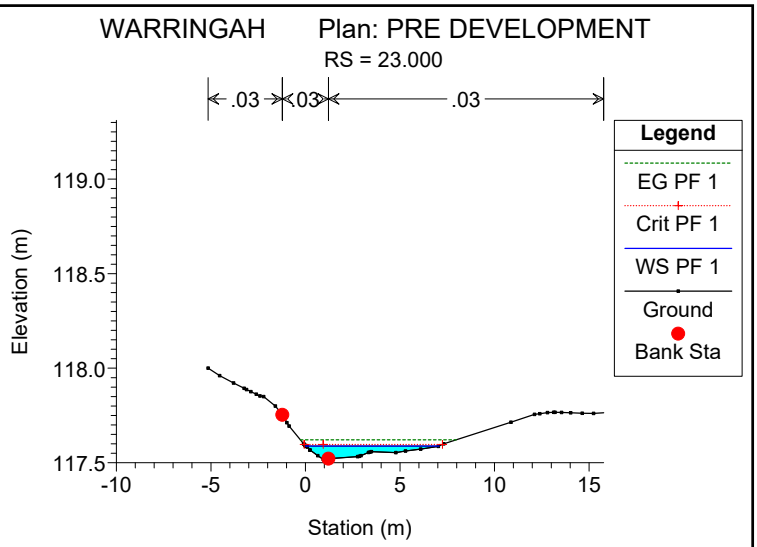


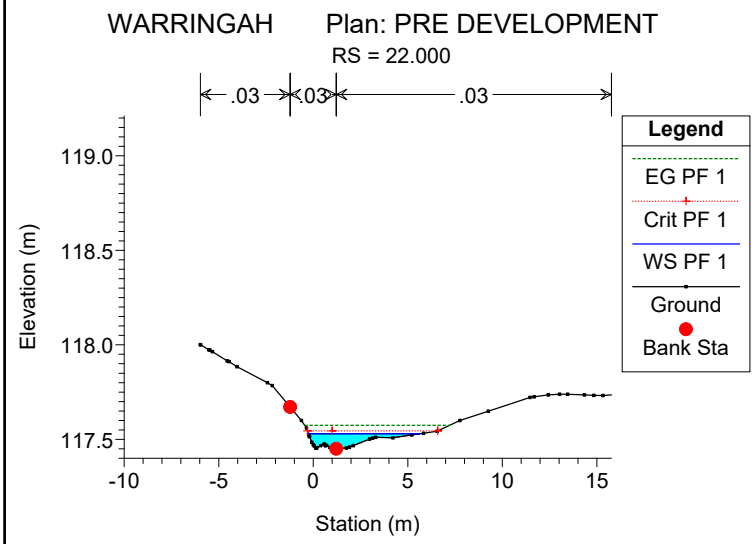
WARRINGAH Plan: PRE DEVELOPMENT
RS = 25.000

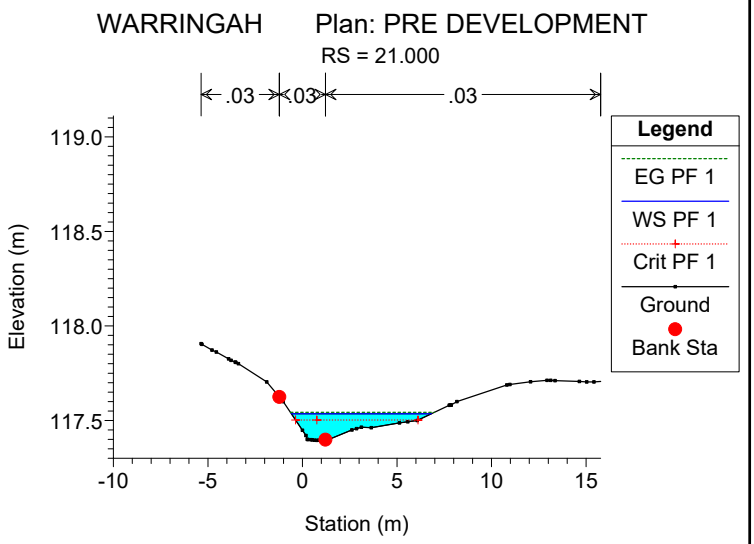


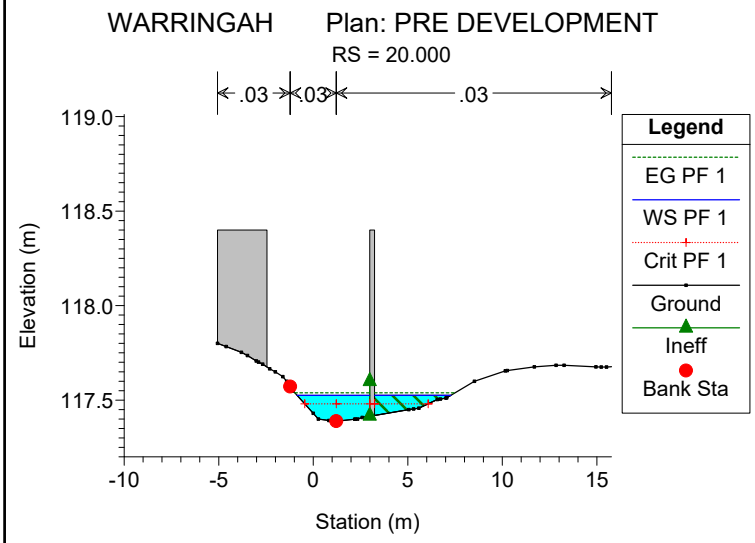
1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

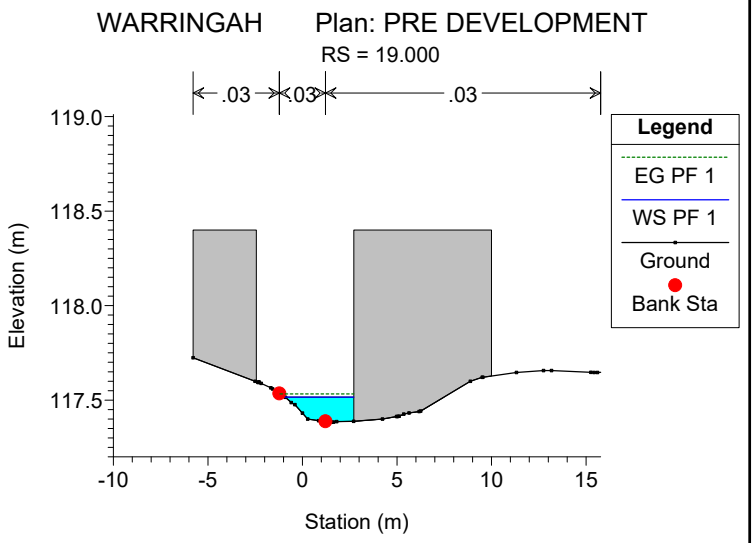


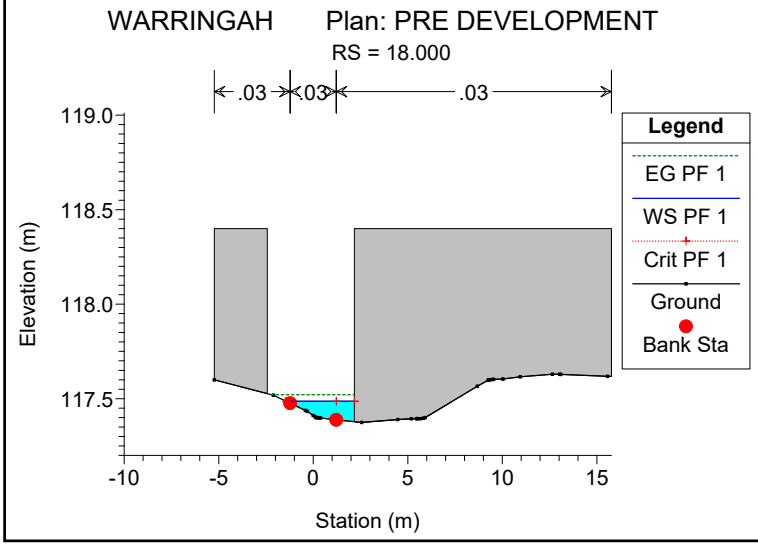


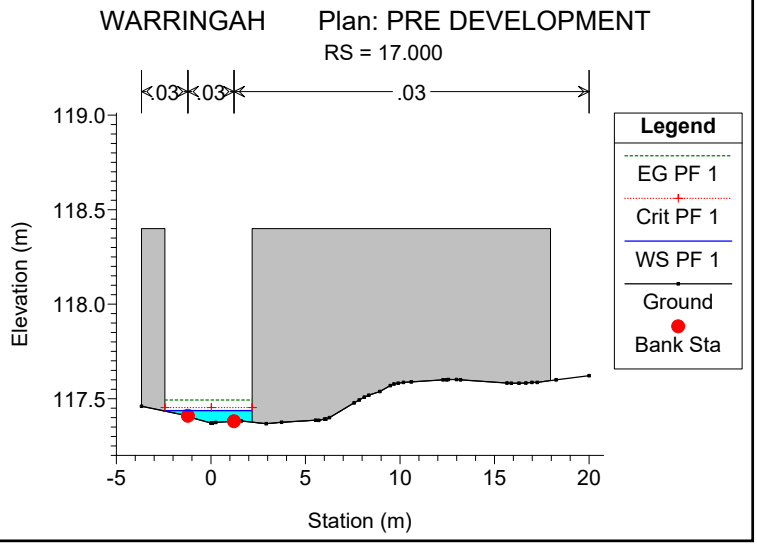






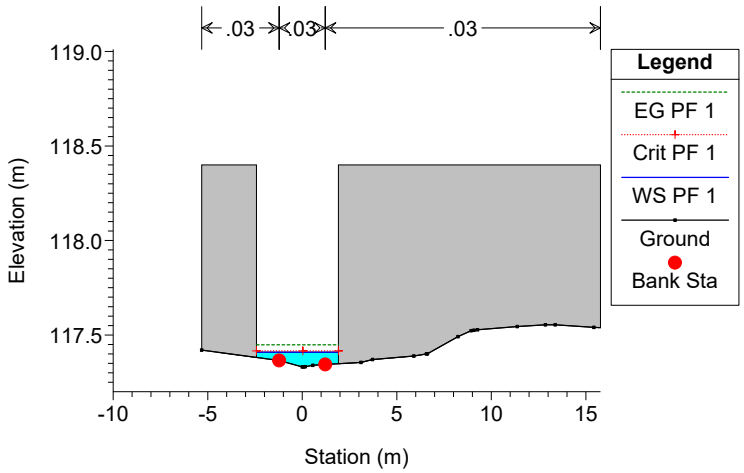




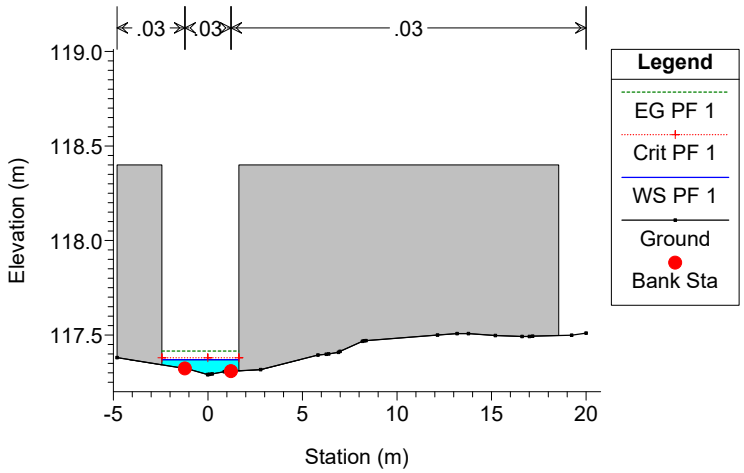


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

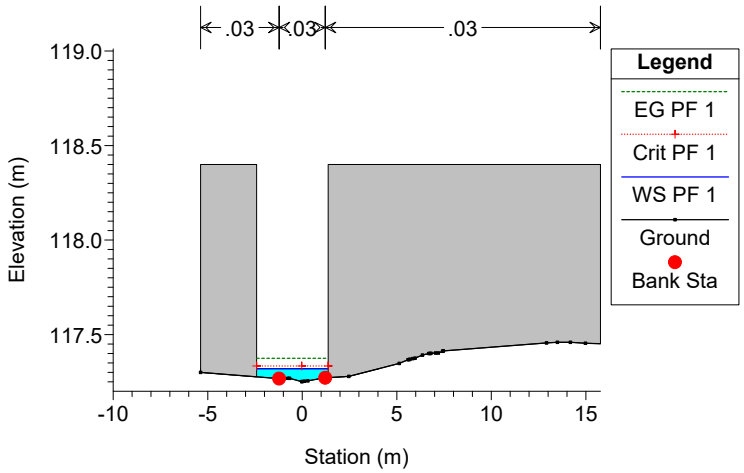
WARRINGAH Plan: PRE DEVELOPMENT
RS = 16.000



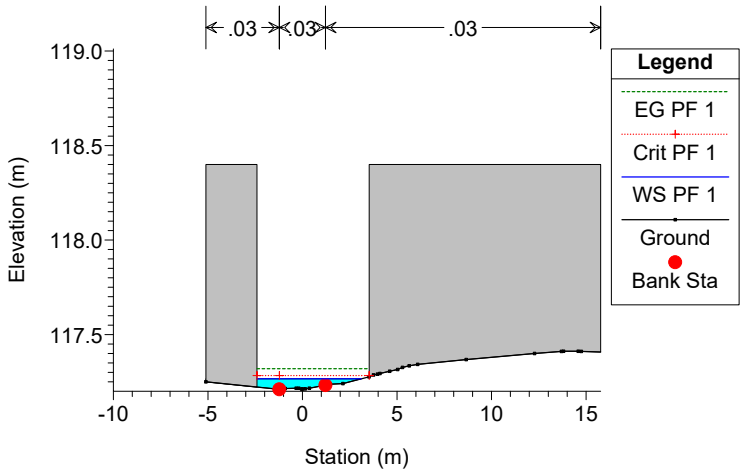
WARRINGAH Plan: PRE DEVELOPMENT
RS = 15.000



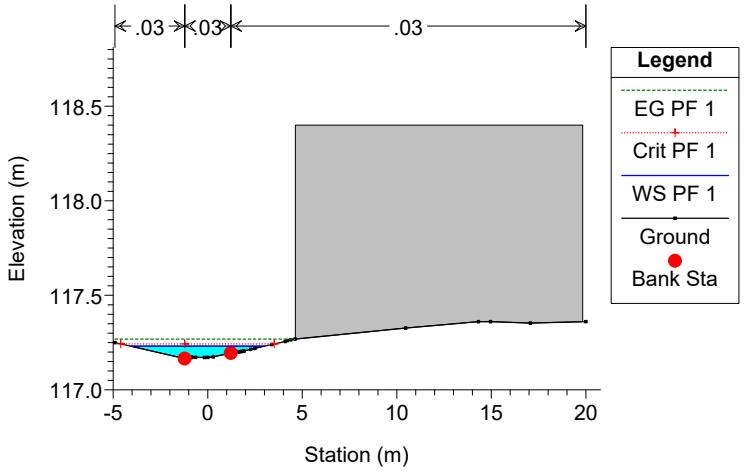
WARRINGAH Plan: PRE DEVELOPMENT
RS = 14.000



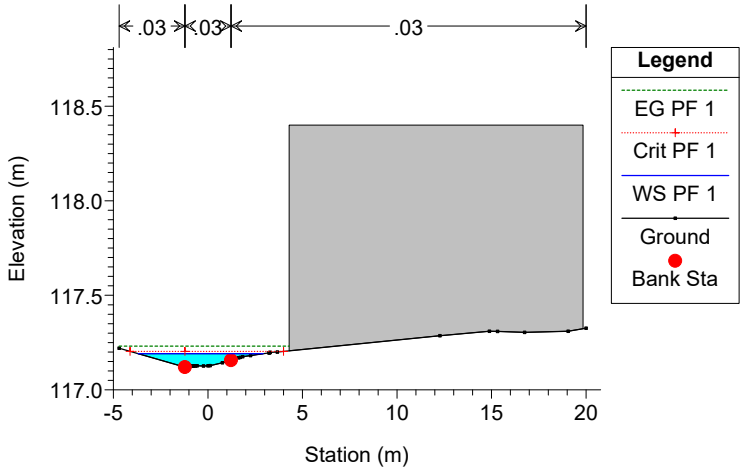
WARRINGAH Plan: PRE DEVELOPMENT
RS = 13.000



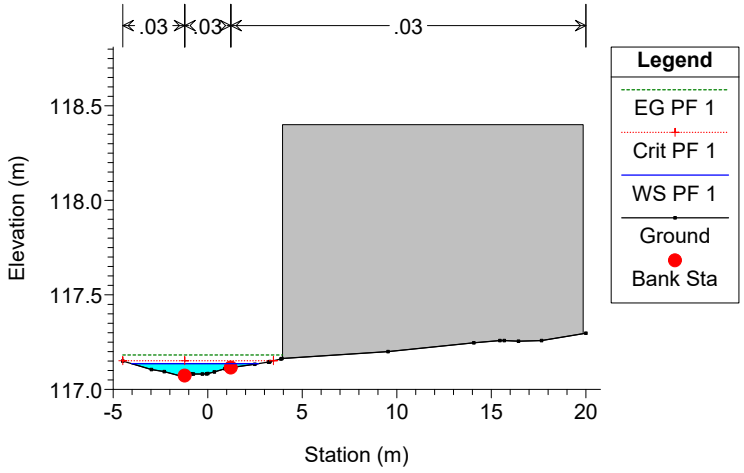
WARRINGAH Plan: PRE DEVELOPMENT
RS = 12.000



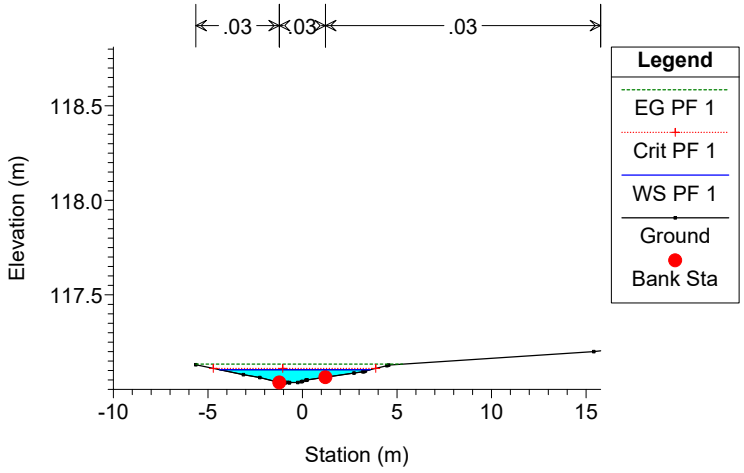
WARRINGAH Plan: PRE DEVELOPMENT
RS = 11.000



WARRINGAH Plan: PRE DEVELOPMENT
RS = 10.000

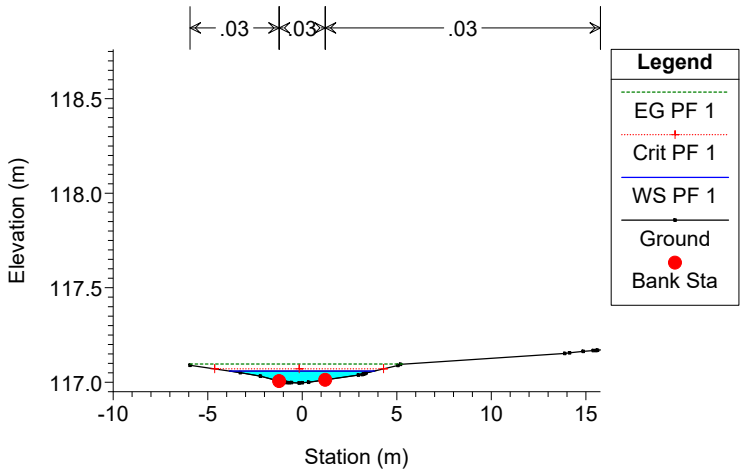


WARRINGAH Plan: PRE DEVELOPMENT
RS = 9.000

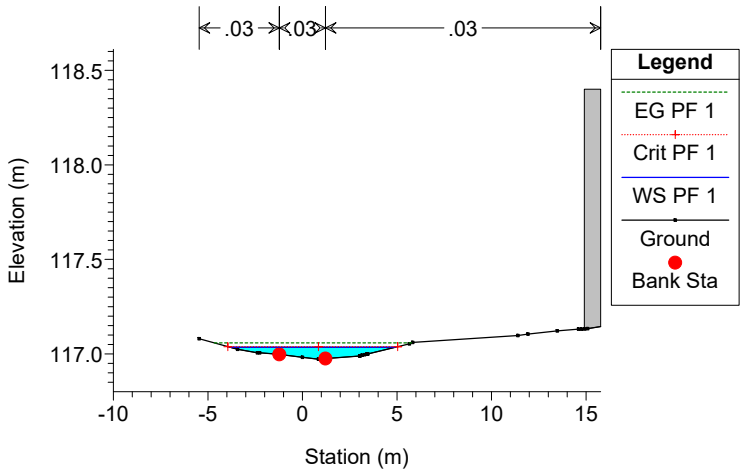


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

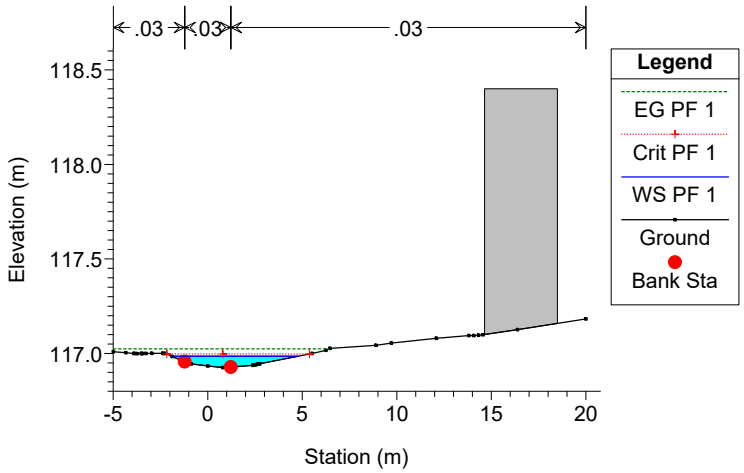
WARRINGAH Plan: PRE DEVELOPMENT
RS = 8.000



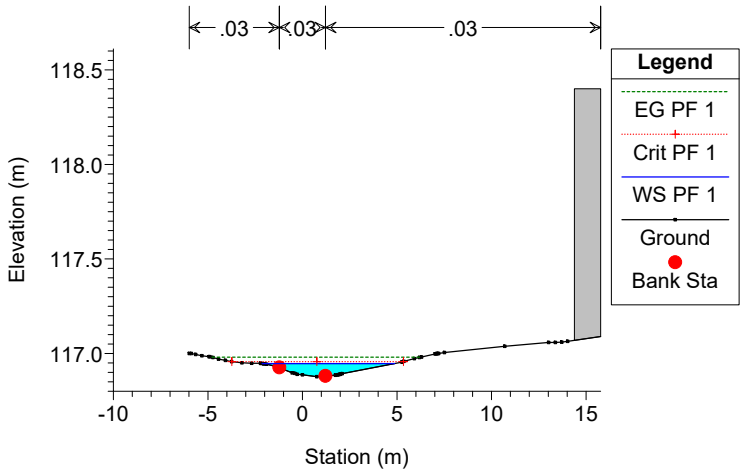
WARRINGAH Plan: PRE DEVELOPMENT
RS = 7.000



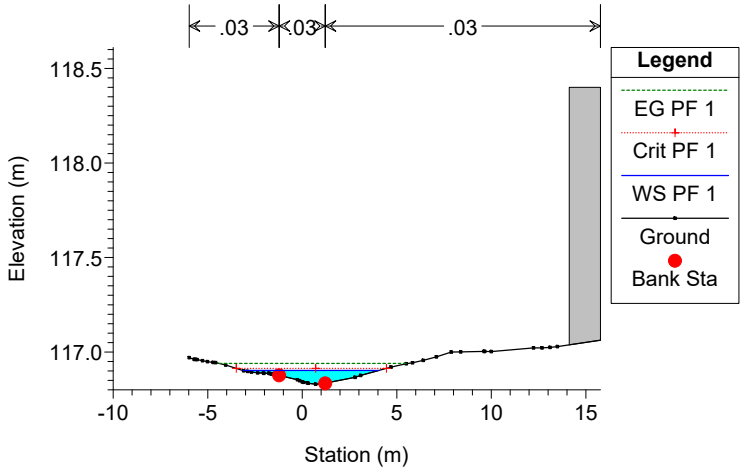
WARRINGAH Plan: PRE DEVELOPMENT
RS = 6.000



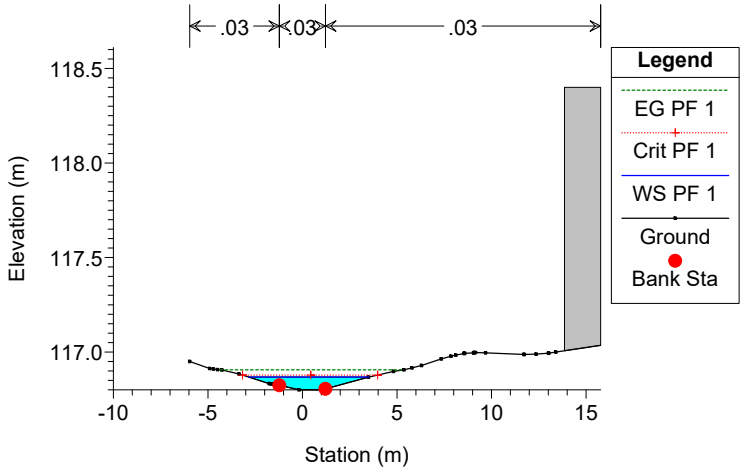
WARRINGAH Plan: PRE DEVELOPMENT
RS = 5.000



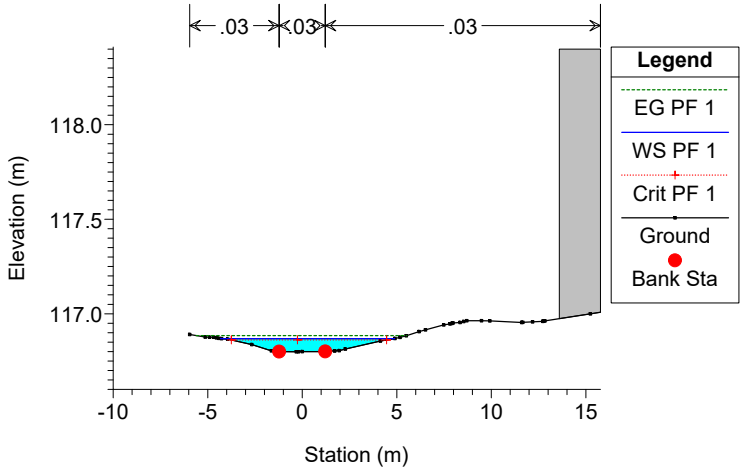
WARRINGAH Plan: PRE DEVELOPMENT
RS = 4.000



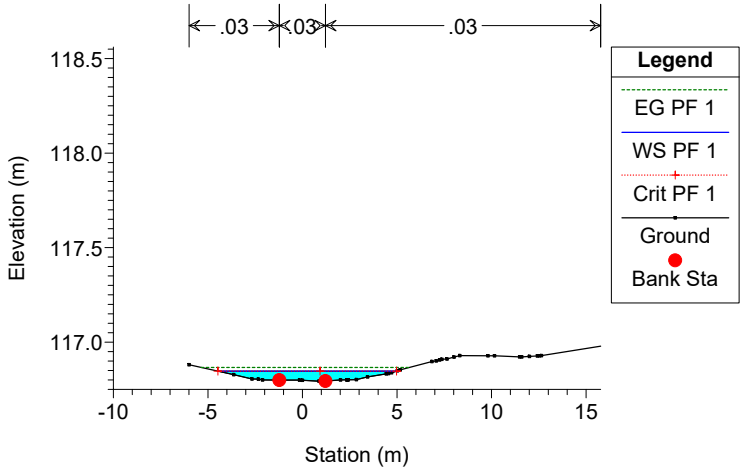
WARRINGAH Plan: PRE DEVELOPMENT
RS = 3.000



WARRINGAH Plan: PRE DEVELOPMENT
RS = 2.000

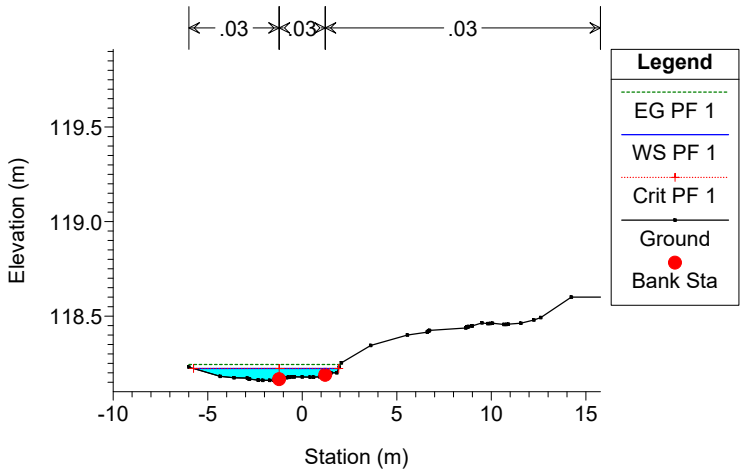


WARRINGAH Plan: PRE DEVELOPMENT
RS = 1.000

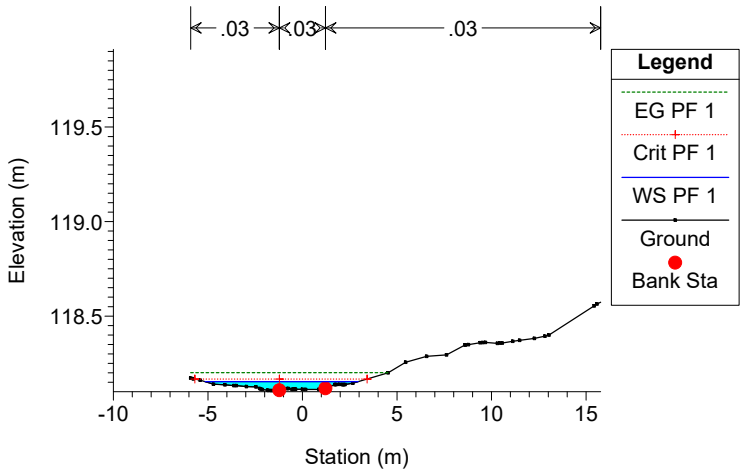


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

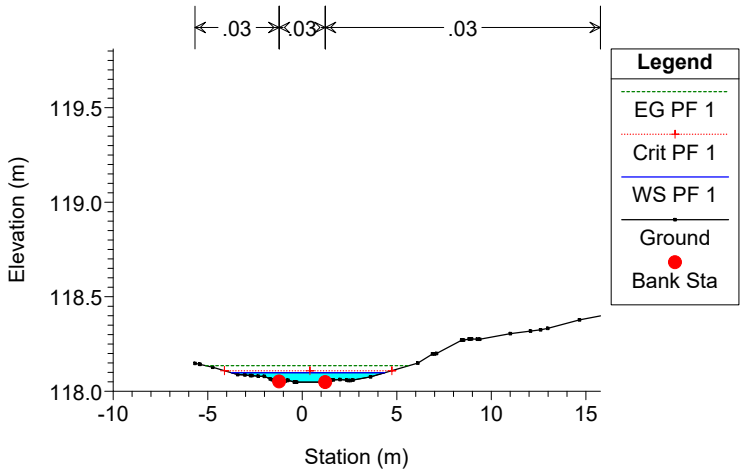
WARRINGAH Plan: POST DEVELOPMENT
RS = 32.000



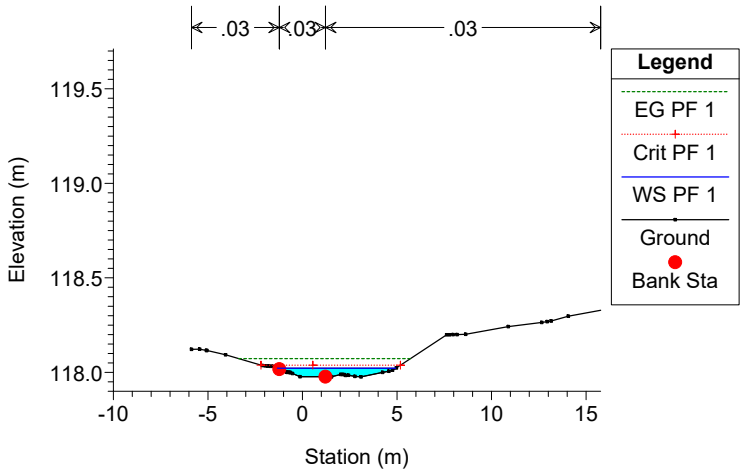
WARRINGAH Plan: POST DEVELOPMENT
RS = 31.000



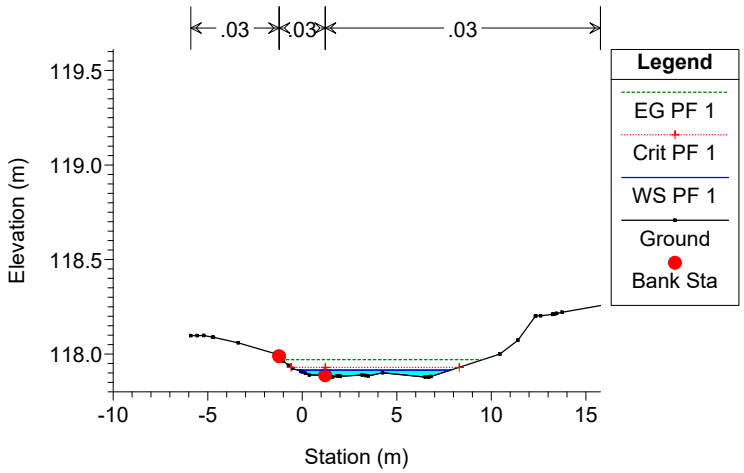
WARRINGAH Plan: POST DEVELOPMENT
RS = 30.000



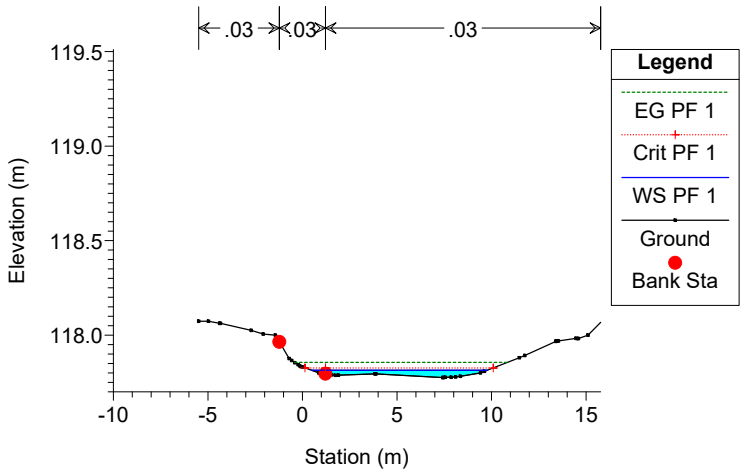
WARRINGAH Plan: POST DEVELOPMENT
RS = 29.000



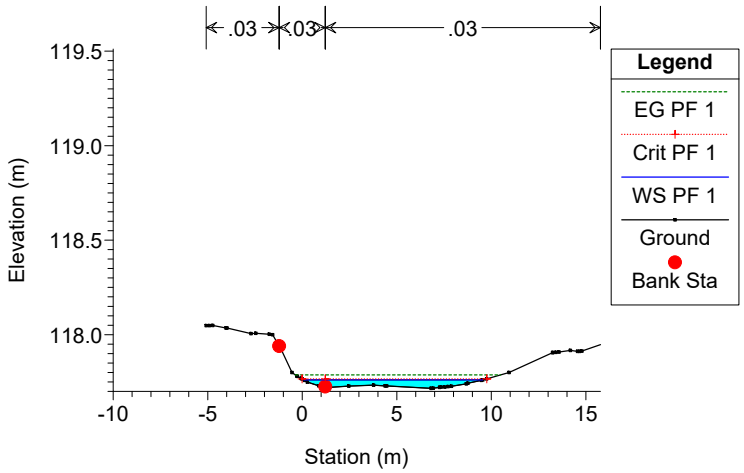
WARRINGAH Plan: POST DEVELOPMENT
RS = 28.000



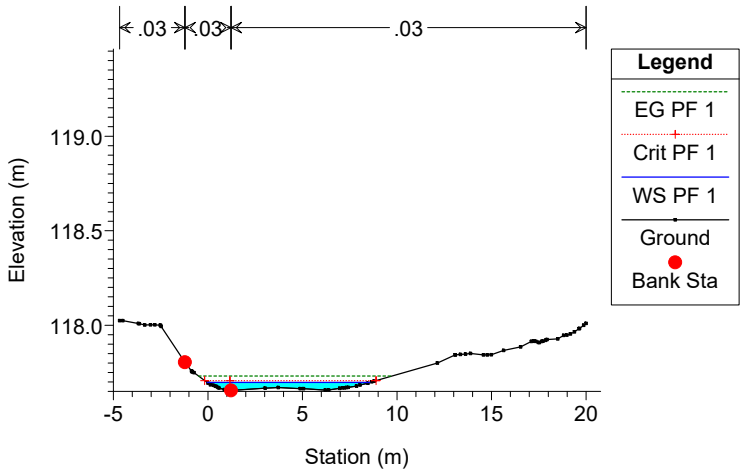
WARRINGAH Plan: POST DEVELOPMENT
RS = 27.000



WARRINGAH Plan: POST DEVELOPMENT
RS = 26.000

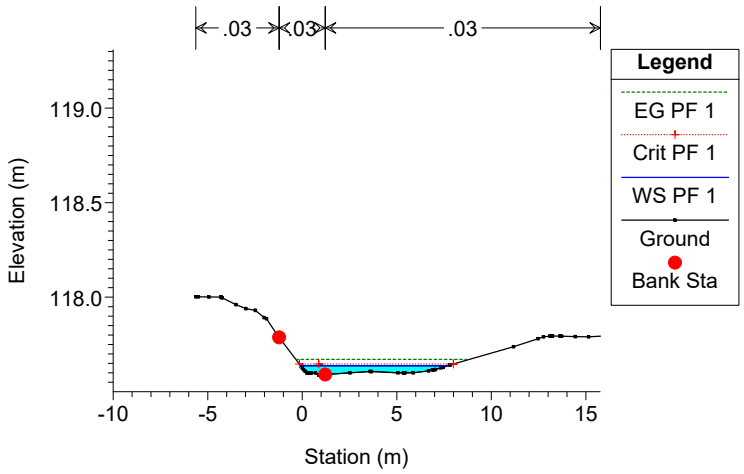


WARRINGAH Plan: POST DEVELOPMENT
RS = 25.000

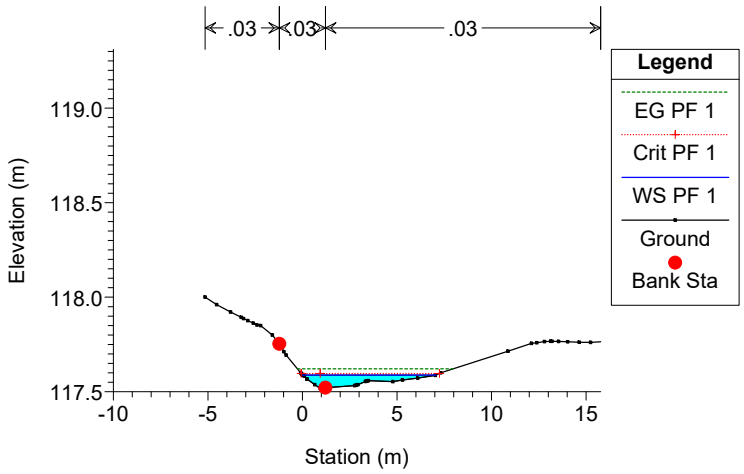


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

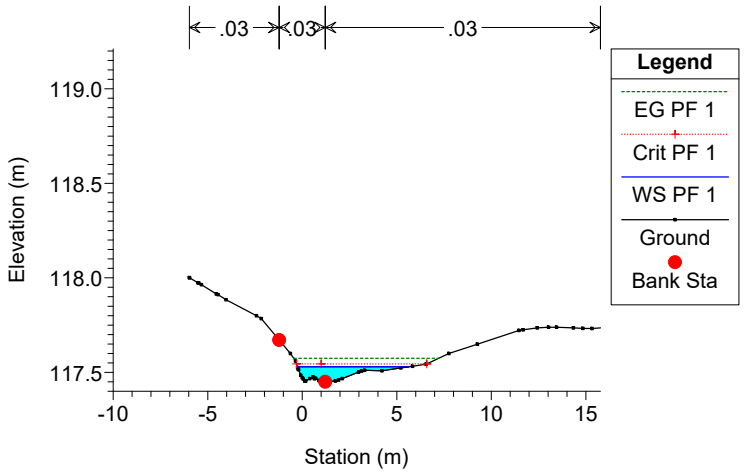
WARRINGAH Plan: POST DEVELOPMENT
RS = 24.000



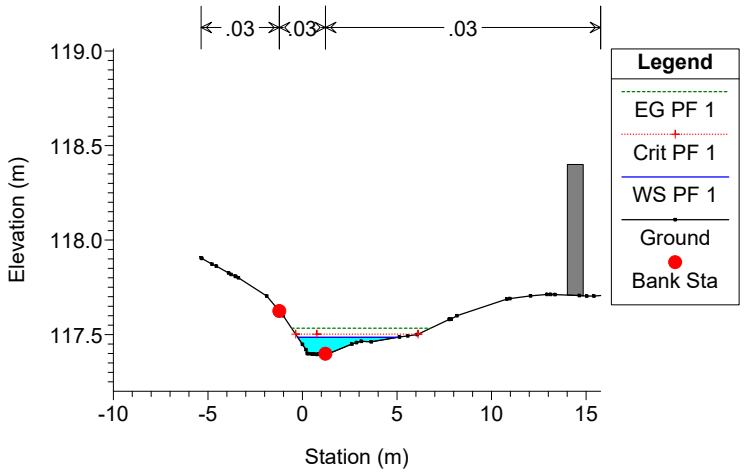
WARRINGAH Plan: POST DEVELOPMENT
RS = 23.000



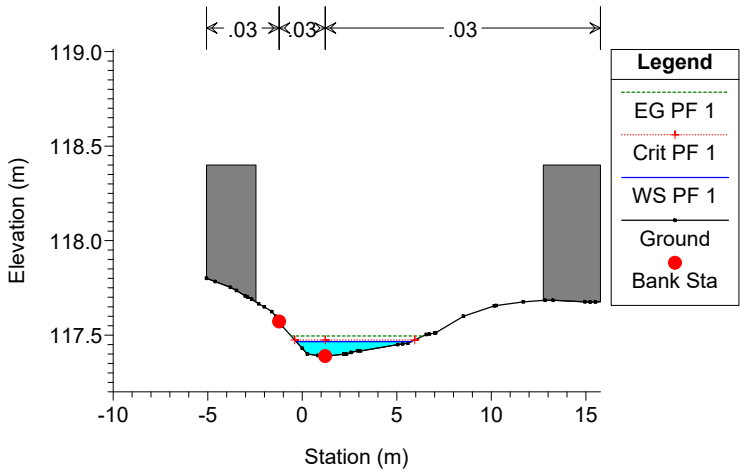
WARRINGAH Plan: POST DEVELOPMENT
RS = 22.000



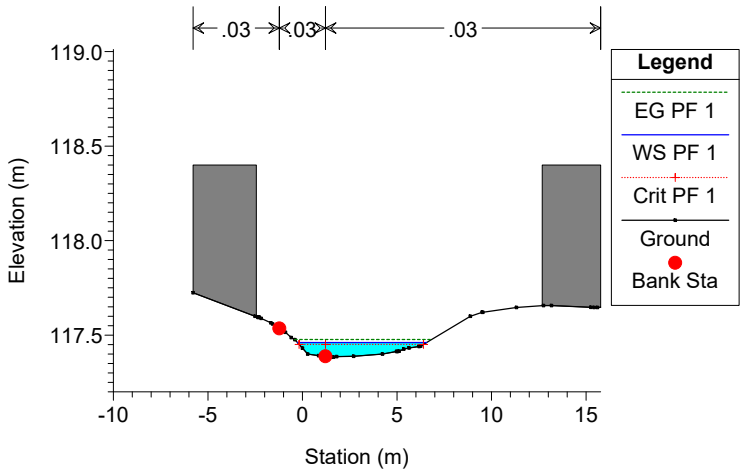
WARRINGAH Plan: POST DEVELOPMENT
RS = 21.000



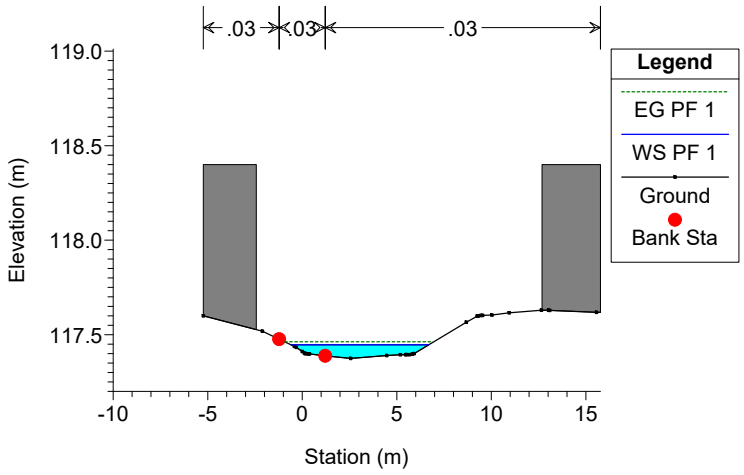
WARRINGAH Plan: POST DEVELOPMENT
RS = 20.000



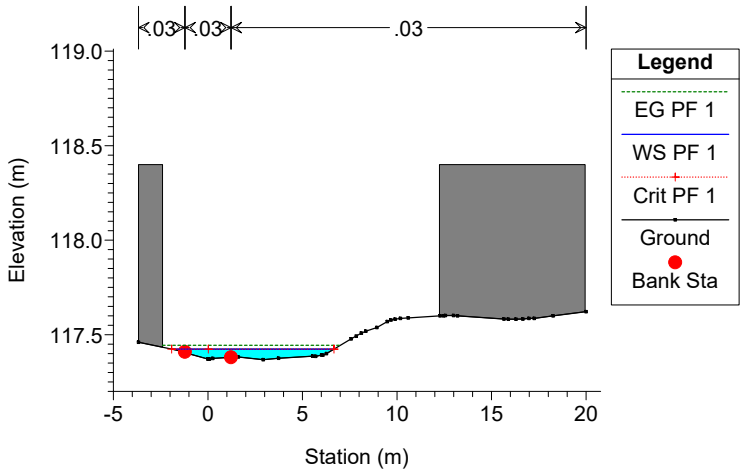
WARRINGAH Plan: POST DEVELOPMENT
RS = 19.000



WARRINGAH Plan: POST DEVELOPMENT
RS = 18.000

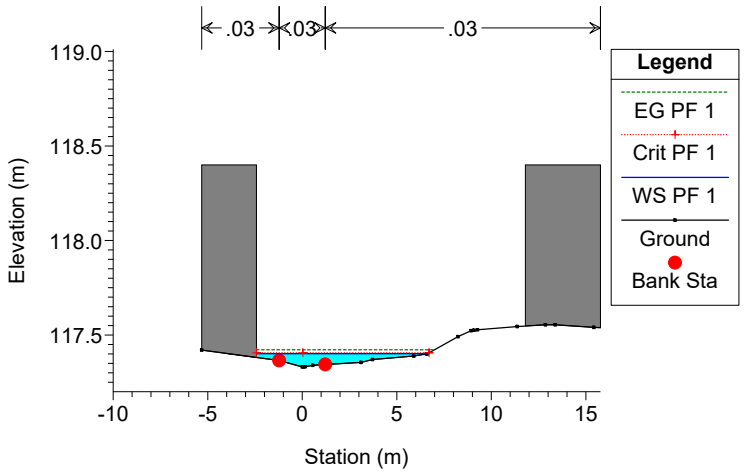


WARRINGAH Plan: POST DEVELOPMENT
RS = 17.000

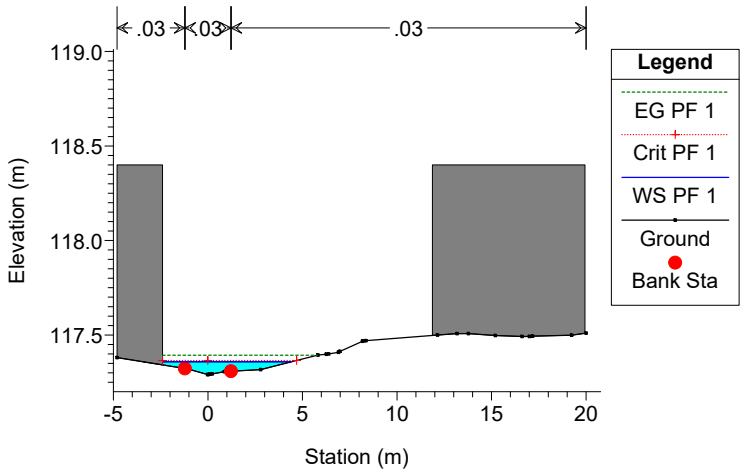


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

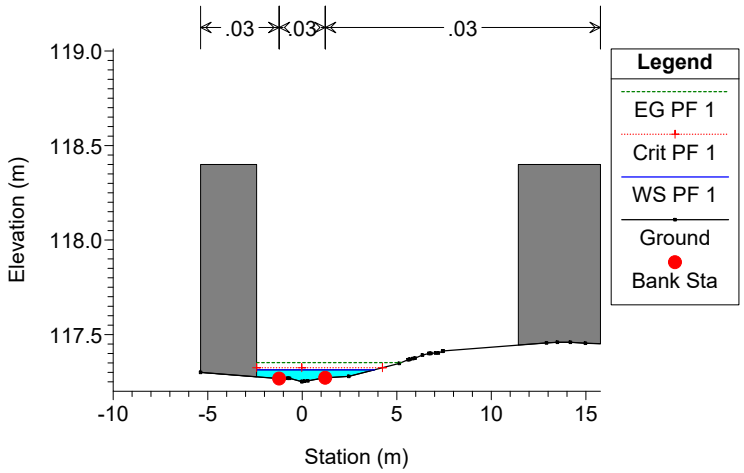
WARRINGAH Plan: POST DEVELOPMENT
RS = 16.000



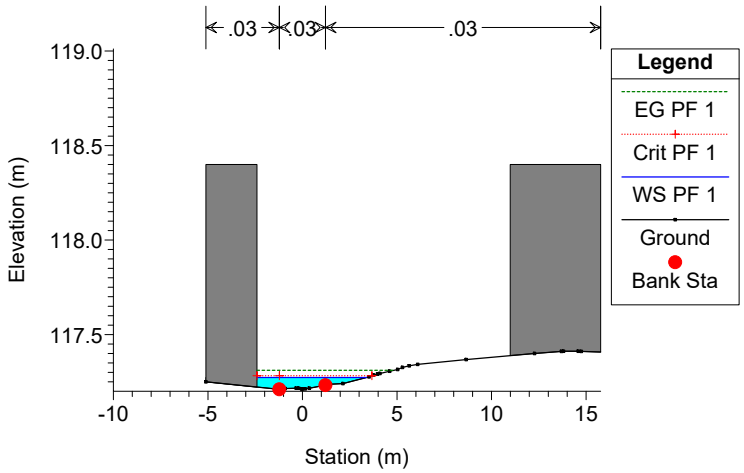
WARRINGAH Plan: POST DEVELOPMENT
RS = 15.000



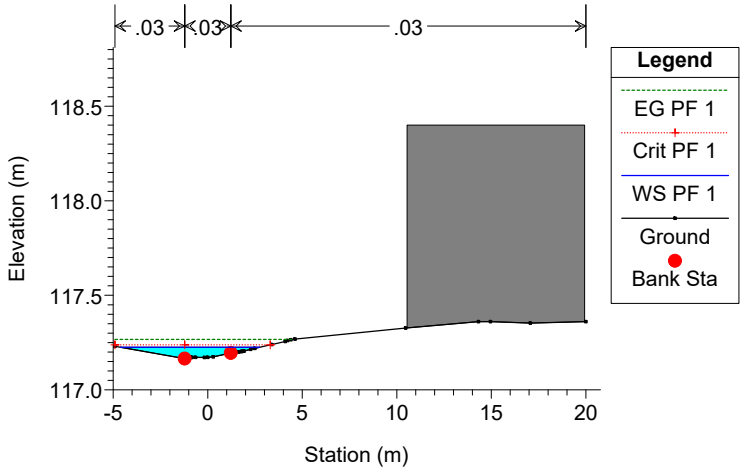
WARRINGAH Plan: POST DEVELOPMENT
RS = 14.000



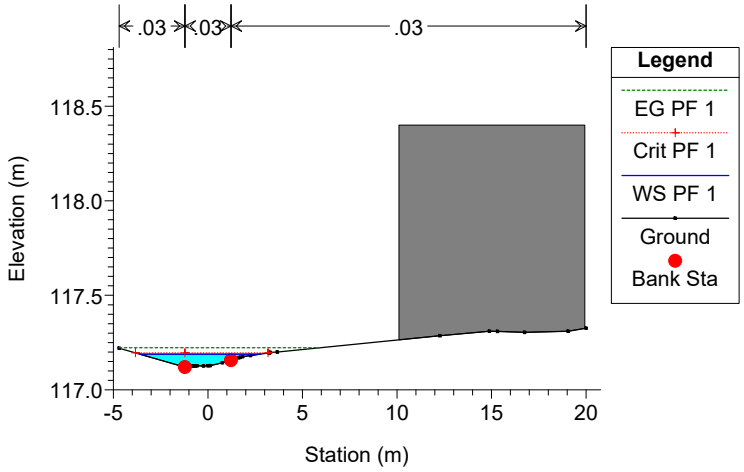
WARRINGAH Plan: POST DEVELOPMENT
RS = 13.000



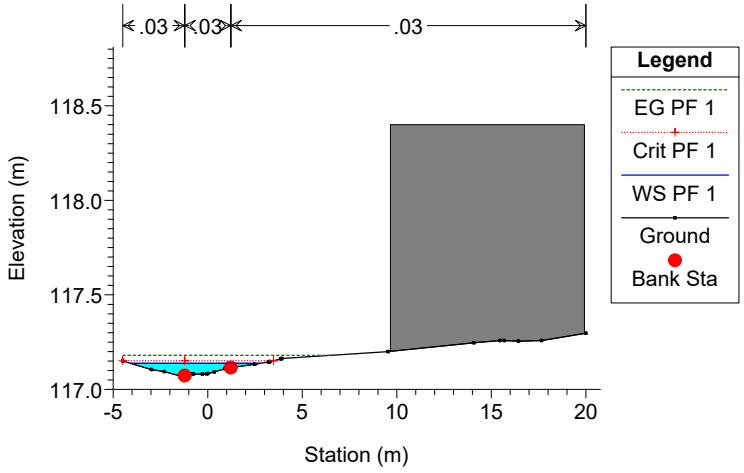
WARRINGAH Plan: POST DEVELOPMENT
RS = 12.000



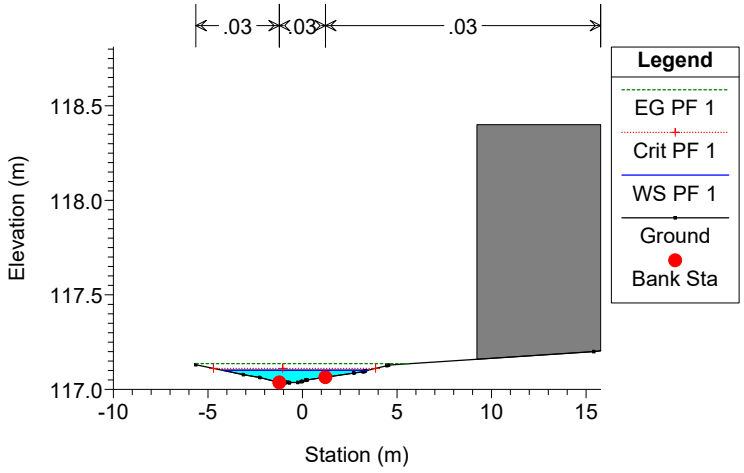
WARRINGAH Plan: POST DEVELOPMENT
RS = 11.000



WARRINGAH Plan: POST DEVELOPMENT
RS = 10.000

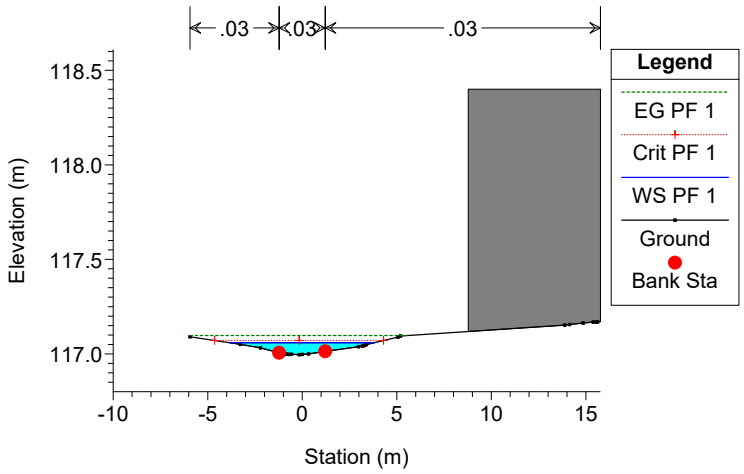


WARRINGAH Plan: POST DEVELOPMENT
RS = 9.000

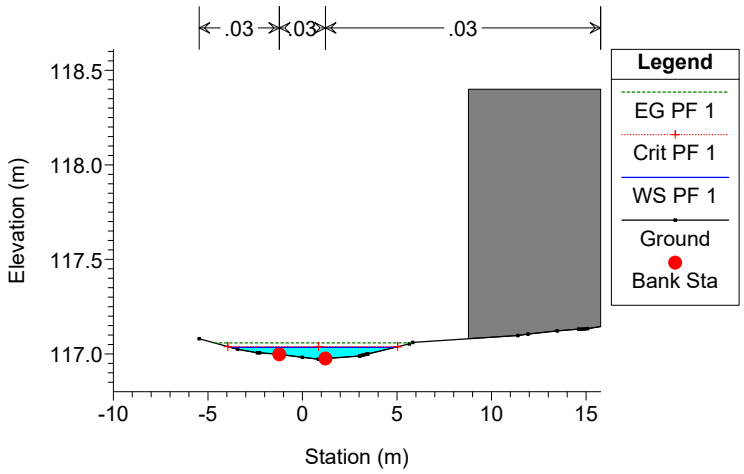


1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m

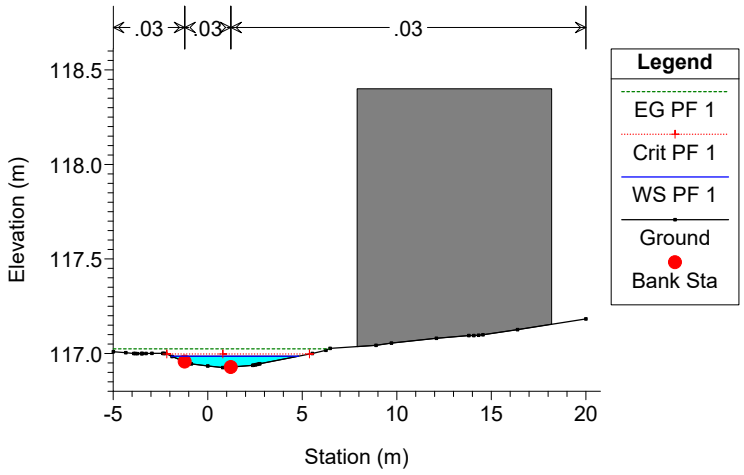
WARRINGAH Plan: POST DEVELOPMENT
RS = 8.000



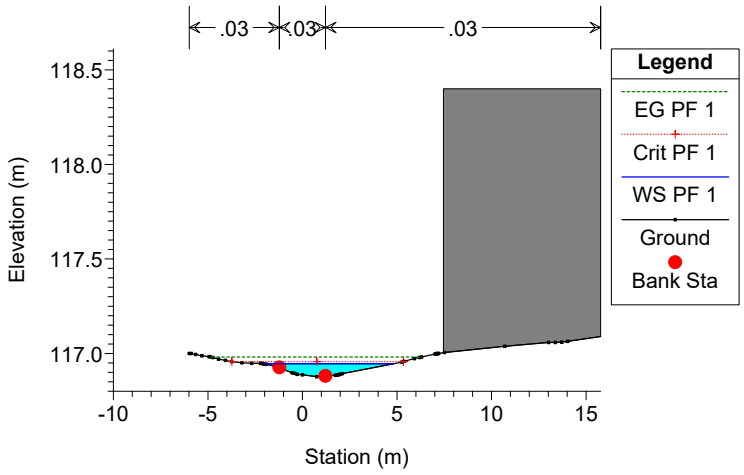
WARRINGAH Plan: POST DEVELOPMENT
RS = 7.000



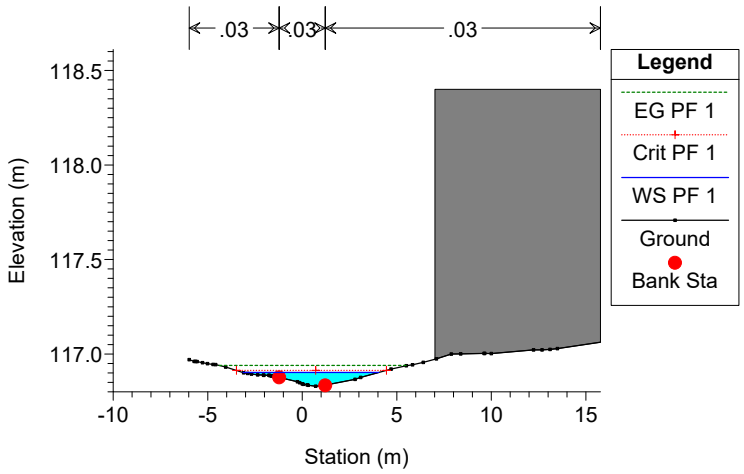
WARRINGAH Plan: POST DEVELOPMENT
RS = 6.000



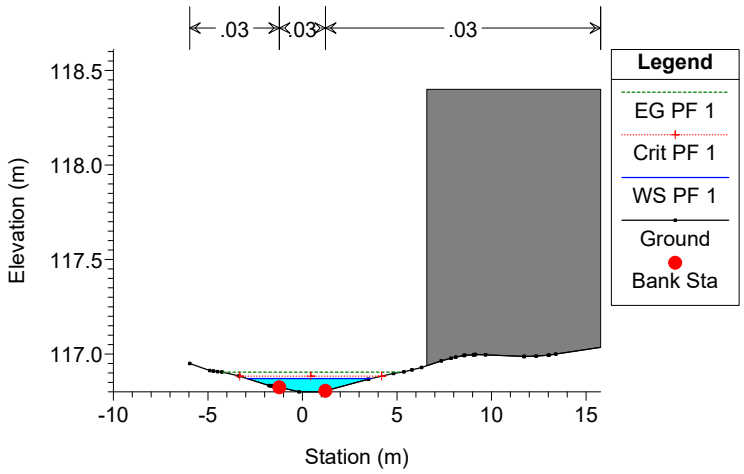
WARRINGAH Plan: POST DEVELOPMENT
RS = 5.000



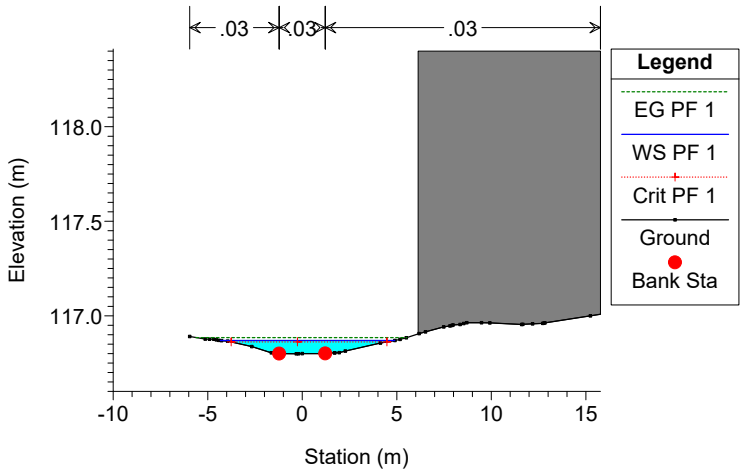
WARRINGAH Plan: POST DEVELOPMENT
RS = 4.000



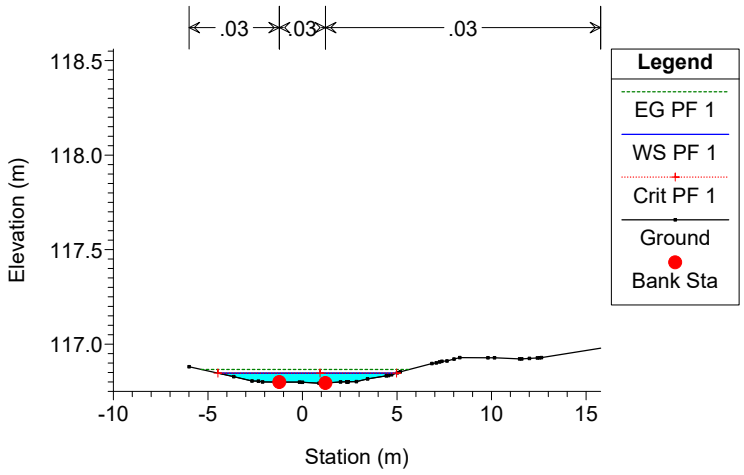
WARRINGAH Plan: POST DEVELOPMENT
RS = 3.000



WARRINGAH Plan: POST DEVELOPMENT
RS = 2.000



WARRINGAH Plan: POST DEVELOPMENT
RS = 1.000



1 cm Horiz. = 4 m 1 cm Vert. = 0.4 m