

Our Ref: 110350_2_Pipe_TC03_and_TC04.docx

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5 May 2017

Blacktown City Council
PO Box 633
Blacktown NSW 2148

Attn: Georg Eberl

**Subject: Marsden Park Section 94 Works;
Piped Option for Trunk Drainage Channel TC03 and TC04**

Dear Georg,

Further to the assessment submitted by Cardno (October 2016), J. Wyndham Prince has been engaged by Stockland to provide a simplified investigation into the feasibility of piping the proposed trunk drainage channels known as MS 1.6 and MS 1.7 within the Marsden Park Contribution Plan No. 21 in lieu of the channels which were proposed as part of the Marsden Park Residential Precinct rezoning process. The piping of these channels will allow approximately 1.2 ha of land to be used as Public Open Space, enhancing the urban outcome of the Marsden Park Residential Precinct.

The purpose of this letter is to gain Council's 'in principle' support to alter the configuration of these trunk drainage elements from channels to a series of pipes. A more detailed hydraulic assessment will be undertaken as part of the detailed concept designs to support the Section 94 works which will be formally submitted for Council's approval.

1. BACKGROUND

Trunk Drainage Channels TC03 and TC04 which formed part of the Water Cycle Management Strategy for the Marsden Park Residential Precinct are referred to in the Marsden Park Contributions Plan No. 21 as items MS 1.7 and MS 1.6 respectively, and discharge into trunk drainage channel MS 1.5 which conveys these flows into regional detention MS 1.0 (formerly known as Basin 4).

The Contributions Plan describes Item MS 1.6 as a 20.5 m wide landscaped open channel, and item MS 1.7 as a 27.7 m wide landscaped open channel. Plate 1.1 provides an overview of the locality of these channels within the Marsden Park Residential precinct.

The *Marsden Park Residential Precinct Post Exhibition Water Cycle & Flood Management Strategy Report*¹ documented Trunk Drainage Channel TC03 as a 370 m long channel with 1:4 batter slopes and a base width transitioning from 14.8 m to 19.2 m, with a 1% AEP flow capacity (climate change conditions) of 14 m³/s to 17 m³/s prior to the confluence with TC04. The upper portion of Trunk Drainage Channel TC04 is documented as a 294 m long channel with 1:4 batter slopes and a base width of 9.4 m which transitions to 35.4 m at the confluence with TC03, and a 1% AEP flow capacity (climate change conditions) of 10 m³/s which increases to 31.2 m³/s at the confluence with TC03.

¹ Marsden Park Residential Precinct Post Exhibition Water Cycle & Flood Management Strategy Report, J. Wyndham Prince, July 2013.

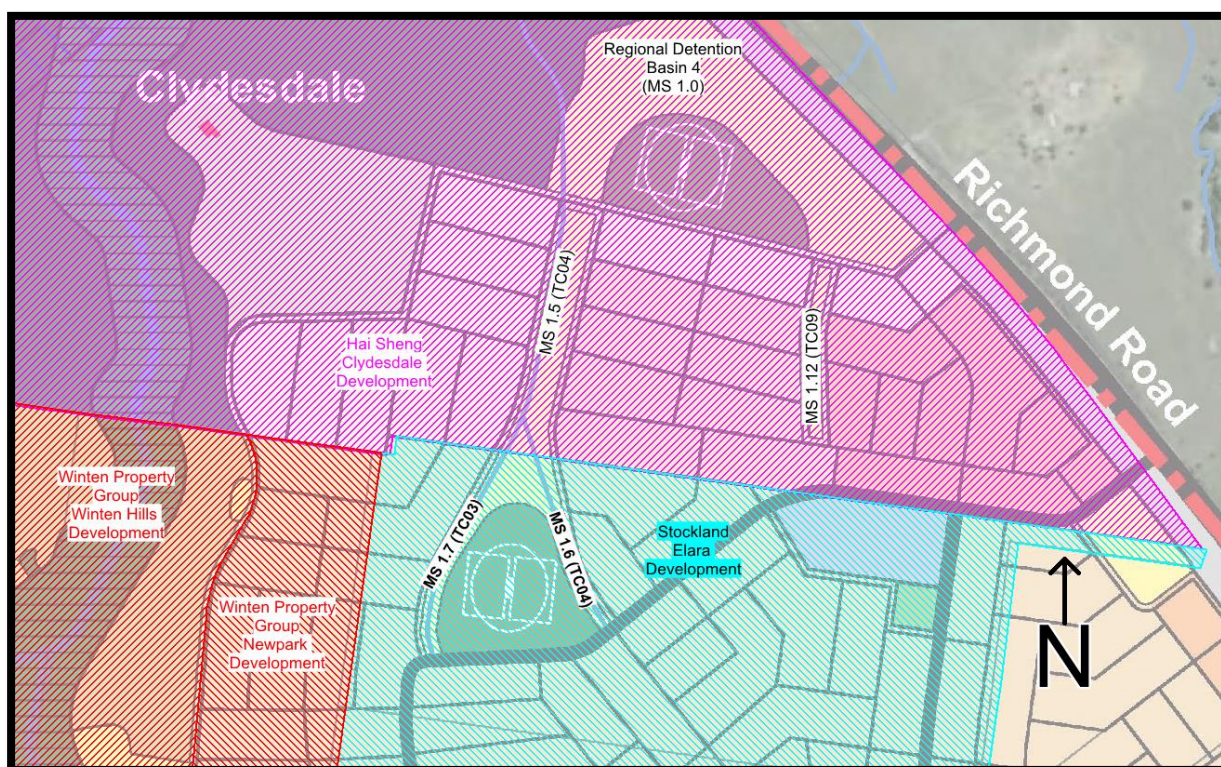


Plate 1.1 Site Locality

In September 2015, the hydrologic modelling (XP-RAFTS) that supported the *Marsden Park Residential Precinct Post Exhibition Water Cycle & Flood Management Strategy Report* was updated to support the Woorong Park Precinct 1 subdivision development application (JRPP-15-2324).

Further refinement to the hydrologic modelling has been completed to inform the design of the Section 94 works in the Marsden Park Precinct. This design will include the trunk drainage channels, regional detention basins and rain gardens throughout the precinct for multiple developers. The catchments reflect the best information for Stockland's Elara development, and Winten Property Group's Newport and Winten Hills development.

As we understand it, the street drainage system has been designed (and constructed) to cater for 10% AEP flows, and hence approximately 73% of the design trunk drainage flow will already be in the ground at the head of the trunk drainage system. The remaining flow will overtop the kerb at sag points in the road system and be collected in an appropriately sized surface inlet pit structure at the head of the proposed trunk drainage pipe systems. Table 1.1 provides details of the anticipated flows that need to be catered for in the trunk drainage culvert design.

Table 1.1 – Trunk Drainage System Flow

ID	Catchment Area (ha)	Impervious Portion of Catchment (%)	1% AEP Flow (m ³ /s)	10% AEP Flow (m ³ /s)	Overland Flow to be Captured by Pit at Head of Trunk Drainage System (1% AEP - 10% AEP) (m ³ /s)
MS 1.6	19.64	85	10.2	7.5	2.7
MS 1.7	34.90	85	18.2	13.3	4.9

The overland flow off the open space/sports field (approximately 5.3 ha) will be in the order of 1.2 m³/s in the 10% AEP event, and 1.8 m³/s in the 1% AEP event (split roughly 50/50 east/west), and can be appropriately managed via an overland swale either side of the field that will be constructed over the proposed pipe infrastructure.

2. CULVERT ASSESSMENT

A high level culvert assessment has been undertaken in HY-8 software to confirm the piped arrangement necessary to convey 1% AEP (climate change) flows through MS 1.6 and MS 1.7. Table 2.1 provides details of the culverts required to convey these flows.

Tailwater levels (Regional 1% AEP tailwater 17.3 m AHD + 1% AEP development flows) were determined based on interrogation of the flood surface that informed Figure 6.15 in the *Marsden Park Residential Precinct Post Exhibition Water Cycle & Flood Management Strategy Report*¹.

Table 2.1 – Preliminary Culvert Sizing of MS 1.6 and MS 1.7

ID	U/S Road Surface (m AHD)	U/S Invert (m AHD)	Length (m)	Slope	1% AEP Tailwater (m AHD)	1% AEP Design Flow (m ³ /s)	Configuration	Capacity (m ³ /s)
MS 1.6	22.00	19.10	200	0.5%	19.00	18.2	4 x 1200 mm RCP + 1 x 1050 mm RCP	18.7
MS 1.7			270		19.20	10.2	3 x 1200 mm RCP	10.7

The assessment indicates that four (4) 1200 mm Reinforced Concrete Pipes (RCPs) and one (1) 1050 mm RCP will be required for MS 1.6, and three (3) 1200 mm RCPs will be required for MS 1.7. The Hy-8 results are provided in Appendix A.

It is anticipated that the final section of culverts may take the form of Reinforced Concrete Box Culverts (RCBCs) to provide a more aesthetically pleasing outlet for the surrounding residents and visitors to the precinct. Further details of this arrangement will be provided as part of the detailed concept design for the Section 94 works.

3. URBAN OUTCOME

The piping of MS1.6 and MS 1.7 adjacent to the proposed northern playing fields at Elara will provide Council and the community with additional active, useable open space. A DA has been submitted by Stockland for the adjoining residential Stages 33 + 34 at Elara that excludes residential development within the proposed SP2/RE1 land. Note that the northern playing fields precinct will be subject to a planning proposal to adjust the zone boundary lines to reflect the amended road layout around the playing fields associated with Stages 33 + 34. There will be no net increase in residential development arising from the rezoning. To assist the finalisation of the planning proposal we seek Council's confirmation of their preferred zoning for the piped drainage section i.e. retain as SP2 or reclassify as RE1.

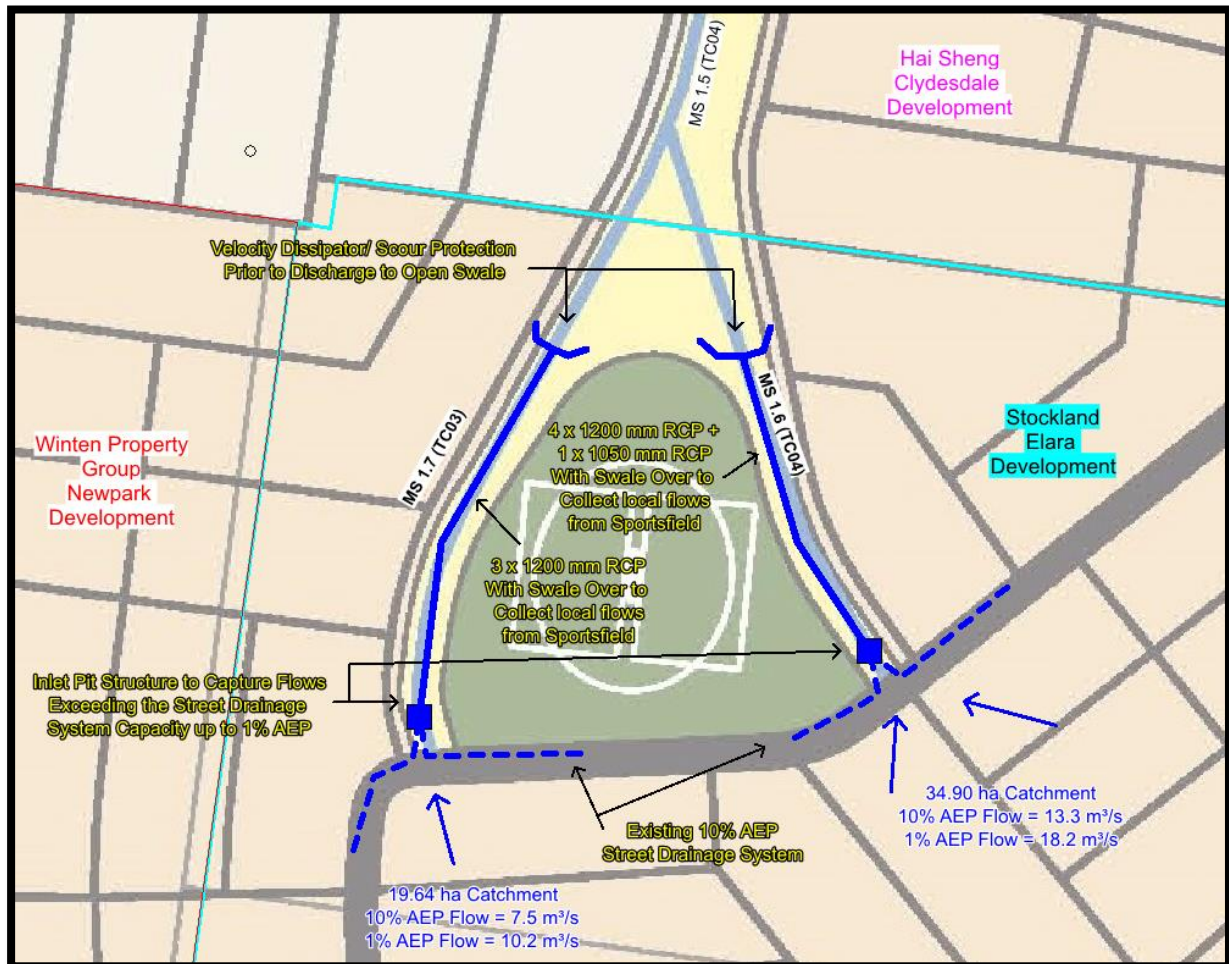


Plate 3.1 Proposed Amendment

4. SUMMARY/CONCLUSION

This report details the investigation completed in order to gain Council's 'in principle' support to alter the configuration of trunk drainage elements MS 1.6 and MS 1.7 in the Marsden Park Contributions Plan No. 21 from landscaped channels to a piped solution.

The XP-RAFTS hydrologic modelling adopted for the *Marsden Park Residential Precinct - Post Exhibition Water Cycle & Flood Management Strategy Report* has been updated to reflect the current and anticipated subdivision design within the Marsden Park Residential Precinct. 1% AEP climate change flows have been extracted to determine the pipe configuration necessary to convey these flows as an alternate to an open channel.

A culvert assessment was undertaken in HY-8 software, and it was found that four (4) 1200 mm Reinforced Concrete Pipes (RCPs) and one (1) 1050 mm RCP will be required for MS 1.6, and three (3) 1200 mm RCPs will be required for MS 1.7.

Detailed design details of the trunk drainage elements will be provided as part of the detailed concept design process for Council's approval, however we trust that this letter provides Council with the necessary confidence that piping trunk drainage elements MS 1.6 and MS 1.7 is a feasible option.

Please confirm Council's acceptance of the alternate configuration of the MS 1.6 (TC04) and MS 1.7 (TC03) trunk drainage elements as well as the preferred zoning status for the piped sections (i.e. either SP2 or RE1).

Should there be any queries regarding this matter please do not hesitate to contact David Crompton on 4720 3340 or dcrompton@jwprince.com.au

Yours faithfully

J. WYNDHAM PRINCE



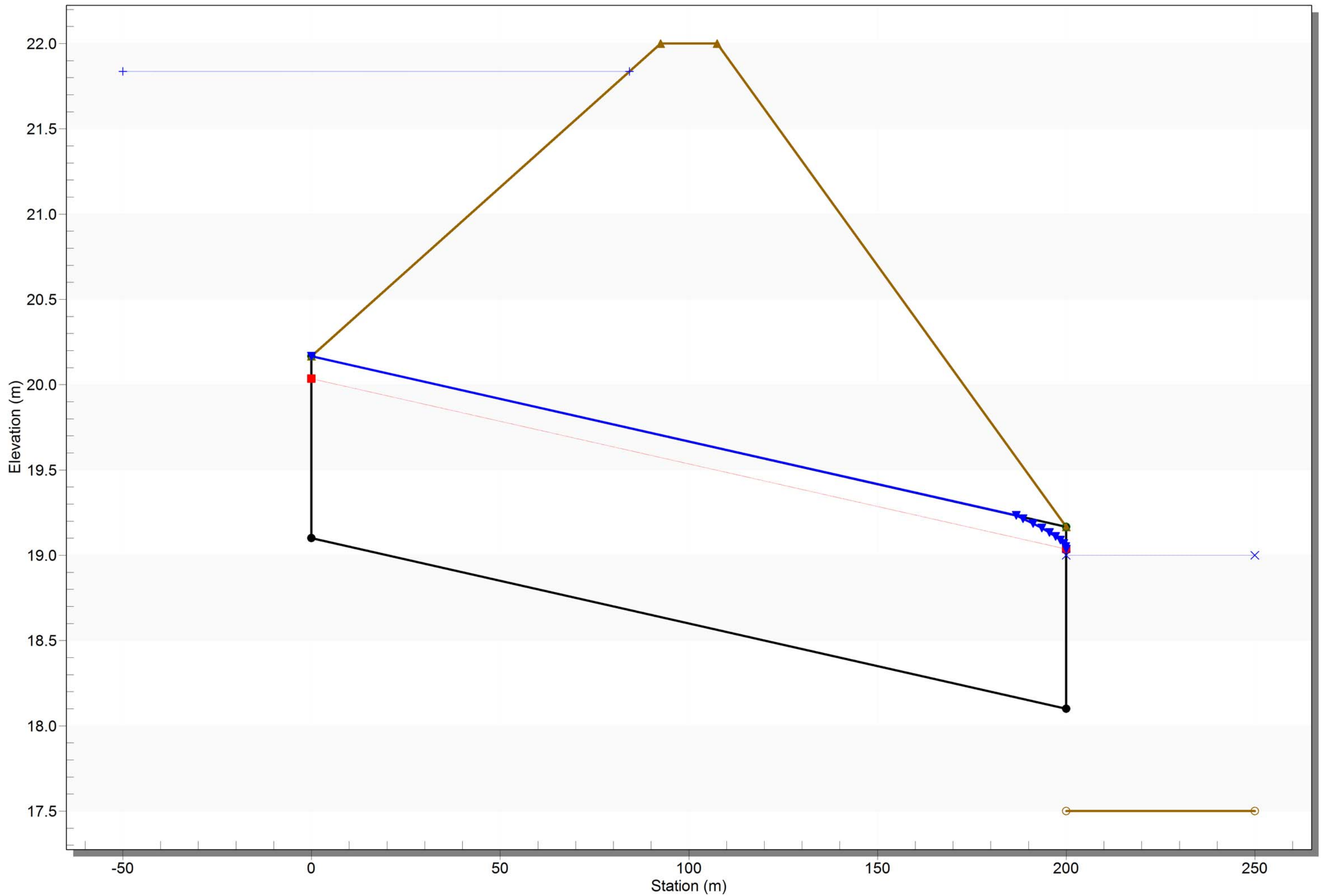
DAVID CROMPTON

Manager – Stormwater and Environment Group

APPENDIX A – HY-8 CULVERT ASSESSMENT RESULTS

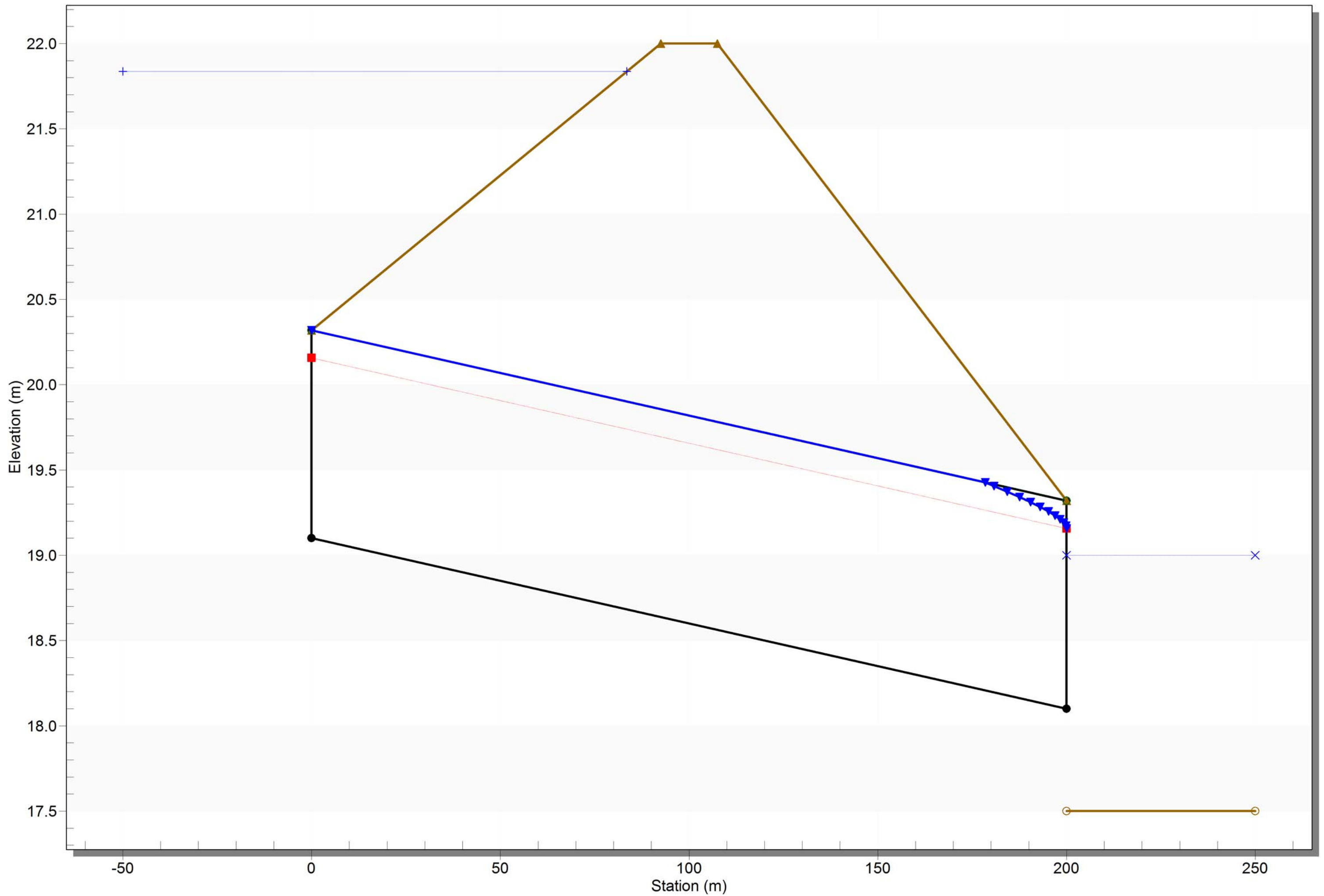
Crossing - MS1.6 (TC04), Design Discharge - 18.20 cms

Culvert - 1 x 1050 mm RCP, Culvert Discharge - 2.83 cms



Crossing - MS1.6 (TC04), Design Discharge - 18.20 cms

Culvert - 4 x 1200 mm RCP, Culvert Discharge - 15.36 cms



HY-8 Analysis Results

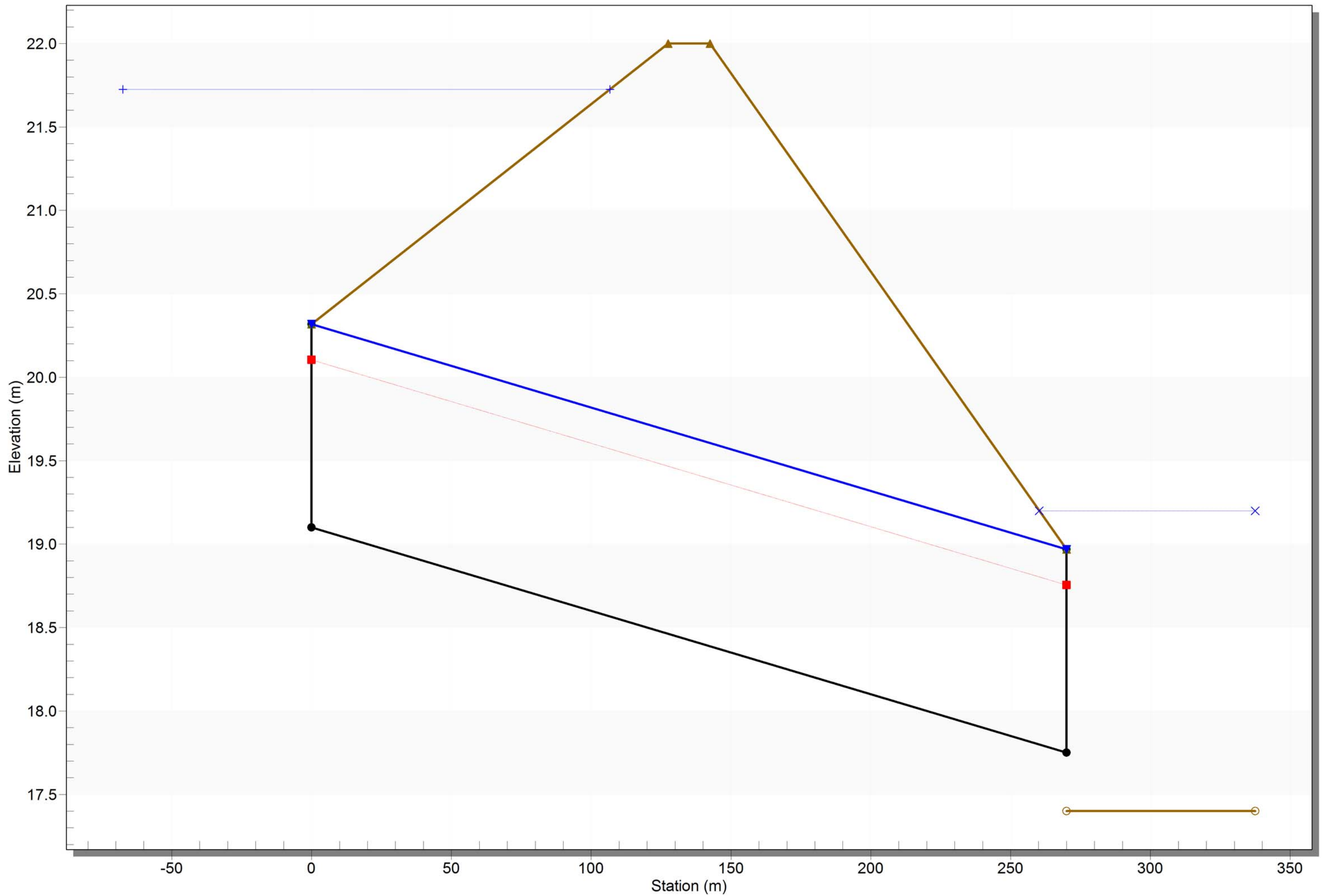
Crossing Summary Table

Culvert Crossing: MS1.6 (TC04)

Headwater Elevation (m)	Total Discharge (cms)	4 x 1200 mm RCP Discharge (cms)	1 x 1050 mm RCP Discharge (cms)	Roadway Discharge (cms)	Iterations
19.10	0.00	0.00	0.00	0.00	0
19.67	3.00	2.45	0.55	0.00	4
19.98	6.00	4.91	1.09	0.00	3
20.24	9.00	7.42	1.59	0.00	4
20.56	12.00	9.86	2.14	0.00	4
20.87	15.00	12.67	2.33	0.00	4
21.78	18.00	15.20	2.80	0.00	4
21.84	18.20	15.36	2.83	0.00	19
22.10	24.00	16.05	2.96	4.97	5
22.13	27.00	16.15	2.98	7.87	5
22.16	30.00	16.23	2.99	10.76	4
22.00	18.72	15.81	2.91	0.00	Overtopping

Crossing - MS1.7 (TC03), Design Discharge - 10.20 cms

Culvert - 3 x 1200 mm RCP, Culvert Discharge - 10.20 cms



HY-8 Analysis Results

Crossing Summary Table

Culvert Crossing: MS1.7 (TC03)

Headwater Elevation (m)	Total Discharge (cms)	3 x 1200 mm RCP Discharge (cms)	Roadway Discharge (cms)	Iterations
19.20	0.00	0.00	0.00	1
19.88	3.00	3.00	0.00	1
20.30	6.00	6.00	0.00	1
21.17	9.00	9.00	0.00	1
21.73	10.20	10.20	0.00	1
22.08	15.00	10.90	4.08	7
22.12	18.00	10.97	7.02	5
22.15	21.00	11.03	9.95	4
22.18	24.00	11.08	12.91	4
22.21	27.00	11.13	15.83	3
22.23	30.00	11.18	18.80	3
22.00	10.74	10.74	0.00	Overtopping