TAYLORS

Urban Development | Infrastructure

Expert Witness Statement - Drainage

Shenstone Park PSP

Whittlesea Amendment C241

26 October 2020

26 October 2020

Meg Lee
Hall & Wilcox Lawyers
Level 11
Rialto South Tower
525 Collins Street
MELBOURNE VIC 3000

EXPERT DRAINAGE OPINION

1100 DONNY BROOK ROAD, DONNYBROOK
SHENSTONE PARK PRECINCT STRUCTURE PLAN
WHITTLESEA AMENDMENT C241

INTRODUCTION

Engagement

1- I have been requested to provide an expert opinion with respect to drainage for the land at 1100 Donnybrook Road, Donnybrook [**Subject Land**] which forms part of the Shenstone Park Precinct Structure Plan [**PSP**]. Taylors has been engaged by Hall and Wilcox Lawyers in an email dated 22 October 2020 to act on behalf of Ouson in respect to this matter – Refer Appendix A.

Summary of Qualification

2- My name is John Yalden and my address of employment is 8/270 Ferntree Gully Road, Notting Hill, Victoria.

3- I am the General Manager – Engineering & Project Management at Taylors. Taylors is a multi-disciplinary consultancy specialising in urban development which includes land development engineering amongst other fields of expertise.

4- I graduated with honours in 1996 with a Bachelor of Engineering in Civil Engineering. I have 24 years' experience and have worked in the geotechnical and land development engineering fields in Melbourne and the Pacific. I also hold a Graduate Certificate in Management (Technology Management).

5- I am a Chartered Professional Engineer (CP Eng) and a Registered Professional Engineer in Queensland (RPEQ). I am listed on the National Engineers Register (NER).

6- I currently hold and have held a position on the Executive Committee of the Association of Land Development Engineers (ALDE) where I have advocated on behalf of the land development engineering community for positive change to professional standards and shared innovation and knowledge.

7- My area of expertise includes urban drainage design, urban road design, sewer reticulation design, water reticulation design, land capability assessment, project management (urban development). I have played an instrumental role in urban development master planning having preparing surface stormwater management strategy for urban areas, and have prepared designs, facilitated approvals and managed the delivery of urban development projects across Melbourne, regional Victoria and in Fiji. I have also provided expert evidence to independent panels, VCAT and the Supreme Court.

8- My qualifications and experience are set out in the Curriculum Vitae attached in Appendix B.

Code of Conduct

9- As an expert witness, I understand that:

- I have a paramount duty to the Panel and not to the party retaining me.
- I have an overriding duty to assist the Panel on matters relevant to my expertise.
- I am an expert witness and not an advocate for a party to a proceeding.

Documents Provided

10- I have relied upon the following documents in compiling this report:

- Taylors, October 2020, Drainage Management Strategy – 1100 Donnybrook Road, Donnybrook, Prepared for Ouson Group Rev A2; noting the sources of information in this report [**DRAINAGE MANAGEMENT STRATEGY REPORT**]. – Refer Appendix C
- Email from Carolina Balagtas, Melbourne Water to Andrew Matheson confirming the flows from the two retarding basins north of the Subject Land and Donnybrook Road are to be piped through the proposed development on the Subject Land.

Significant Contributors to the report

11- My colleague, Andrew Matheson has prepared the Taylors Drainage Management Strategy report which I have reviewed.

12- Andrew Matheson's educational qualifications and membership of professional associations are as follows:

- Bachelor of Engineering (Civil), 2005, Swinburne University

13- Andrew Matheson's professional experience includes 15 years' experience as a Civil Engineer, comprising:

- 5 years, Manager & Engineering Strategist, Taylors Development Strategists
- 9 years, Engineer & Senior Engineer, GHD
- 2 years, Undergraduate Engineer, Land Management Surveys

14- Andrew Matheson has been involved in the land development and civil infrastructure industries for fifteen (15) years and spent most of that time practising in the field of Civil Engineering and specialising in the design and delivery of rural, urban, residential and industrial roads, drainage, sewer and water main infrastructure and earthworks for land development projects. Andrew has considerable experience in the engineering considerations for associated projects of this nature having delivered subdivision infrastructure and major road and drainage infrastructure throughout metropolitan Melbourne and Australia.

15- The opinions in this Expert Witness Statement, however, remain my own.

SUMMARY OF OPINIONS

My opinions in relation to this matter are as follows:The Drainage Management Strategy Report outlines a surface stormwater strategy for a proposed development at the Subject Land. The drainage management strategy was prepared based on the 2019 exhibited PSP plan which has been recently updated to that provided to me with my instructions;

17 The Subject Land is currently rural; however, it is proposed to develop the land for predominantly residential purposes;

18 The Subject land accepts flows from two external catchments – an 84Ha catchment to the north of Donnybrook Road (the flows from this catchment have been retarded) and a 32Ha catchment to the west;

19 A transmission pressure gas pipeline traverses the Subject Land which somewhat constrains the ultimate development of the Subject Land by nature of its legal and physical encumbrances

20 Melbourne Water has prepared a plan (Development Services Scheme) for management of drainage on the Subject Land and surrounding land which includes two pipelines (one on each side of the transmission gas pipeline) directing stormwater flows from two retarding basins on the northern side of Donnybrook Road to a third east-west pipe which then discharges into a proposed “Off-line” sediment basin located near the eastern boundary of the Subject Land. Flows from the sediment basin then discharge to a constructed waterway and constructed wetland system located on the adjoining parcel of land to the east.

21 Minor and Major flows of stormwater originating on the Subject Land have been estimated using RORB software and the Rational Method (Australian Rainfall Runoff) at critical locations across the proposed development and it has been confirmed that critical gap flows can be safely transferred in accordance with the Floodway Safety Criteria published on Melbourne Water’s website – Refer Appendix E.

22 The Drainage Management Strategy Report confirms that the proposed drainage pipe under the transmission pressure gas pipeline can provide adequate clearance and discharge to a proposed sediment basin near the eastern boundary of the subject land without excessively deep excavation.

23 The Drainage Management Strategy Report is generally consistent with Melbourne Water’s Woodstock West Development Services Scheme; however I believe that there is no advantage in the diagonal orientation of the proposed constructed waterway on the Subject Land given the

"flat" nature of the topography in the vicinity of the proposed waterway particularly if an alternative alignment provides a better urban design outcome;

24 Based upon the PSP plan provided with my instructions, Plan 12 of the PSP is now consistent with the Melbourne Water Woodstock West Development Services Scheme.

25 As at the date of preparing this statement, the Drainage Management Strategy Report is yet to be reviewed and approved by Melbourne Water.

Provisional Opinions Not Fully Researched

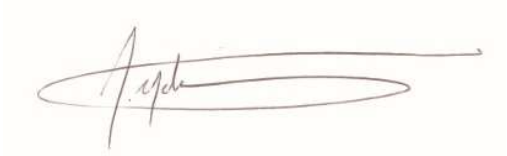
26 I have not reviewed the Northern Quarries Drainage Scheme as this document has not be made available to me. Further, no consideration of any of the ANCOLD guidelines has been made. To the best of my knowledge all other matters on which I have made comment in this statement have been appropriately researched or are based on my knowledge and experience. Unless otherwise stated in my opinion, the statement does not contain any provisional opinions that have not been fully researched.

Matters Outside of My Expertise

27 To the best of my knowledge, none of the matters on which I have made comment in this statement are outside my area of expertise. To the best of my knowledge the report is complete and does not contain matters which are inaccurate.

PRACTICE NOTE DECLARATION

28 I have made all the enquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge been withheld from the Panel. I have read the Guide to Expert Evidence and agree to be bound by it.



JOHN YALDEN

BE (Hons) (Civil), Grad Cert Mgt, MIEAust, CPEng, RPEQ, NER, APEC Engineer, Int PE (Aus)

Appendix A – Instructions

IN THE MATTER OF SHENSTONE PARK PSP - WHITTLESEA AMENDMENT C241

INSTRUCTIONS TO EXPERT WITNESS

JOHN YALDEN - DRAINAGE

Prepared by:	Solicitor's Code: 163
Hall & Wilcox	DX 320, Melbourne
Level 11	Tel: (03) 9603 3555
Rialto South Tower	Ref: 171350
525 Collins Street	Attention: Meg Lee
MELBOURNE VIC 3000	Email: meg.lee@hallandwilcox.com.au

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IN THE MATTER OF SHENSTONE PARK PSP - WHITTLESEA AMENDMENT C241

INSTRUCTIONS TO EXPERT - JOHN YALDEN

Introduction

1. We represent 1100 Donnybrook Road Pty Ltd (a related entity of **Ouson**), in relation to Amendment C241 to the Whittlesea Planning Scheme (**Amendment**).

2. As you are aware, Ouson owns the property at 1100 Donnybrook Road, Donnybrook VIC 3064 which is included within the proposed Shenstone Park PSP (**PSP**) and is submitter (Submission 20) to the Amendment

3. Our client also owns the parcel of land immediately to the south that is outside the PSP area, but which is adjacent to and impacted by the former Phillips Quarry proposal.

4. Attached to these instructions are relevant materials for this matter.

5. We are aware that you have been assisting Ouson in developing the master plan and drainage strategy for the site. We now require your assistance for the Panel Hearing in the event that drainage issues are unresolved.

The Amendment - C241

6. The Amendment applies to approximately to 628 hectares of land, generally bounded by Donnybrook Road to the north, the Urban Growth boundary to the east, the Wollert suburb boundary to the south and the Sydney/Melbourne railway to the west. The precinct lies immediately south of the Donnybrook/Woodstock PSP area and east of the English Street PSP area, while the Donnybrook train station is outside the north-west corner of the precinct.

7. Notably, the precinct contains the existing Woody Hill Quarry and to the south of the PSP area is the proposed Phillips Quarry.

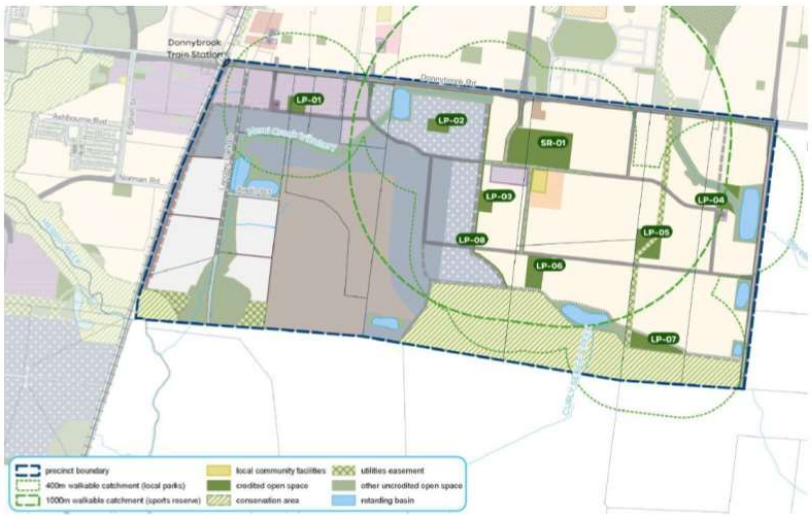
8. The Plan below is the Future Urban Structure Plan 3 from the PSP:

Ouson Submission

9. Ouson's land is parcel 15 in the Land Budget Plan 4 below:

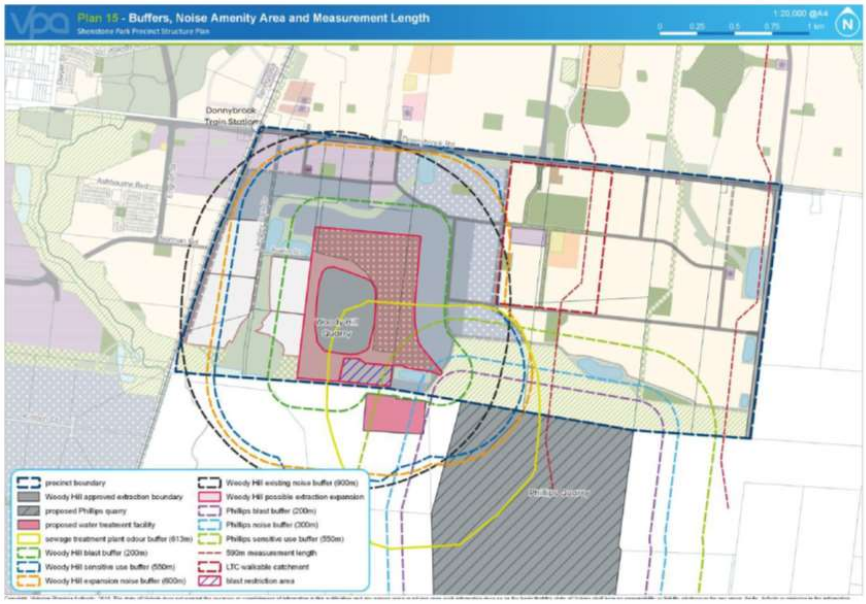
10. Ouson raised a number of issues in its submission (#20) relating to open space, access road, native vegetation / BCS impact and buffers from the Phillips Quarry.

11. Relevant to the issues raised, please note the Open Space Plan 7 extracted below:



12. In addition, a key issue raised by Ouson in its submission is the impact of the buffers from the two quarries and, to a lesser extent, the APA pipeline. These buffers are shown in Plan 15 extracted below.

13. An extension of time was granted recently to the Phillips Quarry permit and a new Work Authority application is currently on foot as WA160 was surrendered. We are seeking copies of further documents in this regard.



14. The VPA has provided its response to each of the key issues raised in the Ouson submission in September as follows - although I note you have had ongoing discussions with the VPA and Melbourne Water:

Issue raised by Ouson	VPA Response	Action	Status
Buffer from Phillips Quarry - ▪ Status of Permit; ▪ Buffer from 'Approved extraction boundary' or the 'Stage 1 works area' on GHD Figure 32 ▪ Question the buffers as shown in the PSP given the proximity of the WAG pipeline. ▪ Quarry buffers for the Phillips Quarry are interrelated to both the Shenstone Park PSP and significant areas of the Northern Quarries PSP.	Discuss with Buffer and resources expert; DJPR - Earth Resources Findings to guide the outcome of this submission. VPA will request the Planning Panels to hold a buffers conclave and determine the appropriate buffers from the Quarries.	Further Investigation	Pending
Open Space treatment/credits ▪ Request the uncredited open space located along the 'Darebin Creek tributary' adjacent to the City Gate gas easement in the northern portion of the site be removed as a designation. ▪ The Melbourne Water approved Lockerbie East DSS shows drainage infrastructure in this area to be piped and aligned with the utilities easement to the west of the 'Darebin Creek tributary'. ▪ The northern extent of this uncredited open space represents an unreasonable encumbrance to our client's land as it is	Further discussion with Melbourne Water in order to finalise response to this submission.	Further Investigation	Pending

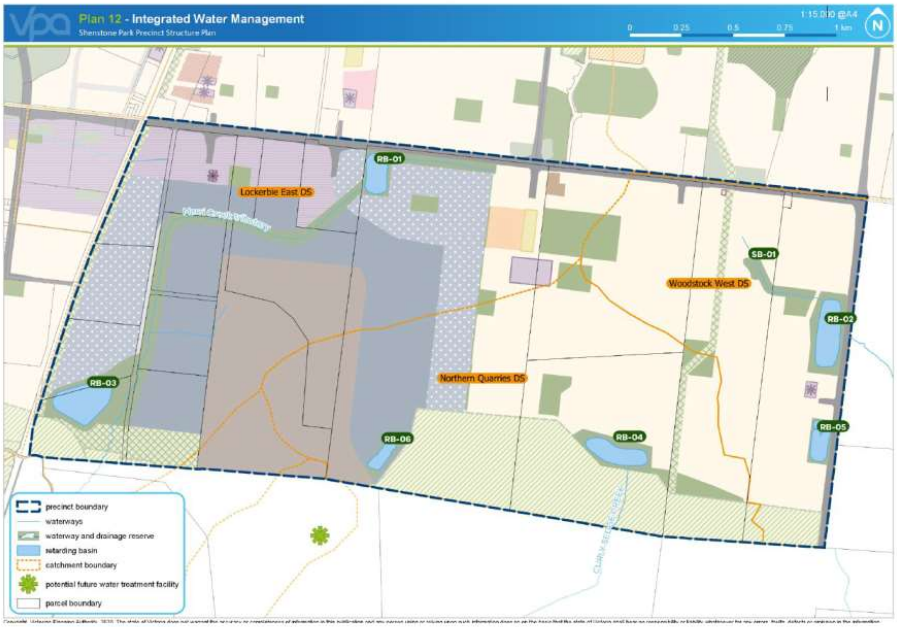
Issue raised by Ouson	VPA Response	Action	Status
not a waterway, nor does it provide any drainage function. ▪ We request that the uncredited open space designation be removed from this part of the land consistent with the Melbourne Water DSS plan shown in Figure 6 of submission.			
Point of Access ▪ Plan 10 'Street Network' on page 30 of the PSP as shown in Figure 7 of submission. ▪ We note all other significant PSP landholdings are each provided with a formal point of access to their land from Donnybrook Road, however no formal access is provided to our client's land except through the adjoining landholdings. ▪ Suggest that either of the nearby access locations on the adjoining properties could be relocated to the common boundary to provide access to both properties.	***Change not supported.*** The Donnybrook Woodstock PSP and ICP has set the locations of intersections along Donnybrook Rd. Transport consultant advised - The V/C ratios in the modelling do not identify the need for an additional connection to Donnybrook Road. It would be possible to provide a local connection to Donnybrook Road as part of the Subdivision stage in the form of Service Road access and/or left-in/left-out arrangement, subject to relevant approvals.	No Change Required	Unresolved
'BCS conservation area' ▪ Refer to the southern portion of our client land as shown in Figure 8 of submission. ▪ We have serious reservations about the way the BCS has been assessed and mapped within the PSP.	***Change not supported.*** Changes to the BCS conservation area is outside the scope of the Shenstone Park amendment process.	No Change Required	Unresolved
Open Space location ▪ Object to the location of the open space areas either side of the utilities easement as shown in Figure 9 of submission. ▪ We consider relocating this open space further to the north and east with the proposed uncredited open space area along the Darebin Creek tributary would result in a more consolidated and usable open space area for future residents.	VPA to discuss further with City of Whittlesea Open space catchment will guide the location for local parks.	Further Investigation	Pending
Utilities ▪ Refer to Plan 13 of the draft PSP illustrating the proposed location of 'Utilities' within the PSP area as shown in Figure 11 of submission. ▪ We have reservations regarding the requirements for the rising main and pump station as indicated in the PSP. ▪ We are currently undertaking our own independent investigations and will provide our findings to the VPA asap.	Change supported. VPA to change Plan 13 (exhibited version) to update the proposed location of sewer rising main and pump station as guided by the YVW. Consider road reserve above rising main. 1/2 - YVW to provided GIS information for the proposed rising main. 2/2 - Discuss with Infrastructure and transport consultant for the level of road reserve.	Further Investigation	Pending

VPA Update

15. The VPA has now issued a mark-up of the PSP including the following new Plan 12 which appears to adopt the Ouson preferred drainage strategy of a piped section to Donnybrook Road.

16. We therefore appear to be in agreement with the VPA and we assume that they have had discussions with Melbourne Water in order for them to have made this requested change.

17. Please confirm the position with Melbourne Water as soon as possible so that you can provide an update in your Evidence.



Panel Hearing

18. The Panel hearing is listed to commence on 16 November and run until 23 December 2020.

19. Key dates are as follows:

- 23 October 2020 - VPA Part A submission due; List of relevant documents;
- 28 October 2020 - Drainage, Traffic, Economic, Noise, Vibration evidence due
- 6 November 2020 - Expert evidence due
- 12 November 2020 - Panel Day 1 (listed until 11 December)
- 13 November 2020 - VPA Part B; Witnesses to be given questions on notice

- 20 November 2020 - Witnesses to provide written answers
- 16-21 December 2020 - presentation of Ouson case.

Instructions & Next Steps

20. You are instructed to prepare a short expert witness statement on drainage issues in relation to the merits of the Updated Drainage Strategy you have been preparing. I suggest that the evidence consist of the following:

    - A short covering witness statement stating your involvement in the matter to date, your discussions with Melbourne Water and the VPA;
    - Annex the final Drainage Strategy
    - Annex any email evidence of Melbourne Water and VPA support for the Strategy.

21. Ideally we would not need to call you to give evidence if the matters are agreed by all parties. We therefore request that you continue to engage with Melbourne Water and seek to obtain confirmation of their at least in principle support.

22. In preparing your evidence you are required to read the Panel Guide to Expert Evidence and to make the Declaration in your report that is contained in the Guide and set out below: https://www.planning.vic.gov.au/__data/assets/word_doc/0024/9483/G2-Guide-to-Expert-Evidence-April-2015.DOCX

23. Your report must include:
    - the facts, matters and all assumptions upon which the report proceeds;
    - reference to those documents and other materials the expert has been instructed to consider or take into account in preparing his or her report, and the literature or other material used in making the report;
    - a summary of the opinion or opinions of the expert;
    - a statement identifying any provisional opinions that are not fully researched for any reason (identifying the reason why such opinions have not been or cannot be fully researched); and
    - a statement setting out:
        - any questions falling outside the expert's expertise, and
        - whether the report is incomplete or inaccurate in any respect.

    You must declare at the end of the report:

    'I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.'

24. For electronic hearings there is a further Addendum to this document has been added requiring a declaration to be made before giving oral evidence via video link as follows:

- *I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel;*
- *I will inform the Panel immediately should another person enter the room from which I am giving evidence;*
- *During breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel; and*
- *I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.*

Meg Lee
Hall & Wilcox
E. meg.lee@hallandwilcox.com.au
T. (03) 9603 3312
M. 0404 070 549

Appendix B – Curriculum Vitae

People Profile

TAYLORS
Urban Development | Infrastructure

John Yalden

General Manager – Engineering & Project Management

John Yalden is an integral member of our Executive Management team and

- Is a Chartered Professional Engineer with over 20 years' experience in the Land Development and Infrastructure industries in Australia and the Pacific
- Has been part of the Taylors team and the Executive Management team for 8 years
- Provides vision, expertise and leadership for the Engineering and Project Management team
- Accomplished in provision of expert evidence at VCAT & Supreme Court
- Represents land development clients in key negotiations with authorities

John's key focus is upon providing strong relationship management and he brings expertise in:

- Project Management and consultant coordination – land development and infrastructure provision
- Preparation and presentation of Expert Evidence
- Construction Surveillance and Contract Administration
- Preparation of Development Cost Estimates and Servicing Strategy Reports
- Preparation of Drainage Management Strategies including Water Sensitive Urban Design (WSUD)

John is primarily involved in projects as Civil Engineer and Project Manager and has successfully provided solutions for:

- International Aid Projects for the provision of essential infrastructure in remote villages including liaison with government authorities - Fiji
- 917 Boundary Road, Truganina – Industrial Subdivision – Project Management & Design review
- Emerald Park Estate, Tarneit – 1000+ lot residential subdivision – Project Management & Design review
- Grand Central, Tarneit – 600+ lot residential subdivision – Project Management & Design review
- One Lyndhurst, Lyndhurst – 186 Lot Land Subdivision (L & L One Holdings) – Project management
- Maplewood, Melton South – 640 Lot Land Subdivision (Golden Group)
- Peppermint Grove, Melton West – 450 Lot Land Subdivision (Golden Group)
- Major Infrastructure Projects for Government Departments such as Melbourne Water, Cardinia Shire Council, Metropolitan Planning Authority
- Preparation of expert evidence to assist in the resolution of a compensation claim by land owners in Supreme Court proceedings
- San Remo – Preparation of expert evidence including Servicing and Drainage Strategy Reports for 150 lot Infill Subdivision
- Recognized expert in medium density development services provision
- Project Management of gas transmission pipeline relocation

Qualifications & Affiliations

- Bachelor of Engineering (Civil), RMIT
- Graduate Certificate in Management (Technology Management), Deakin University
- Chartered Professional Engineer (CP Eng)
- Registered on the National Engineers Register, NER
- Registered Professional Engineer, Queensland (RPEQ)
- Board Member of the Association of Land Development Engineers (ALDE)
- Member of Engineers Australia (MIE Aust)

Relationships | Expertise | Solutions www.taylorsds.com.au

Appendix C – Drainage Management Strategy Report

Urban Development | Infrastructure

Drainage Management Strategy

1100 Donnybrook Road

Donnybrook

October 2020

Prepared for Ouson Group

TABLE OF CONTENTS

INTRODUCTION

It is proposed to subdivide the Subject Land at 1100 Donnybrook Road, Donnybrook (Lot 1 on LP38239) into residential allotments. A surface stormwater drainage management strategy is required to submitted to both Melbourne Water (MWC) and Whittlesea Council in support of the proposed development demonstrating compliance with the relevant requirements of the planning scheme.

COMMISSION

Taylors has been engaged by the applicant to prepare a surface stormwater management strategy that addresses the requirements of Melbourne Water and Whittlesea Council. The scope of the investigation is to include:

- Desktop investigation of existing drainage services in the vicinity of the subject land;
- Site visit to the land to identify opportunities and constraints not readily identifiable from plans;
- Identification of the external catchment and estimation of overland flow paths from the upstream catchment;
- Consultation with Council and Melbourne Water in relation to their requirements for drainage for the development;
- Prepare a conceptual plan detailing how the requirements of the various authorities can be adequately addressed.

PROPOSAL

It is understood that it is proposed to subdivide the land into approximately 950 allotments as shown in the indicative development plan below in Figure 1.

Figure 1 - Indicative / proposed estate master plan

Page 3

INVESTIGATION

The investigation into the likely requirements of the drainage authorities in relation to the above mentioned development included a desktop and field survey. The desktop survey included obtaining existing service information from the following sources:

- Whittlesea Council
- Melbourne Water
- Land Victoria
- Feature Survey prepared by Taylors
- NearMap.com
- Site Visit

LIMITATIONS AND ASSUMPTIONS

This investigation has been scoped and undertaken as a desktop study to provide preliminary advice on the anticipated servicing works at the proposed development site. There are limitations on the level of detail that is able to be given due to the nature of this review. Desktop studies such as this are reliant on information that is made available from service authorities, with an assumption that it provides an accurate representation of existing site conditions.

FINDINGS

Existing Topography and Land Use

The land comprises an area of approximately 67.5 hectares. The Subject Land is undulating and typically falls from the north down towards the south. Existing surface levels of 235 m (AHD) exist at Donnybrook Road, and 225 m (AHD) at the southern boundary. There are a number of features on the Subject Land, including three small rises generally located within the center of the site, and a more predominate raised plateau on the eastern boundary of the site. Due to these features, the Subject Land has a number of internal and external catchments.

The Subject Land has been cleared for farming purposes with minimal tree coverage on the site. There is a small cluster of trees adjacent to the western boundary approximately 780 metres south of Donnybrook Road. An existing house and out-buildings is located in the north-west corner of the Subject Land with a driveway onto Donnybrook Road. A small dam is present adjacent to the eastern boundary, approximately 400 metres south of Donnybrook Road. An APA Group transmission pressure gas main runs through the site, north to south, predominately against the western boundary of the site.

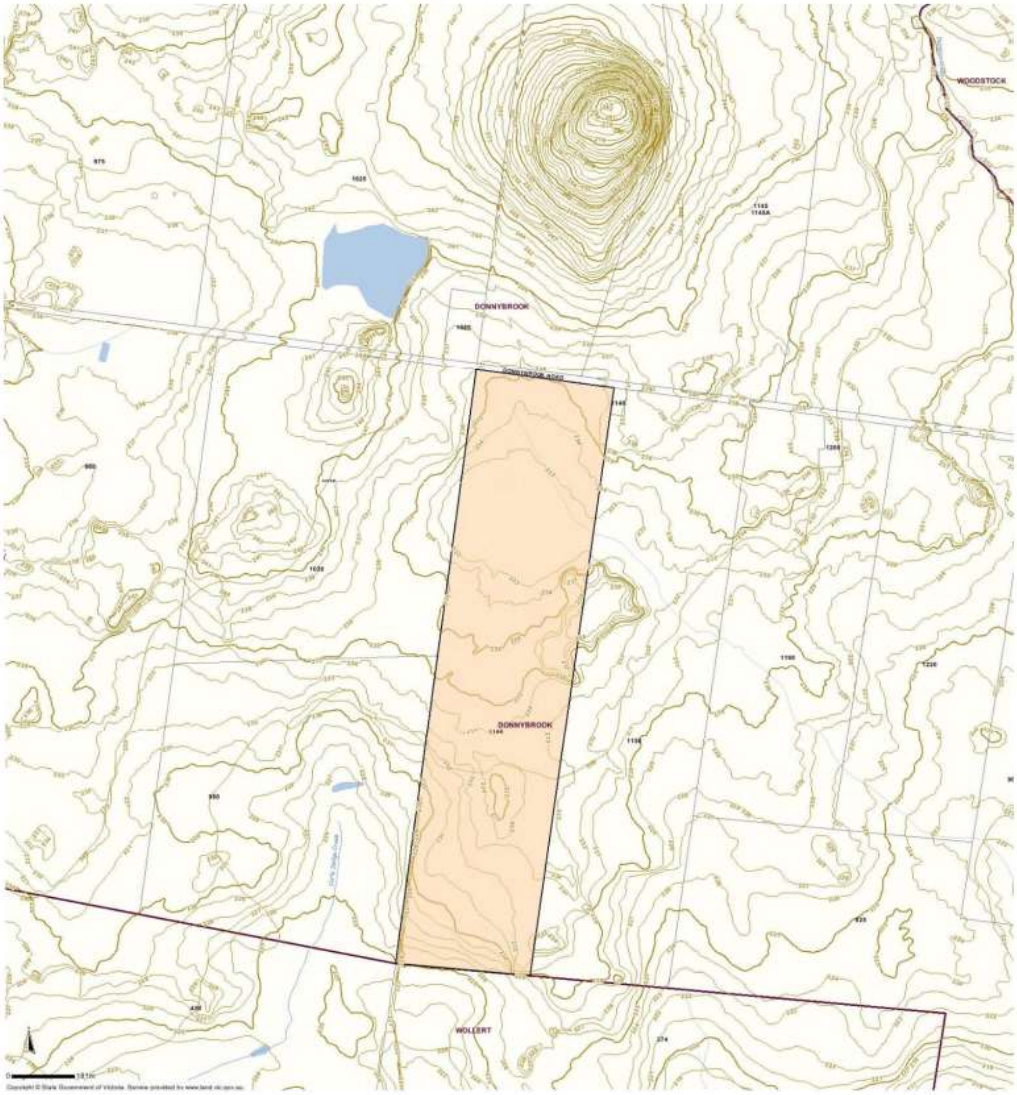


Figure 2 - Topography of the Subject Land

Page 5

Existing Drainage Infrastructure

Whittlesea Council has provided details of their existing drainage infrastructure in the area which confirms that no Council drainage infrastructure is present in Donnybrook Road or on the Subject Land. Only shallow road side table drains are present in Donnybrook Road with a twin 1200 x 450 mm reinforced concrete box culvert transferring stormwater flows under Donnybrook Road adjacent to the existing house.

Figure 3 – Existing Drainage Infrastructure

Catchments

A fundamental component in developing a stormwater strategy is understanding the catchments contributing to a particular flow of stormwater across the subject land.

Existing Upstream Catchments

An analysis of the upstream drainage catchment revealed that:

- Two external catchments contribute flows into the Subject Land.
  - Catchment A of approximately 84.5 Ha contributes stormwater flows from north of Donnybrook Road. This land forms part of the future Donnybrook PSP and will ultimately be developed into standard density, residential allotments.
  - Catchment B of approximately 31.7 Ha contributes stormwater flows from west of the Subject Land from the adjoining development at 1030 Donnybrook Road.
- The use of land in the upstream catchment is currently rural; however, the land within the upstream catchments has been identified for residential use in the future.

Modelling of flows generated from upstream catchments has been provided in the Appendices.

A plan detailing the extent of the upstream drainage catchments is shown in Figure 4 below.

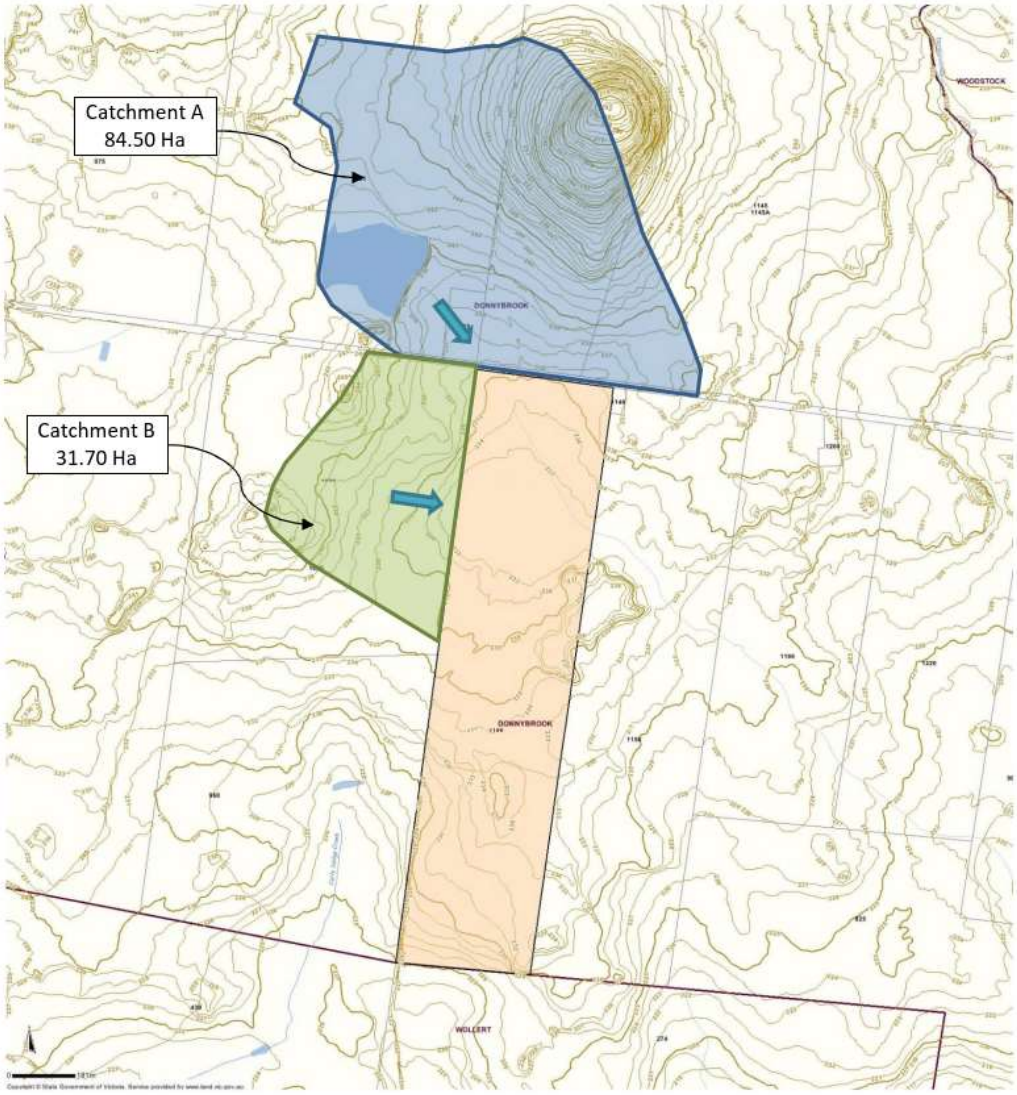


Figure 4 – External Catchments

Drainage Outfall for the Development

The outfall for drainage for the Subject Land will be in accordance with the Melbourne Water drainage schemes that cover the site. The northern half of Subject Land falls within the Woodstock West Developer Services Scheme (DSS) and discharges east into 1150 Donnybrook Road. Details of the scheme are provided below in Figure 5.

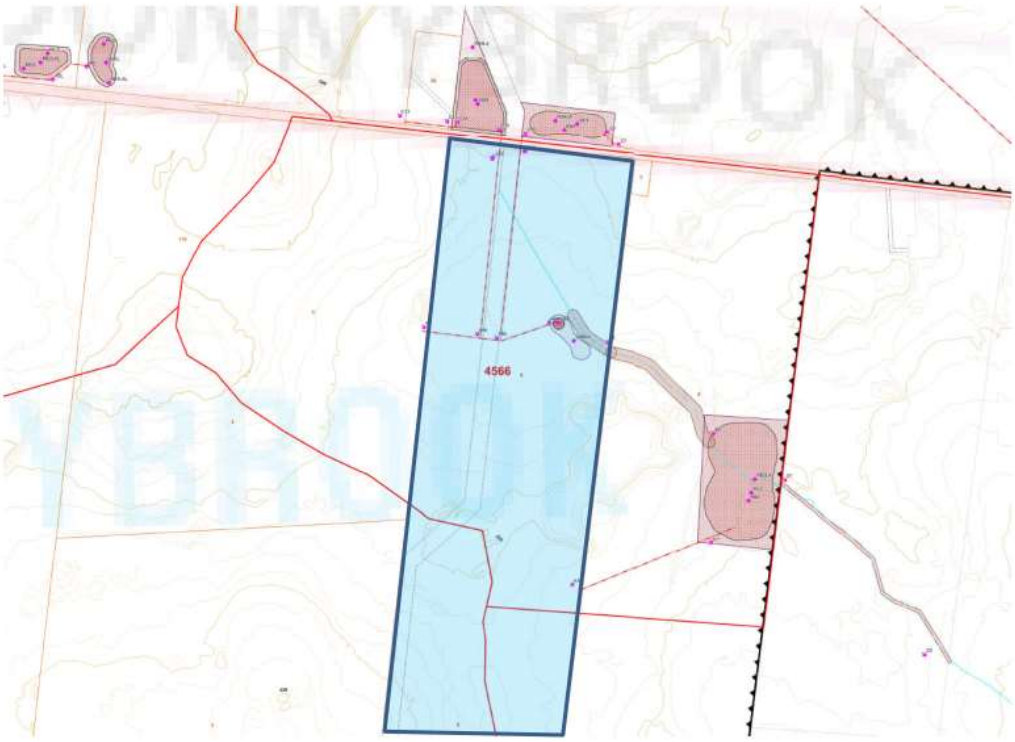


Figure 5 – MWC Woodstock West DSS

The southern section of the site forms part of the Northern Quarries DSS and discharges west to 960 Donnybrook Road.

The Subject Land will be responsible for delivering the following works in accordance with the MWC DSS.

Pipeline	Flow Size	Length (m) (approx.)	Dia. (mm) (approx.)	Design Flow	Ownership
A7 to A6a	20% AEP Pipeline	120	1350	2.650 m^3/s	Council
A6a to A6b	Combined 20% AEP and 1% AEP (Pre Dev) Pipeline	35	1500	2.751 m^3/s	Council
A6b to A6	Combined 20% AEP and 1% AEP (Pre Dev) Pipeline	155	1500	3.313 m^3/s	Council
C15 to A6a	1% AEP (Pre Dev) Pipeline	410	1050	1.840 m^3/s	Council
C11 to A6b	1% AEP (Pre Dev) Pipeline	410	1050	1.862 m^3/s	Council
A6 to A8	Constructed Waterway 1% AEP	80	N/A	13.224 m^3/s	Melbourne Water
SBBLA	4EY Sediment Basin	N/A	N/A	0.855 m^3/s	Melbourne Water

The Woodstock West DSS (at the time of writing this report) is currently published by Melbourne Water and is subject to change. Furthermore, the diameter of pipelines provided in the table above are approximate only and subject to detailed design.

Planning Controls

The northern half of the Subject Land is currently zoned Urban Growth Zone (UGZ) and the southern half is currently zoned Rural Conservation Zone (RCZ1) under the provisions of the Whittlesea Council Planning Scheme. The relevant sections of Clause 56 and other relevant clauses relating to the provision of drainage for the proposed development are discussed below.

Consultation with Melbourne Water

An application for feasibility advice was submitted to Melbourne Water (Main Drainage Authority) and the following response was provided (in summary):

- The land is not subject to flooding from Melbourne Water's drainage system;
- The upstream catchment has been divided in two by the gas main to minimise pipe crossing locations to one location, being A6a to A6b.
- The two retarding basin / wetlands within Peppercorn Hill Estate will discharge pre-developed 1% AEP flows across Donnybrook Road via pipelines A6a and A6b.
- Flows from the northern and western catchment are conveyed through the Subject Land to the proposed constructed waterway at node A6 and discharges to A8.
- A sediment pond is required upstream of the proposed constructed waterway at node A6.

Further, Taylors has sought Melbourne Water's RORB modelling for the Woodstock West DSS and confirmation that it is still intended to pipe attenuated flows from Peppercorn Hill Estate, north of Donnybrook Road, through the Subject Land to the eastern boundary between 1100 and 1150 Donnybrook Road.

DISCUSSION

Outfall

The Subject Land will have 3 outfall locations in accordance with the Woodstock West DSS. The northern portion of the Subject Land, (32.2 ha) will discharge into the proposed Retarding Basin and Sediment Pond at node A6 and then discharges east into 1150 Donnybrook Road. A smaller catchment of (5.91 ha) also drains east into 1150 Donnybrook Road via a 5 year pipe at node A10.

The southern portion of the Subject Land (19.14 ha) drains to the south-west and will discharge south-west through the conservation zone and discharge into 960 Donnybrook Road. This outfall detail needs to be confirmed by Melbourne Water in the Northern Quarries DSS.

Exhibited Shenstone Park PSP

In September 2019, the Victorian Planning Authority exhibited the Shenstone Park Precinct Structure Plan (PSP). It was noted that the VPA's Urban Structure Plan and Integrated Water Management Plan differed from Melbourne Water's Woodstock West DSS. The VPA plans include a waterway and drainage reserve within the Subject Land that extends from the eastern title boundary, at the start of the Melbourne Water constructed water and sediment pond, and continues through to the northern title boundary at Donnybrook Road and appears to connect to the Peppercorn Hill eastern retarding basin.

Figure 6 – Exhibited Shenstone Park PSP – Plan 12 (Extract)

Melbourne Water submitted internal stakeholder comments to the VPA on the 15th November 2019 which explained that the current Melbourne Water scheme provides piped outlets from the two Peppercorn Hill retarding basins, one on either side of the gas easement. Melbourne Water proposes to cross the gas easement only once, and this is approximately 370 metres south of Donnybrook Road to capture flows from Catchment B. The extension of the drainage reserve along the eastern side of the gas easement will only provide an outlet for the retarding basin on the eastern side of the easement which is approximately a flow of 1.9 cu.m/sec, well below the flow required for a constructed waterway.

Melbourne Water's response continues to state that if the extension of the waterway to Donnybrook Road is to provide greater connectivity for Residents then Melbourne Water is generally supportive of this outcome. The VPA has already considered connectivity for Residents as shown in Plan 11 – Public Transport and Pathways, within the exhibited Shenstone Park PSP, which shows an off road path to be constructed within the gas easement connecting to Donnybrook Road. Taylors opinion is that the extension of the drainage reserve to Donnybrook Road is not required for drainage purposes nor for connectivity to Donnybrook Road and therefore should be removed.

Management of external flows

Existing flows from external catchments will be managed by several pieces of infrastructure. Pre-developed 1% AEP flows from external catchment A, will be controlled by the Peppercorn Hill retarding basins on the north side of Donnybrook Road and then discharge through two scheme pipes, B2-A6a and A4-A6b. 20% AEP flows from external catchment B will be controlled via scheme pipe A7-A6a with Gap Flows conveyed overland via proposed road reserves adhering to Melbourne Water Floodway Safety Criteria. Both external catchments then converge at node A6b and flow to the proposed scheme sediment and retarding basin.

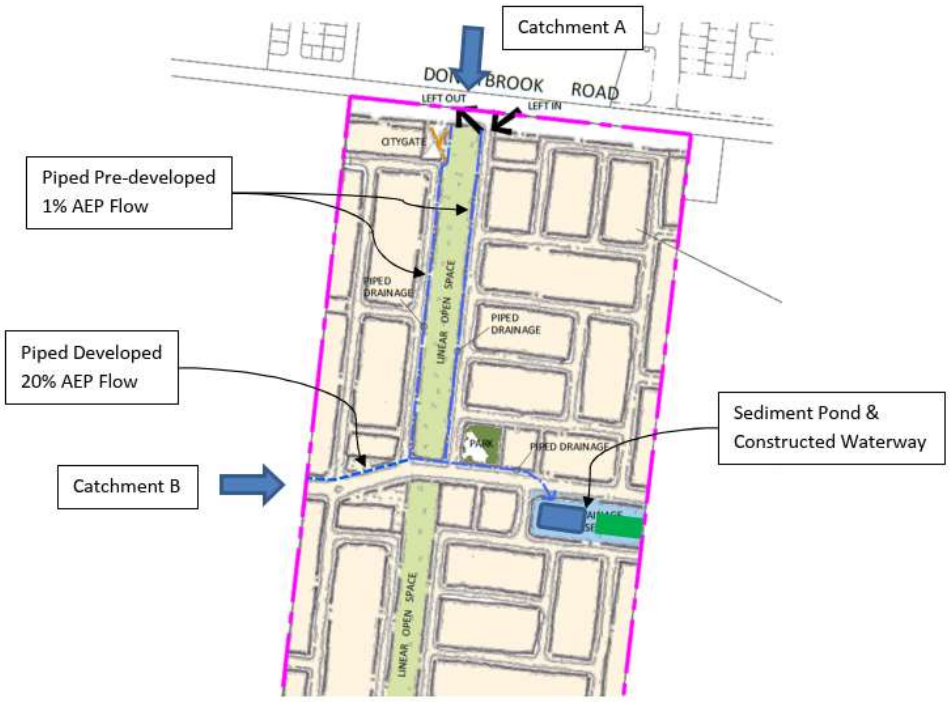


Figure 7 – Management of External Flows

RORB Model

Taylors has modified the Melbourne Water supplied RORB model in order to refine the catchment file to suit the proposed masterplan and ensure a minimum of 4 catchment areas are supplied upstream of critical nodes. The modified RORB model outputs and catchment diagram are provided in Appendix A.

Gas Main

Within the Subject Land is a 35-metre-wide easement in favour of APA Group. The easement covers two existing transmission pressure gas pipelines, 300mm and 400mm in diameter respectively. APA is currently designing the Western Outer Ring Main (WORM) which is to be constructed within the existing easement and will have a diameter of 500mm. In order to provide a drainage outlet for the western wetland within Peppercorn Hill Estate, and external Catchment B from 1030 Donnybrook Road, a drainage pipeline will need to cross the existing and proposed mains perpendicularly.

APA has provided the original construction drawings for the 300mm and 400mm diameter pipelines and these shown the existing mains are approximately 1.2 to 1.5 metres deep to the top of the pipe (cover). The new WORM main (DN500) is to be constructed at a similar depth of cover.

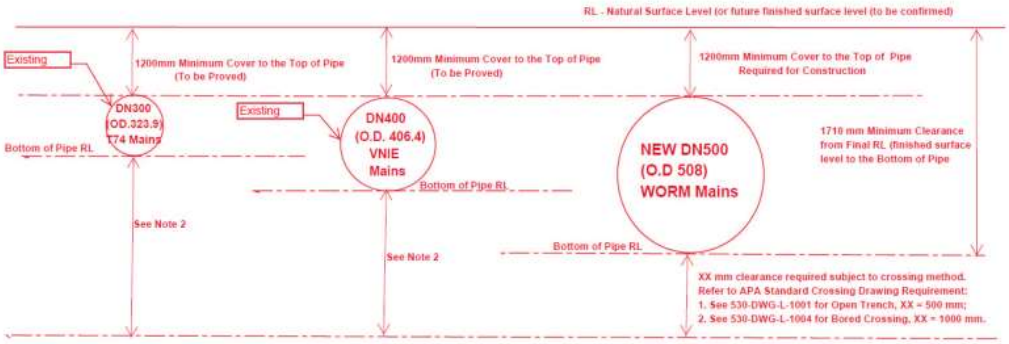


Figure 8 – APA Group Typical Section

It a requirement for protection of the gas main that any service crossing beneath provide a minimum of 0.5 metres clearance. This means that the top of pipe for any drainage crossing is a minimum of 2.2 metres below natural/finished surface. Taylors has investigated the potential to cross over the top of the gas mains, however this is not considered feasible due to the additional fill that would be required, and potential structural impact on the gas pipelines.

As discussed above, Taylors have estimated a peak 20% AEP flow of 2.751 m^3/s at the gas easement crossing. This would ideally require a 1500mm diameter pipe. This results in a pipe invert, with the clearance to the underside of the gas mains, of between 3.7 and 4.0 metres below natural surface. Even if a twin pipe system, such as two 1050mm diameter pipes were used, the depth to invert would still be in the range of 3.25 to 3.55 metres. For the purposes of the following calculations, Taylors will adopt a single 1500mm diameter pipe with depth to invert of 3.7 metres.

The natural surface at the proposed gas main crossing location is 232.8m (AHD) resulting in a pipe invert of approximately 229.1 m (AHD). The proposed sediment basin and constructed waterway are approximately 155 metres east from the centre of the gas easement with a natural surface of 232.2 m (AHD). Running at a grade of 1 in 400 (0.25%) the 1500mm diameter pipe invert and inlet to the sediment pond would be 228.7 m (AHD); a depth to invert of 3.5 metres.

The natural surface level at the eastern title boundary with 1150 Donnybrook Road is 232.0 m (AHD). Assuming the constructed waterway is constructed at the same grade of 1 in 400, the channel would be at a depth of 228.5 m (AHD); a depth to invert of 3.5 metres. An invert of this depth would be required in any case to provide for adequate cover and clearance to water, electricity, telecommunications and reticulated gas utilities in the proposed road reserves.

Constructed Waterway

As part of the Woodstock West drainage scheme, it will be necessary to construct approximately 80 metres of constructed waterway which discharges east into 1150 Donnybrook Road and ultimately into a retarding basin and wetland. Due to the natural topography, it is expected that the longitudinal grade of the waterway will be between 1 in 250 and 1 in 400 making it a compound channel. This will incorporate a low flow channel (or low flow pipeline) , within the main waterway, that conveys between the 4EY and 1EY flow. The main waterway will convey the 1% AEP flow and is to include 300mm of freeboard within the channel. 600mm of freeboard must be provided to allotments adjacent to the waterway.

Taylors has calculated the 1% AEP flow entering the constructed waterway, using RORB model, to be 11.518 cu.m/s and the 4EY and 1EY flow to be 0.791 cu.m/s and 2.373 cu.m/s respectively. Taylors will adopt 1 cu.m/s for the low flow channel. As a preliminary design check of the constructed waterway, Taylors has used PC Convey software. The following parameters, in Figure 9 below, have been input into PC Convey Constructed Waterway Designer.

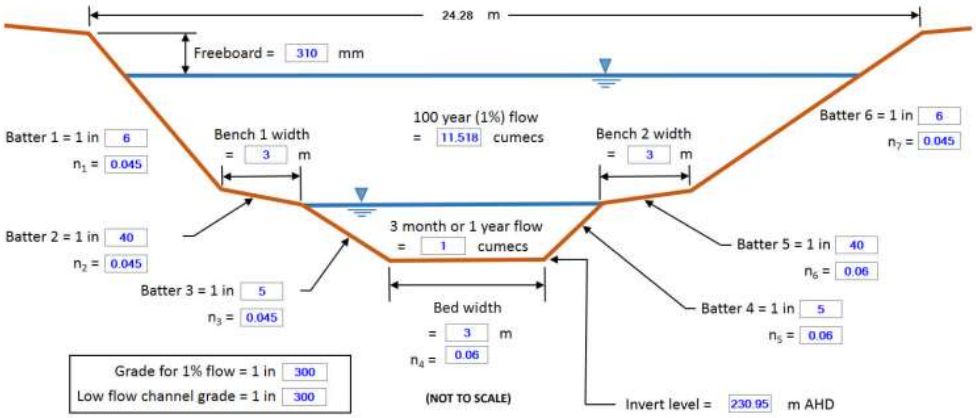


Figure 9 – PC Convey Constructed Waterway Designer

Based on the above inputs, the total depth of the channel, including the low flow channel is 1.10 metres and the hydraulic width is 25.4 metres. The total width of the channel including freeboard is 29.2 metres. The waterway is to be activated on both sides by internal Council roads. Based on Table 3 from Melbourne Water's *Waterway Corridors* guideline document, the total corridor width of the drainage reserve should be not less than 45 metres.

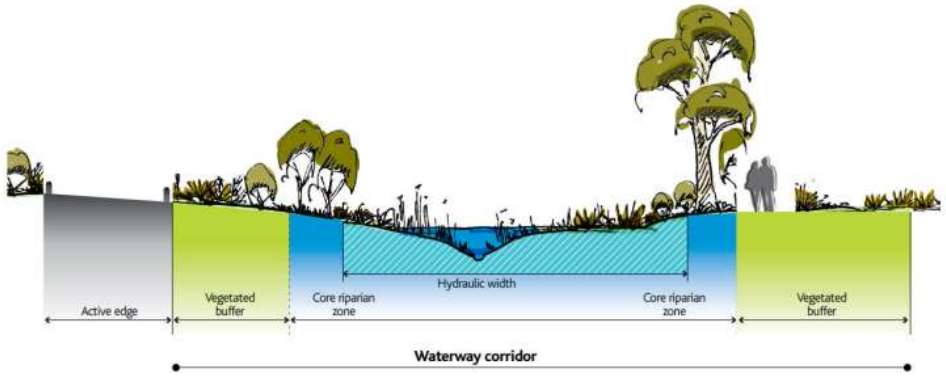


Figure 10 – Extract from Melbourne Water Constructed Waterways Guidelines

The hydraulic assessment using PC Convey shows an average velocity within the channel of 0.86 m/s. Taylors has set the left and right bank within PC Convey at 400 mm depth below the 1% AEP water level to assess floodway safety criteria. Up to 400mm depth, the average velocity is 0.43 m/s. The average velocity multiplied by the actual depth is 0.17. This meets the Melbourne Water floodway safety criteria of ≤ 0.35.

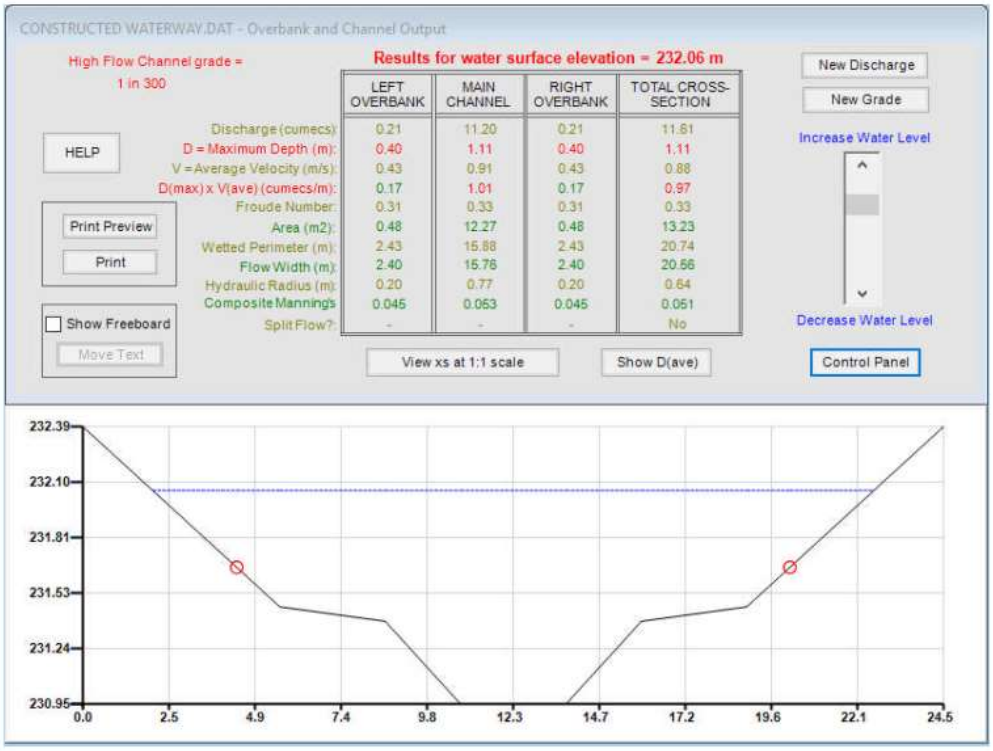


Figure 11 – PC Convey Channel Hydraulics

Sheer Stresses have also been checked within the channel using PC Convey. The calculated maximum sheer stress in the base of the low flow channel is 51.07 N/m^2. The main channel batter and tables are calculated at 14.67 N/m^2 and 33.68 N/m^2 respectively. The calculated shear stresses in the channel meet the requirements of Table 19 in Part D of Melbourne Water's *Constructed Waterways Design Manual* which states that for a waterway with a compound channel it is typical to expect the vegetated low flow channel to have an erosion threshold of 80N/m2 (i.e. long native grasses) and the high flow channel to have an erosion threshold of 45N/m2 (i.e. short native/bunch grass).

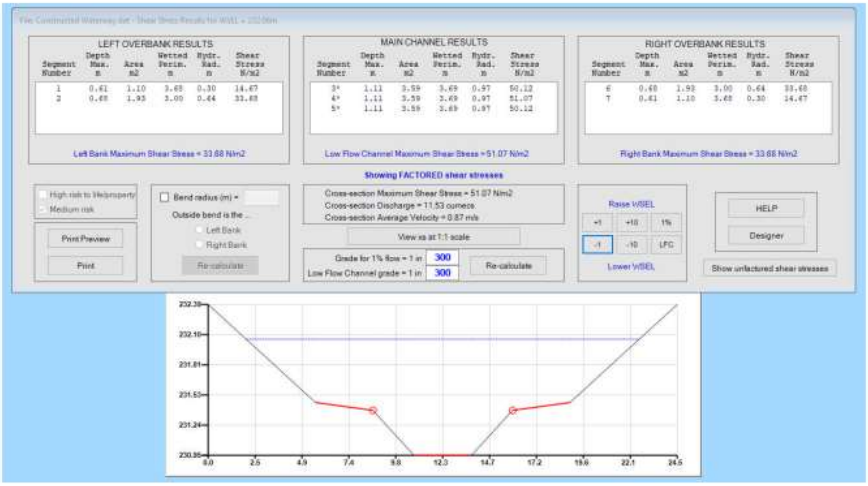


Figure 12 – Main Channel Shear Stress

Management of overland flows within the development

Overland flows originating from within the Subject Land, or directed through the development from external catchments, will be directed along purpose built overland flow paths as shown in Figure 13 below. Internal Catchment 1 (31.6 ha) is shown in red, Internal Catchment 2 (10.90 ha) is shown in green, and Internal Catchment 3 (12.20 ha) is shown in blue. Flows from External Catchments are nominated.

1100 Donnybrook Road			
			Notes
Catchment Name	Catchment 2	Catchment 3	Catchment Name
Area (ha)	10.900	12.200	Areas from Figure 10
T_i (min)	5	5	Initial Time of Concentration
Flow Length (m)	480	625	Longest Flow Path Length
Est. Pipe Velocity (m/s)	1.5	1.5	Estimated Velocity in Pipe
Est. Overland Velocity (m/s)	1	1	Estimated Velocity Overland
T_p (min)	5.3	6.9	Flow Length / Pipe Velocity / 60 sec.
T_o (min)	8.0	10.4	Flow Length / Overland Velocity / 60 sec.
20% AEP T_c (min)	10.3	11.9	$T_c = T_i + T_p$
1% T_c (min)	13.0	15.4	$T_c = T_i + T_o$
Fraction Impervious	0.70	0.70	Fraction Imprevious = f
$^{10}I_1$ (mm/hr)	27.6	27.6	Taken from BOM Rainfall Data
C'_{10}	0.13458	0.13458	$C'_{10} = 0.1 + 0.0133(^{10}I_1 - 25)$
C_{10}%	0.671	0.671	$C_{10} = 0.9f + C'_{10}(1 - f)$
C_{20}	0.638	0.638	$C_{20} = C_{10} \times 0.95$
C_{1}	0.806	0.806	$C_{1} = C_{10} \times 1.20$
I_{20} (mm/hr)	66.3	60.6	Taken from BOM Rainfall Data
I_{1} (mm/hr)	125	116	Taken from BOM Rainfall Data
Q_{20} (m^3/s)	1.281	1.310	$Q_{20} = C_{20}I_{20}A$ / 360
Q_{1} (m^3/s)	3.050	3.168	$Q_{1} = C_{1}I_{1}A$ / 360
Q_{GAP} (m^3/s)	1.770	1.858	$Q_{GAP} = Q_{1} - Q_{20}$
Crtical Section	2	3	Critical Section

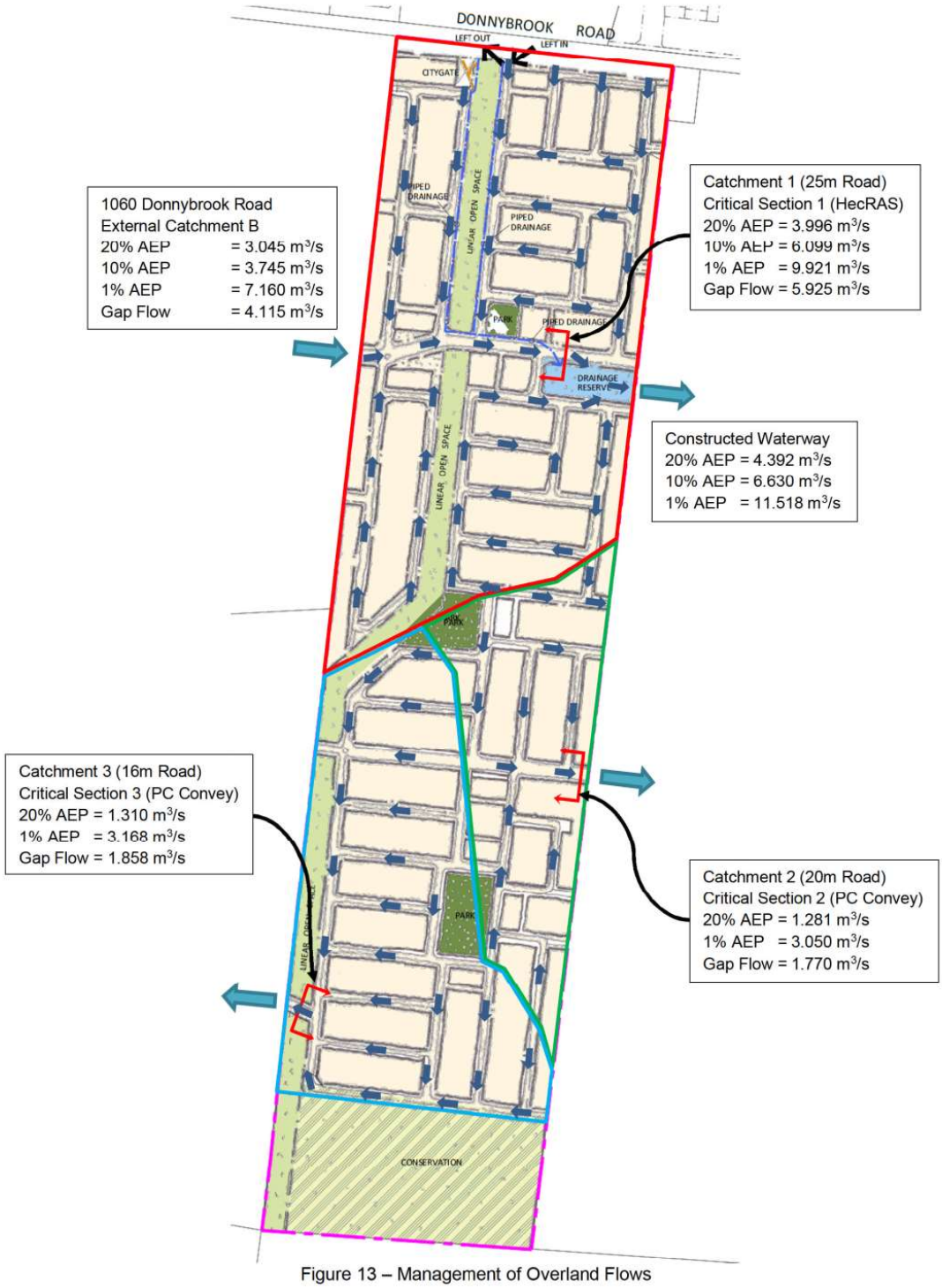


Figure 13 – Management of Overland Flows

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The extent of each of the overland flows through the development has been determined and it has been verified that the proposed overland flow paths have the capacity to cater for the nominated flow whilst meeting the relevant flood safety criteria. Details of the critical overland flows are included in Appendix B together with relevant calculations demonstrating compliance with flood safety criteria.

Freeboard

Council and Melbourne Water guidelines dictate that 150 mm of freeboard is required to be provided adjacent to local overland flow paths and 600 mm of freeboard is required adjacent to the proposed sediment basin and constructed waterway.

Water Quality

Drainage requirements for the proposed development have been identified in the Whittlesea Council Planning Scheme. These requirements have been reiterated in our consultation with Council. It is therefore appropriate to identify a drainage strategy that addresses these requirements.

Urban Stormwater – Best Practice Environmental Guidelines (2006) states that stormwater management should be based on the following principles:

- Provision of public safety and prevention of flood damage and control of storm flows.
- Preservation and enhancement of stormwater quality.
- Preservation of the natural and beneficial function of the natural drainage system.
- Treatment of stormwater in order to meet water quality objectives for reuse and/or discharge to surface waters.
- Protection of natural systems.
- Reduction of potable water demands.

Treatment objectives:

The objectives for environmental management of stormwater are as follows:

Pollutant	Receiving Water Objective	Current best practice performance objective
Post Construction Phase		
Suspended Solids (SS)	Comply with SEPP	80% retention of the typical urban annual load
Total Phosphorus (TP)	Comply with SEPP	45% retention of the typical urban annual load
Total Nitrogen (TN)	Comply with SEPP	45% retention of the typical urban annual load
Litter	Comply with SEPP	70% retention of the typical urban annual load
Flows	Maintain flows at pre-urbanisation levels	Maintain discharges for the 1:1.5 year ARI at pre-development levels
Construction Phase		
Suspended Solids	Comply with SEPP	Effective treatment of 90% of daily runoff events. Effective treatment equates to a 50%ile SS concentration of 50mg/L
Litter	Comply with SEPP	Prevent litter from entering the stormwater system
Other Pollutants	Comply with SEPP	Limit the application, generation and migration of toxic substances to the maximum extent practicable

Pollutant Sources:

The main pollutants in urban stormwater are large quantities of already naturally occurring nutrients and particles such as nitrogen and phosphorus, heavy metals and fine sediments. Typically for a residential area, these pollutants originate from a variety of sources including:

- Atmospheric deposition
- Synthetic and organic litter
- Leaf litter, grass cuttings and other vegetation
- Animal faeces
- Herbicides, pesticides and fertilisers
- Sewer overflows
- Leakages and spillages from vehicles, storage tanks and bins
- Wastewater from cleaning operations
- Vehicle emissions and wear of vehicle components such as tyres and brakes
- Wear of road surfaces
- Erosion from construction activity and vegetation removal on slopes
- Litter

These urban pollutants are washed into waterways during storm events.

Treatment Regime for the Subject Land

In the case of the Subject Land, Melbourne Water DSS nominates treatment of flows via a sediment pond within the Subject Land prior to discharging into the proposed constructed waterway. Further water quality treatment is proposed downstream within basin RB2LA located in 1150 Donnybrook Road.

Taylors has prepared a Concept Design for the sediment pond that treats a total catchment of 63.366 hectares (Internal Catchment 1 and External Catchment B). The surface area of the permanent pool required is 1,200sq.m with a length of 48 metres and a minimum width of 25 metres. The total depth of 1.6 metres allows for 1.1 metres of sediment storage and 500mm clearance to the normal water level. Taylors have assessed the Concept sediment basin against Melbourne Waters, Wetland Design Manual, Deemed to Comply Criteria.

SP1	Sediment ponds must be located offline of waterways but online to the pipe or lined channel they are treating water from. Refer to Part A3 of this Manual for guidance on offline configurations.	The proposed sediment pond is to be located immediately upstream of the waterway and constructed in-line with the proposed scheme pipeline to treat the 3 month flow.
SP2	Sediment ponds must be located at each point stormwater enters the "wetland system" unless: • The catchment of the incoming stormwater is < 5% of the total wetland catchment, or • The incoming stormwater has already passed through a bioretention system or wetland immediately upstream	The proposed sediment pond is located upstream of the constructed waterway. It is anticipated an additional sediment pond will be located downstream within wetland RB2LA.

SP3	Sediment ponds must be sized to: • Capture 95% of coarse particles ≥ 125 µm diameter for the peak three month ARI • ≤ than 1.6m deep • Provide adequate sediment storage volume to store five years of sediment. The top of the sediment accumulation zone must be assumed to be 500 mm below NWL. • Ensure that velocity through the sediment pond during the peak 100 year ARI event is ≤ 0.5 m/s. (The flow area must be assumed to be the EDD multiplied by the narrowest width of the sediment pond, at NWL, between the inlet and overflow outlet). Sediment ponds must be ≤ 120% of the size needed to meet the limiting of the above three criteria. Compliance with the above criteria must be demonstrated using the methods described in WSUD Engineering Procedures: Stormwater (Melbourne Water, 2005). Alternatively, the velocity criteria can be checked using a hydraulic model such as HEC-RAS. Refer to Part D of this Manual for guidance on undertaking velocity checks).	• Concept sediment pond design captures 98% of 125 µm particles. • Concept sediment pond is 1.5 m deep. • 1.1 m deep sediment storage (500mm below NWL), provides clean out frequency of 6.2 years. • It is proposed that the 100 year ARI event (1% AEP) is bypassed around the sediment pond. The concept sediment pond has a minimum width of 25 metres and depth to sediment storage of 500mm. The design 4EY flow of 0.791 m^3/s has a scour velocity of 0.06 m/s. The 20% AEP flow of 4.392 m^3/s has a scour velocity of 0.35 m/s.
SP4	The sediment pond EDD must be ≤ 350 mm.	The concept sediment pond has an EDD of 350mm.

Calculation of the Sediment Pond size to be constructed on the Subject Land is provided in Appendix C.

Stormwater Detention

Stormwater detention facilities are often required to be incorporated into developments to ensure that post development peak stormwater discharges are restricted to predevelopment levels. This is achieved by restricting the stormwater outflow from the development by the use of flow restriction devices (eg: orifices, weirs, etc) within the drainage network. The excess development flows are stored in voids (oversized pipes, detention basins, depressions etc) and reduce the impact of the development on downstream drainage infrastructure.

It is noted, however that where a development is located near an outfall or downstream of a large external catchment, the peak flows from the proposed development can coincide with the time of concentration of the external catchment thereby producing a likely amplification of the peak flow in the downstream drainage infrastructure. This is illustrated in Figure 7 below.

In the case of this development, no detention of flows is required within the Subject Land. Detention of flows from the greater catchment will occur in basin RB2LA downstream of the Subject Land on 1150 Donnybrook Road.

Compliance with Council Planning Scheme

In order to verify that the proposed drainage system meets the requirements of clause 56.07-4 of the Whittlesea Council planning scheme it is appropriate to demonstrate how the proposed stormwater strategy responds to and satisfies the requirements of the planning scheme.

Planning Scheme Requirement	Design Response
The urban stormwater management system must be: • *Designed and managed in accordance with the requirements and to the satisfaction of the relevant drainage authority.* • *Designed and managed in accordance with the requirements and to the satisfaction of the water authority where reuse of urban run-off is proposed.* • *Designed to meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999) as amended.* • *Designed to ensure that flows downstream of the subdivision site are restricted to predevelopment levels unless increased flows are approved by the relevant drainage authority and there are no detrimental downstream impacts.*	*The detailed design of the drainage system will be undertaken in accordance with VPA and Council's Design Guidelines for Subdivisional developments. The design will be submitted to and approved by Council.* *Private rainwater tanks will require installation by a licensed plumber in accordance with the relevant industry standards* *It has been verified that the MWC DSS meets the requirements of Urban Stormwater – Best Practice Environmental Management Guidelines (Victorian Stormwater Committee 1999) as amended.* *Stormwater detention infrastructure has been proposed by MWC downstream of the proposed development, within 1150 Donnybrook Road, which will allow the reduction of post development flows to pre development levels.*
The stormwater management system should be integrated with the overall development plan including the street and public open space networks and landscape design.	*The stormwater management system will be integrated into open space and the landscape network where applicable.*

For all storm events up to and including the 20% Average Exceedance Probability (AEP) standard: • *Stormwater flows should be contained within the drainage system to the requirements of the relevant authority.* • *Ponding on roads should not occur for longer than 1 hour after the cessation of rainfall.*	*The detailed design of the drainage system will be undertaken in accordance with Council's "Design Guidelines for Subdivisional developments." The design will be submitted to and approved by Council. It is noted that the Council guidelines require that storm events up to and including the 20% Average Exceedance Probability (AEP) standard are to be contained within the drainage system.* *The drainage system will be designed so that no ponding of stormwater will occur within road reserves.*
For storm events greater than 20% AEP and up to and including 1% AEP standard: • *Provision must be made for the safe and effective passage of stormwater flows.* • *All new lots should be free from inundation or to a lesser standard of flood protection where agreed by the relevant floodplain management authority.* • *Ensure that streets, footpaths and cycle paths that are subject to flooding meet the safety criteria da Vave < 0.35 m^2/s (where, da = average depth in metres and Vave = average velocity in metres per second).*	*Gap flows will be transferred along the proposed road reserves in accordance with Council requirements.* *A minimum 600mm freeboard shall be provided above the 1 in 100 year water level adjoining the constructed waterway.* *Detailed design demonstrating that that streets, footpaths and cycle paths that are subject to flooding meet the safety criteria da Vave < 0.35 m^2/s will be required to be submitted and approved by Council prior to commencement of works.*
The design of the local drainage network should: • *Ensure run-off is retarded to a standard required by the responsible drainage authority.* • *Ensure every lot is provided with drainage to a standard acceptable to the relevant drainage authority. Wherever possible, run-off should be directed to the front of the lot and discharged into the street drainage system or legal point of discharge.* • *Ensure that inlet and outlet structures take into account the effects of obstructions and debris build up. Any surcharge drainage pit should discharge into an overland flow in a safe and predetermined manner.* • *Include water sensitive urban design features to manage run-off in streets and public open space. Where such features are provided, an application must describe maintenance responsibilities, requirements and costs.*	*The MWC DSS provides stormwater detention infrastructure downstream of the Subject Land within 1150 Donnybrook Road.* *Each allotment shall be provided with a house drainage connection point in accordance with Council's "Design Guidelines for Subdivisional developments."* *Inlet and outlet structures shall be designed and constructed in accordance with Council's "Design Guidelines for Subdivisional."* *The MWC DSS requires a sediment pond to be constructed within the Subject Land, with wetland downstream. It is proposed that sediment pond will be incorporated with road and open space areas in accordance with the requirements of MWC and Council.*
Any flood mitigation works must be designed and constructed in accordance with the requirements of the relevant floodplain management authority.	*Filling of lots shall be designed and constructed (if required) in accordance with the requirements of the MW and Council.*

Construction Site Management

The construction of the development will require careful environmental management to ensure that sensitive features of the proposed stormwater network and environmental values of the Subject Land are not compromised in any way. An environmental management plan (EMP) can assist in identifying environmental values, risks, monitoring activities, responsibilities and construction approaches. The plan should incorporate the following measures:

- Piping of large concentrated flows where dispersive soils are present;
- Stormwater management during construction to meet the objectives of "Best Practice" as specified in this document;
- Erosion prevention and control techniques generally in accordance with EPA Publication 480 (1996) – Environmental Guidelines for Major Construction Sites and EPA Publication 275 (1991) – Construction Techniques for Sediment Pollution Control;
- Protection of vegetation by fencing;
- Stabilisation of earthworks batters;
- Cleaning of construction plant leaving the site;
- Early establishment of vegetation where practical;
- Control of dust and noise;
- Formation of specific facilities for storage of chemicals, fuels, etc;
- Recycling of stormwater where possible; and
- Removal of waste.

CONCLUSION

A surface stormwater drainage management strategy for the subject land has been prepared which has:

- Identified the characteristics of the subject land relevant to drainage;
- Identified local drainage catchments;
- Included details of consultation with Council;
- Undertaken appropriate modelling for water quality and flow;
- Outlined a drainage management strategy for the land which meets the requirements of Clause 56.04-7 of the Whittlesea Council Drainage Scheme.
- Identifies that the MW DSS provides an adequate strategy for the Subject Land which proposes to convey flows from Donnybrook Road in pipes rather than constructed waterways;
- Confirms that the gas transmission pipeline does not unnecessarily lower the incoming invert of the sediment basin.

The report has identified that the configuration of allotments is adequate to accommodate any works to detain, retain and/or treat stormwater.

It is considered that the proposed development can meet the requirements of the Whittlesea Council and Melbourne Water.

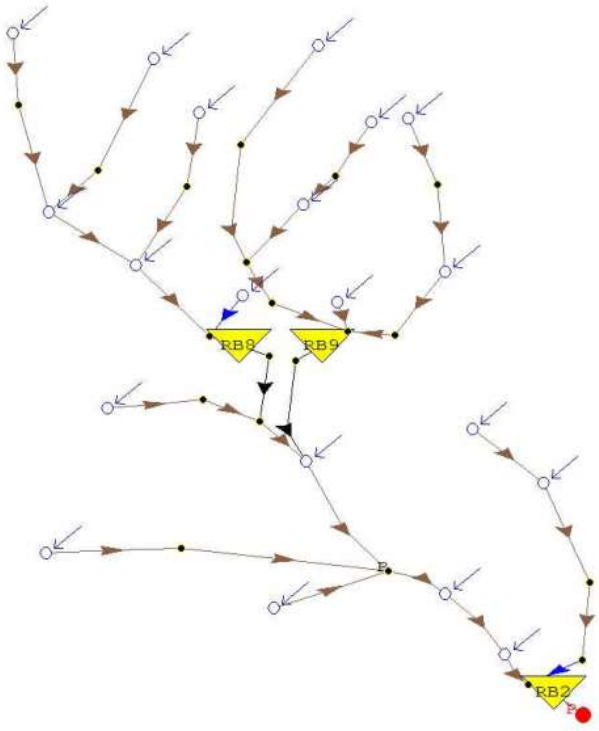
This report comprises 51 pages including appendices and should not be reproduced except in full.

Report prepared by:
TAYLORS

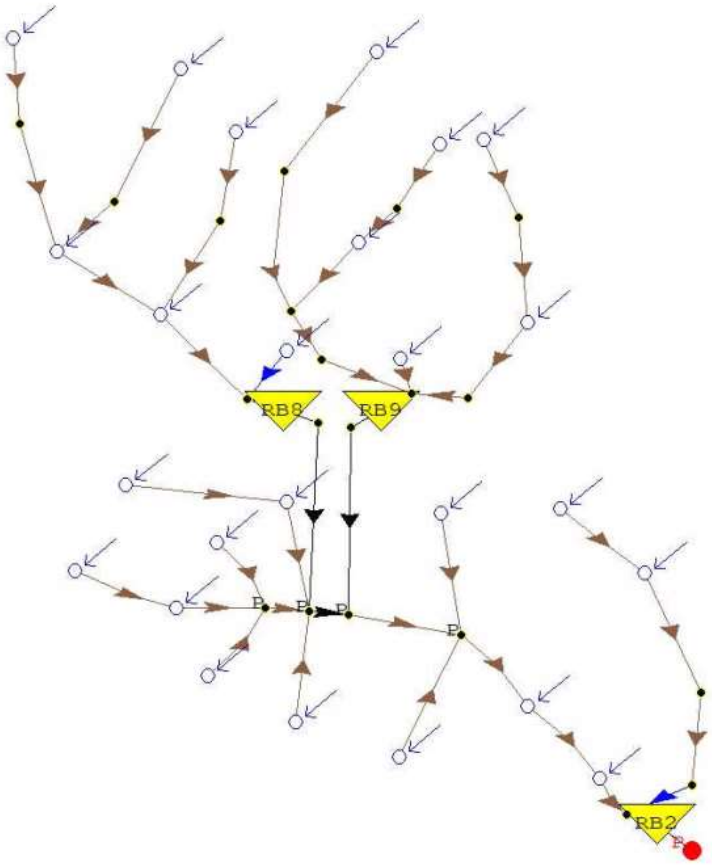
Andrew Matheson
Manage
Engineering Strategy & Feasibility

Appendix A – RORB Model Outputs

Melbourne Water Original Geometry File



Taylors Modified Geometry File



RORBWin Batch Run Summary
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Program version 6.45 (last updated 20th March 2019)
Copyright Monash University and Hydrology and Risk Consulting

Date run: 06 Jul 2020 12:35

Catchment file : K:\20996E\Melbourne Water\Woodstock West_north catchment RORB\Woodstock West DSS_north catchment AHM Rev 2.catg
Rainfall location: User defined
Temporal pattern : ARR2016 point temporal patterns
Spatial pattern : Uniform
Areal Red. Fact. : Based on ARR 2016 (Book 2 Chapter 4)
Loss factors : Constant with ARI

Parameters: kc = 2.70 m = 0.80

Loss parameters Initial loss (mm) Cont. loss (mm/h)
16.00 2.60

Peak Description
01 Special storage : RB8 - Outflow
02 Special storage : RB8 - Inflow
03 Calculated hydrograph, Node A7
04 Calculated hydrograph, Node A6a
05 Special storage : RB9 - Outflow
06 Special storage : RB9 - Inflow
07 Calculated hydrograph, Node A6b
08 Calculated hydrograph, Sed Pond
09 Special storage : RB2 - Outflow
10 Special storage : RB2 - Inflow
11 Calculated hydrograph, End of Catchment

Run	Duration	AEP	TPat	Rain(mm)	ARF	Peak0001	Peak0002	Peak0003	Peak0004	Peak0005	Peak0006	Peak0007	Peak0008	Peak0009	Peak0010	Peak0011
						1.849	7.8283	7.16	8.8352	1.8702	5.7627	9.9212	11.5175	8.4571	13.3603	8.4571
1	10 min	1%	21	23.8	0.97	0.9035	3.6018	4.1735	4.4265	0.8809	2.7868	4.7294	4.6737	1.5106	4.5061	1.5106
1	10 min	1%	22	23.8	0.97	0.9033	3.5982	4.212	4.3799	0.8806	2.7075	4.6964	4.6783	1.5099	4.4762	1.5099
1	10 min	1%	23	23.8	0.97	0.9039	3.6039	4.2835	4.4596	0.8807	2.8503	4.7538	4.6709	1.5112	4.5738	1.5112
1	10 min	1%	24	23.8	0.97	0.9046	3.6113	4.7034	4.5731	0.8843	3.1239	4.8336	4.6801	1.514	4.6876	1.514
1	10 min	1%	25	23.8	0.97	0.9035	3.6008	4.1277	4.4127	0.8804	2.7608	4.719	4.6742	1.5102	4.4787	1.5102
1	10 min	1%	26	23.8	0.97	0.9042	3.6083	4.5096	4.5216	0.8828	2.9908	4.797	4.6603	1.5125	4.7094	1.5125
1	10 min	1%	27	23.8	0.97	0.9031	3.5999	4.1623	4.3991	0.8805	2.7355	4.7101	4.6769	1.51	4.4749	1.51
1	10 min	1%	28	23.8	0.97	0.9049	3.6123	4.661	4.5626	0.8838	3.0943	4.826	4.6761	1.5142	4.7059	1.5142
1	10 min	1%	29	23.8	0.97	0.906	3.6187	4.9674	4.6441	0.887	3.3165	4.8868	4.7118	1.5167	4.5748	1.5167
1	10 min	1%	30	23.8	0.97	0.905	3.6138	4.7383	4.5827	0.8844	3.1474	4.8406	4.6843	1.5141	4.6717	1.5141
2	15 min	1%	21	29	0.97	1.1363	4.6783	4.8564	5.738	1.1213	3.3808	6.0022	6.2525	2.2236	6.0637	2.2236
2	15 min	1%	22	29	0.97	1.1371	4.7104	5.1436	5.8298	1.123	3.5384	6.0667	6.2957	2.2243	6.0654	2.2243
2	15 min	1%	23	29	0.97	1.1371	4.7174	4.9062	5.7549	1.122	3.4012	5.9298	6.2927	2.2244	6.0515	2.2244
2	15 min	1%	24	29	0.97	1.1378	4.764	5.4703	5.9291	1.1282	3.7625	6.0637	6.3687	2.2284	6.098	2.2284
2	15 min	1%	25	29	0.97	1.1377	4.7687	5.0509	5.7966	1.125	3.5098	6.0939	6.3486	2.2249	6.0889	2.2249
2	15 min	1%	26	29	0.97	1.1388	4.7977	5.9046	6.0553	1.1332	4.0401	6.1728	6.4246	2.2313	6.1322	2.2313
2	15 min	1%	27	29	0.97	1.1374	4.7428	5.273	5.8696	1.1247	3.6198	6.0336	6.3358	2.2256	6.0773	2.2256
2	15 min	1%	28	29	0.97	1.1379	4.7625	5.3796	5.9009	1.1277	3.7052	6.0444	6.3615	2.2281	6.0942	2.2281
2	15 min	1%	29	29	0.97	1.1385	4.8381	5.6332	5.9538	1.1309	3.8444	6.4246	6.424	2.2292	6.3234	2.2292
2	15 min	1%	30	29	0.97	1.1378	4.825	5.8305	5.9561	1.1282	4.0479	6.4132	6.3815	2.2291	6.5653	2.2291
3	20 min	1%	21	32.8	0.98	1.2543	5.4311	5.0108	6.4363	1.2623	3.8206	6.952	7.4452	2.744	7.2355	2.744
3	20 min	1%	22	32.8	0.98	1.2536	5.3904	5.0624	6.2704	1.2609	3.6606	6.811	7.4055	2.7446	7.2085	2.7446
3	20 min	1%	23	32.8	0.98	1.2546	5.4544	5.2941	6.4817	1.2651	3.8059	7.004	7.4801	2.7473	7.2539	2.7473
3	20 min	1%	24	32.8	0.98	1.256	5.5839	5.3921	6.6971	1.2683	4.1176	7.0751	7.5095	2.7462	7.2416	2.7462
3	20 min	1%	25	32.8	0.98	1.2569	5.5948	5.9982	6.9454	1.2721	4.1811	7.2624	7.5289	2.7506	7.3228	2.7506
3	20 min	1%	26	32.8	0.98	1.2557	5.5371	5.8565	6.8488	1.2709	4.1514	7.3008	7.5649	2.7478	7.3156	2.7478
3	20 min	1%	27	32.8	0.98	1.2567	5.5844	5.9502	6.9204	1.2715	4.1569	7.2391	7.5168	2.7494	7.3165	2.7494
3	20 min	1%	28	32.8	0.98	1.2558	5.5346	5.9393	6.8577	1.2694	4.2086	7.1933	7.467	2.7456	7.2876	2.7456
3	20 min	1%	29	32.8	0.98	1.2591	5.692	6.1052	7.0079	1.2743	4.2487	7.2379	7.6424	2.7548	7.3174	2.7548
3	20 min	1%	30	32.8	0.98	1.2573	5.645	6.0942	6.9477	1.2733	4.2799	7.2	7.6052	2.7481	7.2841	2.7481
4	25 min	1%	21	35.8	0.98	1.3383	6.0664	5.299	7.052	1.3634	4.3885	7.7032	8.3669	3.1684	8.1241	3.1684
4	25 min	1%	22	35.8	0.98	1.3361	5.9297	5.1079	6.7229	1.3591	4.0868	7.2424	8.1441	3.1687	8.112	3.1687
4	25 min	1%	23	35.8	0.98	1.3355	5.8561	5.1258	6.9335	1.3574	4.137	7.4723	8.1907	3.1657	8.0414	3.1657
4	25 min	1%	24	35.8	0.98	1.3337	5.7993	4.3646	6.4528	1.3511	4.0645	7.1444	8.039	3.1656	8.0032	3.1656
4	25 min	1%	25	35.8	0.98	1.3352	5.8822	4.7456	6.6997	1.3558	4.1808	7.3457	8.1547	3.1666	8.0319	3.1666
4	25 min	1%	26	35.8	0.98	1.3393	6.1105	5.5129	7.024	1.366	4.3382	7.6791	8.3881	3.1711	8.1797	3.1711
4	25 min	1%	27	35.8	0.98	1.3397	6.127	5.8574	7.2402	1.368	4.2563	7.5817	8.3648	3.1719	8.2206	3.1719
4	25 min	1%	28	35.8	0.98	1.3377	6.0518	5.182	6.9433	1.3624	4.3364	7.6349	8.3206	3.1663	8.1175	3.1663
4	25 min	1%	29	35.8	0.98	1.3456	6.377	7.16	7.9891	1.3795	5.0029	8.2989	8.5899	3.1792	8.3321	3.1792
4	25 min	1%	30	35.8	0.98	1.3403	6.1496	5.9171	7.4414	1.3688	4.4457	7.8149	8.3602	3.1707	8.2105	3.1707

5	30 min	1%	21	38.3	0.98	1.4015	6.3668	4.9029	7.0682	1.4343	4.5111	7.877	8.8438	3.5113	8.8364	3.5113
5	30 min	1%	22	38.3	0.98	1.4	6.1936	5.6442	7.042	1.4317	4.2468	7.7293	8.9111	3.511	8.8336	3.511
5	30 min	1%	23	38.3	0.98	1.399	6.0783	5.3429	6.8611	1.4273	4.1863	7.5732	8.8141	3.5096	8.8032	3.5096
5	30 min	1%	24	38.3	0.98	1.4003	6.2384	5.3558	7.0718	1.4317	4.3567	7.7243	8.9072	3.5119	8.8261	3.5119
5	30 min	1%	25	38.3	0.98	1.4061	6.5577	5.4979	7.4706	1.4427	4.6177	8.0501	9.0021	3.5205	8.9544	3.5205
5	30 min	1%	26	38.3	0.98	1.4056	6.5266	5.192	7.3153	1.4405	4.667	8.1143	9.0022	3.5177	8.9114	3.5177
5	30 min	1%	27	38.3	0.98	1.4005	6.2824	5.1155	7.0946	1.4323	4.3773	7.669	8.8709	3.5124	8.8081	3.5124
5	30 min	1%	28	38.3	0.98	1.4031	6.4288	5.5538	7.3787	1.438	4.5333	7.9557	9.0278	3.519	8.8939	3.519
5	30 min	1%	29	38.3	0.98	1.4077	6.6766	6.0484	7.9336	1.4484	4.7992	8.5897	9.2772	3.521	8.9731	3.521
5	30 min	1%	30	38.3	0.98	1.4059	6.5163	5.9207	7.8332	1.4445	4.7211	8.3971	9.1353	3.5199	8.9181	3.5199
6	45 min	1%	21	44.1	0.98	1.5297	6.8254	5.3054	7.8932	1.5756	4.8835	8.7507	10.2336	4.2905	10.3783	4.2905
6	45 min	1%	22	44.1	0.98	1.5331	6.9691	5.75	8.1245	1.5839	4.9963	8.8183	10.2667	4.2809	10.5703	4.2809
6	45 min	1%	23	44.1	0.98	1.5153	5.8425	4.6295	6.5401	1.5448	4.103	7.7447	9.3343	4.3112	10.5525	4.3112
6	45 min	1%	24	44.1	0.98	1.5057	5.6739	4.4871	6.4801	1.5303	4.207	7.7271	9.0304	4.2815	10.5353	4.2815
6	45 min	1%	25	44.1	0.98	1.5104	5.6286	4.4754	6.3229	1.5384	4.1075	7.4634	9.0336	4.2756	10.3159	4.2756
6	45 min	1%	26	44.1	0.98	1.5193	6.4593	4.6153	7.2056	1.5589	4.8273	8.3679	9.7324	4.2788	10.3228	4.2788
6	45 min	1%	27	44.1	0.98	1.5228	6.2039	4.34	6.906	1.5594	4.4297	7.9077	9.678	4.2839	10.5707	4.2839
6	45 min	1%	28	44.1	0.98	1.5215	6.2377	4.0566	6.9977	1.5582	4.457	8.0336	9.6103	4.282	10.3652	4.282
6	45 min	1%	29	44.1	0.98	1.5344	7.2288	5.699	8.3186	1.5882	5.2462	9.041	10.5149	4.281	10.5218	4.281
6	45 min	1%	30	44.1	0.98	1.5261	6.8709	5.5751	7.939	1.5702	5.1792	8.9527	10.0395	4.2844	10.3627	4.2844
7	1 hour	1%	21	48.4	0.98	1.6204	7.5915	5.8532	8.6989	1.6773	5.6794	9.8539	11.2752	4.8504	11.5763	4.8504
7	1 hour	1%	22	48.4	0.98	1.5761	5.6377	4.4146	6.1909	1.5963	3.9195	7.1568	8.9096	4.8056	10.9531	4.8056
7	1 hour	1%	23	48.4	0.98	1.6012	6.574	4.9537	7.7495	1.6424	4.9067	8.6824	10.238	4.8287	11.4997	4.8287
7	1 hour	1%	24	48.4	0.98	1.5758	5.2697	3.8245	6.3623	1.5977	3.8977	7.6256	9.3525	4.8322	10.9522	4.8322
7	1 hour	1%	25	48.4	0.98	1.5561	5.1173	3.9509	6.4733	1.5655	3.7509	7.698	9.1473	4.8382	10.3943	4.8382
7	1 hour	1%	26	48.4	0.98	1.5447	4.893	4.3376	6.5005	1.5474	3.8454	7.7545	8.7626	4.8455	10.8478	4.8455
7	1 hour	1%	27	48.4	0.98	1.5989	6.4289	4.4696	7.2802	1.6388	4.7587	8.3386	10.0465	4.8306	11.435	4.8306
7	1 hour	1%	28	48.4	0.98	1.5983	6.3717	4.2363	7.171	1.6387	4.8048	8.4843	10.2185	4.841	11.6342	4.841
7	1 hour	1%	29	48.4	0.98	1.5923	5.9067	3.7809	6.7117	1.6273	4.4238	7.9912	9.8463	4.8404	11.565	4.8404
7	1 hour	1%	30	48.4	0.98	1.628	7.8283	5.9223	8.8352	1.6868	5.7627	9.9212	11.5175	4.8647	11.8596	4.8647
8	1.5 hour	1%	21	55.3	0.98	1.6687	5.8676	4.171	6.7559	1.677	4.3185	7.8417	9.4432	5.6432	11.2146	5.6432
8	1.5 hour	1%	22	55.3	0.98	1.687	5.6972	3.5855	6.9377	1.722	4.3171	8.3227	10.2465	5.7474	12.4896	5.7474
8	1.5 hour	1%	23	55.3	0.98	1.665	5.0525	3.4614	5.7192	1.67	3.5382	7.2002	8.9819	5.6465	11.4756	5.6465
8	1.5 hour	1%	24	55.3	0.98	1.6252	4.8403	3.6941	6.395	1.6117	3.7803	7.8013	9.1682	5.6783	10.732	5.6783
8	1.5 hour	1%	25	55.3	0.98	1.6201	6.4113	4.5972	7.1666	1.5906	4.632	7.9694	9.3394	5.4784	10.6746	5.4784
8	1.5 hour	1%	26	55.3	0.98	1.7001	5.9855	3.861	7.0171	1.7394	4.4796	8.316	10.3157	5.7237	12.4171	5.7237
8	1.5 hour	1%	27	55.3	0.98	1.6817	5.2471	3.4897	6.5576	1.7062	3.9859	7.9747	9.8972	5.7286	12.0427	5.7286
8	1.5 hour	1%	28	55.3	0.98	1.6792	5.2859	3.7523	6.6357	1.6999	4.0983	8.0743	9.7204	5.7359	12.085	5.7359
8	1.5 hour	1%	29	55.3	0.98	1.6955	6.6629	5.1385	7.9695	1.7349	5.098	9.0525	10.716	5.6909	12.4036	5.6909
8	1.5 hour	1%	30	55.3	0.98	1.6814	6.927	5.4051	8.5909	1.7227	5.3794	9.7641	11.4901	5.7638	12.0017	5.7638
9	2 hour	1%	21	60.8	0.98	1.7036	5.8547	4.1298	6.7438	1.6923	4.3203	7.8644	9.4817	6.1451	11.2049	6.1451
9	2 hour	1%	22	60.8	0.98	1.7289	6.1709	4.6125	6.965	1.7481	4.405	7.9738	10.0622	6.1903	12.4386	6.1903
9	2 hour	1%	23	60.8	0.98	1.6331	6.7982	5.6479	7.9486	1.5539	4.8545	8.6487	9.8972	5.9511	10.1121	5.9511
9	2 hour	1%	24	60.8	0.98	1.6932	5.0287	4.514	5.9506	1.6765	3.4972	7.4678	8.6467	6.1913	11.611	6.1913
9	2 hour	1%	25	60.8	0.98	1.7264	5.3867	3.755	6.8096	1.7382	4.1588	8.275	10.0404	6.3883	11.9091	6.3883
9	2 hour	1%	26	60.8	0.98	1.672	4.0554	2.7641	4.9188	1.6345	2.8943	6.4629	7.9347	6.1676	10.0423	6.1676
9	2 hour	1%	27	60.8	0.98	1.7065	4.6877	3.1997	6.0494	1.7077	3.5573	7.5715	9.4458	6.3679	11.6894	6.3679
9	2 hour	1%	28	60.8	0.98	1.7056	5.1073	4.8627	6.7368	1.6983	4.0474	7.9278	9.13	6.2892	11.1229	6.2892
9	2 hour	1%	29	60.8	0.98	1.7426	5.5012	3.5367	6.7887	1.7641	4.2005	8.1599	10.1583	6.4192	12.3375	6.4192
9	2 hour	1%	30	60.8	0.98	1.7363	6.1986	4.01	7.4325	1.7693	4.7627	8.9238	10.989	6.4583	13.1834	6.4583
10	3 hour	1%	21	69.9	0.99	1.7939	5.9572	3.7321	7.316	1.812	4.5771	8.7526	10.7015	7.4217	12.871	7.4217
10	3 hour	1%	22	69.9	0.99	1.6491	4.4261	3.3681	5.1992	1.6129	2.9743	6.6148	7.9534	5.9711	10.122	5.9711
10	3 hour	1%	23	69.9	0.99	1.5992	4.1715	3.3535	4.893	1.449	2.7914	5.8307	6.9968	6.3014	8.462	6.3014
10	3 hour	1%	24	69.9	0.99	1.6269	3.5029	2.5985	4.8762	1.5756	2.6436	6.2733	7.6192	6.0612	9.5802	6.0612
10	3 hour	1%	25	69.9	0.99	1.68	3.6176	2.7041	4.9142	1.5885	2.587	6.3478	7.4792	6.7388	9.1971	6.7388
10	3 hour	1%	26	69.9	0.99	1.7914	5.2914	3.5153	6.3311	1.7684	4.0237	7.5592	9.5807	7.0857	11.3092	7.0857
10	3 hour	1%	27	69.9	0.99	1.6954	3.2672	2.4571	4.7928	1.6016	2.5114	6.402	7.6965	6.7969	9.2382	6.7969
10	3 hour	1%	28	69.9	0.99	1.762	3.9585	2.4697	5.2534	1.7295	2.9392	6.7389	8.4107	7.0392	10.5478	7.0392
10	3 hour	1%	29	69.9	0.99	1.6733	3.6003	2.6948	5.2937	1.5562	2.7859	6.6471	7.6352	6.6914	9.2583	6.6914
10	3 hour	1%	30	69.9	0.99	1.849	6.0493	4.245	7.5553	1.8702	4.6295	8.9119	10.7938	7.4564	13.3603	7.4564
11	4.5 hour	1%	21	80.8	0.99	1.4998	3.1613	1.9813	3.7547	1.3062	2.1732	4.7627	5.8385	5.8856	7.2906	5.8856
11	4.5 hour	1%	22	80.8	0.99	1.6954	3.4506	2.5444	4.7483	1.5807	2.6026	6.1666	7.222	7.0529	8.8853	7.0529
11	4.5 hour	1%	23	80.8	0.99	1.5286	3.8195	2.6393	4.8636	1.4277	2.8223	5.9338	7.0176	5.9652	8.2983	5.9652
11	4.5 hour	1%	24	80.8	0.99	1.591	4.1906	2.7769	5.4599	1.5667	3.0437	6.8394	8.2573	5.5377	10.3145	5.5377
11	4.5 hour	1%	25	80.8	0.99	1.6011	2.6328	1.6773	3.6155	1.4034	1.8338	4.9424	5.9238	6.4875	7.4476	6.4875
11	4.5 hour	1%	26	80.8	0.99	1.7271	3.7929	2.4092	5.1036	1.6009	2.8698	6.3674	7.7076	7.1738	9.3825	7.1738
11	4.5 hour	1%	27	80.8	0.99	1.6956	3.9917	2.644	5.3324	1.5883	2.9701	6.734	8.2972	7.1964	9.9654	7.1964
11	4.5 hour	1%	28	80.8	0.99	1.661	3.2839	2.4049	4.7337	1.5044	2.5433	5.9533	7.3159	6.8771	8.6607	6.8771
11	4.5 hour	1%	29	80.8	0.99	1.8396	4.709	3.0808	6.056	1.8011	3.5905	7.774	9.6763	8.1738	12.0541	8.1738
11	4.5 hour	1%	30	80.8	0.99	1.8306	4.1544	2.8313	5.5627	1.7696	3.2318	6.9359	8.3038	7.9545	10.715	7.9545
12	6 hour	1%	21	89.8	0.99	1.846	5.8205	3.6947	7.0724	1.8499	4.4729	8.3887	10.7826	8.4571	13.2558	8.4571
12	6 hour	1%	22	89.8	0.99	1.6265	3.3775	2.4881	4.766	1.557	2.5942	6.2675	7.6226	6.2878	9.0177	6.2878
12	6 hour	1%	23	89.8	0.99	1.5669	3.5975	2.7031	5.2245	1.4275	2.8367	6.3858	7.2745	6.4629	8.8806	6.4629
12	6 hour	1%	24	89.8	0.99	1.5034	3.8191	2.9855	4.4826	1.4516	2.5071	5.7385	6.8573	5.6813	8.6658	5.6813
12	6 hour	1%	25	89.8	0.99	1.5512	3.2652	2.4839	4.2528	1.4902	2.2371	5.6599	6.9278	5.5577	8.7132	5.5577
12	6 hour	1%	26	89.8	0.99	1.5267	4.6309	3.5669	6.2469	1.5309	3.5764	7.3991	8.2029	5.4023	9.951	5.4023
12	6 hour	1%	27	89.8	0.99	1.5262	2.3974	1.8301	3.4667	1.2899	1.5891	4.6811	5.6048	6.2428	6.84	6.2428
12	6 hour	1%	28	89.8	0.99	1.5896	2.7718	1.7726	4.0331	1.484	2.0687	5.4281	6.6292	6.3315	8.5459	6.3315
12	6 hour	1%	29	89.8	0.99	1.4923	2.3614	1.4595	3.4903	1.3393	1.7381	4.7543	5.7451	5.847	7.2666	5.847

Our Ref: 20996/E
Drainage Strategy – 1100 Donnybrook Road, Donnybrook Rev A2

12	6 hour	1%	30	89.8	0.99	1.7611	3.498	2.0872	4.7692	1.6411	2.6244	6.1496	7.6126	7.6563	9.6098	7.6563
13	9 hour	1%	21	104	0.99	1.3563	1.9165	1.2016	2.8468	1.0469	1.3781	3.8516	4.5086	5.3153	5.6129	5.3153
13	9 hour	1%	22	104	0.99	1.3471	2.1908	1.3493	3.3689	1.2089	1.6232	4.4544	5.2948	5.0038	6.4383	5.0038
13	9 hour	1%	23	104	0.99	1.7424	4.8657	3.0912	6.0595	1.7257	3.7084	7.3602	8.7905	6.8076	11.0356	6.8076
13	9 hour	1%	24	104	0.99	1.5345	2.3643	1.4461	3.6994	1.359	1.7731	4.9972	6.0231	6.0812	7.4822	6.0812
13	9 hour	1%	25	104	0.99	1.6458	4.8938	3.0077	6.3108	1.661	3.7454	7.6356	8.9722	5.9664	10.216	5.9664
13	9 hour	1%	26	104	0.99	1.3094	1.8997	1.2376	2.9691	1.1208	1.4197	3.9986	4.8242	5.1651	5.9304	5.1651
13	9 hour	1%	27	104	0.99	1.501	2.8188	1.6685	4.1034	1.3739	2.0961	5.3665	6.5147	6.0635	8.0742	6.0635
13	9 hour	1%	28	104	0.99	1.5654	2.4439	1.5133	3.9157	1.3682	1.8055	5.2428	6.2754	6.5709	7.6092	6.5709
13	9 hour	1%	29	104	0.99	1.7072	3.2347	2.0106	4.5055	1.5721	2.4398	5.7555	7.0556	7.4894	8.878	7.4894
13	9 hour	1%	30	104	0.99	1.7603	4.8589	3.2723	6.3468	1.7239	3.7464	7.6358	8.9672	7.9969	10.6673	7.9969
14	12 hour	1%	21	116	0.99	1.6683	3.1225	1.9493	4.4575	1.5859	2.3384	5.9623	7.3465	7.0968	9.2479	7.0968
14	12 hour	1%	22	116	0.99	1.5111	2.5917	1.817	3.9922	1.3234	1.9782	5.2849	6.4025	6.1707	7.7034	6.1707
14	12 hour	1%	23	116	0.99	1.3268	2.2844	1.4461	2.987	1.158	1.5103	4.0391	4.9253	4.8473	6.1322	4.8473
14	12 hour	1%	24	116	0.99	1.4769	2.2822	1.3869	3.4429	1.2952	1.7107	4.7056	5.6889	5.7454	7.0476	5.7454
14	12 hour	1%	25	116	0.99	1.7515	4.7563	3.0577	6.2677	1.7137	3.6439	7.6269	9.0629	7.8512	10.7809	7.8512
14	12 hour	1%	26	116	0.99	1.3477	1.5911	1.0235	2.8605	1.0693	1.167	3.9147	4.6597	5.332	5.6431	5.332
14	12 hour	1%	27	116	0.99	1.4825	2.2077	1.3302	3.5164	1.3226	1.6175	4.791	5.7832	5.7787	7.194	5.7787
14	12 hour	1%	28	116	0.99	1.7386	3.7035	2.4256	4.8884	1.6557	2.8345	6.3118	8.0145	7.6087	10.0307	7.6087
14	12 hour	1%	29	116	0.99	1.395	1.835	1.1112	3.0614	1.1613	1.348	4.1526	4.9267	5.5551	6.0804	5.5551
14	12 hour	1%	30	116	0.99	1.4415	2.7793	1.8292	4.0151	1.3588	2.1036	5.3192	6.4952	5.6033	7.9039	5.6033
15	18 hour	1%	21	133	1	1.0011	1.3269	0.7488	2.0497	0.8115	0.9387	2.84	3.3858	3.4976	4.1903	3.4976
15	18 hour	1%	22	133	1	1.1798	1.402	0.8393	2.4692	0.9334	1.0247	3.3892	4.0148	4.3632	4.9581	4.3632
15	18 hour	1%	23	133	1	1.1802	1.5076	0.8973	2.537	0.938	1.0991	3.428	4.0507	4.4969	4.9241	4.4969
15	18 hour	1%	24	133	1	1.3992	2.1082	1.2513	3.1812	1.2383	1.5566	4.2672	5.1657	5.5487	6.5088	5.5487
15	18 hour	1%	25	133	1	1.4327	2.2114	1.2898	3.4534	1.2251	1.6323	4.6428	5.5834	5.7456	6.8687	5.7456
15	18 hour	1%	26	133	1	1.0926	1.5616	0.9648	2.2862	0.88	1.0651	3.1853	3.8494	3.8033	4.729	3.8033
15	18 hour	1%	27	133	1	1.4522	1.9142	1.1448	3.1296	1.2508	1.4056	4.3626	5.2252	5.7724	6.5672	5.7724
15	18 hour	1%	28	133	1	1.3605	2.4124	1.5024	3.5949	1.2046	1.7382	4.8052	5.863	4.6389	7.015	4.6389
15	18 hour	1%	29	133	1	1.1433	1.6682	1.0142	2.6713	0.9732	1.2064	3.6374	4.3634	4.4179	5.2233	4.4179
15	18 hour	1%	30	133	1	1.1822	1.3688	0.8074	2.4554	0.9237	0.9878	3.3708	4.0081	4.5644	4.9318	4.5644
16	24 hour	1%	21	146	1	1.2243	1.4435	0.8591	2.5202	0.9744	1.048	3.4876	4.1554	4.7705	5.1425	4.7705
16	24 hour	1%	22	146	1	0.9613	1.5034	0.9016	2.0737	0.7373	0.9804	2.634	3.1715	3.5471	3.9567	3.5471
16	24 hour	1%	23	146	1	1.2744	1.953	1.2475	2.8833	1.1258	1.4558	3.9569	4.8129	4.7498	5.938	4.7498
16	24 hour	1%	24	146	1	1.2074	1.8385	1.1063	2.7651	1.0336	1.3541	3.6572	4.2938	4.1866	5.3002	4.1866
16	24 hour	1%	25	146	1	1.2742	2.0371	1.3901	3.0537	1.1717	1.5332	4.2567	5.1919	4.7411	6.2991	4.7411
16	24 hour	1%	26	146	1	1.2276	1.6649	1.0598	2.7469	1.0447	1.2321	3.8003	4.5582	4.7193	5.5766	4.7193
16	24 hour	1%	27	146	1	1.2732	2.0949	1.3455	3.0276	1.1284	1.5702	3.9063	4.7198	4.8531	5.8188	4.8531
16	24 hour	1%	28	146	1	0.9439	1.3601	0.8373	1.9525	0.7851	0.9725	2.7348	3.2854	3.2416	3.972	3.2416
16	24 hour	1%	29	146	1	1.2174	1.8521	1.263	2.8557	1.0075	1.3894	3.6709	4.2233	4.5647	5.095	4.5647
16	24 hour	1%	30	146	1	1.2276	1.9788	1.3817	3.0574	1.0328	1.5305	3.9308	4.5675	4.6263	5.4303	4.6263
17	30 hour	1%	21	155	1	0.929	1.0412	0.6308	1.8319	0.6788	0.7453	2.5248	3.0056	3.4223	3.7095	3.4223
17	30 hour	1%	22	155	1	1.3239	1.7429	1.0391	2.8571	1.0275	1.2759	3.8525	4.5647	5.1853	5.572	5.1853
17	30 hour	1%	23	155	1	0.9636	1.4259	0.8999	2.2545	0.8021	1.0488	2.9959	3.4648	3.4859	4.0873	3.4859
17	30 hour	1%	24	155	1	1.0356	1.2638	0.751	2.1079	0.7723	0.9156	2.8567	3.3668	3.8682	4.0794	3.8682
17	30 hour	1%	25	155	1	1.3873	2.2627	1.2941	3.5811	1.2545	1.6486	4.8511	5.9118	5.1884	7.316	5.1884
17	30 hour	1%	26	155	1	0.9062	1.1624	0.6883	1.9775	0.718	0.8516	2.6814	3.1702	3.3216	3.8264	3.3216
17	30 hour	1%	27	155	1	0.762	0.871	0.5581	1.5518	0.5482	0.6231	2.1047	2.4651	2.7612	3.0044	2.7612
17	30 hour	1%	28	155	1	0.7723	0.8546	0.4881	1.5825	0.5619	0.5973	2.1471	2.5402	2.9046	3.0931	2.9046
17	30 hour	1%	29	155	1	1.0943	1.1993	0.7286	2.2267	0.836	0.8686	3.0738	3.6684	4.0288	4.5538	4.0288
17	30 hour	1%	30	155	1	0.7992	0.903	0.5281	1.6559	0.583	0.6392	2.227	2.6146	3.0107	3.1545	3.0107
18	36 hour	1%	21	162	1	0.8265	0.9826	0.5627	1.7782	0.6484	0.7082	2.4394	2.92	2.8781	3.5415	2.8781
18	36 hour	1%	22	162	1	0.8729	0.962	0.5903	1.7341	0.6409	0.6887	2.3853	2.8394	3.1566	3.4951	3.1566
18	36 hour	1%	23	162	1	1.0706	1.1924	0.7841	2.2273	0.828	0.8629	3.0862	3.7056	3.7477	4.5234	3.7477
18	36 hour	1%	24	162	1	1.3384	1.6984	0.9915	2.9828	1.1357	1.2312	4.1328	4.9732	5.1451	6.1702	5.1451
18	36 hour	1%	25	162	1	0.9988	1.1639	0.7128	1.9752	0.7409	0.8433	2.739	3.2706	3.6349	4.0414	3.6349
18	36 hour	1%	26	162	1	0.9346	1.0303	0.5999	1.9175	0.7171	0.7286	2.6338	3.1201	3.2035	3.8373	3.2035
18	36 hour	1%	27	162	1	0.7047	0.8552	0.5192	1.4121	0.5063	0.6046	1.934	2.3148	2.4758	2.8174	2.4758
18	36 hour	1%	28	162	1	0.6784	0.8796	0.5378	1.5037	0.5031	0.6271	1.9795	2.2898	2.5675	2.6992	2.5675
18	36 hour	1%	29	162	1	1.5873	2.4114	1.4571	3.7569	1.2996	1.7873	5.0263	6.0209	6.5383	7.4313	6.5383
18	36 hour	1%	30	162	1	1.0484	1.175	0.7066	2.1243	0.7955	0.8461	2.9047	3.4274	3.986	4.2475	3.986
19	48 hour	1%	21	173	1	0.7913	0.9175	0.5653	1.5845	0.5806	0.5941	2.1827	2.6171	2.6347	3.2411	2.6347
19	48 hour	1%	22	173	1	1.0299	1.235	0.7079	2.2123	0.8231	0.8861	3.0448	3.6301	3.5434	4.4655	3.5434
19	48 hour	1%	23	173	1	1.3042	1.6769	1.0846	2.7222	1.0759	1.2435	3.8367	4.6528	4.9596	5.7759	4.9596
19	48 hour	1%	24	173	1	0.9353	1.0389	0.6787	1.9429	0.7216	0.7365	2.686	3.2177	3.1871	3.9141	3.1871
19	48 hour	1%	25	173	1	1.3877	2.1014	1.1983	3.4172	1.2452	1.5366	4.6838	5.6878	5.0967	7.0861	5.0967
19	48 hour	1%	26	173	1	0.8997	0.9869	0.5724	1.8438	0.6877	0.6974	2.5293	2.9941	3.0717	3.6694	3.0717
19	48 hour	1%	27	173	1	0.7785	0.863	0.5019	1.6017	0.579	0.6063	2.1788	2.5788	2.6935	3.1706	2.6935
19	48 hour	1%	28	173	1	0.7648	0.8014	0.4695	1.5445	0.5435	0.5636	2.0915	2.446	2.8262	2.9605	2.8262
19	48 hour	1%	29	173	1	0.7245	0.8894	0.5163	1.5741	0.5583	0.6322	2.1315	2.5228	2.6354	3.0714	2.6354
19	48 hour	1%	30	173	1	0.9102	1.3242	0.8983	2.0104	0.6994	0.9772	2.6194	2.9549	3.3425	3.6284	3.3425

RORBWin Batch Run Summary
****

Program version 6.45 (last updated 20th March 2019)
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Date run: 06 Jul 2020 13:43

Catchment file : K:\20996E\Melbourne Water\Woodstock West_north catchment RORB\Woodstock West DSS_north catchment AHM Rev 2.catg
Rainfall location: User defined
Temporal pattern : ARR2016 point temporal patterns
Spatial pattern : Uniform
Areal Red. Fact. : Based on ARR 2016 (Book 2 Chapter 4)
Loss factors : Constant with ARI

Parameters: kc = 2.70 m = 0.80

Loss parameters Initial loss (mm) Cont. loss (mm/h)
16.00 2.60

Peak Description
01 Special storage : RB8 - Outflow
02 Special storage : RB8 - Inflow
03 Calculated hydrograph, Node A7
04 Calculated hydrograph, Node A6a
05 Special storage : RB9 - Outflow
06 Special storage : RB9 - Inflow
07 Calculated hydrograph, Node A6b
08 Calculated hydrograph, Sed Pond
09 Special storage : RB2 - Outflow
10 Special storage : RB2 - Inflow
11 Calculated hydrograph, End of Catchment

Run	Duration	AEP	TPat	Rain(mm)	ARF	Peak0001	Peak0002	Peak0003	Peak0004	Peak0005	Peak0006	Peak0007	Peak0008	Peak0009	Peak0010	Peak0011
						1.295	4.1216	3.7447	5.2421	1.2391	3.1773	6.0988	6.6295	4.3567	6.9609	4.3567
1	10 min	10%	11	13.6	0.97	0.3835	1.5795	1.972	1.9491	0.3419	1.2578	2.01	1.9451	0.4659	1.8484	0.4659
1	10 min	10%	12	13.6	0.97	0.3836	1.5798	2.012	1.9563	0.3423	1.2879	2.0144	1.9469	0.4661	1.8501	0.4661
1	10 min	10%	13	13.6	0.97	0.3835	1.58	2.037	1.9609	0.3425	1.307	2.0173	1.9482	0.4661	1.8513	0.4661
1	10 min	10%	14	13.6	0.97	0.3834	1.5801	2.0532	1.9637	0.3427	1.3196	2.019	1.9487	0.4661	1.8519	0.4661
1	10 min	10%	15	13.6	0.97	0.3837	1.5788	1.9046	1.9333	0.3411	1.1977	2.0007	1.9409	0.4647	1.8483	0.4647
1	10 min	10%	16	13.6	0.97	0.3836	1.5816	2.1529	1.981	0.3438	1.3979	2.0293	1.9528	0.4665	1.8559	0.4665
1	10 min	10%	17	13.6	0.97	0.3836	1.5816	2.1487	1.9803	0.3439	1.3946	2.029	1.9527	0.4665	1.8559	0.4665
1	10 min	10%	18	13.6	0.97	0.3835	1.5799	2.0264	1.9588	0.3424	1.2989	2.016	1.9476	0.4661	1.8507	0.4661
1	10 min	10%	19	13.6	0.97	0.3853	1.5867	2.4283	2.0365	0.3487	1.4011	2.0712	1.976	0.4716	1.8804	0.4716
1	10 min	10%	20	13.6	0.97	0.3835	1.5827	2.1853	1.9856	0.3445	1.4259	2.0318	1.9538	0.4666	1.8572	0.4666
2	15 min	10%	11	16.6	0.97	0.5029	2.0125	2.3407	2.4014	0.4405	1.5798	2.4758	2.4951	0.6496	2.3997	0.6496
2	15 min	10%	12	16.6	0.97	0.5032	2.0171	2.432	2.4207	0.4426	1.6349	2.4934	2.5023	0.6503	2.4059	0.6503
2	15 min	10%	13	16.6	0.97	0.503	2.0158	2.4141	2.4171	0.4424	1.6369	2.4897	2.5011	0.6502	2.4048	0.6502
2	15 min	10%	14	16.6	0.97	0.5022	2.0231	2.3066	2.429	0.4446	1.5053	2.5465	2.5027	0.6509	2.4078	0.6509
2	15 min	10%	15	16.6	0.97	0.5069	2.0483	2.539	2.4667	0.4454	1.511	2.587	2.5281	0.6557	2.4329	0.6557
2	15 min	10%	16	16.6	0.97	0.5024	2.0272	2.3943	2.462	0.4457	1.5472	2.5723	2.5159	0.6522	2.4126	0.6522
2	15 min	10%	17	16.6	0.97	0.5068	2.0497	2.4505	2.4873	0.4458	1.5208	2.6005	2.5339	0.6557	2.4326	0.6557
2	15 min	10%	18	16.6	0.97	0.5027	2.029	2.3755	2.4568	0.4442	1.4948	2.5722	2.5188	0.6519	2.4189	0.6519
2	15 min	10%	19	16.6	0.97	0.507	2.0518	2.5629	2.5293	0.4498	1.6569	2.6267	2.5469	0.6577	2.4331	0.6577
2	15 min	10%	20	16.6	0.97	0.5072	2.0529	2.6669	2.5515	0.4513	1.7348	2.6408	2.5526	0.658	2.4324	0.658
3	20 min	10%	11	18.7	0.98	0.623	2.3847	2.4238	2.8443	0.5551	1.6304	2.9225	3.0642	0.8865	2.9648	0.8865
3	20 min	10%	12	18.7	0.98	0.6235	2.3873	2.4796	2.8564	0.5559	1.5758	2.9493	3.0713	0.8873	2.9725	0.8873
3	20 min	10%	13	18.7	0.98	0.6222	2.383	2.338	2.8037	0.5535	1.5951	2.8653	3.0515	0.8859	2.9548	0.8859
3	20 min	10%	14	18.7	0.98	0.6286	2.4731	2.7843	2.9313	0.5643	1.9274	3.1194	3.1212	0.896	3.0035	0.896
3	20 min	10%	15	18.7	0.98	0.6232	2.4143	2.5379	2.8934	0.5568	1.6773	2.9381	3.0905	0.8887	2.9752	0.8887
3	20 min	10%	16	18.7	0.98	0.6252	2.4372	2.6437	2.9246	0.5601	1.761	3.0186	3.1118	0.8935	2.9837	0.8935
3	20 min	10%	17	18.7	0.98	0.6273	2.4473	2.8191	2.9847	0.5628	1.872	3.0278	3.1263	0.8954	2.9978	0.8954
3	20 min	10%	18	18.7	0.98	0.6273	2.4447	2.6958	2.9518	0.5617	1.7879	2.9947	3.1154	0.8942	2.9933	0.8942
3	20 min	10%	19	18.7	0.98	0.6297	2.4837	3.0532	2.996	0.5696	1.9398	3.1645	3.1475	0.8992	3.0235	0.8992
3	20 min	10%	20	18.7	0.98	0.6289	2.4781	2.7848	2.972	0.5659	1.8972	3.1528	3.121	0.8965	3.0108	0.8965
4	25 min	10%	11	20.4	0.98	0.7132	2.6458	2.3431	2.9485	0.6669	1.6368	3.1446	3.4527	1.0768	3.3934	1.0768
4	25 min	10%	12	20.4	0.98	0.7142	2.6745	2.3953	3.0637	0.6696	1.7697	3.2605	3.4669	1.0773	3.3923	1.0773
4	25 min	10%	13	20.4	0.98	0.7201	2.732	2.5988	3.179	0.679	1.8816	3.3709	3.5156	1.0865	3.4351	1.0865
4	25 min	10%	14	20.4	0.98	0.7219	2.7566	2.8755	3.329	0.6868	1.9436	3.4913	3.5811	1.0882	3.4746	1.0882
4	25 min	10%	15	20.4	0.98	0.7163	2.7286	2.7019	3.1948	0.6838	1.9258	3.3812	3.5403	1.0837	3.4284	1.0837
4	25 min	10%	16	20.4	0.98	0.7166	2.6915	2.7554	3.2325	0.6796	1.9297	3.3635	3.5353	1.0825	3.4374	1.0825
4	25 min	10%	17	20.4	0.98	0.7207	2.7218	2.8128	3.2711	0.6823	1.9576	3.4075	3.5561	1.0866	3.4558	1.0866
4	25 min	10%	18	20.4	0.98	0.7197	2.7131	2.4728	3.1666	0.6783	1.7673	3.2769	3.5252	1.0859	3.4387	1.0859
4	25 min	10%	19	20.4	0.98	0.7215	2.7666	3.165	3.3796	0.6914	2.1761	3.46	3.6042	1.0896	3.4738	1.0896

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4	25 min	10%	20	20.4	0.98	0.722	2.815	3.0766	3.361	0.6946	2.1177	3.5556	3.6261	1.0917	3.4777	1.0917
5	30 min	10%	11	21.9	0.98	0.8073	3.0637	3.1256	3.6179	0.7857	2.1125	3.8623	4.0116	1.2752	3.8901	1.2752
5	30 min	10%	12	21.9	0.98	0.8104	3.0545	3.2895	3.7189	0.7843	2.2892	3.8908	4.0282	1.2786	3.9111	1.2786
5	30 min	10%	13	21.9	0.98	0.8058	3.0259	2.8199	3.443	0.7768	2.0243	3.7264	3.9677	1.2693	3.8692	1.2693
5	30 min	10%	14	21.9	0.98	0.7976	2.8673	2.4469	3.0649	0.7587	1.7751	3.3746	3.8057	1.2637	3.7885	1.2637
5	30 min	10%	15	21.9	0.98	0.7965	2.8754	2.5777	3.2872	0.761	1.947	3.5036	3.797	1.2595	3.7623	1.2595
5	30 min	10%	16	21.9	0.98	0.8007	2.8956	2.4114	3.1122	0.7614	1.8149	3.4132	3.822	1.2661	3.7983	1.2661
5	30 min	10%	17	21.9	0.98	0.7997	2.8803	2.2408	3.1512	0.759	1.8561	3.4061	3.7879	1.2659	3.7782	1.2659
5	30 min	10%	18	21.9	0.98	0.8052	2.9893	2.7629	3.4011	0.7742	1.8922	3.6185	3.944	1.2695	3.8633	1.2695
5	30 min	10%	19	21.9	0.98	0.8	2.9228	2.4823	3.2446	0.766	1.8415	3.525	3.8725	1.2651	3.8203	1.2651
5	30 min	10%	20	21.9	0.98	0.8132	3.1106	3.3484	3.7441	0.7923	2.3259	3.8735	4.0663	1.2834	3.9256	1.2834
6	45 min	10%	11	25.2	0.98	0.9733	3.6387	3.3962	4.1934	0.9408	2.5039	4.6024	4.9206	1.705	4.8118	1.705
6	45 min	10%	12	25.2	0.98	0.9433	2.8091	2.2862	3.0729	0.8847	1.8041	3.5971	4.3045	1.6784	4.568	1.6784
6	45 min	10%	13	25.2	0.98	0.943	2.9629	2.5248	3.4641	0.8908	2.0171	3.9664	4.3703	1.6793	4.5519	1.6793
6	45 min	10%	14	25.2	0.98	0.9465	3.0212	2.2025	3.3521	0.8911	2.0059	3.8635	4.3728	1.6794	4.4596	1.6794
6	45 min	10%	15	25.2	0.98	0.9542	3.198	2.2865	3.4884	0.9058	2.0711	3.9762	4.5242	1.6859	4.5871	1.6859
6	45 min	10%	16	25.2	0.98	0.9657	3.35	2.8864	3.8222	0.9236	2.1725	4.158	4.7497	1.6961	4.733	1.6961
6	45 min	10%	17	25.2	0.98	0.9568	3.2629	3.1258	3.7694	0.9129	2.4381	4.2549	4.5651	1.6941	4.9632	1.6941
6	45 min	10%	18	25.2	0.98	0.9495	3.0976	2.2687	3.3988	0.8938	2.0581	3.8427	4.3714	1.6888	4.6635	1.6888
6	45 min	10%	19	25.2	0.98	0.959	3.3245	2.6822	3.7123	0.9194	2.1232	4.1028	4.6505	1.6906	4.6545	1.6906
6	45 min	10%	20	25.2	0.98	0.9704	3.5641	3.1039	4.1046	0.9357	2.4574	4.4409	4.8352	1.7033	4.7808	1.7033
7	1 hour	10%	11	27.7	0.99	1.0654	3.2641	2.5402	3.695	1.0094	2.1411	4.2281	5.0186	2.0203	5.2002	2.0203
7	1 hour	10%	12	27.7	0.99	1.0311	2.6483	1.6216	3.1354	0.9529	1.7909	3.8322	4.52	1.994	5.0731	1.994
7	1 hour	10%	13	27.7	0.99	1.0403	3.1461	2.4341	3.5386	0.9674	2.0432	3.9311	4.5526	1.9994	5.2757	1.9994
7	1 hour	10%	14	27.7	0.99	1.0197	2.7768	2.4662	3.11	0.9394	1.7795	3.5774	4.3219	1.9825	5.0049	1.9825
7	1 hour	10%	15	27.7	0.99	1.0611	3.1776	2.2436	3.5405	0.9997	2.0865	4.1566	4.9266	2.0237	5.2297	2.0237
7	1 hour	10%	16	27.7	0.99	1.0571	3.0157	2.3599	3.3465	0.9925	1.9958	4.0229	4.8525	2.0228	5.3648	2.0228
7	1 hour	10%	17	27.7	0.99	1.0659	3.3295	2.5267	3.6978	1.002	2.1351	4.1377	4.9515	2.0239	5.3339	2.0239
7	1 hour	10%	18	27.7	0.99	1.0627	3.2098	2.2995	3.5752	1.0056	2.124	4.179	4.9843	2.0222	5.2449	2.0222
7	1 hour	10%	19	27.7	0.99	1.0606	3.2725	2.5855	3.8583	1.0105	2.2811	4.3761	4.9994	2.0121	5.0815	2.0121
7	1 hour	10%	20	27.7	0.99	1.0717	3.5479	3.0519	4.248	1.0268	2.4685	4.6598	5.2224	2.0126	5.2463	2.0126
8	1.5 hour	10%	11	31.6	0.99	1.0639	2.302	2.4267	2.7993	0.9307	1.574	3.6439	4.2303	2.4521	5.0934	2.4521
8	1.5 hour	10%	12	31.6	0.99	1.0974	2.5269	1.7502	2.9643	0.985	1.6953	3.703	4.4228	2.4532	5.1844	2.4532
8	1.5 hour	10%	13	31.6	0.99	1.0791	2.4164	2.2675	3.387	0.9582	1.8258	4.1581	4.5365	2.4775	5.5241	2.4775
8	1.5 hour	10%	14	31.6	0.99	1.1328	3.4262	3.1391	4.0561	1.0585	2.423	4.406	4.7793	2.5088	6.2404	2.5088
8	1.5 hour	10%	15	31.6	0.99	1.128	2.7927	2.1642	3.6333	1.0632	2.0414	4.3896	5.1513	2.485	5.5102	2.485
8	1.5 hour	10%	16	31.6	0.99	1.158	3.1902	2.1571	3.7021	1.1096	2.1845	4.4588	5.3724	2.5178	6.0637	2.5178
8	1.5 hour	10%	17	31.6	0.99	1.1034	2.7285	1.8505	3.0268	0.9938	1.7456	3.8245	4.4228	2.4846	5.76	2.4846
8	1.5 hour	10%	18	31.6	0.99	1.1001	2.6863	2.7465	3.8256	1.0189	2.2005	4.6298	4.9408	2.4869	5.765	2.4869
8	1.5 hour	10%	19	31.6	0.99	1.188	3.9839	2.9759	4.6137	1.1722	2.8069	5.1952	6.0698	2.5462	6.3686	2.5462
8	1.5 hour	10%	20	31.6	0.99	1.1797	3.6817	3.5558	4.5737	1.164	2.6719	5.1625	5.9477	2.558	6.0775	2.558
9	2 hour	10%	11	34.8	0.99	1.2275	3.2459	2.4108	4.1021	1.1988	2.389	4.9269	5.8837	2.9461	6.5341	2.9461
9	2 hour	10%	12	34.8	0.99	1.0284	2.1801	2.4668	2.5187	0.8449	1.6066	3.242	3.7437	2.7273	4.513	2.7273
9	2 hour	10%	13	34.8	0.99	1.095	2.4185	1.9671	2.6448	0.9322	1.4715	3.5293	4.1107	2.8276	5.137	2.8276
9	2 hour	10%	14	34.8	0.99	1.1217	3.2651	2.3947	3.6551	1.0616	2.225	4.326	5.1948	2.7475	5.7058	2.7475
9	2 hour	10%	15	34.8	0.99	1.1958	2.8987	1.9617	3.5129	1.1415	2.0961	4.3698	5.2486	2.9037	6.1533	2.9037
9	2 hour	10%	16	34.8	0.99	1.198	2.8073	2.2751	3.8615	1.1358	2.1753	4.7914	5.4757	2.9414	6.5643	2.9414
9	2 hour	10%	17	34.8	0.99	1.1688	2.9553	1.9299	3.4496	1.0929	2.0193	4.2591	5.1359	2.8771	5.8504	2.8771
9	2 hour	10%	18	34.8	0.99	1.1411	2.1923	1.5123	3.0127	1.0373	1.5971	3.8864	4.6492	2.8385	5.4285	2.8385
9	2 hour	10%	19	34.8	0.99	1.1559	2.1422	1.3884	2.9951	1.0612	1.5436	3.9505	4.7535	2.8798	5.7002	2.8798
9	2 hour	10%	20	34.8	0.99	1.2473	4.1216	3.7447	5.2421	1.2391	3.1773	6.0988	6.6295	2.9508	6.9609	2.9508
10	3 hour	10%	11	40.1	0.99	0.9906	2.6572	1.9766	3.063	0.8169	1.6651	3.3681	3.9428	3.0119	4.4749	3.0119
10	3 hour	10%	12	40.1	0.99	1.1215	2.2714	1.9535	2.9326	0.9452	1.5137	3.7311	4.2756	3.2974	4.9583	3.2974
10	3 hour	10%	13	40.1	0.99	1.1266	2.9026	2.2591	3.4307	1.0118	1.8534	3.8022	4.5461	2.9843	5.7053	2.9843
10	3 hour	10%	14	40.1	0.99	1.1844	1.9402	1.213	3.0308	1.0679	1.4448	4.021	4.7472	3.4182	5.784	3.4182
10	3 hour	10%	15	40.1	0.99	1.1642	1.908	1.315	2.9485	1.0351	1.4357	3.9248	4.6488	3.3866	5.4467	3.3866
10	3 hour	10%	16	40.1	0.99	1.0917	1.7515	1.228	2.6421	0.9221	1.3156	3.524	4.1488	3.2093	4.8176	3.2093
10	3 hour	10%	17	40.1	0.99	1.1247	2.2132	1.8529	3.2792	1.0173	1.733	4.1785	4.7822	3.2826	5.1319	3.2826
10	3 hour	10%	18	40.1	0.99	1.0542	1.5827	1.0155	2.2501	0.8721	1.0775	3.0851	3.6771	3.1631	4.4999	3.1631
10	3 hour	10%	19	40.1	0.99	1.281	3.0617	2.358	4.0045	1.2384	2.3704	5.1268	6.1321	3.5904	6.6846	3.5904
10	3 hour	10%	20	40.1	0.99	1.2074	2.5631	1.6531	3.4645	1.129	1.9234	4.3748	5.1399	3.437	6.0382	3.437
11	4.5 hour	10%	11	46.6	0.99	1.1549	2.2888	1.7244	2.8185	1.0194	1.5814	3.6548	4.4295	3.6572	5.3436	3.6572
11	4.5 hour	10%	12	46.6	0.99	1.0481	2.2036	1.5906	2.6943	0.9347	1.5346	3.3923	4.0196	3.075	4.7962	3.075
11	4.5 hour	10%	13	46.6	0.99	0.9465	1.7437	1.4447	2.5207	0.817	1.3603	3.2214	3.6903	3.0226	4.0251	3.0226
11	4.5 hour	10%	14	46.6	0.99	1.0901	3.1324	2.5742	3.6827	0.9909	1.9795	4.2714	4.8246	2.5995	5.2121	2.5995
11	4.5 hour	10%	15	46.6	0.99	1.0412	1.6082	0.9779	2.2271	0.8664	1.1011	3.0765	3.6676	3.4702	4.4723	3.4702
11	4.5 hour	10%	16	46.6	0.99	1.1421	1.7952	1.2147	2.648	0.9684	1.2421	3.5263	4.2249	3.7032	5.119	3.7032
11	4.5 hour	10%	17	46.6	0.99	1.0426	1.2242	0.7515	2.1444	0.8101	0.8831	2.9468	3.4817	3.5	4.2987	3.5
11	4.5 hour	10%	18	46.6	0.99	1.0904	1.8065	1.2037	2.5933	0.9234	1.3281	3.3252	3.9978	3.6075	4.6775	3.6075
11	4.5 hour	10%	19	46.6	0.99	1.295	2.3403	1.6905	3.5953	1.2161	1.7379	4.7186	5.5542	4.0967	6.4884	4.0967
11	4.5 hour	10%	20	46.6	0.99	1.1985	1.9606	1.3566	3.1937	1.0487	1.4918	4.1443	4.7545	3.9277	5.7072	3.9277
12	6 hour	10%	11	52	0.99	0.9964	1.8871	1.2887	2.6112	0.8581	1.315	3.2589	3.8297	3.1989	4.2132	3.1989
12	6 hour	10%	12	52	0.99	1.0009	2.7332	2.4102	3.2157	0.9024	1.8438	3.813	4.3431	2.5019	4.757	2.5019
12	6 hour	10%	13	52	0.99	1.1685	2.0381	1.5799	3.2785	1.0291	1.5218	4.2017	4.7765	3.5663	5.3996	3.5663
12	6 hour	10%	14	52	0.99	1.0069	1.4806	0.8981	2.1853	0.8477	1.0672	2.9804	3.563	3.1548	4.3301	3.1548
12	6 hour	10%	15	52	0.99	1.1667	1.5606	0.9734	2.5016	0.9684	1.154	3.4615	4.0966	4.0449	5.064	4.0449
12	6 hour	10%	16	52	0.99	1.0084	1.4984	1.1324	2.1454	0.8234	1.144	2.87	3.4	3.567	4.1624	3.567
12	6 hour	10%	17	52	0.99	1.1185	1.6211	1.0861	2.4978	0.9635	1.2045	3.4518	4.0937	3.528	5.0281	3.528
12	6 hour	10%	18	52	0.99	0.8996	1.2962	0.768	1.9341	0.7389	0.921	2.5995	3.0879	3.046	3.6971	3.046
12	6 hour	10%	19	52	0.99	1.1952	2.3702	1.5217	3.3232	1.0801	1.7725	4.189	4.9551	4.0099	5.7451	4.0099

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12	6 hour	10%	20	52	0.99	1.1282	1.5228	0.9908	2.5313	0.9359	1.1039	3.4136	4.0229	3.8912	4.9308	3.8912
13	9 hour	10%	11	60.9	1	1.2372	2.1619	1.4721	3.1077	1.1097	1.6351	4.1791	5.0416	4.3567	5.9309	4.3567
13	9 hour	10%	12	60.9	1	0.9697	1.9035	1.3144	2.4778	0.8949	1.4114	3.1901	3.8975	3.2518	4.4111	3.2518
13	9 hour	10%	13	60.9	1	0.8162	1.0483	0.6797	1.6944	0.6331	0.7671	2.3136	2.7361	2.4011	3.2981	2.4011
13	9 hour	10%	14	60.9	1	1.1828	2.2434	1.3381	2.9023	1.0467	1.5447	3.8416	4.6957	3.4321	5.6828	3.4321
13	9 hour	10%	15	60.9	1	0.876	1.0699	0.6413	1.84	0.6845	0.7672	2.4656	2.9217	3.1153	3.5208	3.1153
13	9 hour	10%	16	60.9	1	0.9	1.3136	0.793	2.0691	0.73	0.9536	2.7047	3.1326	3.0143	3.6745	3.0143
13	9 hour	10%	17	60.9	1	0.9966	1.3004	0.8362	2.2565	0.8171	0.9396	3.0568	3.5623	3.2619	4.2574	3.2619
13	9 hour	10%	18	60.9	1	0.8338	0.9313	0.5769	1.7007	0.6173	0.6627	2.2996	2.6944	2.8578	3.2735	2.8578
13	9 hour	10%	19	60.9	1	1.0043	1.1581	0.6959	1.9961	0.7692	0.838	2.7624	3.2671	3.6753	4.0296	3.6753
13	9 hour	10%	20	60.9	1	1.1386	1.6939	1.0462	2.721	0.9556	1.2485	3.6258	4.2461	3.9312	5.1169	3.9312
14	12 hour	10%	11	68.2	1	0.8449	1.0323	0.6258	1.7654	0.6568	0.7402	2.3832	2.8213	2.9701	3.3934	2.9701
14	12 hour	10%	12	68.2	1	1.1797	1.6652	1.0275	2.6912	1.013	1.2099	3.629	4.3101	4.3026	5.2482	4.3026
14	12 hour	10%	13	68.2	1	1.135	2.4973	1.6293	3.2247	1.0191	1.6704	3.992	4.685	2.669	5.2529	2.669
14	12 hour	10%	14	68.2	1	1.0387	1.7697	1.1571	2.5602	0.9163	1.2985	3.3517	3.921	3.0568	4.4863	3.0568
14	12 hour	10%	15	68.2	1	0.9204	1.3959	0.9036	2.0618	0.8022	1.0099	2.7522	3.3084	2.5139	4.0429	2.5139
14	12 hour	10%	16	68.2	1	0.7557	1.0879	0.6963	1.547	0.5938	0.7389	2.1384	2.5178	2.3565	3.1607	2.3565
14	12 hour	10%	17	68.2	1	0.7762	0.8815	0.5915	1.5753	0.573	0.6335	2.1224	2.5167	2.8009	3.1177	2.8009
14	12 hour	10%	18	68.2	1	0.8609	1.3004	0.8177	2.0173	0.7137	0.9474	2.661	3.0931	2.8673	3.5677	2.8673
14	12 hour	10%	19	68.2	1	0.9311	1.4641	0.9464	2.1136	0.8225	1.0626	2.8082	3.351	3.2833	4.1098	3.2833
14	12 hour	10%	20	68.2	1	0.8771	1.182	0.7571	1.9896	0.7031	0.8591	2.6532	3.1162	3.0858	3.6637	3.0858
15	18 hour	10%	11	79.6	1	0.916	1.2175	0.7257	1.874	0.7515	0.8823	2.6321	3.1483	3.1531	3.8814	3.1531
15	18 hour	10%	12	79.6	1	0.7112	0.7784	0.477	1.4321	0.5153	0.5453	1.9475	2.2969	2.5449	2.8001	2.5449
15	18 hour	10%	13	79.6	1	0.7682	0.9426	0.5454	1.6109	0.5807	0.6834	2.1753	2.5626	2.5057	3.0727	2.5057
15	18 hour	10%	14	79.6	1	0.6958	0.8125	0.4843	1.3759	0.5133	0.5772	1.8915	2.2503	2.3921	2.7563	2.3921
15	18 hour	10%	15	79.6	1	0.8015	0.9165	0.5602	1.6539	0.6139	0.6439	2.2612	2.6752	2.7456	3.2538	2.7456
15	18 hour	10%	16	79.6	1	0.6492	0.7028	0.434	1.318	0.4703	0.4917	1.7867	2.1095	2.3353	2.5571	2.3353
15	18 hour	10%	17	79.6	1	0.668	0.7776	0.4893	1.3193	0.4893	0.5583	1.8108	2.1684	2.3753	2.6452	2.3753
15	18 hour	10%	18	79.6	1	0.591	0.8654	0.4974	1.4062	0.4811	0.6146	1.8665	2.1809	1.9865	2.5353	1.9865
15	18 hour	10%	19	79.6	1	0.8505	1.1538	0.7724	1.8366	0.7113	0.8488	2.5555	3.0517	2.8938	3.6282	2.8938
15	18 hour	10%	20	79.6	1	0.9858	1.3453	0.8696	2.1679	0.8394	0.9854	3.0129	3.6046	3.4814	4.3476	3.4814
16	24 hour	10%	11	88.2	1	0.64	0.7768	0.4545	1.3596	0.4769	0.5416	1.8227	2.1437	2.2745	2.5842	2.2745
16	24 hour	10%	12	88.2	1	0.6943	0.8212	0.4827	1.4819	0.5285	0.5769	2.0012	2.3543	2.2436	2.8375	2.2436
16	24 hour	10%	13	88.2	1	0.6369	0.9961	0.6424	1.3992	0.5055	0.7189	1.7858	2.1262	1.9112	2.5468	1.9112
16	24 hour	10%	14	88.2	1	0.704	0.9305	0.5822	1.4846	0.5281	0.6693	1.9479	2.2808	2.1979	2.7708	2.1979
16	24 hour	10%	15	88.2	1	0.5156	0.6488	0.4328	1.081	0.3647	0.4555	1.3985	1.6406	1.6625	1.9366	1.6625
16	24 hour	10%	16	88.2	1	0.5654	0.8781	0.5244	1.289	0.431	0.6292	1.6689	1.9021	1.8241	2.2147	1.8241
16	24 hour	10%	17	88.2	1	0.4439	0.5081	0.3185	0.8878	0.3137	0.3462	1.2061	1.4308	1.5432	1.7098	1.5432
16	24 hour	10%	18	88.2	1	0.8265	0.8824	0.5149	1.6594	0.6033	0.6251	2.2591	2.6668	3.0595	3.2393	3.0595
16	24 hour	10%	19	88.2	1	0.7064	0.8334	0.4851	1.425	0.5224	0.585	1.9172	2.2666	2.5378	2.8105	2.5378
16	24 hour	10%	20	88.2	1	0.7716	1.0521	0.6515	1.6691	0.5701	0.7592	2.1984	2.5593	2.4646	3.0421	2.4646
17	30 hour	10%	11	94.9	1	0.6011	0.659	0.4146	1.2309	0.4225	0.4576	1.6404	1.9012	2.1955	2.3048	2.1955
17	30 hour	10%	12	94.9	1	0.6018	0.741	0.4376	1.1588	0.4159	0.4517	1.5848	1.9014	1.902	2.3754	1.902
17	30 hour	10%	13	94.9	1	0.7523	0.9658	0.581	1.6659	0.5742	0.6802	2.2231	2.6007	2.8527	3.1332	2.8527
17	30 hour	10%	14	94.9	1	0.6262	0.7942	0.4661	1.1988	0.4289	0.4721	1.6484	1.9871	1.9191	2.4684	1.9191
17	30 hour	10%	15	94.9	1	0.4624	0.5205	0.3122	0.9554	0.3278	0.3508	1.2772	1.4988	1.658	1.8232	1.658
17	30 hour	10%	16	94.9	1	0.4847	0.6335	0.3758	1.0798	0.3724	0.4345	1.438	1.6773	1.6483	2.0009	1.6483
17	30 hour	10%	17	94.9	1	0.5946	0.651	0.376	1.2228	0.4337	0.4492	1.6636	1.9698	1.8864	2.4074	1.8864
17	30 hour	10%	18	94.9	1	0.6475	0.731	0.4378	1.3464	0.4857	0.5058	1.8473	2.2057	1.9073	2.6948	1.9073
17	30 hour	10%	19	94.9	1	0.4756	0.5303	0.3308	0.9782	0.3309	0.3614	1.2983	1.5114	1.7171	1.8393	1.7171
17	30 hour	10%	20	94.9	1	0.7145	0.7901	0.5167	1.4185	0.5041	0.5665	1.9056	2.2666	2.6198	2.742	2.6198
18	36 hour	10%	11	100	1	0.5588	0.6047	0.3736	1.0885	0.3809	0.4186	1.4806	1.7634	1.9641	2.1652	1.9641
18	36 hour	10%	12	100	1	0.6546	0.7444	0.4191	1.3682	0.4839	0.5145	1.8547	2.1973	2.2443	2.6566	2.2443
18	36 hour	10%	13	100	1	0.4994	0.6885	0.4373	1.1386	0.3828	0.49	1.4906	1.7027	1.6832	2.0192	1.6832
18	36 hour	10%	14	100	1	0.3586	0.5177	0.3044	0.8394	0.2493	0.3038	1.0701	1.2588	1.2177	1.4719	1.2177
18	36 hour	10%	15	100	1	0.6798	1.0397	0.6702	1.5473	0.529	0.7485	2.0078	2.3031	2.3024	2.6786	2.3024
18	36 hour	10%	16	100	1	0.5252	0.575	0.3621	1.0768	0.3817	0.39	1.4706	1.7559	1.6032	2.1374	1.6032
18	36 hour	10%	17	100	1	0.9956	1.311	0.8126	2.0635	0.7398	0.9544	2.7538	3.1882	3.5778	3.9547	3.5778
18	36 hour	10%	18	100	1	0.3764	0.3944	0.2328	0.7467	0.2506	0.255	0.9977	1.1786	1.2258	1.4369	1.2258
18	36 hour	10%	19	100	1	0.4877	0.5143	0.3127	0.995	0.3335	0.3467	1.3309	1.5542	1.7559	1.8468	1.7559
18	36 hour	10%	20	100	1	0.5261	0.7478	0.4499	1.227	0.4265	0.5252	1.6282	1.8957	1.785	2.2411	1.785
19	48 hour	10%	11	108	1	0.5081	0.5278	0.3212	1.0165	0.3517	0.3572	1.3712	1.6183	1.6885	1.9648	1.6885
19	48 hour	10%	12	108	1	0.5077	0.5298	0.3185	1.0158	0.3466	0.3572	1.3584	1.5875	1.8464	1.9281	1.8464
19	48 hour	10%	13	108	1	0.6146	0.7459	0.4805	1.2421	0.4229	0.5241	1.631	1.9551	2.1627	2.3819	2.1627
19	48 hour	10%	14	108	1	0.6548	0.9268	0.6329	1.3179	0.4748	0.6662	1.7436	2.159	2.0081	2.6458	2.0081
19	48 hour	10%	15	108	1	0.3226	0.4676	0.2774	0.7571	0.221	0.2738	0.9598	1.13	1.0543	1.3219	1.0543
19	48 hour	10%	16	108	1	0.9867	1.2364	0.7313	2.178	0.8129	0.8692	3.0239	3.6451	2.9302	4.4119	2.9302
19	48 hour	10%	17	108	1	0.4277	0.518	0.3346	0.8484	0.2799	0.3505	1.114	1.3484	1.3837	1.6471	1.3837
19	48 hour	10%	18	108	1	0.5157	0.7581	0.4211	1.1875	0.3588	0.4351	1.523	1.7815	1.5777	2.0983	1.5777
19	48 hour	10%	19	108	1	0.6004	0.6961	0.4125	1.2338	0.433	0.4855	1.6605	1.9537	2.1751	2.3787	2.1751
19	48 hour	10%	20	108	1	0.6693	0.7037	0.5007	1.3621	0.4746	0.507	1.8696	2.2241	2.4077	2.5875	2.4077

RORBWin Batch Run Summary
****

Program version 6.45 (last updated 20th March 2019)
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Date run: 06 Jul 2020 12:40

Catchment file : K:\20996E\Melbourne Water\Woodstock West_north catchment RORB\Woodstock West DSS_north catchment AHM Rev 2.catg
Rainfall location: User defined
Temporal pattern : ARR2016 point temporal patterns
Spatial pattern : Uniform
Areal Red. Fact. : Based on ARR 2016 (Book 2 Chapter 4)
Loss factors : Constant with ARI

Parameters: kc = 2.70 m = 0.80

Loss parameters	Initial loss (mm)	Cont. loss (mm/h)
	16.00	2.60

Peak	Description
01	Special storage : RB8 - Outflow
02	Special storage : RB8 - Inflow
03	Calculated hydrograph, Node A7
04	Calculated hydrograph, Node A6a
05	Special storage : RB9 - Outflow
06	Special storage : RB9 - Inflow
07	Calculated hydrograph, Node A6b
08	Calculated hydrograph, Sed Pond
09	Special storage : RB2 - Outflow
10	Special storage : RB2 - Inflow
11	Calculated hydrograph, End of Catchment

Run	Duration	AEP	TPat	Rain(mm)	ARF	Peak0001	Peak0002	Peak0003	Peak0004	Peak0005	Peak0006	Peak0007	Peak0008	Peak0009	Peak0010	Peak0011
						1.0418	2.7992	3.0451	3.592	0.9654	2.2103	3.9963	4.3924	3.3884	5.1746	3.3884
1	10 min	20%	1	11.1	0.97	0.2759	1.2247	1.681	1.5342	0.2542	1.0822	1.5619	1.4992	0.3147	1.4263	0.3147
1	10 min	20%	2	11.1	0.97	0.2759	1.2239	1.6111	1.5245	0.2536	1.0252	1.5567	1.4977	0.3144	1.4245	0.3144
1	10 min	20%	3	11.1	0.97	0.2759	1.2239	1.6052	1.5235	0.2534	1.0202	1.5562	1.4974	0.3144	1.4243	0.3144
1	10 min	20%	4	11.1	0.97	0.2762	1.2234	1.5068	1.5088	0.2524	0.9439	1.5483	1.4948	0.3137	1.4216	0.3137
1	10 min	20%	5	11.1	0.97	0.2758	1.224	1.6318	1.5274	0.2537	1.0417	1.5583	1.4981	0.3145	1.4249	0.3145
1	10 min	20%	6	11.1	0.97	0.2762	1.2234	1.5065	1.5087	0.2524	0.9437	1.5483	1.4948	0.3137	1.4216	0.3137
1	10 min	20%	7	11.1	0.97	0.2763	1.227	1.8744	1.5581	0.2592	1.1126	1.5751	1.5072	0.3167	1.4366	0.3167
1	10 min	20%	8	11.1	0.97	0.2762	1.2234	1.5073	1.5088	0.2524	0.9443	1.5483	1.4948	0.3137	1.4216	0.3137
1	10 min	20%	9	11.1	0.97	0.2761	1.2258	1.7337	1.5408	0.2555	1.1266	1.5651	1.5005	0.3149	1.4278	0.3149
1	10 min	20%	10	11.1	0.97	0.276	1.2252	1.7628	1.5446	0.257	1.138	1.5677	1.5019	0.3153	1.4294	0.3153
2	15 min	20%	1	13.5	0.98	0.3785	1.5493	1.8434	1.8362	0.3328	1.245	1.9087	1.8907	0.4566	1.8238	0.4566
2	15 min	20%	2	13.5	0.98	0.3782	1.5442	1.7483	1.8254	0.3308	1.1587	1.8794	1.8865	0.4561	1.8195	0.4561
2	15 min	20%	3	13.5	0.98	0.378	1.5437	1.6548	1.7989	0.3303	1.0986	1.8769	1.8788	0.4563	1.8169	0.4563
2	15 min	20%	4	13.5	0.98	0.3827	1.5761	1.9222	1.9364	0.3408	1.2205	2.0009	1.9391	0.4643	1.8442	0.4643
2	15 min	20%	5	13.5	0.98	0.379	1.5556	1.983	1.8651	0.3355	1.2316	1.9476	1.9107	0.4579	1.8312	0.4579
2	15 min	20%	6	13.5	0.98	0.3793	1.5596	1.9521	1.9002	0.3368	1.1799	1.9735	1.9225	0.4595	1.8341	0.4595
2	15 min	20%	7	13.5	0.98	0.3826	1.5765	1.9787	1.9473	0.3414	1.2632	2.0073	1.9418	0.4647	1.8453	0.4647
2	15 min	20%	8	13.5	0.98	0.3788	1.5566	1.825	1.8908	0.3363	1.163	1.9621	1.9155	0.4578	1.8267	0.4578
2	15 min	20%	9	13.5	0.98	0.3789	1.5617	2.0873	1.9616	0.3409	1.3384	2.0139	1.9421	0.4625	1.8441	0.4625
2	15 min	20%	10	13.5	0.98	0.3788	1.5638	2.201	1.9688	0.344	1.4235	2.0136	1.9402	0.4622	1.8445	0.4622
3	20 min	20%	1	15.2	0.98	0.4423	1.7501	1.8487	2.0734	0.3866	1.2305	2.0967	2.1842	0.5564	2.0982	0.5564
3	20 min	20%	2	15.2	0.98	0.442	1.7522	1.6922	2.0363	0.3837	1.1236	2.0725	2.175	0.5554	2.095	0.5554
3	20 min	20%	3	15.2	0.98	0.4461	1.7849	1.8052	2.0921	0.3867	1.1736	2.1239	2.203	0.5608	2.1201	0.5608
3	20 min	20%	4	15.2	0.98	0.4461	1.8059	1.9975	2.1319	0.3919	1.3708	2.2383	2.2141	0.5624	2.1372	0.5624
3	20 min	20%	5	15.2	0.98	0.4464	1.8083	2.3913	2.2105	0.3953	1.4761	2.253	2.2393	0.5637	2.1504	0.5637
3	20 min	20%	6	15.2	0.98	0.4466	1.8119	2.188	2.1659	0.3943	1.3938	2.2702	2.2313	0.5633	2.146	0.5633
3	20 min	20%	7	15.2	0.98	0.4463	1.8103	2.0601	2.172	0.394	1.3605	2.2706	2.2304	0.5628	2.1421	0.5628
3	20 min	20%	8	15.2	0.98	0.4457	1.8026	2.0083	2.1108	0.3911	1.3606	2.2178	2.2092	0.5623	2.1354	0.5623
3	20 min	20%	9	15.2	0.98	0.447	1.8157	2.3047	2.1853	0.396	1.393	2.2889	2.242	0.5654	2.1539	0.5654
3	20 min	20%	10	15.2	0.98	0.4472	1.8184	2.1686	2.2237	0.3986	1.3782	2.3124	2.2514	0.5657	2.1513	0.5657
4	25 min	20%	1	16.6	0.98	0.4984	1.9218	1.7924	2.1875	0.4334	1.278	2.2889	2.4133	0.6476	2.3407	0.6476
4	25 min	20%	2	16.6	0.98	0.4981	1.9233	1.8411	2.2185	0.4313	1.2887	2.3031	2.418	0.6455	2.3575	0.6455
4	25 min	20%	3	16.6	0.98	0.5031	1.9478	1.915	2.2761	0.4344	1.3207	2.3338	2.4532	0.6508	2.3793	0.6508
4	25 min	20%	4	16.6	0.98	0.5011	1.962	2.038	2.312	0.4394	1.3863	2.3652	2.4719	0.6517	2.3773	0.6517
4	25 min	20%	5	16.6	0.98	0.5044	1.9927	2.1756	2.3685	0.4422	1.4527	2.4129	2.4942	0.6534	2.3944	0.6534
4	25 min	20%	6	16.6	0.98	0.5027	1.952	1.7595	2.2253	0.434	1.2469	2.2904	2.4392	0.6511	2.3678	0.6511
4	25 min	20%	7	16.6	0.98	0.504	1.9723	2.0867	2.3706	0.4396	1.358	2.4389	2.493	0.6521	2.4013	0.6521
4	25 min	20%	8	16.6	0.98	0.5041	1.974	2.0596	2.3481	0.4395	1.3593	2.3936	2.4848	0.6521	2.3921	0.6521
4	25 min	20%	9	16.6	0.98	0.5064	2.0303	2.2941	2.3948	0.4451	1.5677	2.5296	2.5152	0.6577	2.428	0.6577

4	25 min	20%	10	16.6	0.98	0.5062	2.0202	2.4988	2.4703	0.4467	1.6692	2.5022	2.5362	0.6578	2.4283	0.6578
5	30 min	20%	1	17.8	0.98	0.5666	2.0914	1.9236	2.3591	0.4979	1.4376	2.5196	2.6863	0.7825	2.6431	0.7825
5	30 min	20%	2	17.8	0.98	0.5707	2.1507	1.934	2.4003	0.4979	1.306	2.5334	2.7407	0.7805	2.6778	0.7805
5	30 min	20%	3	17.8	0.98	0.5645	2.0739	1.6402	2.2716	0.4904	1.2447	2.4048	2.6434	0.7752	2.6219	0.7752
5	30 min	20%	4	17.8	0.98	0.5712	2.1615	2.1093	2.5294	0.5027	1.468	2.5878	2.7727	0.7827	2.6938	0.7827
5	30 min	20%	5	17.8	0.98	0.5709	2.1621	2.1977	2.5388	0.5054	1.5412	2.6073	2.7744	0.7851	2.6914	0.7851
5	30 min	20%	6	17.8	0.98	0.5713	2.1606	2.0174	2.4934	0.5018	1.4328	2.6012	2.7529	0.7824	2.6917	0.7824
5	30 min	20%	7	17.8	0.98	0.572	2.185	2.1836	2.5655	0.5071	1.5069	2.6357	2.7942	0.7858	2.7042	0.7858
5	30 min	20%	8	17.8	0.98	0.571	2.1574	2.0878	2.4667	0.4997	1.5009	2.5876	2.7269	0.7824	2.6746	0.7824
5	30 min	20%	9	17.8	0.98	0.5775	2.2527	2.3443	2.6397	0.5123	1.5997	2.7763	2.839	0.7931	2.7336	0.7931
5	30 min	20%	10	17.8	0.98	0.5757	2.2604	2.5383	2.6844	0.5147	1.7433	2.8509	2.8594	0.7933	2.7551	0.7933
6	45 min	20%	1	20.5	0.99	0.7046	2.3142	1.6717	2.5156	0.6379	1.3805	2.7864	3.2142	1.0778	3.2716	1.0778
6	45 min	20%	2	20.5	0.99	0.7019	2.2792	1.7138	2.5248	0.6376	1.3644	2.7832	3.1944	1.0734	3.2452	1.0734
6	45 min	20%	3	20.5	0.99	0.699	2.1618	1.8229	2.3302	0.6288	1.2698	2.6131	3.1416	1.0716	3.2351	1.0716
6	45 min	20%	4	20.5	0.99	0.6978	2.2398	1.585	2.4113	0.6272	1.3888	2.699	3.0928	1.0717	3.2375	1.0717
6	45 min	20%	5	20.5	0.99	0.7092	2.4656	2.2004	2.8293	0.6616	1.5952	3.0565	3.373	1.0793	3.3455	1.0793
6	45 min	20%	6	20.5	0.99	0.709	2.4395	1.7914	2.6236	0.65	1.5088	2.8724	3.2563	1.0835	3.2874	1.0835
6	45 min	20%	7	20.5	0.99	0.7214	2.6356	2.2541	2.9633	0.6773	1.629	3.1353	3.4768	1.0961	3.4278	1.0961
6	45 min	20%	8	20.5	0.99	0.7101	2.4054	2.2833	2.6835	0.6554	1.5165	2.8469	3.3409	1.0846	3.3539	1.0846
6	45 min	20%	9	20.5	0.99	0.7252	2.7423	2.8663	3.2368	0.6942	1.9141	3.3681	3.5986	1.1016	3.4919	1.1016
6	45 min	20%	10	20.5	0.99	0.7216	2.6586	2.3436	2.9781	0.6809	1.6555	3.1925	3.4978	1.0952	3.4362	1.0952
7	1 hour	20%	1	22.6	0.99	0.7851	2.0505	1.8196	2.2631	0.7112	1.2343	2.7528	3.2828	1.3109	3.7124	1.3109
7	1 hour	20%	2	22.6	0.99	0.7853	2.0696	1.6691	2.3535	0.7108	1.3303	2.825	3.2969	1.3071	3.6955	1.3071
7	1 hour	20%	3	22.6	0.99	0.7919	2.0923	1.7231	2.335	0.7203	1.2875	2.8294	3.3437	1.3165	3.7463	1.3165
7	1 hour	20%	4	22.6	0.99	0.8212	2.5521	2.1925	2.8652	0.777	1.561	3.1601	3.7651	1.3412	3.8467	1.3412
7	1 hour	20%	5	22.6	0.99	0.8096	2.4539	1.6376	2.6998	0.76	1.5761	3.1344	3.5964	1.3287	3.7078	1.3287
7	1 hour	20%	6	22.6	0.99	0.8168	2.6158	2.2306	2.9735	0.778	1.666	3.2608	3.7672	1.3322	3.8469	1.3322
7	1 hour	20%	7	22.6	0.99	0.8255	2.6616	2.145	2.9547	0.7849	1.6304	3.2713	3.8377	1.3426	3.8787	1.3426
7	1 hour	20%	8	22.6	0.99	0.8063	2.3398	1.765	2.5233	0.7517	1.435	2.9782	3.5586	1.3267	3.8125	1.3267
7	1 hour	20%	9	22.6	0.99	0.8262	2.798	3.0451	3.3825	0.8012	2.1742	3.717	3.8605	1.3499	4.2824	1.3499
7	1 hour	20%	10	22.6	0.99	0.8297	2.7992	2.7146	3.4042	0.8051	1.9618	3.6371	3.924	1.3566	3.8655	1.3566
8	1.5 hour	20%	1	25.9	0.99	0.8911	2.2386	1.7873	2.458	0.7991	1.3228	2.8845	3.4945	1.6945	4.143	1.6945
8	1.5 hour	20%	2	25.9	0.99	0.8034	2.5052	2.2101	2.8114	0.6558	1.585	3.0186	3.2787	1.6611	3.8707	1.6611
8	1.5 hour	20%	3	25.9	0.99	0.8238	1.9966	1.8143	2.2778	0.7079	1.3315	2.8014	3.1385	1.654	3.9702	1.654
8	1.5 hour	20%	4	25.9	0.99	0.9222	2.2865	1.4615	2.7527	0.8589	1.6061	3.3985	3.9196	1.7192	4.4342	1.7192
8	1.5 hour	20%	5	25.9	0.99	0.9021	2.6824	2.2963	2.9826	0.811	1.6219	3.2158	3.7719	1.712	4.3044	1.712
8	1.5 hour	20%	6	25.9	0.99	0.8856	1.9496	1.2823	2.5295	0.8132	1.369	3.1633	3.6174	1.6895	4.1467	1.6895
8	1.5 hour	20%	7	25.9	0.99	0.8876	2.453	1.9873	2.7619	0.7971	1.5617	2.9858	3.4801	1.7008	4.2555	1.7008
8	1.5 hour	20%	8	25.9	0.99	0.9228	2.29	1.8743	2.6945	0.8604	1.6208	3.3565	3.8959	1.7196	4.5653	1.7196
8	1.5 hour	20%	9	25.9	0.99	0.9415	2.6149	2.1925	3.2726	0.8878	1.8706	3.7679	4.2149	1.7301	4.3424	1.7301
8	1.5 hour	20%	10	25.9	0.99	0.9332	2.7017	2.9837	3.592	0.8998	2.2103	3.9963	4.2492	1.7379	4.6355	1.7379
9	2 hour	20%	1	28.6	0.99	0.8484	1.9741	1.6757	2.2242	0.7038	1.2164	2.6627	3.06	1.9277	3.7341	1.9277
9	2 hour	20%	2	28.6	0.99	0.8393	2.146	1.8902	2.4076	0.6662	1.293	2.5369	2.8965	1.9182	3.5786	1.9182
9	2 hour	20%	3	28.6	0.99	0.9189	1.9247	1.8963	2.1399	0.7966	1.2171	2.8553	3.3935	1.991	4.0294	1.991
9	2 hour	20%	4	28.6	0.99	0.9624	1.8462	1.7199	2.4751	0.8586	1.2283	3.2253	3.8135	2.0313	4.4077	2.0313
9	2 hour	20%	5	28.6	0.99	0.9734	2.1996	1.8354	2.9801	0.8951	1.7299	3.674	4.0899	2.0301	4.7696	2.0301
9	2 hour	20%	6	28.6	0.99	0.8877	1.5955	1.3501	2.4215	0.7778	1.235	3.0833	3.4307	1.9639	4.1778	1.9639
9	2 hour	20%	7	28.6	0.99	0.9484	1.7499	1.3304	2.4068	0.8452	1.2667	3.138	3.6553	2.0337	4.2343	2.0337
9	2 hour	20%	8	28.6	0.99	0.9223	1.8669	1.3387	2.5917	0.8359	1.4269	3.2309	3.7238	1.9617	4.0944	1.9617
9	2 hour	20%	9	28.6	0.99	1.035	2.6245	1.7147	3.0285	0.9569	1.7879	3.6027	4.3053	2.0871	5.0631	2.0871
9	2 hour	20%	10	28.6	0.99	1.0334	2.4664	1.8901	2.9124	0.9654	1.7239	3.6871	4.3924	2.0904	5.1746	2.0904
10	3 hour	20%	1	32.9	0.99	0.7748	1.8263	1.4261	2.0644	0.6084	1.1644	2.4976	2.831	2.1448	3.1037	2.1448
10	3 hour	20%	2	32.9	0.99	0.8621	1.5942	1.0213	1.9719	0.7193	0.9759	2.531	3.0441	2.2049	3.6388	2.2049
10	3 hour	20%	3	32.9	0.99	0.9501	2.2659	1.7	2.5637	0.8359	1.4768	3.0183	3.6879	2.376	4.4137	2.376
10	3 hour	20%	4	32.9	0.99	0.9462	2.0819	1.4121	2.5118	0.8335	1.3355	3.0495	3.619	2.3443	4.3112	2.3443
10	3 hour	20%	5	32.9	0.99	0.9219	1.3184	0.857	2.1337	0.79	0.97	2.8432	3.3183	2.3564	3.9523	2.3564
10	3 hour	20%	6	32.9	0.99	0.9067	1.3315	0.9124	2.1481	0.7703	0.9818	2.8293	3.253	2.3553	3.971	2.3553
10	3 hour	20%	7	32.9	0.99	0.8564	1.3584	0.8724	1.8047	0.6905	0.8469	2.4525	2.909	2.2822	3.5701	2.2822
10	3 hour	20%	8	32.9	0.99	1.0374	2.5241	1.8397	3.1504	0.9465	1.7392	3.7332	4.3148	2.3759	4.8079	2.3759
10	3 hour	20%	9	32.9	0.99	1.0211	1.9477	1.401	2.7305	0.9321	1.4786	3.5105	4.1257	2.4355	4.5806	2.4355
10	3 hour	20%	10	32.9	0.99	1.0366	1.7939	1.1539	2.538	0.9192	1.3223	3.3614	4.0205	2.4794	4.6886	2.4794
11	4.5 hour	20%	1	38.3	0.99	0.7571	1.161	0.7171	1.5582	0.5594	0.6833	2.0933	2.4736	2.3821	2.9965	2.3821
11	4.5 hour	20%	2	38.3	0.99	0.8094	1.1797	0.7538	1.793	0.6742	0.861	2.438	2.8638	2.3938	3.3906	2.3938
11	4.5 hour	20%	3	38.3	0.99	0.8313	1.639	1.3525	2.0702	0.6404	1.0782	2.4421	2.7444	2.5357	3.3839	2.5357
11	4.5 hour	20%	4	38.3	0.99	0.8246	1.3148	0.8883	1.8272	0.6444	0.7731	2.4097	2.7838	2.5154	3.2817	2.5154
11	4.5 hour	20%	5	38.3	0.99	0.8525	1.368	1.0133	1.878	0.6639	0.869	2.5199	2.892	2.6214	3.5294	2.6214
11	4.5 hour	20%	6	38.3	0.99	0.8705	1.4534	1.2228	2.2259	0.7227	1.142	2.8478	3.2828	2.593	3.624	2.593
11	4.5 hour	20%	7	38.3	0.99	0.8956	1.2034	0.8403	2.0549	0.7246	0.8844	2.7616	3.1854	2.6934	3.7392	2.6934
11	4.5 hour	20%	8	38.3	0.99	0.8356	0.9906	0.6479	1.7009	0.6355	0.6644	2.3341	2.7497	2.5625	3.3532	2.5625
11	4.5 hour	20%	9	38.3	0.99	1.0193	1.4211	0.8829	2.2897	0.8527	1.0391	3.1113	3.6876	2.9269	4.3943	2.9269
11	4.5 hour	20%	10	38.3	0.99	1.0075	1.7857	1.2435	2.5634	0.8887	1.3447	3.3225	3.9216	2.8218	4.4737	2.8218
12	6 hour	20%	1	42.7	0.99	0.8387	1.6559	1.3659	2.0942	0.6477	1.0932	2.4733	2.7777	2.6054	3.4206	2.6054
12	6 hour	20%	2	42.7	0.99	0.7489	1.5914	1.131	1.9075	0.6477	0.9678	2.3443	2.8436	1.9956	3.3276	1.9956
12	6 hour	20%	3	42.7	0.99	0.6583	0.944	0.5838	1.4322	0.5201	0.6511	1.9163	2.2625	2.2077	2.6977	2.2077
12	6 hour	20%	4	42.7	0.99	0.8074	1.2325	0.8885	1.7803	0.6545	0.8828	2.3757	2.7638	2.3645	3.4465	2.3645
12	6 hour	20%	5	42.7	0.99	0.7525	1.1257	0.7863	1.5386	0.5675	0.6865	2.0853	2.4585	2.5158	3.0243	2.5158
12	6 hour	20%	6	42.7	0.99	0.855	1.1085	0.7644	1.7422	0.6719	0.7908	2.408	2.8483	2.7447	3.4834	2.7447
12	6 hour	20%	7	42.7	0.99	0.7776	1.0181	0.667	1.6889	0.6013	0.7353	2.2314	2.6043	2.6124	3.066	2.6124
12	6 hour	20%	8	42.7	0.99	0.9769	1.6459	1.2541	2.5435	0.8671	1.2168	3.3166	3.8073	2.7928	4.2366	2.7928
12	6 hour	20%	9	42.7	0.99	1.0258	1.6399	1.1323	2.5608	0.8775	1.2292	3.3852	3.915	3.1076	4.5466	3.1076

Our Ref: 20996/E
Drainage Strategy – 1100 Donnybrook Road, Donnybrook Rev A2

12	6 hour	20%	10	42.7	0.99	1.0238	1.805	1.3919	2.674	0.8891	1.3806	3.413	4.0088	3.0893	4.5469	3.0893
13	9 hour	20%	1	50	1	0.7068	1.1113	0.7444	1.6512	0.5802	0.8182	2.1001	2.523	1.8868	2.8944	1.8868
13	9 hour	20%	2	50	1	0.7413	1.0736	0.6812	1.7384	0.5898	0.7936	2.2532	2.581	2.0256	3.0449	2.0256
13	9 hour	20%	3	50	1	0.6896	1.2002	0.9146	1.5283	0.5077	0.694	1.9623	2.2656	2.3226	2.7323	2.3226
13	9 hour	20%	4	50	1	0.8228	1.1624	0.7961	1.8911	0.6749	0.8583	2.5333	2.9552	2.6816	3.4155	2.6816
13	9 hour	20%	5	50	1	0.7056	0.9549	0.5692	1.5741	0.5391	0.6818	2.0798	2.4309	2.309	2.8905	2.309
13	9 hour	20%	6	50	1	0.8533	1.0385	0.6288	1.7841	0.6672	0.7474	2.4129	2.8566	2.8519	3.4441	2.8519
13	9 hour	20%	7	50	1	0.6745	1.0935	0.7418	1.5883	0.562	0.803	2.0152	2.4202	2.007	2.7678	2.007
13	9 hour	20%	8	50	1	1.0277	1.3901	0.8298	2.2363	0.8586	1.0077	3.0403	3.6369	3.3884	4.4447	3.3884
13	9 hour	20%	9	50	1	0.9319	1.3069	0.9245	2.1524	0.7529	0.97	2.8639	3.3325	3.1216	3.9297	3.1216
13	9 hour	20%	10	50	1	0.991	1.5622	1.0003	2.2701	0.8615	1.1629	3.1142	3.7304	3.1254	4.4166	3.1254
14	12 hour	20%	1	56	1	0.6459	0.8644	0.5875	1.4466	0.4875	0.6213	1.8607	2.1335	2.0909	2.5159	2.0909
14	12 hour	20%	2	56	1	0.8733	1.4061	0.8877	2.0649	0.7716	1.0412	2.6552	3.1857	2.4431	3.7438	2.4431
14	12 hour	20%	3	56	1	0.5494	0.9798	0.6346	1.1582	0.3895	0.5581	1.5112	1.7926	1.5051	2.1146	1.5051
14	12 hour	20%	4	56	1	0.6876	0.8849	0.5266	1.457	0.5285	0.6268	1.9378	2.2857	2.2141	2.7442	2.2141
14	12 hour	20%	5	56	1	0.7978	0.9611	0.6193	1.6679	0.611	0.6911	2.2176	2.6387	2.6721	3.1514	2.6721
14	12 hour	20%	6	56	1	0.5064	0.5977	0.3615	1.0179	0.3715	0.4112	1.3885	1.6362	1.7914	2.009	1.7914
14	12 hour	20%	7	56	1	0.7788	0.9583	0.658	1.6668	0.5875	0.6926	2.2402	2.6335	2.6648	3.0825	2.6648
14	12 hour	20%	8	56	1	0.8587	1.1658	0.7387	1.9044	0.6978	0.8412	2.5417	2.9609	2.9669	3.483	2.9669
14	12 hour	20%	9	56	1	1.0418	1.5663	1.0015	2.3519	0.896	1.1517	3.1449	3.7568	3.2565	4.4696	3.2565
14	12 hour	20%	10	56	1	0.8126	1.2443	0.9168	2.0512	0.7084	0.93	2.7185	3.1417	2.5835	3.5558	2.5835
15	18 hour	20%	1	65.3	1	0.5622	0.6337	0.3741	1.1351	0.4013	0.4379	1.5283	1.7975	1.8415	2.1736	1.8415
15	18 hour	20%	2	65.3	1	0.9229	1.4183	0.9021	2.0669	0.7605	0.861	2.8313	3.4178	2.6001	4.1231	2.6001
15	18 hour	20%	3	65.3	1	0.6601	0.9271	0.6057	1.4381	0.4896	0.5958	1.9171	2.3047	1.7953	2.7926	1.7953
15	18 hour	20%	4	65.3	1	0.5356	0.6125	0.3778	1.063	0.3697	0.4205	1.4245	1.6802	1.8661	2.0346	1.8661
15	18 hour	20%	5	65.3	1	0.6137	0.8745	0.511	1.4529	0.4893	0.64	1.9191	2.2224	1.7082	2.5333	1.7082
15	18 hour	20%	6	65.3	1	0.4975	0.5809	0.3654	1.0282	0.3535	0.3976	1.3657	1.586	1.5866	1.9171	1.5866
15	18 hour	20%	7	65.3	1	0.4511	0.5351	0.3467	0.923	0.3065	0.3316	1.2238	1.431	1.6288	1.7287	1.6288
15	18 hour	20%	8	65.3	1	0.6709	0.8022	0.5048	1.3505	0.4952	0.5686	1.8545	2.1965	2.2526	2.6307	2.2526
15	18 hour	20%	9	65.3	1	0.531	0.5644	0.3376	1.069	0.3672	0.3818	1.432	1.6785	1.9252	2.0485	1.9252
15	18 hour	20%	10	65.3	1	1.0297	1.5624	0.9272	2.3174	0.8375	1.144	3.0568	3.5467	3.335	4.2646	3.335
16	24 hour	20%	1	72.4	1	0.5035	0.5956	0.4208	1.0481	0.3692	0.4274	1.4224	1.6838	1.5285	1.9609	1.5285
16	24 hour	20%	2	72.4	1	0.6749	1.1466	0.655	1.4904	0.469	0.6458	1.8271	2.1598	1.8111	2.6873	1.8111
16	24 hour	20%	3	72.4	1	0.6128	0.7223	0.5073	1.3278	0.4482	0.4994	1.7684	2.0378	1.889	2.433	1.889
16	24 hour	20%	4	72.4	1	0.4351	0.6275	0.3743	0.9133	0.299	0.3659	1.1781	1.3659	1.4494	1.6434	1.4494
16	24 hour	20%	5	72.4	1	0.3727	0.4561	0.2844	0.7537	0.2492	0.2836	0.9959	1.162	1.2603	1.3921	1.2603
16	24 hour	20%	6	72.4	1	0.3578	0.4323	0.2651	0.7172	0.2458	0.2735	0.962	1.1355	1.228	1.3446	1.228
16	24 hour	20%	7	72.4	1	0.6225	0.9315	0.5364	1.4924	0.5196	0.6549	1.9971	2.3438	1.9689	2.7223	1.9689
16	24 hour	20%	8	72.4	1	0.6114	0.8332	0.5368	1.3095	0.4998	0.5997	1.8195	2.1814	1.9706	2.6118	1.9706
16	24 hour	20%	9	72.4	1	0.7052	0.8142	0.5125	1.4629	0.5279	0.5749	1.9771	2.325	2.4773	2.9076	2.4773
16	24 hour	20%	10	72.4	1	0.5142	0.5786	0.3623	1.0256	0.3663	0.396	1.3952	1.6521	1.7604	1.9885	1.7604
17	30 hour	20%	1	77.9	1	0.5003	0.6326	0.4087	1.0362	0.35	0.4506	1.3534	1.5772	1.5594	1.9141	1.5594
17	30 hour	20%	2	77.9	1	0.5244	0.6058	0.3569	1.0138	0.3584	0.3923	1.3826	1.6457	1.7726	2.042	1.7726
17	30 hour	20%	3	77.9	1	0.5403	0.6701	0.4111	1.1465	0.3892	0.4637	1.5151	1.7535	1.9374	2.0831	1.9374
17	30 hour	20%	4	77.9	1	0.3323	0.3464	0.2088	0.6516	0.2106	0.2177	0.8637	1.0191	1.1637	1.2382	1.1637
17	30 hour	20%	5	77.9	1	0.5248	0.8222	0.5306	1.2003	0.415	0.5781	1.5593	1.7685	1.7036	2.103	1.7036
17	30 hour	20%	6	77.9	1	0.3734	0.4001	0.2448	0.7542	0.2481	0.2592	0.998	1.1674	1.2678	1.425	1.2678
17	30 hour	20%	7	77.9	1	0.456	0.5773	0.4169	0.9032	0.3201	0.4081	1.2504	1.5276	1.3343	1.8191	1.3343
17	30 hour	20%	8	77.9	1	0.4651	0.4877	0.2898	0.9143	0.3136	0.3247	1.2304	1.4522	1.6632	1.7728	1.6632
17	30 hour	20%	9	77.9	1	0.3991	0.4598	0.2778	0.7863	0.2703	0.3003	1.0657	1.2694	1.3792	1.5489	1.3792
17	30 hour	20%	10	77.9	1	0.5298	0.6307	0.3638	1.1362	0.396	0.4348	1.5292	1.7996	1.7952	2.153	1.7952
18	36 hour	20%	1	82.4	1	0.4595	0.4818	0.2863	0.9034	0.3093	0.3204	1.2151	1.4344	1.6415	1.7508	1.6415
18	36 hour	20%	2	82.4	1	0.4717	0.6032	0.334	1.0383	0.3515	0.4016	1.3847	1.6364	1.5262	1.9448	1.5262
18	36 hour	20%	3	82.4	1	0.3776	0.4921	0.2923	0.7251	0.2405	0.2663	0.9746	1.1767	1.1913	1.4471	1.1913
18	36 hour	20%	4	82.4	1	0.3412	0.4139	0.2803	0.6674	0.2238	0.2696	0.904	1.0941	0.9896	1.3267	0.9896
18	36 hour	20%	5	82.4	1	0.373	0.4439	0.2623	0.7806	0.2594	0.2945	1.0316	1.2018	1.259	1.4253	1.259
18	36 hour	20%	6	82.4	1	0.4125	0.5303	0.3135	0.9056	0.3114	0.3582	1.2063	1.4142	1.3817	1.699	1.3817
18	36 hour	20%	7	82.4	1	0.3771	0.3989	0.2466	0.7561	0.2472	0.2601	0.998	1.1635	1.3313	1.4159	1.3313
18	36 hour	20%	8	82.4	1	0.5206	0.7871	0.5283	1.0765	0.3538	0.515	1.3614	1.7005	1.2842	2.0999	1.2842
18	36 hour	20%	9	82.4	1	0.5929	0.8456	0.5293	1.3036	0.4491	0.5982	1.7086	1.9623	1.9444	2.3258	1.9444
18	36 hour	20%	10	82.4	1	0.8794	1.1008	0.6435	1.9365	0.7234	0.7672	2.6864	3.2286	2.4911	3.8904	2.4911
19	48 hour	20%	1	89.3	1	0.3765	0.4236	0.2496	0.7714	0.2636	0.2762	1.0354	1.2242	1.1107	1.4942	1.1107
19	48 hour	20%	2	89.3	1	0.5177	0.6396	0.3796	1.1214	0.3892	0.4137	1.5196	1.8164	1.6854	2.1556	1.6854
19	48 hour	20%	3	89.3	1	0.6334	0.6944	0.3961	1.2634	0.451	0.476	1.7132	2.0299	2.1861	2.5351	2.1861
19	48 hour	20%	4	89.3	1	0.8085	1.0099	0.7153	1.6166	0.6012	0.751	2.2729	2.7869	2.3049	3.3847	2.3049
19	48 hour	20%	5	89.3	1	0.4017	0.5511	0.3339	0.9159	0.3056	0.3734	1.2026	1.3909	1.311	1.6355	1.311
19	48 hour	20%	6	89.3	1	0.6879	0.9348	0.5226	1.5698	0.5555	0.6455	2.1251	2.527	2.0455	3.0159	2.0455
19	48 hour	20%	7	89.3	1	0.4453	0.6018	0.3524	1.0069	0.3506	0.4124	1.3447	1.5744	1.5289	1.8625	1.5289
19	48 hour	20%	8	89.3	1	0.364	0.4165	0.2389	0.765	0.2557	0.276	1.0174	1.1913	1.0993	1.4086	1.0993
19	48 hour	20%	9	89.3	1	0.616	0.839	0.5502	1.3975	0.4791	0.6003	1.8314	2.1049	2.2607	2.5253	2.2607
19	48 hour	20%	10	89.3	1	0.3933	0.5014	0.3131	0.8646	0.2812	0.3393	1.1292	1.2998	1.3423	1.5328	1.3423

RORBWin Batch Run Summary
****

Program version 6.45 (last updated 20th March 2019)
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Date run: 06 Jul 2020 13:35

Catchment file : K:\20996E\Melbourne Water\Woodstock West_north catchment RORB\Woodstock West DSS_north catchment AHM Rev 2.catg
Rainfall location: User defined
Temporal pattern : ARR2016 point temporal patterns
Spatial pattern : Uniform
Areal Red. Fact. : Based on ARR 2016 (Book 2 Chapter 4)
Loss factors : Constant with ARI

Parameters: kc = 2.70 m = 0.80

Loss parameters Initial loss (mm) Cont. loss (mm/h)
16.00 2.60

Peak Description
01 Special storage : RB8 - Outflow
02 Special storage : RB8 - Inflow
03 Calculated hydrograph, Node A7
04 Calculated hydrograph, Node A6a
05 Special storage : RB9 - Outflow
06 Special storage : RB9 - Inflow
07 Calculated hydrograph, Node A6b
08 Calculated hydrograph, Sed Pond
09 Special storage : RB2 - Outflow
10 Special storage : RB2 - Inflow
11 Calculated hydrograph, End of Catchment

Run	Duration	AEP	TPat	Rain(mm)	ARF	Peak0001	Peak0002	Peak0003	Peak0004	Peak0005	Peak0006	Peak0007	Peak0008	Peak0009	Peak0010	Peak0011
						0.632	1.54	1.8054	1.9257	0.5295	1.2082	2.0585	2.3725	1.661	2.6467	1.661
1	10 min	63.20%	1	6.83	0.97	0.1295	0.6622	0.9598	0.8302	0.1135	0.6107	0.832	0.7948	0.1394	0.7552	0.1394
1	10 min	63.20%	2	6.83	0.97	0.1294	0.6615	0.923	0.8282	0.1132	0.5786	0.8327	0.7927	0.1392	0.7543	0.1392
1	10 min	63.20%	3	6.83	0.97	0.1294	0.6615	0.92	0.828	0.1131	0.5758	0.8328	0.7929	0.1392	0.7542	0.1392
1	10 min	63.20%	4	6.83	0.97	0.1294	0.6616	0.8686	0.8246	0.1129	0.5317	0.8333	0.7947	0.1385	0.7529	0.1385
1	10 min	63.20%	5	6.83	0.97	0.1293	0.6615	0.9339	0.8288	0.1132	0.5882	0.8325	0.7931	0.1393	0.7546	0.1393
1	10 min	63.20%	6	6.83	0.97	0.1294	0.6616	0.8685	0.8246	0.1129	0.5316	0.8334	0.7947	0.1385	0.7529	0.1385
1	10 min	63.20%	7	6.83	0.97	0.1298	0.6628	1.0596	0.8338	0.1165	0.6294	0.8311	0.8054	0.141	0.7625	0.141
1	10 min	63.20%	8	6.83	0.97	0.1294	0.6616	0.8689	0.8246	0.1129	0.5319	0.8333	0.7946	0.1385	0.7529	0.1385
1	10 min	63.20%	9	6.83	0.97	0.1295	0.662	0.9869	0.8311	0.1141	0.6366	0.8311	0.7965	0.1395	0.7558	0.1395
1	10 min	63.20%	10	6.83	0.97	0.1295	0.6619	1.002	0.8319	0.1153	0.6439	0.831	0.7982	0.1398	0.7567	0.1398
2	15 min	63.20%	1	8.31	0.98	0.1732	0.8407	1.0434	1.0128	0.1534	0.6987	1.0413	1.015	0.1961	0.9655	0.1961
2	15 min	63.20%	2	8.31	0.98	0.1731	0.839	0.996	0.9955	0.1526	0.6496	1.0277	1.0097	0.1959	0.9631	0.1959
2	15 min	63.20%	3	8.31	0.98	0.1731	0.8389	0.9422	0.9937	0.1522	0.6146	1.0245	1.0078	0.1959	0.962	0.1959
2	15 min	63.20%	4	8.31	0.98	0.1756	0.8561	1.1133	1.0656	0.1587	0.6913	1.0823	1.0367	0.2009	0.9865	0.2009
2	15 min	63.20%	5	8.31	0.98	0.1732	0.8425	1.1154	1.0326	0.1552	0.6918	1.0579	1.0228	0.1968	0.9703	0.1968
2	15 min	63.20%	6	8.31	0.98	0.1732	0.8438	1.0922	1.0452	0.1557	0.6605	1.0658	1.0258	0.1976	0.9734	0.1976
2	15 min	63.20%	7	8.31	0.98	0.1755	0.8561	1.1433	1.0686	0.1589	0.7158	1.0831	1.0366	0.201	0.9837	0.201
2	15 min	63.20%	8	8.31	0.98	0.173	0.8425	1.0552	1.0397	0.1559	0.657	1.0596	1.0208	0.1967	0.9682	0.1967
2	15 min	63.20%	9	8.31	0.98	0.1734	0.8444	1.1997	1.0707	0.1586	0.7601	1.0809	1.033	0.1998	0.9792	0.1998
2	15 min	63.20%	10	8.31	0.98	0.1733	0.8449	1.2546	1.0633	0.1606	0.8096	1.0691	1.0238	0.1994	0.9741	0.1994
3	20 min	63.20%	1	9.41	0.98	0.2104	0.9631	1.0705	1.1389	0.1851	0.7	1.1487	1.1645	0.2385	1.1192	0.2385
3	20 min	63.20%	2	9.41	0.98	0.2104	0.9637	0.9835	1.1209	0.1825	0.6398	1.1444	1.1598	0.2377	1.1174	0.2377
3	20 min	63.20%	3	9.41	0.98	0.2138	0.9822	1.0485	1.1522	0.1857	0.6621	1.1769	1.178	0.2414	1.1346	0.2414
3	20 min	63.20%	4	9.41	0.98	0.2135	0.9884	1.1438	1.1923	0.1899	0.7744	1.2258	1.197	0.2423	1.1402	0.2423
3	20 min	63.20%	5	9.41	0.98	0.2138	0.9893	1.3617	1.1985	0.192	0.838	1.238	1.205	0.243	1.1454	0.243
3	20 min	63.20%	6	9.41	0.98	0.2138	0.9906	1.2409	1.2093	0.192	0.7888	1.2419	1.2046	0.2428	1.1447	0.2428
3	20 min	63.20%	7	9.41	0.98	0.2135	0.9896	1.1979	1.2102	0.1924	0.7685	1.2403	1.2031	0.2428	1.1438	0.2428
3	20 min	63.20%	8	9.41	0.98	0.2135	0.9876	1.1482	1.181	0.1897	0.7696	1.2179	1.1942	0.2423	1.1388	0.2423
3	20 min	63.20%	9	9.41	0.98	0.214	0.992	1.3045	1.2199	0.1932	0.788	1.2517	1.211	0.2441	1.1508	0.2441
3	20 min	63.20%	10	9.41	0.98	0.2139	0.9926	1.2651	1.2319	0.1956	0.7872	1.2572	1.2115	0.2445	1.151	0.2445
4	25 min	63.20%	1	10.3	0.98	0.2402	1.0576	1.0354	1.1969	0.2134	0.7265	1.2503	1.2801	0.274	1.2436	0.274
4	25 min	63.20%	2	10.3	0.98	0.2405	1.0477	1.0762	1.2291	0.2106	0.7316	1.247	1.2909	0.2721	1.2439	0.2721
4	25 min	63.20%	3	10.3	0.98	0.2435	1.0738	1.1155	1.2568	0.2145	0.7509	1.261	1.3091	0.2756	1.2613	0.2756
4	25 min	63.20%	4	10.3	0.98	0.2415	1.0744	1.1756	1.2632	0.2171	0.7884	1.2977	1.3098	0.2759	1.2631	0.2759
4	25 min	63.20%	5	10.3	0.98	0.2441	1.0905	1.2507	1.2875	0.2189	0.8233	1.3233	1.3198	0.2771	1.2689	0.2771
4	25 min	63.20%	6	10.3	0.98	0.2434	1.0757	1.0242	1.2272	0.2128	0.7117	1.2586	1.2993	0.2755	1.2578	0.2755
4	25 min	63.20%	7	10.3	0.98	0.2441	1.084	1.2152	1.3064	0.2162	0.7679	1.3168	1.3283	0.2761	1.2715	0.2761
4	25 min	63.20%	8	10.3	0.98	0.2438	1.0839	1.1957	1.2901	0.2179	0.7706	1.2904	1.3214	0.2764	1.2689	0.2764
4	25 min	63.20%	9	10.3	0.98	0.2459	1.107	1.3044	1.3385	0.2221	0.8857	1.3813	1.3516	0.2801	1.2872	0.2801

4	25 min	63.20%	10	10.3	0.98	0.2452	1.1012	1.4282	1.3368	0.2226	0.9471	1.3732	1.3505	0.2801	1.2879	0.2801
5	30 min	63.20%	1	11.1	0.98	0.2694	1.1418	1.1061	1.2751	0.2384	0.8093	1.3407	1.386	0.3074	1.3641	0.3074
5	30 min	63.20%	2	11.1	0.98	0.2695	1.1555	1.1077	1.2982	0.238	0.7166	1.3504	1.408	0.3057	1.373	0.3057
5	30 min	63.20%	3	11.1	0.98	0.2669	1.1052	0.9647	1.2528	0.2325	0.6902	1.2809	1.3826	0.3047	1.3523	0.3047
5	30 min	63.20%	4	11.1	0.98	0.2704	1.1685	1.2144	1.3606	0.2436	0.8226	1.3851	1.4319	0.3085	1.3833	0.3085
5	30 min	63.20%	5	11.1	0.98	0.2702	1.168	1.259	1.3601	0.2432	0.8643	1.3941	1.427	0.3078	1.3792	0.3078
5	30 min	63.20%	6	11.1	0.98	0.2704	1.1571	1.1713	1.3553	0.2395	0.7963	1.3737	1.4304	0.3072	1.3792	0.3072
5	30 min	63.20%	7	11.1	0.98	0.2706	1.1775	1.2539	1.3778	0.2456	0.8436	1.4154	1.4412	0.3097	1.3916	0.3097
5	30 min	63.20%	8	11.1	0.98	0.2702	1.1561	1.2102	1.3414	0.2407	0.8398	1.3675	1.4178	0.3071	1.3691	0.3071
5	30 min	63.20%	9	11.1	0.98	0.2744	1.205	1.3229	1.4232	0.2486	0.892	1.48	1.4689	0.3127	1.4072	0.3127
5	30 min	63.20%	10	11.1	0.98	0.2734	1.207	1.4228	1.4698	0.2506	0.9536	1.5196	1.4873	0.3131	1.4155	0.3131
6	45 min	63.20%	1	12.9	0.99	0.3383	1.2598	0.9555	1.3408	0.2832	0.717	1.4142	1.5959	0.4008	1.5963	0.4008
6	45 min	63.20%	2	12.9	0.99	0.3355	1.2467	0.988	1.3563	0.2822	0.7065	1.4202	1.598	0.3998	1.5938	0.3998
6	45 min	63.20%	3	12.9	0.99	0.3332	1.1969	1.0103	1.235	0.276	0.6664	1.3155	1.552	0.3958	1.57	0.3958
6	45 min	63.20%	4	12.9	0.99	0.3328	1.2069	0.9398	1.2942	0.2794	0.7279	1.3596	1.5364	0.3955	1.5517	0.3955
6	45 min	63.20%	5	12.9	0.99	0.3389	1.3134	1.2486	1.517	0.2917	0.8498	1.5677	1.6755	0.4016	1.6357	0.4016
6	45 min	63.20%	6	12.9	0.99	0.3402	1.2724	1.0554	1.4113	0.2884	0.795	1.4606	1.6221	0.4062	1.6157	0.4062
6	45 min	63.20%	7	12.9	0.99	0.3474	1.3878	1.2784	1.5431	0.2989	0.8626	1.6062	1.7132	0.413	1.6736	0.413
6	45 min	63.20%	8	12.9	0.99	0.3415	1.3015	1.2208	1.3917	0.2878	0.803	1.449	1.6411	0.405	1.6348	0.405
6	45 min	63.20%	9	12.9	0.99	0.3504	1.4241	1.5965	1.6538	0.3065	1.0429	1.7258	1.758	0.4175	1.7038	0.4175
6	45 min	63.20%	10	12.9	0.99	0.3471	1.3917	1.3326	1.5805	0.3012	0.8602	1.6453	1.7243	0.4143	1.684	0.4143
7	1 hour	63.20%	1	14.3	0.99	0.3772	1.1132	0.948	1.1853	0.2965	0.6131	1.3329	1.5923	0.4656	1.7315	0.4656
7	1 hour	63.20%	2	14.3	0.99	0.3772	1.1637	0.8679	1.2348	0.2984	0.6538	1.3659	1.5999	0.4654	1.7123	0.4654
7	1 hour	63.20%	3	14.3	0.99	0.3798	1.159	0.8719	1.2272	0.3039	0.6233	1.377	1.6255	0.4689	1.7352	0.4689
7	1 hour	63.20%	4	14.3	0.99	0.3941	1.3883	1.2282	1.4977	0.3279	0.8149	1.5789	1.8278	0.4844	1.829	0.4844
7	1 hour	63.20%	5	14.3	0.99	0.3887	1.3637	0.9921	1.4475	0.3249	0.7831	1.5631	1.7707	0.4791	1.7832	0.4791
7	1 hour	63.20%	6	14.3	0.99	0.3932	1.397	1.268	1.5751	0.3278	0.8597	1.6317	1.8469	0.4809	1.8365	0.4809
7	1 hour	63.20%	7	14.3	0.99	0.3965	1.4527	1.2261	1.5756	0.335	0.8216	1.642	1.8668	0.4885	1.8614	0.4885
7	1 hour	63.20%	8	14.3	0.99	0.3878	1.3165	0.9976	1.3427	0.319	0.6927	1.4734	1.7317	0.4781	1.7717	0.4781
7	1 hour	63.20%	9	14.3	0.99	0.3962	1.5131	1.8054	1.8161	0.3543	1.2082	1.8953	1.9224	0.4927	1.9208	0.4927
7	1 hour	63.20%	10	14.3	0.99	0.3984	1.5087	1.6088	1.8254	0.3526	1.0691	1.8548	1.9645	0.4939	1.8955	0.4939
8	1.5 hour	63.20%	1	16.5	0.99	0.4355	1.1029	0.9322	1.1987	0.3314	0.6233	1.3582	1.6598	0.5847	1.9586	0.5847
8	1.5 hour	63.20%	2	16.5	0.99	0.4009	1.1726	1.16	1.3471	0.2867	0.7666	1.3643	1.4229	0.5791	1.9488	0.5791
8	1.5 hour	63.20%	3	16.5	0.99	0.4108	0.9466	1.004	1.1629	0.3072	0.6688	1.3836	1.5333	0.5723	1.9557	0.5723
8	1.5 hour	63.20%	4	16.5	0.99	0.4572	1.3513	0.8991	1.4711	0.3791	0.7689	1.6657	1.9346	0.6062	2.113	0.6062
8	1.5 hour	63.20%	5	16.5	0.99	0.4392	1.3023	1.1752	1.4523	0.3302	0.7711	1.5162	1.7437	0.5904	2.0544	0.5904
8	1.5 hour	63.20%	6	16.5	0.99	0.4387	1.1653	0.786	1.3458	0.3592	0.6682	1.5427	1.7799	0.5913	2.0221	0.5913
8	1.5 hour	63.20%	7	16.5	0.99	0.4344	1.204	1.1261	1.3612	0.3258	0.7698	1.4005	1.6226	0.5868	2.0389	0.5868
8	1.5 hour	63.20%	8	16.5	0.99	0.4539	1.3629	1.0911	1.4339	0.3772	0.7832	1.6344	1.9254	0.6055	2.18	0.6055
8	1.5 hour	63.20%	9	16.5	0.99	0.4638	1.4826	1.3329	1.7462	0.3987	0.9501	1.8665	2.0733	0.61	2.0806	0.61
8	1.5 hour	63.20%	10	16.5	0.99	0.4636	1.54	1.7906	1.9257	0.4148	1.204	2.0109	2.1406	0.6152	2.2063	0.6152
9	2 hour	63.20%	1	18.2	0.99	0.4404	0.9477	0.915	1.0966	0.3285	0.5958	1.3669	1.5583	0.6874	1.8705	0.6874
9	2 hour	63.20%	2	18.2	0.99	0.4324	0.9847	0.9248	1.0939	0.3082	0.6072	1.2522	1.4655	0.6827	1.7768	0.6827
9	2 hour	63.20%	3	18.2	0.99	0.4719	0.9018	0.8322	1.1352	0.3645	0.5053	1.4265	1.6958	0.7078	1.9755	0.7078
9	2 hour	63.20%	4	18.2	0.99	0.5031	1.0499	0.7818	1.3429	0.407	0.6393	1.6434	1.9308	0.742	2.1744	0.742
9	2 hour	63.20%	5	18.2	0.99	0.5113	1.313	1.1117	1.6193	0.4366	0.9035	1.8604	2.0743	0.7473	2.4064	0.7473
9	2 hour	63.20%	6	18.2	0.99	0.4661	0.9543	0.8109	1.3195	0.3732	0.6721	1.5727	1.7479	0.7105	2.1144	0.7105
9	2 hour	63.20%	7	18.2	0.99	0.4954	1.0525	0.7747	1.2952	0.3984	0.6117	1.5736	1.8625	0.7405	2.123	0.7405
9	2 hour	63.20%	8	18.2	0.99	0.4811	1.1052	0.817	1.4051	0.4041	0.73	1.6655	1.8975	0.7018	2.0126	0.7018
9	2 hour	63.20%	9	18.2	0.99	0.5372	1.4886	1.0472	1.615	0.4496	0.8481	1.7817	2.1817	0.7712	2.5014	0.7712
9	2 hour	63.20%	10	18.2	0.99	0.5409	1.436	1.1436	1.5679	0.458	0.8467	1.8868	2.2518	0.7806	2.5939	0.7806
10	3 hour	63.20%	1	21.1	0.99	0.4342	0.9307	0.8079	1.1291	0.3347	0.5097	1.4003	1.5418	0.8669	1.6431	0.8669
10	3 hour	63.20%	2	21.1	0.99	0.459	0.8674	0.579	1.0217	0.3346	0.4469	1.2793	1.5285	0.8698	1.8811	0.8698
10	3 hour	63.20%	3	21.1	0.99	0.4967	1.1622	1	1.3114	0.3677	0.6494	1.4483	1.8129	0.941	2.1517	0.941
10	3 hour	63.20%	4	21.1	0.99	0.5031	1.1888	0.8562	1.3403	0.3865	0.6628	1.4819	1.8088	0.9317	2.1998	0.9317
10	3 hour	63.20%	5	21.1	0.99	0.517	0.8044	0.5073	1.2078	0.4044	0.5586	1.5485	1.8251	0.9367	2.0679	0.9367
10	3 hour	63.20%	6	21.1	0.99	0.5086	0.8085	0.5587	1.2221	0.4041	0.5718	1.5531	1.8135	0.9364	2.1111	0.9364
10	3 hour	63.20%	7	21.1	0.99	0.4726	0.7395	0.5031	0.9871	0.3489	0.4036	1.3181	1.5614	0.9109	1.9193	0.9109
10	3 hour	63.20%	8	21.1	0.99	0.5508	1.4786	1.1088	1.7087	0.4545	0.8484	1.8714	2.2246	0.9379	2.4906	0.9379
10	3 hour	63.20%	9	21.1	0.99	0.5837	1.1808	0.868	1.5672	0.5058	0.8105	1.9264	2.2217	0.9838	2.464	0.9838
10	3 hour	63.20%	10	21.1	0.99	0.5842	1.0968	0.7103	1.4421	0.4866	0.7031	1.8402	2.1698	1.003	2.458	1.003
11	4.5 hour	63.20%	1	24.6	1	0.4333	0.6124	0.4319	0.8994	0.3125	0.3525	1.1982	1.4098	1.0447	1.6734	1.0447
11	4.5 hour	63.20%	2	24.6	1	0.4752	0.716	0.4419	1.0698	0.3874	0.5109	1.4371	1.6744	1.0725	1.9287	1.0725
11	4.5 hour	63.20%	3	24.6	1	0.4741	0.9502	0.8154	1.1036	0.3556	0.5225	1.3292	1.5613	1.1114	1.8823	1.1114
11	4.5 hour	63.20%	4	24.6	1	0.4705	0.7141	0.5074	1.0546	0.3541	0.4383	1.3547	1.5837	1.0979	1.8538	1.0979
11	4.5 hour	63.20%	5	24.6	1	0.4912	0.7889	0.6173	1.1058	0.3635	0.4559	1.4591	1.6664	1.1628	2.0095	1.1628
11	4.5 hour	63.20%	6	24.6	1	0.5124	0.8536	0.7449	1.2927	0.4188	0.6642	1.6835	1.901	1.1556	2.0623	1.1556
11	4.5 hour	63.20%	7	24.6	1	0.5265	0.7272	0.5087	1.2196	0.4035	0.5159	1.6047	1.8382	1.1849	2.1513	1.1849
11	4.5 hour	63.20%	8	24.6	1	0.4813	0.5648	0.3634	0.998	0.3547	0.378	1.3472	1.585	1.1245	1.9148	1.1245
11	4.5 hour	63.20%	9	24.6	1	0.6018	0.8701	0.545	1.3539	0.4787	0.616	1.8151	2.1297	1.2577	2.4808	1.2577
11	4.5 hour	63.20%	10	24.6	1	0.6052	1.0869	0.768	1.5001	0.5166	0.8035	1.9723	2.2879	1.2194	2.499	1.2194
12	6 hour	63.20%	1	27.4	1	0.4786	0.9602	0.8239	1.1169	0.3594	0.531	1.3421	1.5767	1.1651	1.9015	1.1651
12	6 hour	63.20%	2	27.4	1	0.3888	0.8765	0.6601	0.9789	0.309	0.4616	1.1944	1.3794	0.9684	1.5871	0.9684
12	6 hour	63.20%	3	27.4	1	0.37	0.546	0.351	0.7597	0.246	0.2974	0.9962	1.1637	1.054	1.4116	1.054
12	6 hour	63.20%	4	27.4	1	0.442	0.7314	0.5361	0.9778	0.3397	0.4263	1.3101	1.5168	1.1173	1.8287	1.1173
12	6 hour	63.20%	5	27.4	1	0.43	0.6227	0.4635	0.8951	0.3022	0.3512	1.1937	1.3971	1.1794	1.6652	1.1794
12	6 hour	63.20%	6	27.4	1	0.4906	0.6439	0.4584	1.0092	0.3695	0.408	1.3729	1.6186	1.2622	1.9474	1.2622
12	6 hour	63.20%	7	27.4	1	0.452	0.6117	0.4035	0.9555	0.3213	0.4173	1.2519	1.4625	1.2209	1.7635	1.2209
12	6 hour	63.20%	8	27.4	1	0.567	0.9977	0.7656	1.4804	0.4821	0.7064	1.8616	2.0912	1.3025	2.2899	1.3025
12	6 hour	63.20%	9	27.4	1	0.6224	0.994	0.6935	1.5413	0.5172	0.7282	2.0044	2.2902	1.4142	2.6183	1.4142

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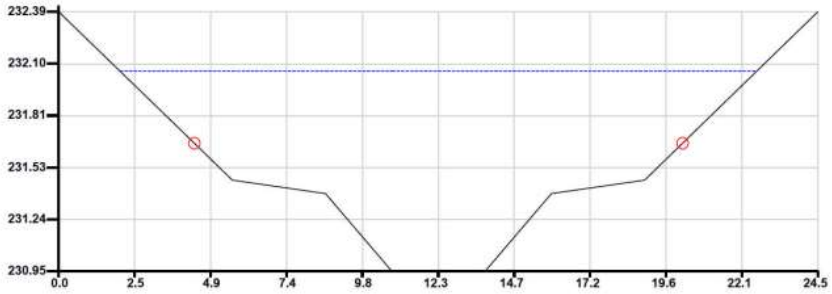
Drainage Strategy – 1100 Donnybrook Road, Donnybrook Rev A2

12	6 hour	63.20%	10	27.4	1	0.6283	1.0864	0.8547	1.5783	0.5252	0.8166	2.0585	2.3725	1.4464	2.6334	1.4464
13	9 hour	63.20%	1	31.8	1	0.3783	0.6458	0.4481	0.8832	0.3051	0.4431	1.1499	1.3601	0.8659	1.5001	0.8659
13	9 hour	63.20%	2	31.8	1	0.3829	0.6437	0.41	0.9066	0.2843	0.4051	1.0962	1.2934	0.9063	1.4777	0.9063
13	9 hour	63.20%	3	31.8	1	0.4049	0.6318	0.4023	0.8633	0.2851	0.3773	1.124	1.3009	1.1651	1.5617	1.1651
13	9 hour	63.20%	4	31.8	1	0.4827	0.6824	0.477	1.1167	0.3791	0.4852	1.4729	1.6965	1.3105	1.9129	1.3105
13	9 hour	63.20%	5	31.8	1	0.4168	0.5665	0.3415	0.9223	0.3048	0.3876	1.1993	1.3827	1.1561	1.6101	1.1561
13	9 hour	63.20%	6	31.8	1	0.4978	0.6185	0.3786	1.0428	0.3772	0.4274	1.4088	1.6653	1.3461	1.9872	1.3461
13	9 hour	63.20%	7	31.8	1	0.3896	0.6389	0.4452	0.8979	0.3202	0.4502	1.1782	1.3893	1.0195	1.5426	1.0195
13	9 hour	63.20%	8	31.8	1	0.6212	0.8407	0.5009	1.3211	0.4994	0.5929	1.8122	2.157	1.6204	2.5909	1.6204
13	9 hour	63.20%	9	31.8	1	0.5623	0.7839	0.5581	1.2825	0.4223	0.5523	1.6779	1.937	1.5954	2.2541	1.5954
13	9 hour	63.20%	10	31.8	1	0.6051	0.9302	0.6126	1.3749	0.5003	0.6749	1.8568	2.1936	1.5187	2.5172	1.5187
14	12 hour	63.20%	1	35.4	1	0.3613	0.4948	0.3232	0.8058	0.2634	0.3351	1.0125	1.1919	0.9153	1.3595	0.9153
14	12 hour	63.20%	2	35.4	1	0.4822	0.8328	0.5386	1.1159	0.3916	0.55	1.4395	1.7263	1.0215	1.9553	1.0215
14	12 hour	63.20%	3	35.4	1	0.2755	0.478	0.3714	0.5974	0.1795	0.24	0.7728	0.9024	0.6693	1.0354	0.6693
14	12 hour	63.20%	4	35.4	1	0.3969	0.5207	0.3117	0.8346	0.2948	0.3518	1.1092	1.3077	1.0355	1.5368	1.0355
14	12 hour	63.20%	5	35.4	1	0.4575	0.5604	0.3684	0.9454	0.3369	0.3859	1.2687	1.5034	1.2368	1.8048	1.2368
14	12 hour	63.20%	6	35.4	1	0.2754	0.3365	0.2055	0.5437	0.1701	0.1922	0.7066	0.8324	0.8872	1.0098	0.8872
14	12 hour	63.20%	7	35.4	1	0.4465	0.5586	0.3885	0.9652	0.3269	0.3841	1.2778	1.4858	1.297	1.7265	1.297
14	12 hour	63.20%	8	35.4	1	0.5086	0.6953	0.4396	1.1151	0.3968	0.4861	1.4681	1.691	1.4805	2.0222	1.4805
14	12 hour	63.20%	9	35.4	1	0.632	0.9424	0.6059	1.3911	0.5295	0.6755	1.9007	2.2531	1.6563	2.6467	1.6563
14	12 hour	63.20%	10	35.4	1	0.4843	0.7536	0.5431	1.222	0.3987	0.5401	1.589	1.8081	1.3423	2.0163	1.3423
15	18 hour	63.20%	1	40.9	1	0.2973	0.3563	0.2095	0.5944	0.1956	0.213	0.789	0.9326	0.7964	1.1124	0.7964
15	18 hour	63.20%	2	40.9	1	0.4855	0.7499	0.4743	1.1327	0.3562	0.4619	1.4538	1.7238	1.067	2.0105	1.067
15	18 hour	63.20%	3	40.9	1	0.3436	0.5194	0.2974	0.7399	0.2128	0.2853	0.8934	1.0631	0.6423	1.284	0.6423
15	18 hour	63.20%	4	40.9	1	0.2932	0.3373	0.2155	0.5802	0.1877	0.212	0.7704	0.909	0.8727	1.085	0.8727
15	18 hour	63.20%	5	40.9	1	0.3253	0.5025	0.3011	0.7585	0.2172	0.3039	0.9501	1.0922	0.7267	1.2203	0.7267
15	18 hour	63.20%	6	40.9	1	0.2616	0.3237	0.2063	0.5369	0.1706	0.2095	0.6912	0.8238	0.6353	0.9714	0.6353
15	18 hour	63.20%	7	40.9	1	0.2457	0.2889	0.1797	0.5011	0.1466	0.1603	0.6444	0.753	0.7582	0.9004	0.7582
15	18 hour	63.20%	8	40.9	1	0.3869	0.462	0.292	0.7805	0.2696	0.31	1.056	1.2441	1.1463	1.468	1.1463
15	18 hour	63.20%	9	40.9	1	0.2971	0.3177	0.1898	0.5981	0.1865	0.1966	0.7813	0.9142	0.9883	1.1072	0.9883
15	18 hour	63.20%	10	40.9	1	0.6119	0.9265	0.5623	1.3243	0.4801	0.6589	1.7008	2.0343	1.661	2.4728	1.661
16	24 hour	63.20%	1	45	1	0.2537	0.3201	0.2312	0.5618	0.1717	0.209	0.7288	0.8564	0.732	0.9654	0.732
16	24 hour	63.20%	2	45	1	0.3004	0.5359	0.3257	0.6246	0.1767	0.2509	0.7959	0.9771	0.7973	1.1823	0.7973
16	24 hour	63.20%	3	45	1	0.3251	0.4141	0.2835	0.7239	0.2226	0.2785	0.9324	1.065	0.7359	1.2334	0.7359
16	24 hour	63.20%	4	45	1	0.2296	0.2893	0.1867	0.4823	0.1412	0.1802	0.5962	0.7058	0.6769	0.8308	0.6769
16	24 hour	63.20%	5	45	1	0.1889	0.247	0.1537	0.3823	0.1058	0.1222	0.4774	0.5625	0.5718	0.6682	0.5718
16	24 hour	63.20%	6	45	1	0.1803	0.2267	0.1406	0.3572	0.0981	0.1118	0.4557	0.5372	0.5487	0.6387	0.5487
16	24 hour	63.20%	7	45	1	0.3455	0.5399	0.3032	0.8191	0.2741	0.3606	1.0686	1.2365	0.9106	1.4076	0.9106
16	24 hour	63.20%	8	45	1	0.3306	0.4646	0.3071	0.7236	0.2669	0.318	0.986	1.1739	0.9647	1.3754	0.9647
16	24 hour	63.20%	9	45	1	0.4025	0.4696	0.2937	0.8355	0.289	0.3135	1.1171	1.3125	1.2564	1.6194	1.2564
16	24 hour	63.20%	10	45	1	0.2757	0.3181	0.202	0.5601	0.1811	0.1984	0.7407	0.8775	0.8546	1.0401	0.8546
17	30 hour	63.20%	1	48.2	1	0.2597	0.3546	0.245	0.5117	0.1649	0.2241	0.6717	0.8184	0.6642	0.998	0.6642
17	30 hour	63.20%	2	48.2	1	0.2715	0.3477	0.2085	0.5358	0.1671	0.1744	0.705	0.8452	0.7521	1.0386	0.7521
17	30 hour	63.20%	3	48.2	1	0.2974	0.371	0.2359	0.6136	0.1879	0.2406	0.7854	0.9082	0.8693	1.1112	0.8693
17	30 hour	63.20%	4	48.2	1	0.1659	0.1929	0.1078	0.3254	0.0847	0.0902	0.411	0.4855	0.5142	0.5836	0.5142
17	30 hour	63.20%	5	48.2	1	0.2949	0.4537	0.2995	0.6201	0.1948	0.2958	0.7708	0.9322	0.7364	1.1498	0.7364
17	30 hour	63.20%	6	48.2	1	0.1865	0.2107	0.1288	0.3851	0.1049	0.118	0.4864	0.5693	0.5675	0.6872	0.5675
17	30 hour	63.20%	7	48.2	1	0.2343	0.2989	0.2195	0.4804	0.1662	0.2087	0.656	0.791	0.6028	0.9307	0.6028
17	30 hour	63.20%	8	48.2	1	0.2475	0.2644	0.1582	0.492	0.1505	0.1571	0.6444	0.7605	0.7905	0.9162	0.7905
17	30 hour	63.20%	9	48.2	1	0.2024	0.2449	0.1526	0.4023	0.1199	0.1373	0.5246	0.6269	0.6238	0.7529	0.6238
17	30 hour	63.20%	10	48.2	1	0.2761	0.3529	0.2033	0.6121	0.197	0.2247	0.8018	0.9375	0.8268	1.1027	0.8268
18	36 hour	63.20%	1	50.9	1	0.2433	0.2601	0.1557	0.4838	0.1474	0.1539	0.6331	0.747	0.7718	0.8996	0.7718
18	36 hour	63.20%	2	50.9	1	0.2396	0.3351	0.191	0.5516	0.1623	0.2027	0.7051	0.8234	0.7008	0.9592	0.7008
18	36 hour	63.20%	3	50.9	1	0.1842	0.2084	0.1287	0.3623	0.0951	0.1045	0.4565	0.5376	0.4484	0.6705	0.4484
18	36 hour	63.20%	4	50.9	1	0.1642	0.2057	0.1416	0.335	0.0968	0.121	0.4341	0.5236	0.4524	0.6238	0.4524
18	36 hour	63.20%	5	50.9	1	0.191	0.2357	0.1406	0.3855	0.1035	0.1339	0.4796	0.5612	0.5039	0.6763	0.5039
18	36 hour	63.20%	6	50.9	1	0.2125	0.292	0.174	0.4563	0.1322	0.1737	0.5751	0.6731	0.6245	0.7945	0.6245
18	36 hour	63.20%	7	50.9	1	0.1935	0.2092	0.1289	0.3914	0.1064	0.1142	0.4948	0.5759	0.5765	0.6941	0.5765
18	36 hour	63.20%	8	50.9	1	0.2514	0.3582	0.2737	0.5262	0.1514	0.212	0.6859	0.8528	0.5383	1.0184	0.5383
18	36 hour	63.20%	9	50.9	1	0.3243	0.4758	0.304	0.6677	0.2145	0.3125	0.8495	1.0068	0.7779	1.2391	0.7779
18	36 hour	63.20%	10	50.9	1	0.5027	0.6473	0.3717	1.1088	0.4009	0.4308	1.5161	1.8065	1.3711	2.1425	1.3711
19	48 hour	63.20%	1	55	1	0.1727	0.2267	0.1333	0.3817	0.108	0.1268	0.4856	0.5734	0.4311	0.6899	0.4311
19	48 hour	63.20%	2	55	1	0.262	0.3607	0.2127	0.5667	0.144	0.163	0.705	0.8509	0.7359	0.9955	0.7359
19	48 hour	63.20%	3	55	1	0.3405	0.3802	0.2304	0.7046	0.225	0.2558	0.9226	1.0873	0.9919	1.3234	0.9919
19	48 hour	63.20%	4	55	1	0.4345	0.54	0.4041	0.8974	0.3054	0.3849	1.2249	1.4964	1.0748	1.7793	1.0748
19	48 hour	63.20%	5	55	1	0.1881	0.2985	0.1837	0.46	0.1283	0.1796	0.5743	0.6633	0.5795	0.767	0.5795
19	48 hour	63.20%	6	55	1	0.3629	0.535	0.2968	0.8545	0.2588	0.3229	1.0994	1.2986	0.9303	1.5215	0.9303
19	48 hour	63.20%	7	55	1	0.2361	0.3346	0.198	0.5197	0.1573	0.2064	0.6629	0.7733	0.6587	0.9003	0.6587
19	48 hour	63.20%	8	55	1	0.1633	0.2225	0.1252	0.3741	0.1006	0.1205	0.471	0.5524	0.3755	0.6374	0.3755
19	48 hour	63.20%	9	55	1	0.3447	0.4696	0.3119	0.7636	0.2488	0.3177	0.9864	1.1244	1.0863	1.3311	1.0863
19	48 hour	63.20%	10	55	1	0.1961	0.2671	0.1692	0.4469	0.1151	0.1567	0.5535	0.6356	0.6436	0.7405	0.6436

Appendix B – Constructed Waterway Sizing

PROJECT: 1100 Donnybrook Road
Constructed Waterway
Print-out date: 06/07/2020 - Time: 2:09
Data File: K:\20996E\Design\Computations\PC Convey\Constructed Waterway.dat

1. CROSS-SECTION:



2. DISCHARGE INFORMATION:

100 year (1%) storm event
XS for QLFC = 1 cumecs and Q100 = 11.518 cumecs

Total discharge = 11.52 cumecs

There is no pipe discharge
Overland / Channel / Watercourse discharge = 11.52 cumecs

3. RESULTS: Water surface elevation = 232.060m

High Flow Channel grade = 1 in 300, Main Channel / Low Flow Channel grade = 1 in 300.

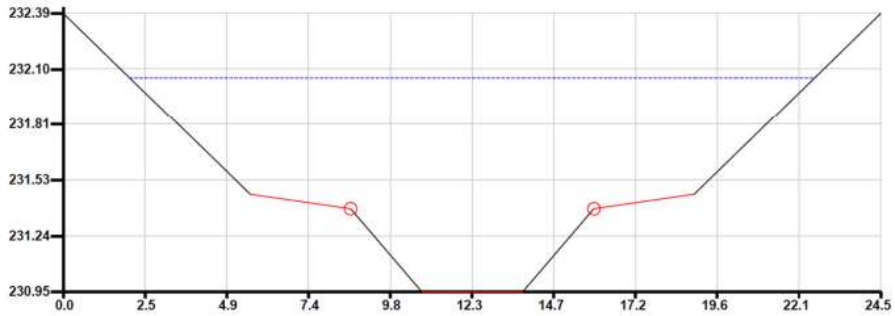
	LEFT OVERBANK	MAIN CHANNEL	RIGHT OVERBANK	TOTAL CROSS-SECTION
Discharge (cumecs):	0.21	11.20	0.21	11.61
D(Max) = Max. Depth (m):	0.40	1.11	0.40	1.11
D(Ave) = Ave. Depth (m):	0.20	0.78	0.20	0.78
V = Ave. Velocity (m/s):	0.43	0.91	0.43	0.88
D(Max) x V (cumecs/m):	0.17	1.01	0.17	0.97
D(Ave) x V (cumecs/m):	0.09	0.71	0.09	0.68
Froude Number:	0.31	0.33	0.31	0.33
Area (m^2):	0.48	12.27	0.48	13.23
Wetted Perimeter (m):	2.43	15.88	2.43	20.74
Flow Width (m):	2.40	15.76	2.40	20.56
Hydraulic Radius (m):	0.20	0.77	0.20	0.64
Composite Manning's n:	0.045	0.053	0.045	0.051
Split Flow?	-	-	-	No

4. CROSS-SECTION DATA:

	LEFT HAND POINT		RIGHT HAND POINT		
SEGMENT NO.	CHAINAGE (m)	R.L. (m)	CHAINAGE (m)	R.L. (m)	MANNING'S N
1	0.000	232.390	4.378	231.660	0.045
2	4.378	231.660	5.608	231.455	0.045
3	5.608	231.455	8.608	231.380	0.045
4	8.608	231.380	10.758	230.950	0.045
5	10.758	230.950	13.758	230.950	0.060
6	13.758	230.950	15.908	231.380	0.060
7	15.908	231.380	18.908	231.455	0.060
8	18.908	231.455	20.138	231.660	0.045
9	20.138	231.660	24.516	232.390	0.045

PROJECT: 1100 Donnybrook Road
Print-out date: 06/07/2020 - Time: 2:12
Data File: K:\20996E\Design\Computations\PC Convey\Constructed Waterway.dat

1. CROSS-SECTION:



2. RESULTS SUMMARY:

Results for water surface level = 232.06 m, 1% Waterway grade = 1 in 300, Main / Low Flow Channel grade = 1 in 300.
Water density = 1000.0 kg/m3, Gravity = 9.80 m/s2.
The cross-section is not on a bend.
Top width = 20.56m, Red Segments on graph are showing maximum FACTORED shear stresses.

2.1 Discharges and Velocities
Left Overbank (LOB) discharge = 2.29 cumecs. LOB average velocity = 0.76 m/s.
Main / Low Flow Channel (M/LFC) discharge = 7.27 cumecs. M/LFC average velocity = 1.01 m/s.
Right Overbank (ROB) discharge = 1.97 cumecs. ROB average velocity = 0.65 m/s.
Total discharge = 11.53 cumecs. Cross-section average velocity = 0.87 m/s.

2.2 Shear Stresses
Maximum (factored) shear stress = 51.07 N/m2 in Segment 5.
Maximum (factored) Left Overbank shear stress = 33.68 N/m2 in Segment 3.
Maximum (factored) Main / Low Flow Channel shear stress = 51.07 N/m2 in Segment 5.
Maximum (factored) Right Overbank shear stress = 33.68 N/m2 in Segment 7.

3. SHEAR STRESS DETAILS:

3.1 Left Overbank results

Segment	Shear Stress Results (Mean and Factored Shear Stresses are in N/m2)								
Number	D Max (m)	A (m2)	W.P. (m)	H.R. (m)	Mean	Side Factor	Bed Factor	Bend Factor	Factored
1	0.40	0.48	2.43	0.20	6.44	1.51	N/A	1.00	9.70
2	0.61	0.62	1.25	0.50	16.19	1.70	N/A	1.00	27.50
3	0.68	1.93	3.00	0.64	20.98	N/A	1.60	1.00	33.68

3.2 Main / Low Flow Channel results

Segment	Shear Stress Results (Mean and Factored Shear Stresses are in N/m2)								
Number	D Max (m)	A (m2)	W.P. (m)	H.R. (m)	Mean	Side Factor	Bed Factor	Bend Factor	Factored
4*	1.11	3.59	3.69	0.97	31.75	1.58	N/A	1.00	50.12
5*	1.11	3.59	3.69	0.97	31.75	N/A	1.61	1.00	51.07
6*	1.11	3.59	3.69	0.97	31.75	1.58	N/A	1.00	50.12

3.3 Right Overbank results

Segment Number	Shear Stress Results (Mean and Factored Shear Stresses are in N/m2)								
	D Max (m)	A (m2)	W.P. (m)	H.R. (m)	Mean	Side Factor	Bed Factor	Bend Factor	Factored
7	0.68	1.93	3.00	0.64	20.98	N/A	1.60	1.00	33.68
8	0.61	0.62	1.25	0.50	16.19	1.70	N/A	1.00	27.50
9	0.40	0.48	2.43	0.20	6.44	1.51	N/A	1.00	9.70

4. CROSS-SECTION DATA:

SEGMENT NO.	LEFT HAND POINT CHAINAGE (m)	LEFT HAND POINT R.L. (m)	RIGHT HAND POINT CHAINAGE (m)	RIGHT HAND POINT R.L. (m)	MANNING'S N
1	0.000	232.390	4.378	231.660	0.045
2	4.378	231.660	5.608	231.455	0.045
3	5.608	231.455	8.608	231.380	0.045
4	8.608	231.380	10.758	230.950	0.045
5	10.758	230.950	13.758	230.950	0.060
6	13.758	230.950	15.908	231.380	0.060
7	15.908	231.380	18.908	231.455	0.060
8	18.908	231.455	20.138	231.660	0.045
9	20.138	231.660	24.516	232.390	0.045

Notes:

1. du Boys cross-sections

Segments with an asterisk (if any) form a trapezoidal cross-section, or part of one, of the type for which du Boys' equation for calculating mean (unfactored) shear stresses was specifically developed. In PC-Convey these Segments are together referred to as 'du Boys cross-sections'. Segments without an asterisk (which aren't part of a trapezoidal cross section) have their mean shear stress calculated by applying du Boys' equation to the individual Segment.

du Boys cross-sections have their shear stresses calculated using a combination of the areas, wetted perimeters and hydraulic radii of the Segments making up the du Boys cross-section. Consequently, all Segments of a du Boys cross-section are given the same area, wetted perimeter and hydraulic radius. For more information search for "PC-Convey Approach" in PC-Convey's Help.

2. Rounding

The shear stresses reported in Section 3 are the same (rounded) shear stresses that would be obtained from manual calculations carried out in accordance with PC-Convey's approach. Sometimes, due to rounding, the area and wetted perimeter of a Segment may not combine to give exactly the hydraulic radius reported for that Segment. For the same reason, using the reported hydraulic radius in du Boys' equation might not give exactly the shear stress reported.

Appendix C – Sediment Pond Calculations

Project:	1100 Donnybrook Road, Donnybrook	
Date:	24/06/2020	
Designer:	AHM	

Flows	Sed Pond SBB
Q(1 in 3 month) (m3/s)	0.791
Peak flow (before bypass) (m3/s)	4.392
Q5 (m3/s)	4.392
Area (ha)	63.366

Basin Parameters

d_e	0.35	Extended detention depth
d_p	1.6	Depth of permanent pool (m)
d*	1.10	Sediment storage depth
λ	0.3	Hydraulic efficiency -> 0.11 - 0.9 (see Fig 4.3 right)
n	1.43	Turbulence parameter
v_s	0.011	Settling velocity of target sediments (mm/s)
Q	0.791	Design flow (m^3/s)
Q	4.392	Peak flow (m^3/s)
P_w	25	Width of permanent pool water surface (m)
P_L	48	Length of permanent pool water surface (m)
A	1200.0	Area of permanent pool water surface (m^2)

Basin Efficiency

R	98.2%	**Target sediment capture efficiency (%)**

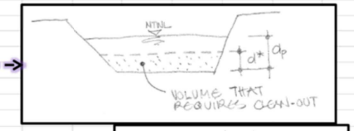
Scour Check

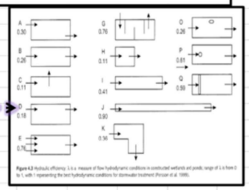
v	0.06	**Scour velocity over top storage volume during design flow event (m/s)**
v	0.35	**Scour velocity over top storage volume during peak flow event (m/s)**

Storage Volume & Clean-out Frequency

C_a	63.366	Contributing catchment area (ha)
L_o	1.6	Sediment loading unit rate (m^3/ha/yr) -> Willing and Partners 1992
s	5	Sediment basin side batter slope
	860	Storage volume top area
A_B	288	Sediment basin base area (m^2)
S_t	603.4	Storage volume available (m^3)
F_r	5.95	**Clean-out frequency (yrs)**

101.3856 sediment loading rate

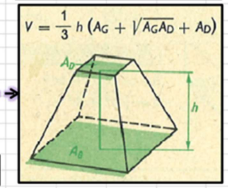




$(\lambda = 1 - 1/n);\ n = \frac{1}{1-\lambda}$

$R = 1 - \left[1 + \frac{1}{n} \times \frac{v_s}{Q/A} \times \frac{(d_e + d_p)}{(d_e + d^*)}\right]^{-n}$

$V = \frac{1}{3} h \left(A_G + \sqrt{A_G A_D} + A_D\right)$



$S_t = C_a \times R \times L_o \times F_r$

Table 4.1: Settling Velocities (v_s) under Ideal Conditions

Classification of particle size	Particle diameter (μm)	Settling velocities (mm/s)
Very coarse sand	2000	200
Coarse sand	1000	100
Medium sand	500	53
Fine sand	250	26
Very fine sand	125	11
Coarse silt	62	2.3
Medium silt	31	0.66
Fine silt	16	0.18
Very fine silt	8	0.04
Clay	4	0.011

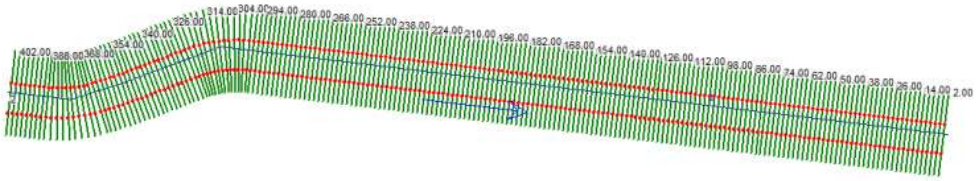
Source: (Maryland Dept. of Environment 1987 in Engineers Australia 2003)

Our Ref: 20996/E
1100 Donnybrook Road, Donnybrook – Expert Witness Statement 26 October 2020

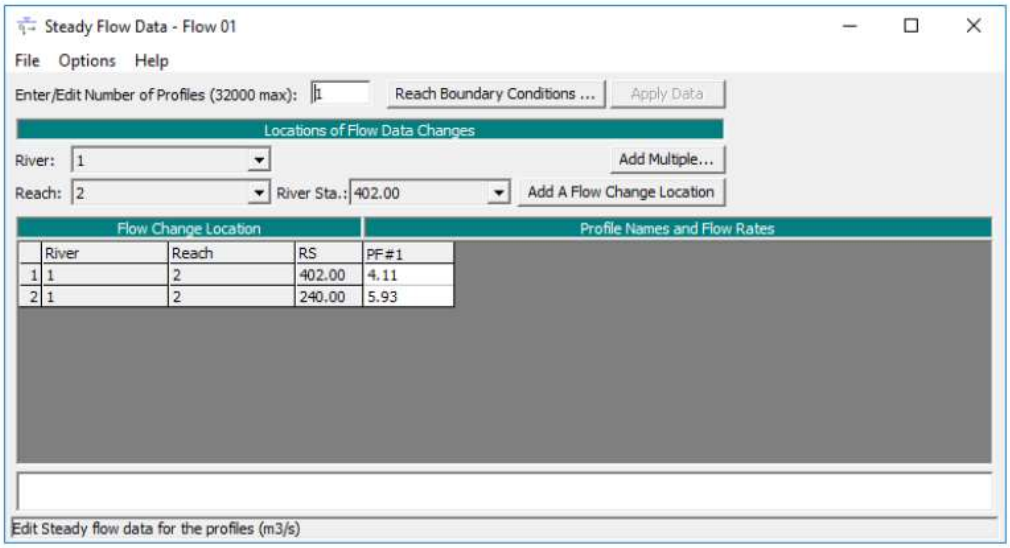
Appendix D – Floodway Safety Calculations

East- West Connector Road – Critical Section 1

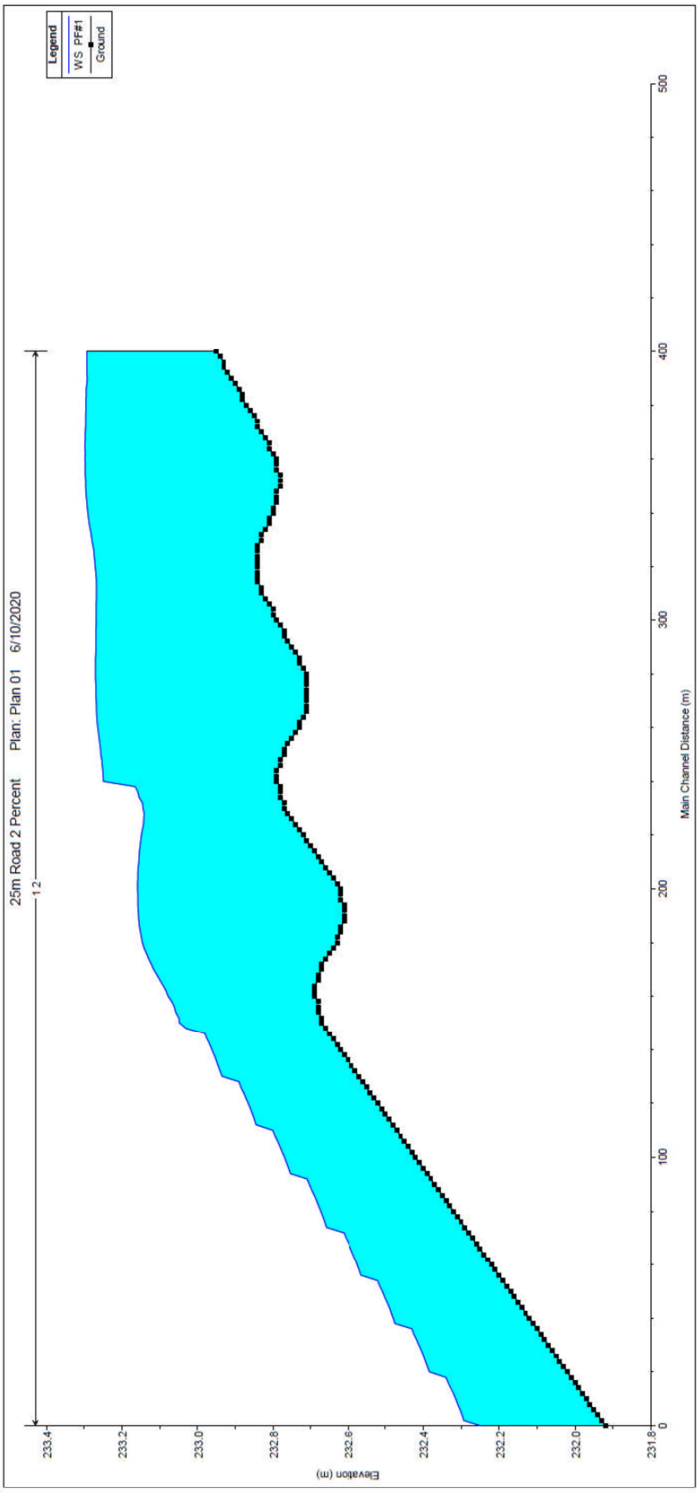
HecRAS Geometry File



HecRAS Steady Flow Data



HecRAS Longitudinal Section



HecRAS Output Table

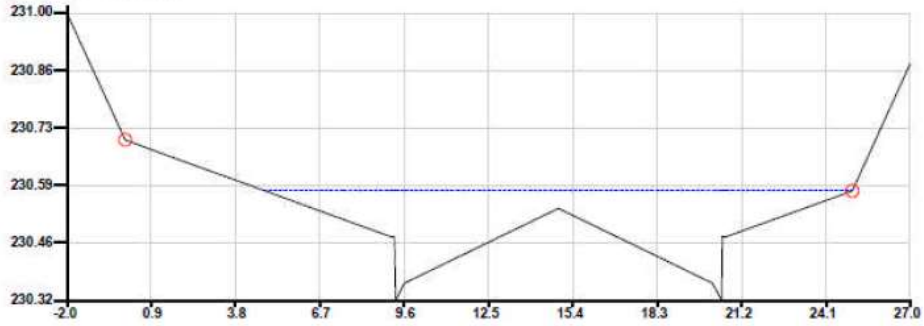
River Sta	Q Total (m3/s)	Mann Wtd Total	Hydr Depth (m)	Vel Total (m/s)	V x D (m^2/s)	E.G. Elev (m)	E.G. Slope (m/m)	Flow Area (m2)	Top Width (m)	W.S. Elev (m)	Min Ch El (m)	Max Depth (m)	Shear Chan (N/m2)	Shear Total (N/m2)
402	4.11	0.014	0.18	0.91	0.1638	233.36	0.00148	4.52	24.5	233.29	232.95	0.34	3.92	2.65
400	4.11	0.014	0.19	0.87	0.1653	233.36	0.001301	4.74	24.94	233.29	232.94	0.35	3.57	2.4
398	4.11	0.014	0.2	0.83	0.166	233.35	0.001155	4.98	25.34	233.29	232.93	0.36	3.27	2.2
396	4.11	0.014	0.2	0.8	0.16	233.35	0.00104	5.16	25.45	233.29	232.93	0.36	3.03	2.05
394	4.11	0.014	0.21	0.77	0.1617	233.34	0.000946	5.35	25.46	233.29	232.92	0.37	2.83	1.93
392	4.11	0.014	0.22	0.75	0.165	233.34	0.000884	5.51	25.58	233.29	232.91	0.38	2.68	1.85
390	4.11	0.014	0.22	0.71	0.1562	233.34	0.000777	5.77	25.7	233.29	232.9	0.39	2.44	1.69
388	4.11	0.015	0.23	0.68	0.1564	233.34	0.000692	6.04	25.82	233.29	232.89	0.4	2.24	1.57
386	4.11	0.015	0.24	0.66	0.1584	233.33	0.000633	6.22	25.93	233.29	232.88	0.41	2.1	1.47
384	4.11	0.015	0.25	0.64	0.16	233.33	0.000568	6.46	25.97	233.3	232.88	0.42	1.94	1.37
382	4.11	0.015	0.25	0.62	0.155	233.33	0.000542	6.62	26.08	233.3	232.87	0.43	1.87	1.34
380	4.11	0.015	0.26	0.6	0.156	233.33	0.000489	6.87	26.23	233.3	232.86	0.44	1.73	1.24
378	4.11	0.015	0.27	0.58	0.1566	233.33	0.00044	7.14	26.34	233.3	232.85	0.45	1.6	1.16
376	4.11	0.015	0.28	0.56	0.1568	233.33	0.000405	7.32	26.42	233.3	232.84	0.46	1.51	1.09
374	4.11	0.015	0.28	0.55	0.154	233.32	0.000371	7.54	26.48	233.3	232.84	0.46	1.42	1.03
372	4.11	0.015	0.29	0.53	0.1537	233.32	0.000355	7.71	26.59	233.3	232.83	0.47	1.37	1
370	4.11	0.015	0.3	0.52	0.156	233.32	0.000325	7.97	26.72	233.3	232.82	0.48	1.28	0.94
368	4.11	0.016	0.31	0.5	0.155	233.32	0.000296	8.23	26.85	233.3	232.81	0.49	1.2	0.88
366	4.11	0.016	0.31	0.49	0.1519	233.32	0.000276	8.41	26.91	233.3	232.81	0.49	1.14	0.84
364	4.11	0.016	0.32	0.48	0.1536	233.32	0.000266	8.55	26.99	233.3	232.8	0.5	1.11	0.82
362	4.11	0.016	0.32	0.47	0.1504	233.32	0.000249	8.74	27.04	233.3	232.79	0.51	1.06	0.78
360	4.11	0.016	0.32	0.47	0.1504	233.32	0.000244	8.8	27.11	233.3	232.79	0.51	1.04	0.77
358	4.11	0.016	0.33	0.46	0.1518	233.32	0.000238	8.88	27.1	233.3	232.79	0.51	1.02	0.76
356	4.11	0.016	0.33	0.46	0.1518	233.32	0.000233	8.94	27.16	233.3	232.78	0.52	1.01	0.74
354	4.11	0.016	0.33	0.46	0.1518	233.32	0.000231	8.98	27.16	233.3	232.78	0.52	1	0.74
352	4.11	0.016	0.33	0.46	0.1518	233.32	0.00023	8.99	27.11	233.3	232.78	0.52	1	0.74
350	4.11	0.016	0.33	0.46	0.1518	233.32	0.000237	8.88	27.1	233.3	232.79	0.51	1.02	0.75
348	4.11	0.016	0.33	0.47	0.1551	233.31	0.00024	8.83	27.09	233.29	232.79	0.5	1.03	0.76
346	4.11	0.016	0.32	0.47	0.1504	233.31	0.000255	8.67	27.03	233.29	232.79	0.5	1.08	0.79
344	4.11	0.016	0.32	0.48	0.1536	233.31	0.000265	8.54	26.97	233.29	232.8	0.49	1.11	0.81
342	4.11	0.016	0.31	0.49	0.1519	233.31	0.000285	8.33	26.88	233.29	232.8	0.49	1.17	0.86
340	4.11	0.015	0.3	0.51	0.153	233.31	0.000305	8.12	26.77	233.29	232.81	0.48	1.23	0.9
338	4.11	0.015	0.3	0.52	0.156	233.31	0.000328	7.92	26.66	233.29	232.81	0.48	1.29	0.95
336	4.11	0.015	0.29	0.54	0.1566	233.31	0.000369	7.6	26.56	233.28	232.82	0.46	1.41	1.03
334	4.11	0.015	0.28	0.56	0.1568	233.31	0.000397	7.38	26.43	233.28	232.83	0.45	1.49	1.08
332	4.11	0.015	0.27	0.57	0.1539	233.31	0.000426	7.21	26.34	233.28	232.83	0.45	1.57	1.13
330	4.11	0.015	0.27	0.59	0.1593	233.31	0.000456	7.01	26.25	233.28	232.84	0.44	1.65	1.18
328	4.11	0.015	0.26	0.6	0.156	233.31	0.000489	6.85	26.21	233.28	232.84	0.44	1.74	1.24
326	4.11	0.015	0.26	0.61	0.1586	233.31	0.000503	6.79	26.15	233.27	232.84	0.43	1.77	1.27
324	4.11	0.015	0.26	0.61	0.1586	233.31	0.000513	6.73	26.12	233.27	232.84	0.43	1.8	1.28
322	4.11	0.015	0.26	0.61	0.1586	233.3	0.000522	6.71	26.16	233.27	232.84	0.43	1.82	1.3
320	4.11	0.015	0.26	0.61	0.1586	233.3	0.000525	6.69	26.14	233.27	232.84	0.43	1.83	1.3
318	4.11	0.015	0.26	0.61	0.1586	233.3	0.000522	6.69	26.12	233.27	232.84	0.43	1.82	1.3
316	4.11	0.015	0.26	0.61	0.1586	233.3	0.000503	6.77	26.12	233.27	232.84	0.43	1.77	1.27
314	4.11	0.015	0.26	0.6	0.156	233.3	0.000481	6.91	26.23	233.27	232.83	0.44	1.71	1.23
312	4.11	0.015	0.27	0.58	0.1566	233.3	0.000452	7.04	26.24	233.27	232.83	0.44	1.64	1.18
310	4.11	0.015	0.27	0.57	0.1539	233.3	0.000431	7.19	26.36	233.27	232.82	0.45	1.58	1.14
308	4.11	0.015	0.28	0.55	0.154	233.3	0.000388	7.46	26.49	233.27	232.81	0.46	1.46	1.06
306	4.11	0.015	0.29	0.54	0.1566	233.29	0.000362	7.63	26.58	233.27	232.8	0.47	1.39	1.01
304	4.11	0.015	0.29	0.52	0.1508	233.29	0.000335	7.84	26.6	233.27	232.8	0.47	1.32	0.96
302	4.11	0.015	0.3	0.51	0.153	233.29	0.000319	8.01	26.73	233.27	232.79	0.48	1.27	0.93
300	4.11	0.016	0.31	0.5	0.155	233.29	0.000291	8.28	26.85	233.27	232.78	0.49	1.19	0.87
298	4.11	0.016	0.32	0.48	0.1536	233.29	0.000267	8.55	26.99	233.27	232.77	0.5	1.11	0.82
296	4.11	0.016	0.32	0.47	0.1504	233.29	0.000249	8.73	27.05	233.27	232.77	0.5	1.06	0.78
294	4.11	0.016	0.33	0.46	0.1518	233.29	0.000233	8.94	27.13	233.27	232.76	0.51	1.01	0.75
292	4.11	0.016	0.34	0.45	0.153	233.29	0.000221	9.14	27.26	233.27	232.75	0.52	0.97	0.72
290	4.11	0.016	0.34	0.44	0.1496	233.29	0.000204	9.39	27.34	233.27	232.74	0.53	0.91	0.68
288	4.11	0.016	0.35	0.43	0.1505	233.29	0.00019	9.65	27.42	233.27	232.73	0.54	0.87	0.65
286	4.11	0.016	0.36	0.42	0.1512	233.29	0.000179	9.82	27.53	233.27	232.73	0.54	0.83	0.62
284	4.11	0.016	0.36	0.41	0.1476	233.29	0.000173	9.96	27.62	233.27	232.72	0.55	0.81	0.61
282	4.11	0.016	0.37	0.4	0.148	233.29	0.000163	10.18	27.66	233.27	232.71	0.56	0.77	0.58
280	4.11	0.016	0.37	0.4	0.148	233.28	0.000161	10.22	27.7	233.27	232.71	0.56	0.77	0.58
278	4.11	0.016	0.37	0.4	0.148	233.28	0.000157	10.29	27.74	233.27	232.71	0.56	0.76	0.57
276	4.11	0.016	0.37	0.4	0.148	233.28	0.000156	10.3	27.74	233.27	232.71	0.56	0.75	0.56
274	4.11	0.016	0.37	0.4	0.148	233.28	0.000157	10.3	27.73	233.27	232.71	0.56	0.75	0.56
272	4.11	0.016	0.37	0.4	0.148	233.28	0.000158	10.26	27.72	233.27	232.71	0.56	0.76	0.57
270	4.11	0.016	0.37	0.4	0.148	233.28	0.000163	10.17	27.68	233.27	232.71	0.56	0.78	0.58
268	4.11	0.016	0.37	0.41	0.1517	233.28	0.000166	10.11	27.63	233.27	232.71	0.56	0.78	0.59
266	4.11	0.016	0.36	0.42	0.1512	233.28	0.000178	9.88	27.58	233.27	232.72	0.55	0.83	0.62
264	4.11	0.016	0.35	0.42	0.147	233.28	0.000185	9.71	27.49	233.27	232.73	0.54	0.85	0.63
262	4.11	0.016	0.35	0.43	0.1505	233.28	0.000198	9.49	27.35	233.26	232.73	0.53	0.89	0.67
260	4.11	0.016	0.34	0.45	0.153	233.28	0.000216	9.19	27.26	233.26	232.74	0.52	0.95	0.71
258	4.11	0.016	0.33	0.46	0.1518	233.28	0.000238	8.89	27.12	233.26	232.75	0.51	1.02	0.76
256	4.11	0.016	0.32	0.48	0.1536	233.28	0.000264	8.58	27	233.26	232.76	0.5	1.1	0.81
254	4.11	0.016	0.31	0.49	0.1519	233.28	0.000282	8.35	26.86	233.26	232.77	0.49	1.16	0.85
252	4.11	0.016	0.31	0.5	0.155	233.28	0.000302	8.17	26.76	233.26	232.77	0.49	1.22	0.89
250	4.11	0.015	0.3	0.52	0.156	233.28	0.000323	7.95	26.7	233.25	232.78	0.47	1.28	0.93
248	4.11	0.015	0.29	0.53	0.1537	233.28	0.000341	7.82	26.61	233.25	232.78	0.47	1.33	0.97
246	4.11	0.015	0.29	0.53	0.1537	233.28	0.000353	7.7	26.59	233.25	232.79	0.46	1.37	0.99
244	4.11	0.015	0.29	0.54	0.1566	233.28	0.000364	7.62	26.53	233.25	232.79	0.46	1.4	1.02
242	4.11	0.015	0.29	0.54	0.1566	233.28	0.000362	7.63	26.57	233.25	232.79	0.46	1.39	1.01
240	5.93	0.014	0.22	1.07	0.2354	233.27	0.001811	5.54	25.59	233.17	232.78	0.39	5.52	3.81
238	5.93	0.014	0.21	1.1	0.231	233.26	0.001975	5.37	25.53	233.16	232.78	0.38	5.88	4.03
236	5.93	0.014	0.21	1.1	0.231	233.26	0.001926	5.39	25.49	233.15	232.78	0.37	5.79	3.95
234	5.93	0.014	0.21	1.12	0.2352	233.25	0.002043	5.3	25.49	233.15	232.77	0.38	6.03	4.12
232	5.93	0.014	0.21	1.09	0.2289	233.25	0.001892	5.42	25.58	233.14	232.77	0.37	5.72	3.89
230	5.93	0.014	0.22	1.06	0.2332	233.24	0.001761	5.58	25.58	233.14	232.76	0.38	5.41	3.73
228	5.93	0.014	0.23	1.02	0.2346	233.23	0.001557	5.84	25.7	233.14	232.75	0.39	4.95	3.43
226	5.93	0.015	0.24	0.97	0.2328	233.23	0.00137	6.12	25.84	233.14	232.74	0.4	4.5	3.15
224	5.93	0.015	0.25	0.92	0.23	233.22	0.001188	6.46	26	233.15	232.73	0.42	4.06	2.86
222	5.93	0.015	0.26	0.88	0.2288	233.22	0.001044	6.77	26.15	233.15	232.72	0.43	3.69	2.62
220	5.93	0.015	0.27	0.84	0.2268	233.21	0.000922	7.08	26.29	233.15	232.71	0.44	3.37	2.41
218	5.93	0.015	0.28	0.8	0.224	233.21	0.000819	7.4	26.44	233.15	232.7	0.45	3.08	2.23
216	5.93	0.015	0.29	0.77	0.2233	233.21	0.000734	7.7	26.58	233.15	232.69	0.46	2.85	2.06
214	5.93	0.015	0.3	0.74	0.222	233.2	0.000662	7.99	26.71	233.15	232.68	0.47	2.64	1.92
212	5.93	0.016	0.31	0.72	0.2232	233.2	0.000598	8.29	26.84	233.16	232.67	0.49	2.45	1.79

River Sta	Q Total (m3/s)	Mann Wtd Total	Hydr Depth (m)	Vel Total (m/s)	V x D (m^2/s)	E.G. Elev (m)	E.G. Slope (m/m)	Flow Area (m2)	Top Width (m)	W.S. Elev (m)	Min Ch El (m)	Max Depth (m)	Shear Chan (N/m2)	Shear Total (N/m2)
210	5.93	0.016	0.32	0.69	0.2208	233.2	0.000542	8.59	26.98	233.16	232.66	0.5	2.28	1.67
208	5.93	0.016	0.33	0.67	0.2211	233.2	0.000493	8.89	27.11	233.16	232.65	0.51	2.13	1.57
206	5.93	0.016	0.34	0.65	0.221	233.2	0.000453	9.16	27.23	233.16	232.64	0.52	2	1.48
204	5.93	0.016	0.34	0.63	0.2142	233.2	0.000429	9.36	27.33	233.16	232.63	0.53	1.91	1.43
202	5.93	0.016	0.35	0.62	0.217	233.19	0.000399	9.61	27.4	233.16	232.62	0.54	1.82	1.36
200	5.93	0.016	0.35	0.61	0.2135	233.19	0.000394	9.66	27.48	233.16	232.62	0.54	1.8	1.35
198	5.93	0.016	0.36	0.61	0.2196	233.19	0.000376	9.79	27.52	233.16	232.62	0.54	1.74	1.3
196	5.93	0.016	0.36	0.6	0.216	233.19	0.000371	9.86	27.52	233.16	232.61	0.55	1.72	1.29
194	5.93	0.016	0.36	0.6	0.216	233.19	0.00037	9.86	27.55	233.16	232.61	0.55	1.72	1.29
192	5.93	0.016	0.36	0.6	0.216	233.19	0.000376	9.81	27.54	233.16	232.61	0.55	1.74	1.3
190	5.93	0.016	0.36	0.61	0.2196	233.19	0.000379	9.78	27.48	233.16	232.61	0.55	1.75	1.31
188	5.93	0.016	0.35	0.62	0.217	233.19	0.000394	9.64	27.46	233.15	232.62	0.53	1.8	1.34
186	5.93	0.016	0.34	0.63	0.2142	233.19	0.00042	9.44	27.36	233.15	232.62	0.53	1.89	1.41
184	5.93	0.016	0.34	0.64	0.2176	233.19	0.000442	9.24	27.28	233.15	232.63	0.52	1.96	1.45
182	5.93	0.016	0.33	0.66	0.2178	233.19	0.000483	8.98	27.12	233.15	232.63	0.52	2.09	1.55
180	5.93	0.016	0.32	0.69	0.2208	233.18	0.00054	8.62	27.01	233.14	232.64	0.5	2.27	1.67
178	5.93	0.016	0.31	0.72	0.2232	233.18	0.00062	8.21	26.82	233.14	232.65	0.49	2.51	1.84
176	5.93	0.015	0.29	0.76	0.2204	233.18	0.000722	7.78	26.64	233.13	232.66	0.47	2.81	2.05
174	5.93	0.015	0.28	0.8	0.224	233.18	0.000817	7.41	26.44	233.12	232.67	0.45	3.08	2.22
172	5.93	0.015	0.27	0.83	0.2241	233.18	0.000919	7.12	26.29	233.12	232.67	0.45	3.35	2.41
170	5.93	0.015	0.26	0.88	0.2288	233.18	0.001064	6.72	26.13	233.11	232.68	0.43	3.74	2.66
168	5.93	0.015	0.25	0.92	0.23	233.18	0.001214	6.43	25.99	233.1	232.68	0.42	4.11	2.92
166	5.93	0.015	0.24	0.97	0.2328	233.17	0.001374	6.11	25.89	233.09	232.69	0.4	4.52	3.15
164	5.93	0.014	0.23	1.01	0.2323	233.17	0.001544	5.87	25.71	233.08	232.69	0.39	4.91	3.42
162	5.93	0.014	0.22	1.03	0.2266	233.17	0.00162	5.76	25.72	233.08	232.69	0.39	5.1	3.52
160	5.93	0.014	0.22	1.06	0.2332	233.17	0.001758	5.6	25.62	233.07	232.68	0.39	5.4	3.73
158	5.93	0.014	0.21	1.09	0.2289	233.16	0.001916	5.43	25.55	233.06	232.68	0.38	5.75	3.95
156	5.93	0.014	0.21	1.09	0.2289	233.16	0.001865	5.45	25.52	233.06	232.68	0.38	5.66	3.87
154	5.93	0.014	0.21	1.1	0.231	233.15	0.001947	5.4	25.54	233.05	232.67	0.38	5.82	4
152	5.93	0.014	0.22	1.08	0.2376	233.15	0.001814	5.51	25.62	233.05	232.67	0.38	5.54	3.79
150	5.93	0.014	0.21	1.13	0.2373	233.14	0.002063	5.25	25.42	233.03	232.66	0.37	6.09	4.14
148	5.93	0.013	0.18	1.39	0.2502	233.14	0.003464	4.28	23.97	232.98	232.65	0.33	8.91	6
146	5.93	0.013	0.18	1.35	0.243	233.13	0.003242	4.39	24.17	232.98	232.64	0.34	8.49	5.72
144	5.93	0.014	0.18	1.32	0.2376	233.11	0.003091	4.48	24.31	232.97	232.63	0.34	8.19	5.53
142	5.93	0.014	0.19	1.3	0.247	233.1	0.002942	4.57	24.47	232.96	232.62	0.34	7.9	5.33
140	5.93	0.014	0.19	1.27	0.2413	233.09	0.002788	4.66	24.65	232.96	232.61	0.35	7.6	5.12
138	5.93	0.014	0.19	1.24	0.2356	233.08	0.002638	4.76	24.84	232.95	232.6	0.35	7.3	4.91
136	5.93	0.014	0.2	1.21	0.242	233.07	0.002481	4.88	25.03	232.94	232.59	0.35	6.98	4.7
134	5.93	0.014	0.2	1.18	0.236	233.06	0.00233	5.01	25.24	232.94	232.58	0.36	6.66	4.49
132	5.93	0.014	0.2	1.15	0.23	233.05	0.00218	5.14	25.37	232.94	232.57	0.37	6.35	4.29
130	5.93	0.013	0.18	1.39	0.2502	233.05	0.003479	4.27	23.96	232.89	232.56	0.33	8.94	6.02
128	5.93	0.013	0.18	1.35	0.243	233.04	0.003256	4.39	24.15	232.88	232.55	0.33	8.51	5.74
126	5.93	0.013	0.18	1.33	0.2394	233.02	0.003113	4.47	24.29	232.88	232.54	0.34	8.24	5.56
124	5.93	0.014	0.19	1.3	0.247	233.01	0.002961	4.55	24.45	232.87	232.53	0.34	7.94	5.36
122	5.93	0.014	0.19	1.28	0.2432	233	0.002816	4.64	24.63	232.87	232.52	0.35	7.66	5.15
120	5.93	0.014	0.19	1.25	0.2375	232.99	0.002655	4.76	24.81	232.86	232.51	0.35	7.33	4.94
118	5.93	0.014	0.19	1.22	0.2318	232.98	0.002502	4.87	25.01	232.85	232.5	0.35	7.02	4.73
116	5.93	0.014	0.2	1.19	0.238	232.97	0.00235	4.99	25.21	232.85	232.49	0.36	6.71	4.52
114	5.93	0.014	0.2	1.16	0.232	232.96	0.002203	5.11	25.36	232.84	232.48	0.36	6.4	4.31
112	5.93	0.013	0.18	1.39	0.2502	232.96	0.003499	4.26	23.94	232.8	232.47	0.33	8.97	6.04
110	5.93	0.013	0.18	1.35	0.243	232.95	0.003276	4.38	24.13	232.79	232.46	0.33	8.55	5.77
108	5.93	0.013	0.18	1.33	0.2394	232.93	0.003132	4.45	24.27	232.79	232.45	0.34	8.27	5.58
106	5.93	0.014	0.19	1.31	0.2489	232.92	0.002987	4.54	24.44	232.78	232.44	0.34	8	5.38
104	5.93	0.014	0.19	1.28	0.2432	232.91	0.002834	4.63	24.61	232.78	232.43	0.35	7.69	5.18
102	5.93	0.014	0.19	1.25	0.2375	232.9	0.002677	4.74	24.78	232.77	232.42	0.35	7.38	4.97
100	5.93	0.014	0.19	1.22	0.2318	232.89	0.002523	4.85	24.98	232.76	232.41	0.35	7.06	4.76
98	5.93	0.014	0.2	1.19	0.238	232.88	0.002375	4.97	25.2	232.76	232.4	0.36	6.76	4.54
96	5.93	0.014	0.2	1.16	0.232	232.87	0.002223	5.1	25.35	232.75	232.39	0.36	6.44	4.34
94	5.93	0.013	0.18	1.39	0.2502	232.87	0.003514	4.26	23.91	232.71	232.38	0.33	9	6.07
92	5.93	0.013	0.18	1.36	0.2448	232.86	0.0033	4.36	24.11	232.7	232.37	0.33	8.6	5.8
90	5.93	0.013	0.18	1.34	0.2412	232.85	0.003164	4.43	24.25	232.7	232.36	0.34	8.34	5.61
88	5.93	0.013	0.19	1.31	0.2489	232.83	0.003013	4.52	24.41	232.69	232.35	0.34	8.05	5.41
86	5.93	0.014	0.19	1.28	0.2432	232.82	0.002854	4.62	24.57	232.68	232.34	0.34	7.73	5.21
84	5.93	0.014	0.19	1.26	0.2394	232.81	0.002724	4.71	24.75	232.68	232.33	0.35	7.47	5.04
82	5.93	0.014	0.19	1.23	0.2337	232.8	0.00257	4.82	24.94	232.67	232.32	0.35	7.16	4.83
80	5.93	0.014	0.2	1.2	0.24	232.79	0.002423	4.93	25.15	232.67	232.31	0.36	6.86	4.62
78	5.93	0.014	0.2	1.17	0.234	232.78	0.002267	5.07	25.34	232.66	232.3	0.36	6.53	4.4
76	5.93	0.014	0.2	1.14	0.228	232.77	0.002116	5.2	25.4	232.66	232.29	0.37	6.2	4.21
74	5.93	0.013	0.18	1.39	0.2502	232.77	0.003495	4.27	23.96	232.61	232.28	0.33	8.96	6.05
72	5.93	0.013	0.18	1.35	0.243	232.76	0.00328	4.38	24.16	232.61	232.27	0.34	8.56	5.77
70	5.93	0.014	0.18	1.33	0.2394	232.75	0.003132	4.46	24.3	232.6	232.26	0.34	8.27	5.58
68	5.93	0.014	0.19	1.3	0.247	232.73	0.002981	4.55	24.46	232.59	232.25	0.34	7.98	5.38
66	5.93	0.014	0.19	1.28	0.2432	232.72	0.002827	4.65	24.63	232.59	232.24	0.35	7.67	5.18
64	5.93	0.014	0.19	1.25	0.2375	232.71	0.002676	4.74	24.82	232.58	232.23	0.35	7.37	4.97
62	5.93	0.014	0.19	1.22	0.2318	232.7	0.002521	4.86	25.01	232.57	232.22	0.35	7.06	4.76
60	5.93	0.014	0.2	1.19	0.238	232.69	0.002369	4.98	25.22	232.57	232.21	0.36	6.74	4.54
58	5.93	0.014	0.2	1.16	0.232	232.68	0.002218	5.11	25.36	232.56	232.2	0.36	6.42	4.34
56	5.93	0.013	0.18	1.39	0.2502	232.68	0.003492	4.27	23.97	232.52	232.19	0.33	8.96	6.04
54	5.93	0.013	0.18	1.35	0.243	232.67	0.003275	4.38	24.17	232.52	232.18	0.34	8.55	5.76
52	5.93	0.014	0.18	1.33	0.2394	232.66	0.003128	4.46	24.3	232.51	232.17	0.34	8.26	5.58
50	5.93	0.014	0.19	1.3	0.247	232.64	0.002977	4.55	24.46	232.5	232.16	0.34	7.97	5.38
48	5.93	0.014	0.19	1.28	0.2432	232.63	0.002831	4.64	24.64	232.5	232.15	0.35	7.68	5.18
46	5.93	0.014	0.19	1.25	0.2375	232.62	0.002676	4.74	24.82	232.49	232.14	0.35	7.37	4.97
44	5.93	0.014	0.19	1.22	0.2318	232.61	0.002517	4.86	25.01	232.48	232.13	0.35	7.05	4.75
42	5.93	0.014	0.2	1.19	0.238	232.6	0.002366	4.98	25.22	232.48	232.12	0.36	6.74	4.54
40	5.93	0.014	0.2	1.16	0.232	232.59	0.002218	5.11	25.36	232.47	232.11	0.36	6.43	4.34
38	5.93	0.013	0.18	1.39	0.2502	232.59	0.003509	4.26	23.96	232.43	232.1	0.33	8.99	6.06
36	5.93	0.013	0.18	1.35	0.243	232.58	0.003287	4.38	24.15	232.42	232.09	0.33	8.56	5.78
34	5.93	0.014	0.18	1.33	0.2394	232.57	0.003142	4.46	24.29	232.42	232.08	0.34	8.29	5.6
32	5.93	0.014	0.19	1.31	0.2489	232.55	0.002992	4.54	24.44	232.41	232.07	0.34	8	5.4
30	5.93	0.014	0.19	1.28	0.2432	232.54	0.002845	4.63	24.62	232.41	232.06	0.35	7.71	5.19
28	5.93	0.014	0.19	1.25	0.2375	232.53	0.002688	4.74	24.79	232.4	232.05	0.35	7.39	4.99
26	5.93	0.014	0.19	1.22	0.2318	232.52	0.002534	4.85	24.99	232.39	232.04	0.35	7.08	4.78
24	5.93	0.014	0.2	1.19	0.238	232.51	0.002381	4.97	25.21	232.39	232.03	0.36	6.77	4.56
22	5.93	0.014	0.2	1.16	0.232	232.5	0.002234	5.09	25.35	232.38	232.02	0.36	6.46	4.36
20	5.93	0.013	0.18	1.39	0.2502	232.5	0.003527	4.26	23.93	232.34	232.01	0.33	9.02	6.09

River Sta	Q Total	Mann Wtd Total	Hydr Depth	Vel Total	V x D	E.G. Elev	E.G. Slope	Flow Area	Top Width	W.S. Elev	Min Ch El	Max Depth	Shear Chan	Shear Total
	(m3/s)		(m)	(m/s)	(m^2/s)	(m)	(m/m)	(m2)	(m)	(m)	(m)	(m)	(N/m2)	(N/m2)
18	5.93	0.013	0.18	1.36	0.2448	232.49	0.003313	4.36	24.12	232.33	232	0.33	8.61	5.82
16	5.93	0.014	0.18	1.34	0.2412	232.48	0.003169	4.44	24.26	232.33	231.99	0.34	8.34	5.63
14	5.93	0.014	0.19	1.31	0.2489	232.46	0.003024	4.52	24.42	232.32	231.98	0.34	8.06	5.43
12	5.93	0.014	0.19	1.28	0.2432	232.45	0.002865	4.62	24.58	232.31	231.97	0.34	7.75	5.23
10	5.93	0.014	0.19	1.26	0.2394	232.44	0.002714	4.72	24.76	232.31	231.96	0.35	7.45	5.02
8	5.93	0.014	0.19	1.23	0.2337	232.43	0.00256	4.83	24.96	232.3	231.95	0.35	7.13	4.81
6	5.93	0.014	0.2	1.2	0.24	232.42	0.002412	4.94	25.17	232.3	231.94	0.36	6.83	4.6
4	5.93	0.014	0.2	1.17	0.234	232.41	0.00226	5.07	25.35	232.29	231.93	0.36	6.52	4.39
2	5.93	0.013	0.18	1.39	0.2502	232.41	0.003518	4.26	23.94	232.25	231.92	0.33	9	6.08

PROJECT: 1100 Donnybrook Road
Critical Section 2
Print-out date: 06/07/2020 - Time: 9:09
Data File: K:\20996E\Design\Computations\PC Convey\25m Section.dat

1. CROSS-SECTION:



2. DISCHARGE INFORMATION:

100 year (1%) storm event
Critical Section 2

Total discharge = 1.77 cumecs

There is no pipe discharge
Overland / Channel / Watercourse discharge = 1.770 cumecs

3. RESULTS: Water surface elevation = 230.581m

High Flow Channel grade = 1 in 200, Main Channel / Low Flow Channel grade = 1 in 200.

	LEFT OVERBANK	MAIN CHANNEL	RIGHT OVERBANK	TOTAL CROSS-SECTION
Discharge (cumecs):	0.00	1.74	0.00	1.74
D(Max) = Max. Depth (m):	0.00	0.26	0.00	0.26
D(Ave) = Ave. Depth (m):	0.00	0.10	0.00	0.10
V = Ave. Velocity (m/s):	0.00	0.84	0.02	0.84
D(Max) x V (cumecs/m):	0.00	0.22	0.00	0.22
D(Ave) x V (cumecs/m):	0.00	0.09	0.00	0.09
Froude Number:	0.00	0.84	0.22	0.84
Area (m^2):	0.00	2.06	0.00	2.06
Wetted Perimeter (m):	0.00	20.50	0.01	20.51
Flow Width (m):	0.00	20.25	0.01	20.26
Hydraulic Radius (m):	0.00	0.10	0.00	0.10
Composite Manning's n:	0.000	0.018	0.030	0.018
Split Flow?	-	-	-	No

4. CROSS-SECTION DATA:

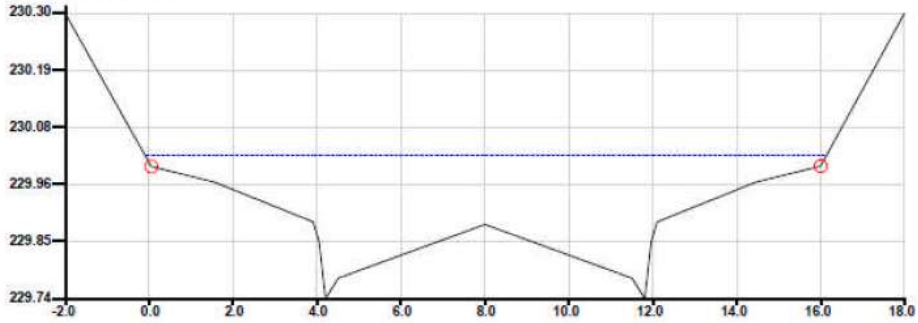
SEGMENT NO.	LEFT HAND POINT CHAINAGE (m)	LEFT HAND POINT R.L. (m)	RIGHT HAND POINT CHAINAGE (m)	RIGHT HAND POINT R.L. (m)	MANNING'S N
1	-2.000	231.000	0.000	230.700	0.013
2	0.000	230.700	1.500	230.663	0.013
3	1.500	230.663	4.500	230.588	0.030
4	4.500	230.588	7.500	230.513	0.013
5	7.500	230.513	9.150	230.471	0.030
6	9.150	230.471	9.260	230.471	0.013
7	9.260	230.471	9.300	230.321	0.013
8	9.300	230.321	9.600	230.361	0.013
9	9.600	230.361	11.400	230.421	0.013
10	11.400	230.421	14.900	230.538	0.013
11	14.900	230.538	18.400	230.421	0.013

4. CROSS-SECTION DATA: (continued)

SEGMENT NO.	LEFT HAND POINT CHAINAGE (m)	LEFT HAND POINT R.L. (m)	RIGHT HAND POINT CHAINAGE (m)	RIGHT HAND POINT R.L. (m)	MANNING'S N
12	18.400	230.421	20.200	230.361	0.013
13	20.200	230.361	20.500	230.321	0.013
14	20.500	230.321	20.540	230.471	0.013
15	20.540	230.471	20.650	230.471	0.013
16	20.650	230.471	23.500	230.543	0.030
17	23.500	230.543	25.000	230.580	0.013
18	25.000	230.580	27.000	230.880	0.030

PROJECT: 1100 Donnybrook
16m Road
Print-out date: 06/07/2020 - Time: 8:35
Data File: K:\20996E\Design\Computations\PC Convey\16m Road.dat

1. CROSS-SECTION:



2. DISCHARGE INFORMATION:

100 year (1%) storm event
Critical Section 3

Total discharge = 1.86 cumecs

There is no pipe discharge
Overland / Channel / Watercourse discharge = 1.858 cumecs

3. RESULTS: Water surface elevation = 230.021m

High Flow Channel grade = 1 in 200, Main Channel / Low Flow Channel grade = 1 in 200.

	LEFT OVERBANK	MAIN CHANNEL	RIGHT OVERBANK	TOTAL CROSS-SECTION
Discharge (cumecs):	0.00	1.98	0.00	1.98
D(Max) = Max. Depth (m):	0.02	0.28	0.02	0.28
D(Ave) = Ave. Depth (m):	0.01	0.13	0.01	0.13
V = Ave. Velocity (m/s):	0.12	0.93	0.11	0.93
D(Max) x V (cumecs/m):	0.00	0.26	0.00	0.26
D(Ave) x V (cumecs/m):	0.00	0.12	0.00	0.12
Froude Number:	0.35	0.82	0.35	0.81
Area (m^2):	0.00	2.12	0.00	2.12
Wetted Perimeter (m):	0.15	16.04	0.14	16.34
Flow Width (m):	0.15	15.95	0.14	16.24
Hydraulic Radius (m):	0.01	0.13	0.01	0.13
Composite Manning's n:	0.030	0.020	0.030	0.020
Split Flow?	-	-	-	No

4. CROSS-SECTION DATA:

SEGMENT NO.	LEFT HAND POINT CHAINAGE (m)	LEFT HAND POINT R.L. (m)	RIGHT HAND POINT CHAINAGE (m)	RIGHT HAND POINT R.L. (m)	MANNING'S N
1	-2.000	230.299	0.050	229.999	0.030
2	0.050	229.999	1.550	229.969	0.013
3	1.550	229.969	3.900	229.891	0.030
4	3.900	229.891	4.050	229.851	0.013
5	4.050	229.851	4.200	229.741	0.013
6	4.200	229.741	4.500	229.781	0.013
7	4.500	229.781	8.000	229.886	0.013
8	8.000	229.886	11.500	229.781	0.013
9	11.500	229.781	11.800	229.741	0.013
10	11.800	229.741	11.950	229.851	0.013
11	11.950	229.851	12.100	229.891	0.013

4. CROSS-SECTION DATA: (continued)

SEGMENT NO.	LEFT HAND POINT CHAINAGE (m)	LEFT HAND POINT R.L. (m)	RIGHT HAND POINT CHAINAGE (m)	RIGHT HAND POINT R.L. (m)	MANNING'S N
12	12.100	229.891	14.450	229.969	0.030
13	14.450	229.969	15.950	229.999	0.013
14	15.950	229.999	16.000	230.000	0.030
15	16.000	230.000	18.000	230.300	0.030

Appendix D – Consultation with Melbourne Water

From: Carolina Balagtas <Carolina.Balagtas@melbournewater.com.au>
Sent: Thursday, 14 May 2020 11:00 AM
To: Andrew Matheson <a.matheson@taylorsds.com.au>
Cc: Laurence Newcome <Laurence.Newcome@melbournewater.com.au>

Subject: RE: Shenstone Park PSP

Hi Andrew

The current drainage strategy for Woodstock West DSS includes two pipelines running parallel on each side of the gas easement. These two pipelines serve as an outlet for RB8 and RB9 having an estimated flow of 1.8m3/s for each pipe. This is to allow only one crossing at the gas easement to minimise risk of any adverse impact on the gas main and also reduce installation costs.

If you have further queries please don't hesitate to email me.

Regards
Carolina

From: Andrew Matheson <a.matheson@taylorsds.com.au>
Sent: Wednesday, 13 May 2020 9:40 AM
To: Laurence Newcome <Laurence.Newcome@melbournewater.com.au>
Cc: Carolina Balagtas <Carolina.Balagtas@melbournewater.com.au>

Subject: Shenstone Park PSP

Hi Laurence and Carolina, hope you are well.

Thank you for sending through the RORB model, it is greatly appreciated.

My understanding from the RORB model is that the peak attenuated 1% AEP discharge from RB08 and RB09 is 1.8586cu.m/s and 1.8849cu.m/s respectively. Is it correct to assume that these flows are piped down either side of the gas easement and discharge into the proposed constructed waterway on the eastern side of 1100 Donnybrook Road?

Kind Regards

Andrew Matheson
Design Manager (Feasibility) | **TAYLORS**
Phone: **(03) 9501 2800** | Mobile: **0439 008 069**
8/270 Ferntree Gully Road, Notting Hill VIC 3168 | PO Box 938, Mount Waverley VIC 3149

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Appendix E – Floodway Safety Criteria

Floodway safety criteria

These guidelines have been prepared to simplify and standardise application and computation of floodway safety requirements in the greater Melbourne region. They're intended for use by the subdivisional development industry, local government and water management agencies including ourselves.

The guidelines have been largely adapted from the laboratory research results reported by Keller and Mitsch (1995), tempered by experiences of the authors and other practitioners.

The guidelines apply to artificial or modified drainage systems in greenfields, infill and redevelopment situations, for which the design floodway use couldn't be expected to be clearly recognisable by the lay observer.

Hence the guidelines don't cover those systems which by their visual nature and setting are clearly discernible to be open waterways likely to be subject to flooding from time to time.

All natural waterways and flood plains are thereby specifically excluded.

Methodology

Floodway hydraulics may be determined using Manning's Equation. Unless uniform flow conditions can be confidently predicted, steady-state backwater programs such as HEC-RAS shall be used to compute depths and velocities. Safety criteria are normally expressed in terms of the product of velocity and depth of flow but in most applications limits on either or both of velocity and depth may also apply.

For the purposes of these guidelines the following parameter values and definitions will apply:

1. Manning's 'n' = 0.020 for streets used as floodways
2. Manning's 'n' = 0.030 for well maintained grassed floodways in easements possibly containing sparse tree plantings on the verges, in urban areas
3. Manning's 'n' = 0.035 for all other formed grassed floodways containing sparse tree and shrub plantings in urban areas
4. Vav = average cross-sectional velocity for area of the full floodway section contributing to flow (m/s)
5. Vbank = average cross-sectional velocity in the area of the bank zone that contributes to flow (m/s)
6. Backwater pools and / or fringe pondage areas are not considered to contribute to flow
7. dav = average cross-sectional depth calculated as cross-sectional area contributing to flow/top water width (m)
8. dmax = maximum flow depth of the floodway (e.g. the gutter invert in a road floodway or car park)
9. act = actual depth of the floodway at any reference point
10. For road floodways, the top water width shall be the road reserve width or actual water surface width, whichever is the lesser. No cross-section area beyond the adopted top water width shall be included in the calculations
11. The design floodway flow for the recommended safety limits shall normally be the 100 year ARI peak flow, less the effective capacity of any related underground system
12. Where significant inlet blockage problems could reasonably be expected to occur with the fully constructed drainage system during major flood events, the effective capacity of the underground system shall be considered to be 80% of its potential capacity

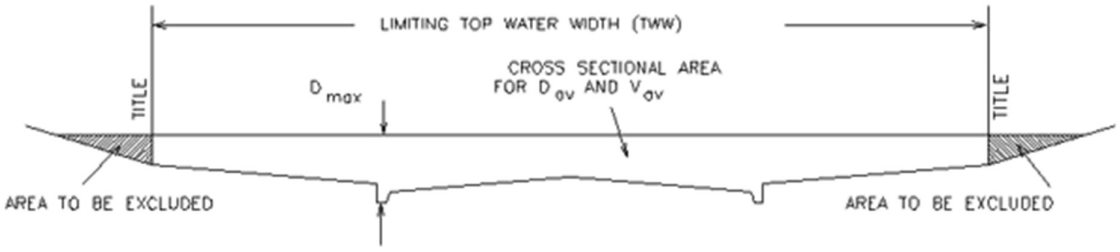

Figure A1 Road Floodway Definitions

Floodway criteria

28.1.1 Residential streets used as floodways

For streets in residential areas which are designed to function as integral components of the major drainage system when pipe capacities are exceeded, velocity and depth limits shall be dictated by safety of children first and stability of cars second. Car stability is significant because of the potential for increased flood levels due to floodway blockage.

It's considered appropriate for an allowance to be made for variation of depth over the road cross-section and the typically localised nature of the highest hazard zone which is concentrated around the gutter line. This allowance has been achieved through use of the cross-sectionally averaged depth in lieu of actual gutter depth.

28.1.1.1 Recommended safety limits

For continuously grading streets: Vav.dav <= 0.35 m2/s, and dav <= 0.30m

(for 1:200 slope and 16 m reserve width, Vav.dav will control with

dmax = 0.42 m)

28.1.1.2 For undulating streets

Where the road longitudinal section is formed as a series of dips and crests (more usual in flat terrain) with a nominal grade applied along the crests, the limits shall be:

Crests - Vav.dav <= 0.35 m2/s, and dav <= 0.30m

Dips- Vav.dav <= 0.30 m2/s, and dav <= 0.60m

(For 1:200 pavement slope, 16 m reserve width and 1: 800 slope across crests, the dips will limit allowable peak discharge with dmax <= 0. 8 m)

Backwater analyses shall be provided to verify conditions with such road formations.

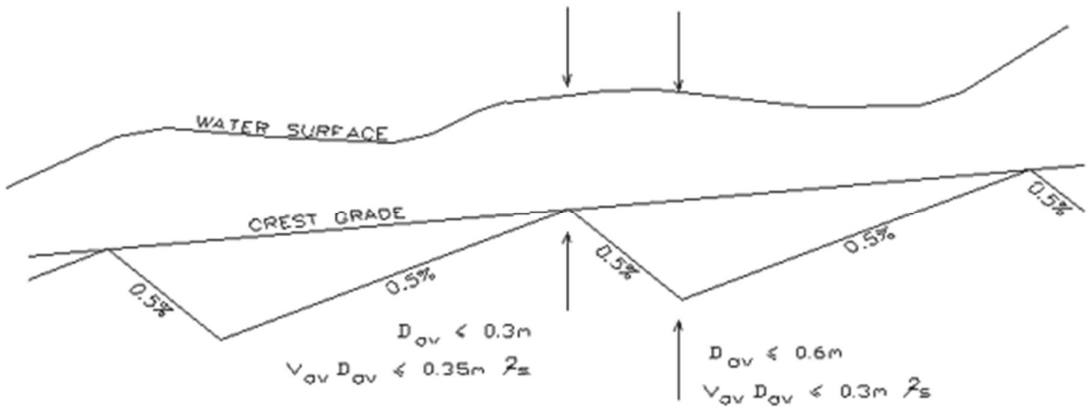

Figure A2 Undulating road floodway

28.1.2 Industrial streets used as floodways

For streets in industrial areas which are designed to function as integral components of the major drainage system when pipe capacities are exceeded, velocity and depth limits shall be dictated by safety of adults and stability of cars. Small children wouldn't normally be expected to be present in such areas.

The stability of cars is more critical according to the results of Keller and Mitsch (1995). It's considered appropriate for an allowance to be made for variation of depth over the roadway cross-section and the typically localised nature of the highest hazard zone which is concentrated around the gutter line. This allowance has been achieved through use of the cross-sectionally averaged depth in lieu of actual gutter depth.

28.1.2.1 Recommended safety limits

The limiting Vav.dav may be determined by linear interpolation between the following limits:

Vav.dav <= 0.60 m2/s, for dav <= 0.1 m

Vav.dav <= 0.80 m2/s, for dav =0.2m

Vav.dav <= 0.35 m2/s, for dav >= 0.3 m

Where the road longitudinal section is formed as a series of dips and crests (more usual in flat terrain) with a nominal grade applied along the crests, dav shall not exceed 0.60 m at the low points. Backwater analyses shall be provided to verify conditions with such road formations.

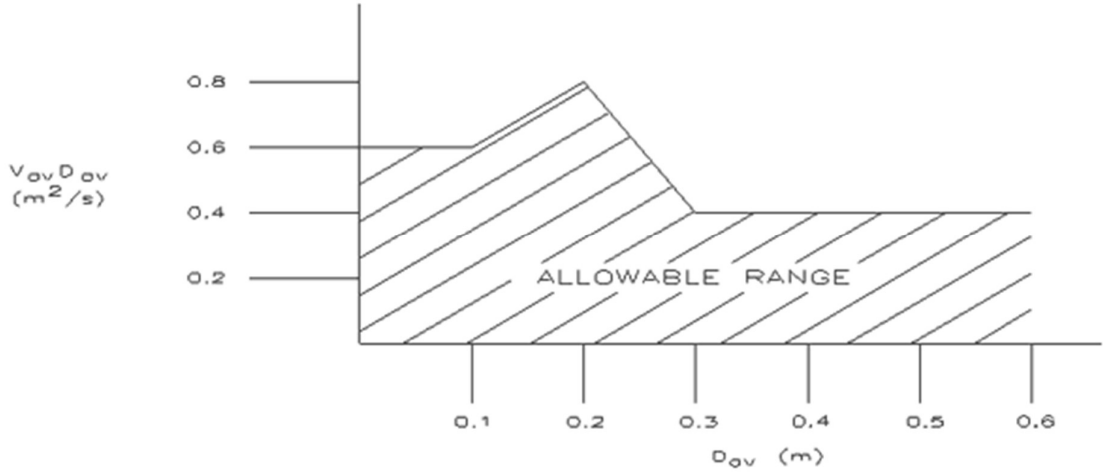

Figure A3 road floodways - Industrial areas

28.1.3 Streets crossed by floodways

For streets which are crossed by open floodway systems, lateral stability of cars may become more critical as depth increases. Firstly, because of the general unforeseen nature of the primary hazard. Secondly, for the possibility a vehicle and its occupants may be swept off the road into an area of far greater hazard downstream.

Local hydraulic conditions will dictate actual velocity and depth in the pavement area/s. As these conditions may vary greatly between sites as well as across the road formation at any particular site, a full understanding of the site-specific hydraulic controls is essential. Where the road formation itself doesn't form the hydraulic control across the range of flows being considered, a backwater analysis will be required.

28.1.4 Embankment crossings

The following limits apply to floodway crossings of any road which effectively exists as an embankment control relative to the levels of the downstream floodway but which isn't specifically designated as a floodway crossing and fitted with appropriate signage and flood depth boards.

28.1.4.1 Recommended safety limits

Vav.dav <= 0.35 m2/s along footpath alignments (existing or hypothetical), and dmax < 0.30 m measured at both the downstream back of kerb and the pavement centreline.

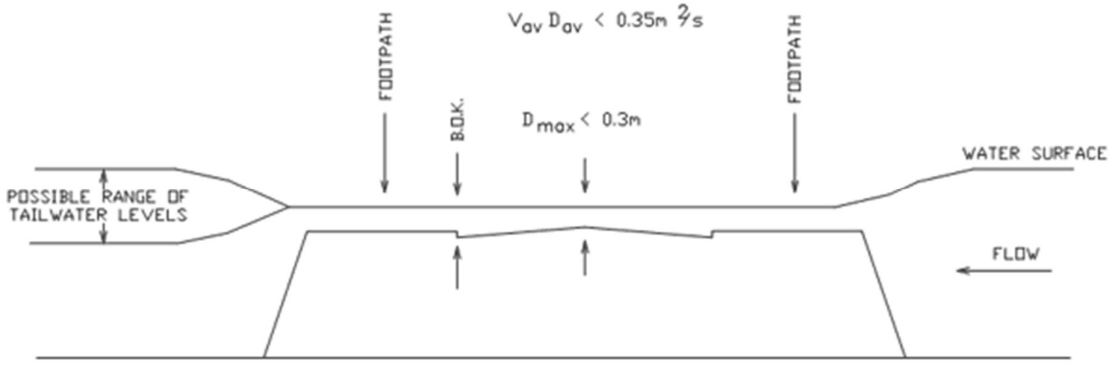

Figure A4 Floodway discharge controlled by road crossing embankment

28.1.5 Low point depression crossings

For crossings in locations where downstream hydraulic controls force deep flooding at slow velocities, there's a likelihood of higher property damage costs, but depth restrictions may be relaxed.

28.1.5.1 Recommended safety limits

Vav.dav <= 0.35 m2/s along footpath alignments (existing or hypothetical), and dmax <= 0.8 m measured gutter invert.

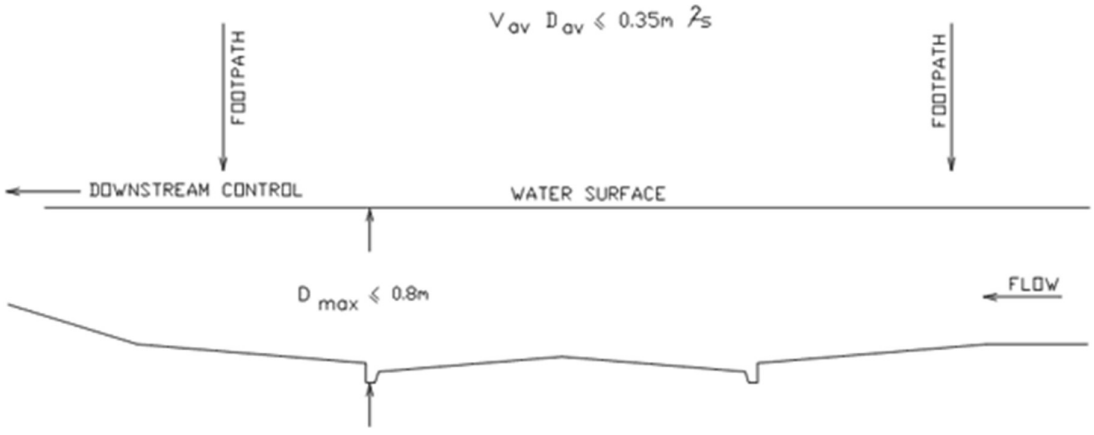

Figure A5 Floodway crossing low point depression

28.1.6 At-Grade crossings

For at-grade crossings where one route is designed to act as a floodway, child and car stability objectives are generally similar.

28.1.6.1 Recommended safety limits

Road intersections: Vav.dav <= 0.35 m2/s and dav <=0.30 m (using the cross-section at kerb return on the downstream side of the intersection on the floodway route), subject also to dmax < 0.30 m measured at the centreline road crown intersection point.

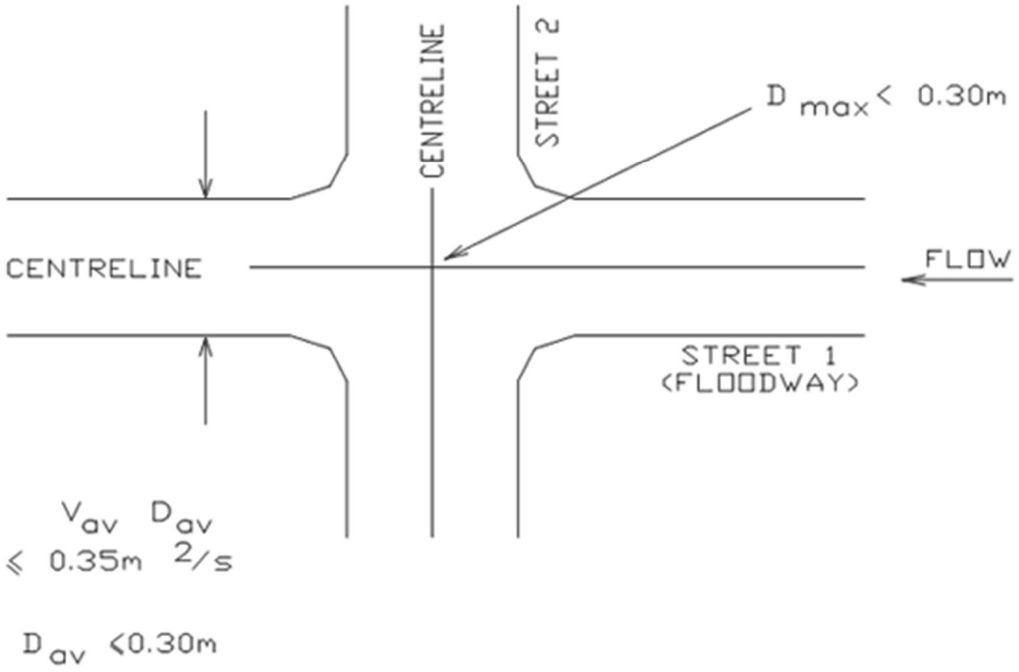

Figure A6 Road intersections (At Grade)

Roads crossing floodways: Vav.dav <= 0.35 m2/s and dav <=0.30 m along footpath hypothetical) and along the road pavement centreline, taking into account any skew in the floodway crossing.

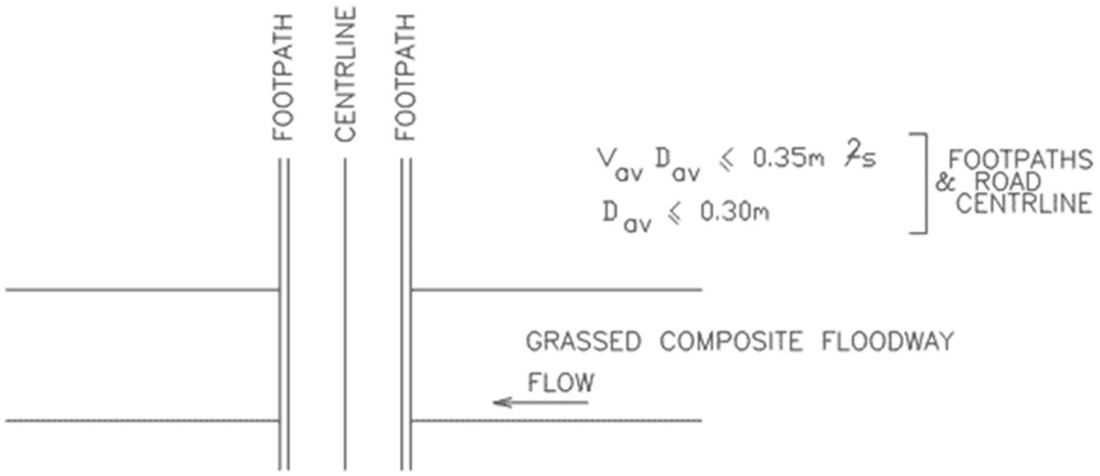

Figure A7 Road crossing floodway (At Grade)

For any road crossed by a floodway, the use of other design measures should be encouraged to control approach speed and/or to alert the driver to possible changing conditions. These could include variation of pavement form, provision of slow points, and use of stop/give way signs on crossroads.

28.1.7 Grassed floodways in drainage reserves

In dedicated drainage reserves, the primary criteria should be appropriate to the safety of children, but with provision for increased depth and velocity of flow towards the centre of the floodway where an avenue for retreat is provided by cross-sectional design.

Full child safety is to be maintained out to depths of at least 0.4 m on both banks wherever free access is available. (E.g. full child safety will be provided to act = 0.4 m out into a grassed floodway channel grading at 1 in 150 with batter slopes of 8:1 (H:V)).

For act > 0.4, the V*d ratio may increase without the need for provision of safety barriers, provided that no steepening of the bank slopes occurs and a limit is placed on maximum channel velocity.

28.1.7.1 Recommended safety limits

Vbank.dact <= 0.35 m2/s and act <=0.40 m
and Vav <= 1.5 m/s for act > 0. 4

28.1.8 Grassed/composite floodways in easements through residential or commercial property (peripheral car parking only)

The primary criteria should be appropriate to the safety of children, but with provision for increased depth and velocity of flow towards the centre of the floodway where an avenue for retreat is provided by cross-sectional design and a barrier to accidental access into deeper zones is provided. As for the drainage reserve case, full child safety is to be maintained out to depths of at least 0.4 m on both banks wherever free access is available.

For act > 0.4, the V*d ratio may increase provided that no steepening of the bank slopes occurs, a barrier is provided to deter accidental access, and maximum velocity is limited.

28.1.8.1 Recommended safety limits

Vbank.dact <= 0.35 m2/s and act <=0.40 m
Barrier at act = 0.4 m
Vav <= 1.5 m/s for act > 0. 4

The barrier could be bollards and chain, timber posts and rail or similar. It doesn't have to prevent access, but it must be clear above water surface level.

Any driveways or car park areas aligned parallel to the flow direction shall be located where act <= 0.30 m.

Any driveway or roadway crossings of the floodway shall conform to the safety requirements set out in Section 3.3 above.

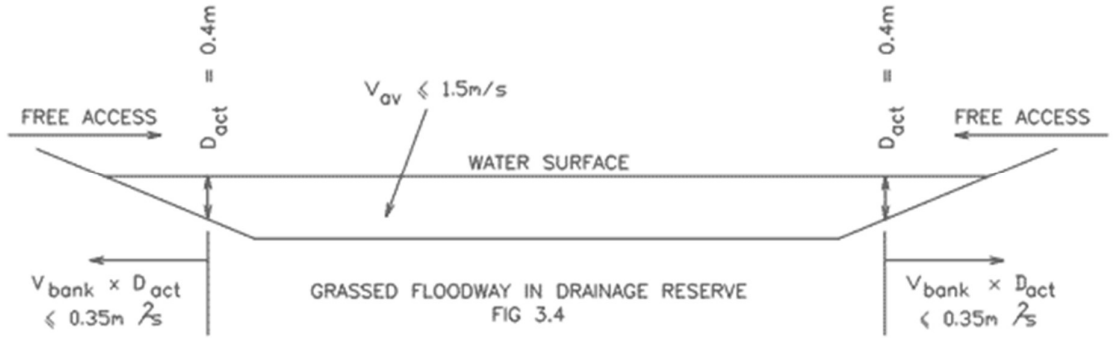

Figure A8 Grassed/Composite floodway in easement in residential/commercial Property

28.1.9 Grassed/composite floodways through residential or commercial property car park zones

The primary criteria should be appropriate to the safety of children, but with assured stability of parked cars. Property damage objectives conform with desired floodway operation characteristics in this instance because of the potential blockage effects if cars are de-stabilised and moved during the flood.

The stability of cars generally controls at depth greater than 0.30 m.

28.1.9.1 Recommended safety limits

Vav.dav <= 0.35 m2/s and dav <=0.30 m
and dmax < 0. 40 m

No barriers required.