LOWER TRENT CONSERVATION
714 Murray Street, R.R. 1, Trenton, Ontario K8V 0N1
Tel: 613-394-4829 Fax: 613-394-5226 Website: www.ltc.on.ca Email: information@ltc.on.ca
Registered Charitable Organization No. 107646598RR0001

NOTICE OF HEARING BOARD MEETING
LOWER TRENT CONSERVATION
TO BE HELD AT
Administration Office, 714 Murray Street, Trenton / Virtually Join the Meeting
On
Thursday, July 13, 2023, at 1:00 PM
For
O. Reg. 163/06 Permit Application #RP-23-055 and #RP-23-108

APPLICANT: **for RP-23-055:** Jewell Engineering Inc. for 2852243 Ontario Inc.

for RP-23-108: Jewell Engineering Inc for Mr. Trumble

LOCATION: **for RP-23-055:** 37B Durham Street North, Northumberland County, Geographic Township of Cramahe, Concession 2, Part Lot 29

for RP-23-108: 2420 Shelter Valley Road, Northumberland County, Geographic Township of Haldimand, Concession 3, Part Lot 12

AGENDA

1. Meeting called to order by the Chair
2. Motion for the Board of Directors to sit as the Hearing Board

There are two Hearings to be conducted:

3. Opening Remarks by Chair for **RP-23-055**
4. Disclosure of pecuniary interests
5. Staff Report and Presentation — Page # 3
6. Applicant Presentation — Page # 353
7. Additional Information Sharing
   a. Additional Questions from the Board
   b. Comments or Question from the Applicant
   c. Comments or Questions from Staff
8. Deliberation (In-Camera if required)
9. Motion on the Hearing Board Decision for RP-23-055

10. Opening Remarks by Chair for **RP-23-108**

11. Disclosure of pecuniary interests

12. Staff Report and Presentation Page # 367

13. Applicant Presentation Page # 445

14. Additional Information Sharing

a. Additional Questions from the Board
b. Comments or Question from the Applicant
c. Comments or Questions from Staff

15. Deliberation (In-Camera if required)

16. Motion on the Hearing Board Decision for RP-23-108

17. Motion to adjourn the Hearing Board

PLEASE CONTACT THE OFFICE IF YOU WILL BE UNABLE TO ATTEND THIS MEETING

Kelly Vandette 613-394-3915 ext. #215
kelly.vandette@ltc.on.ca

LOWER TRENT CONSERVATION

STAFF REPORT

Date: June 23, 2023
To: Lower Trent Conservation Hearing Board
Re: Ontario Regulation 163/06 Application for Permission RP-23-055 to Develop/Alter Two Watercourse Features
Prepared by: Gage Comeau, Manager, Watershed Management, Planning and Regulations

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DATE

June 23, 2023

DATE RECEIVED

Permit application received - March 7, 2023
Permit application submission deemed complete – May 24, 2023
Request for Hearing received - May 26, 2023

APPLICANT

2852243 Ontario Inc. (OWNER)
Amanda Redden– Jewell Engineering Inc. (AGENT)
(Project Description letter, Copy of application, Hydrology & Hydraulic Analysis, Revised Environmental Impact Study/Fisheries Assessment, Slope Stability Assessment letter report, Watercourse relocation plan, DFO Review letter report and Proposed Watercourse engineer design drawings, ***Appendices 1 – 8***)

LOCATION

37B Durham Street North, Village of Colborne – Eastfields Subdivision Lands, Geographic Township of Cramahe, Concession 2, Part of Lot 29
(Map attached, see ***Appendix 9***)

OVERVIEW

Lower Trent Region Conservation Authority (LTC) received an application for the alteration of two watercourse features and development within the regulated area associated with two tributary streams of Colborne Creek. The proposed watercourse alterations (see **Appendix 6**) involves removing a portion of a smaller tributary stream (noted as reach 3A in the EIS, see **Appendix 4**) and the removal and realignment of a portion of the other tributary stream (noted as reach 2, in EIS, see **Appendix 4**), both watercourse features traverse the middle of the property and flow to the South- South West. Further, a portion of the tributary stream noted as Reach 2, will be piped and another section will have the embankments altered.

The purpose of removing and relocating the watercourse features are to allow for a larger development area for a residential plan of subdivision. Technical submission materials have identified that the proposed relocation will offer many benefits including; decreased erosion and

sediment transport downstream, efficient management of multiple drainage routes, and creating a more natural channel that will assist with improving the water quality and aquatic habitat. The proposed works; however, do not comply with LTC's Ontario Regulation 163/06 Policy Document (February 2022) and a permit cannot be issued by staff.

PROPOSAL

The proponent is seeking approval from LTC to remove and redirect portions of the two intermittent watercourse features in order to increase the development area for future residential development on the property. The subject watercourses extend through the middle of the parcel, which is currently vacant and used for agricultural purposes.

As previously noted, the proposed watercourse alterations involve removing a portion of a smaller tributary stream (noted as Reach 3A in the EIS) and the removal and realignment of a portion of the other tributary stream (noted as Reach 2, in EIS). A portion of the tributary stream noted as Reach 2, will be piped and another section will have the embankments altered. The piped section of Reach 2 will be connected to and converge with Reach 3A.

(Detailed design plans attached, see ***Appendices 6 and 8***).

SUMMARY

LTC is responsible for the administration of Ontario Regulation 163/06 – *Lower Trent Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. In order to guide the implementation of Ontario Regulation 163/06 made pursuant to Section 28 of the *Conservation Authorities Act*, the LTC Board of Directors has approved policies, most recently updated in February 2022. Where a proposal for development or alteration follows the approved policies or is not a significant deviation from the approved policies, designated authority staff may grant permission.

The proposed watercourse alterations have the direct purpose of increasing the development area and would be a significant deviation from the current approved policies. As such, designated staff are not in a position to grant approval of the Ontario Regulation 163/06 permit application.

Key issue: A permit from LTC is required for the proposed watercourse alterations as the activity of excavating, filling and site grading are considered "development" under the Conservation Authorities Act and are to take place within a regulated area as described in Ontario Regulation 163/06. Specifically, within a river or stream valley (Section 2.1.b) of the Regulation). Furthermore, this proposal would constitute an interference with a watercourse (i.e., diversion of an existing channel) which requires permission under Ontario Regulation 163/06 (Section 5. of the Regulation) (refer to ***Appendix 10*** for a copy of O. Reg. 163/06). Given that the permit application is to allow for an activity that does not adhere to the following

policies, LTC staff are not in a position to grant permission:

Lower Trent Region Conservation Authority
Ontario Regulation 163/06 Policy Document (February 2022)

Section 7.2.1 Interference with a Watercourse

1) Interference with a watercourse shall not be permitted.

2) 2) Proposals for channelization and/or realignment will not be considered where the purpose of the proposal is to increase the development potential on the lands.

(LTC's 2022 Policies attached, see ***Appendix 11*** – Relevant sections only).

The applicant was notified that staff could not approve the permit application and of their right to a Hearing before the Authority's Board of Directors (see LTC Letter of Denial, May 26, 2023 – ***Appendix 12***).

The proponent requested LTC staff to proceed with the necessary arrangements for a Hearing (June 6, 2023 Notice of Hearing scheduled for July 13, 2023 – ***Appendix 13***).

The proponent was provided the Hearing Guidelines.
(LTC's 2022 Hearing Guidelines attached, see ***Appendix 14***).

BACKGROUND INFORMATION & CONSIDERATIONS

Planning History

In 2017, LTC received a Draft Plan of Subdivision for the subject property, the subdivision was noted as Colborne Ridge. LTC staff provided comments and recommended approval of the subdivision with conditions. The Draft Plan of Subdivision at the time of submission was for a total of 202 units (121 detached, 16 semi-detached, 20 multiple attached and 45 apartment units, see **Appendix 15 for 2017 Subdivision lot plan**)

In 2021, LTC was circulated on a resubmission for the Draft Plan of Subdivision for the Eastfields Subdivision (formerly known as Colborne Ridge Subdivision). There was a delay due to the Township investigating water and sanitary system capacity. The resubmission was completed by a new developer (2852243. Ontario Inc.) and the same documents/reports were used in the resubmission. Staff noted that are comments from the 2017 submission were still relevant and applicable. On April 22, 2022, LTC was circulated on the approved decision for the Draft Plan of Subdivision (see **Appendix 16**).

On September 6, 2022, LTC attended a meeting with the property owner, the owner's planning consultant (RFA), Northumberland County staff and Cramahe Township staff. The meeting was requested to discuss the redline

process. During this meeting, LTC staff requested further information as revisions were being made to the original subdivision plan (i.e., intensification of the number of units and the stormwater management block was moving). Following this meeting, LTC staff noticed slight issues with the reports that had been submitted and accepted in 2017 and resubmitted in 2021. Current LTC staff had concerns regarding items that seemed to have been missed or not addressed by staff at the time of the 2017 submission nor the 2021 resubmission.

On December 8, 2022, LTC was circulated on the Redline amendment to the Draft Plan of Subdivision. A new set of technical reports and information was provided as part of the submission. The purpose of the Redline application was to revise the overall road network, the type and positioning of 212 residential units and the location of the stormwater and parkland blocks. Within this new submission, an Environmental Impact Study (EIS) addendum showed the presence of a watercourse feature that traversed the property flowing from the East and flowing west through a wetland feature that was mapped as part of the previous EIS that was completed for the 2017 submission. This watercourse feature was not mapped during the original EIS. Additionally, the Redline submission illustrated the realignment of the watercourse that was illustrated in the EIS addendum. Through the design process for the Redline application for the subdivision, the applicants determined that the previous proposal was not adequate to meet their needs.

Following a full and thorough review of the Redline submission, LTC staff were not confident in the previously accepted EIS. As such, a site visit was completed to review the property and verify the information shown in the EIS addendum. While attending the site, two unmapped watercourse features were observed. LTC Staff comments regarding this submission requested a deferral in order to properly assess the regulated features on the subject property (i.e., identify the watercourse locations). Additionally, staff noted that a watercourse alignment would not be supported by staff and that if a permit was submitted, the owner/agent could request a Hearing when the permit is formally denied by staff.

On March 7, 2023, a permit application was made for the watercourse alterations on the subject property. On the same day, LTC Staff provided a checklist of reports and information required for a complete permit application.

On April 17, 2023, LTC staff were circulated on a second Redline submission, which provided the information that was requested previously. The revised plans showed the lot plan accommodating the 212 total units without an alteration or realignment to the watercourse features (see **Appendices 17-18**). LTC provided comments in support of the second Redline submission on May 4, 2023.

Following the submission of our Planning comments on May 4, 2023, LTC staff received the remainder of the documents required for the permit application. The permit was deemed complete on May 24, 2023.

It is staff's understanding that the secondary submission for the Redline application was made to avoid delays while concurrently proceeding with the permit application. A modification to the Redline application to reflect the proposed watercourse alteration (if approved) would not merit a full recirculation.

DEVELOPMENT & INTERFERENCE WITH A WATERCOURSE

The proposed works would include earth works that would involve excavating and site grading within the valley associated with the existing watercourses. Once the proposed works are constructed and stabilized, flows will be diverted from the existing watercourses through the new channel and the existing watercourse feature will be backfilled. These "development" activities require written permission, with or without conditions, from LTC. Overall, the proposal constitutes a watercourse interference as it is to involve the diversion of existing watercourses. Interference with a watercourse requires written permission, with or without conditions, from LTC.

Ontario Regulation 163/06 states that the Authority (i.e., LTC) may grant permission for development in a river or stream valley if, in its opinion, the control of flooding, erosion, pollution or the conservation of land will not be affected by the development. Further, Ontario Regulation 163/06 states that the Authority (i.e., LTC) may grant permission to in interfere with a watercourse. The technical submissions and design details have demonstrated that the proposed alterations can proceed without affecting the control of flooding, erosion, pollution or the conservation of land. However, LTC's permitting policies as described indicate that realigning a watercourse to allow for a larger development area is generally not an acceptable watercourse interference.

STAFF CONCLUSION

The proposal requires a permit from LTC pursuant to Ontario Regulation 163/06 and does not conform to LTC's Ontario Regulation 163/06 Regulation Policy Document (see ***Appendix 11***).

JEWELL ENGINEERING

April 26, 2023

Lower Trent Conservation
714 Murray St
R.R.#1 Trenton ON K8V 0N1

Attn: Gage Comeau
Regulation & Enforcement Officer

Re: Eastfields Subdivision – Watercourse Realignment
Permit No. RP-23-055
Jewell File No. 210-5024

Mr. Comeau:

Jewell Engineering Inc (Jewell) was retained by Fidelity Group of Companies (Fidelity) to prepare this project description provided to support the Watercourse Realignment permit (RP-23-055) submitted for the Eastfields Subdivision.

The site is currently vacant undeveloped land and has draft plan approval for the Eastfields Subdivision.

An unmapped watercourse traverses the site, draining from northeast to southwest. The watercourse commences at Durham St North at the confluence of the existing roadside ditches and a 450mm road cross culvert. Drainage from these features converges at the east site boundary and flows across the site through the active agricultural lands before entering a wooded/wetland area. From here drainage continues southwest until it reaches Colborne Creek at the Kensington Ave crossing. See attached excerpt from the Environmental Impact Study Review completed by Cambium Inc (Cambium). As shown, six distinct reaches were identified within the watercourse on the subject site.

The proposed watercourse realignment is summarized on the attached sketch and includes realignment of reaches 2 and 3A.

No modifications are proposed downstream of Reach 3A within the natural wooded/wetland area.

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1—71 Millennium Pkwy.
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208—4 Cataraqui St.
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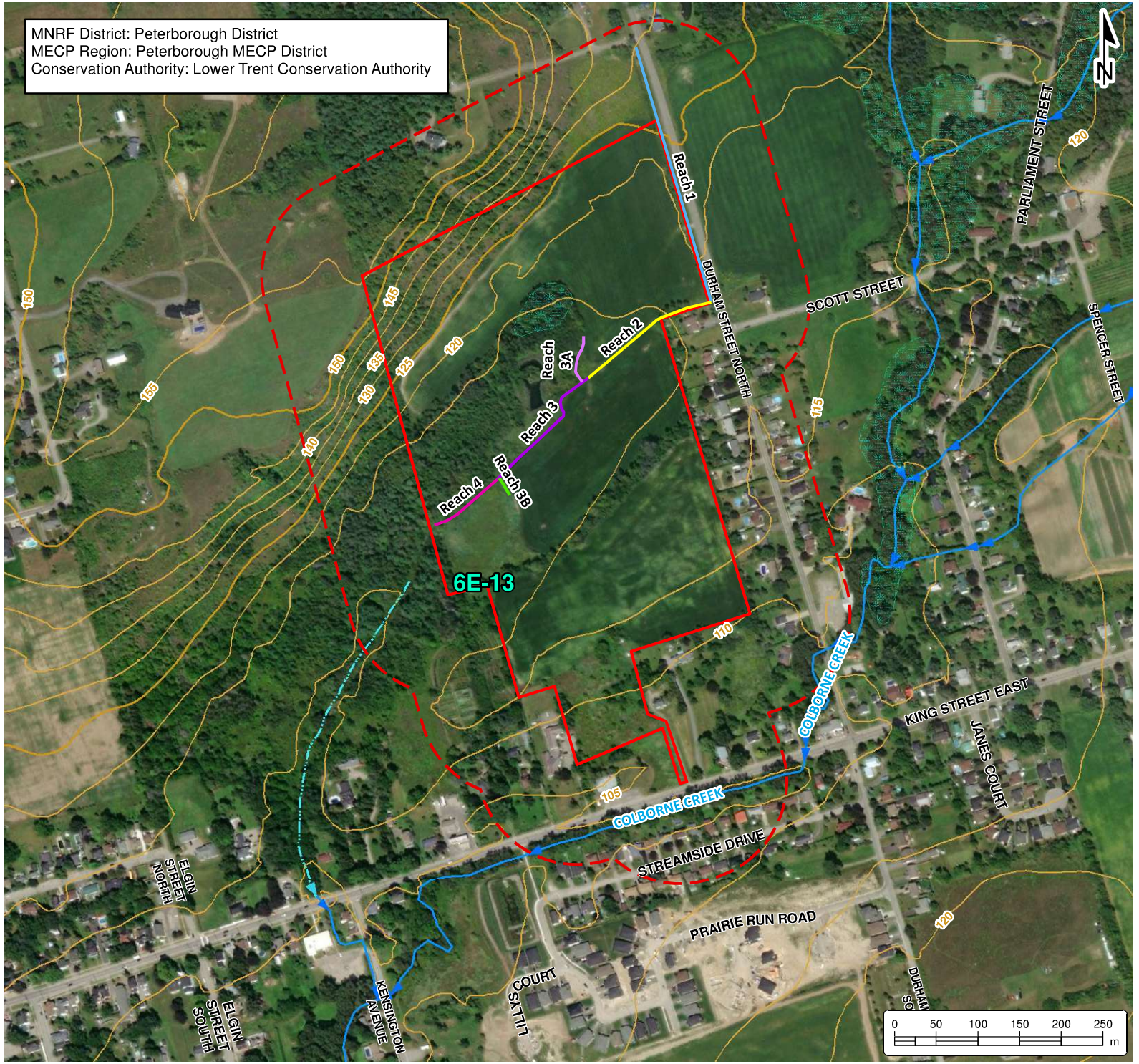
OAKVILLE
214-231 Oak Park Boulevard
Oakville, ON L6H 7S8
Tel: 905-257-2880
oakville@jewelleng.ca

www.jewelleng.ca

Based on historical aerial imagery, it is Cambium's understanding that the feature on site is of man-made origin and has a relatively low sensitivity (channelized, limited substrates/habitat features, choked with in-channel vegetation, contains phragmites). The Environmental Impact Study Review completed by Cambium provides a detailed summary of mitigation measures that, if adhered to, will appropriately mitigate any potential negative impacts associated with the watercourse realignment work.

Consideration has been given to maintaining the existing watercourse feature and altering the draft plan accordingly. However, disturbance of the watercourse would still be necessary for the crossing of Street B. The minor realignment proposed on either side of the Street B crossing allows for a more orderly progression of development and will provide a higher value watercourse section once completed (will not be choked with in-channel vegetation, no phragmites, etc.). The proposed realignment will also provide a larger, undivided area for active parkland use.

Amanda Redden, P.Eng.
Jewell Engineering Inc.



ENVIRONMENTAL IMPACT STUDY

2852243 ONTARIO INC., FIDELITY ENGINEERING & CONSTRUCTION
Part of Lot 182, Reid Plan and
Part of Lot 29, Concession 2,
Township of Cramahe, Ontario

LEGEND

- Watercourse, Intermittent
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Unevaluated Wetlands
- Ecodistrict
- Adjacent Lands (120m)
- Site

Drainage Feature:

- Reach 1
- Reach 2
- Reach 3
- Reach 3A
- Reach 3B
- Reach 4

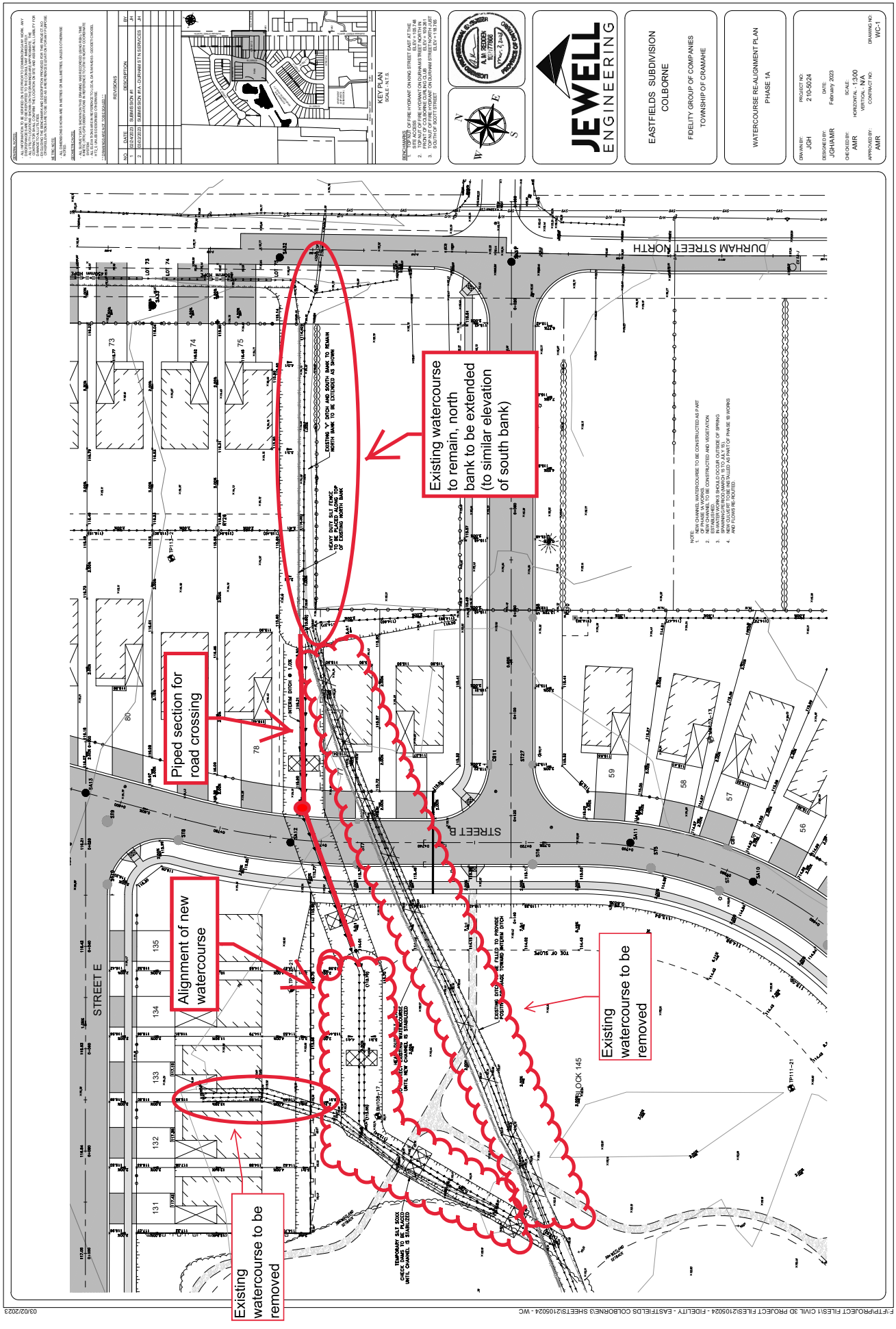
Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources and Forestry or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

CAMBIUM
194 Sophia Street
Peterborough, Ontario, K9H 1E5
Tel: (705) 742.7900 Fax: (705) 742.7907
www.cambium-inc.com

SITE DRAINAGE FEATURES

Project No.: 6697-003		Date: February 2023 Rev.:	
Scale: 1:6,500		Projection: NAD 1983 UTM Zone 18N	
Created by: DBB	Checked by: KD	Figure:	1

O:\GIS\MXDs\6600-6699\6697-003 Fidelity Engineering & Construction - EIS Review - Eastfields Colborne Res Dev\2023-03-16 FIG 1 - Site Drainage Features.mxd


Existing watercourse to remain, north bank to be extended (to similar elevation of south bank)
Piped section for road crossing
Alignment of new watercourse
Existing watercourse to be removed
Existing watercourse to be removed
DURHAM STREET NORTH
STREET B
STREET E
JEWELL ENGINEERING
EASTFIELDS SUBDIVISION
COLBORNE
FIDELITY GROUP OF COMPANIES
TOWNSHIP OF CRAMAHE
WATERCOURSE RE-ALIGNMENT PLAN
PHASE 1A
KEY PLAN
SCALE N.T.S.
REVISIONS
DESIGNED BY: JGH/AMR
CHECKED BY: AMR
APPROVED BY: AMR
PROJECT NO: 21-05024
DATE: February 2023
SCALE: HORIZONTAL - 1:300 VERTICAL - N/A
DRAWING NO: WC-1
CONTRACT NO:

LOWER TRENT
CONSERVATION

714 Murray Street, R.R. 1, Trenton, Ontario K8V 0N1
Tel: 613-394-4829 Fax: 613-394-5226 Website: www.ltc.on.ca Email: information@ltc.on.ca
Registered Charitable Organization No. 107646598RR0001

Application

Development, Interference with Wetlands & Alterations to Shorelines & Watercourses
(Pursuant to Ontario Regulation 163/06)

Please read, complete each section as required, date and sign this application

Project Description		
Project Location (Civic Address): 37B Durham St N, Colborne		
Municipality: Cramahe		
Nearest Intersection: Durham St N & King St E		
Assessment Roll Number*: 14110120301161000000		
Lot: 29	Concession: 2	Ward:

*Note: The Roll Number can be found from your Property Assessment Notice, real estate agent, or online Map Viewer at www.ltc.on.ca (click on Planning & Permits)

Project Details

Description of Proposed Works:
Watercourse re-alignment for facilitation of Eastfields development.

Amount & type of fill (m^3) to be added/removed/moved:
NA

Note: Fill is defined as earth, sand, gravel, topsoil, building materials, rubble, rubbish, garbage or any other material whether similar to or different from any of the aforementioned materials, whether originating on the site or elsewhere, used or capable of being used to raise, lower, or in any way affect or alter the contours of the ground.

Proposed Start date (YYYY/MM/DD):	Anticipated Date of Completion:
2024/01/01	2024/03/31

Has a previous application to Lower Trent Conservation been filed on this property? If yes, please provide previous permit number.

- ☐ Yes
- ☒ No

Property Owner	
Name: 2852243 Ontario Inc.	
Mailing Address: 512 Purdy Rd	
City: Colborne	Postal Code: K0K 1S0
Phone #: 905-376-4804	Cell #:
Email: jpillsworth@fidelityeng.com	Fax #: 905-355-2555

Agent	
☐ Same as Property Owner	
Name: Amanda Redden	
Company/Organization: Jewell Engineering Inc.	
Mailing Address: 1 - 71 Millennium Parkway	
City: Belleville	Postal Code: K8N 4Z5
Phone #: 613-969-1111	Cell #:
Email: reddena@jewelleng.ca	Fax #:

Note: Correspondence will be sent to agent, when applicable.

Approved Permit Circulation

☒ email pdf copy ONLY ☐ mail hardcopy ONLY ☐ Pickup at LTC office ***appointment required***

Pre-application Consultation

A pre-application consultation may be in the form of a phone conversation, a meeting, email message, and/or site visit.

Have you conducted any pre-application consultation with a Lower Trent Conservation staff member to determine site issues and technical requirements for a "complete" application?

☒ **Yes (please indicate method below)** LTC File Number: PL-22-301 & PL-23-012

☐ by phone ☒ by meeting ☐ by email ☐ by site visit

☐ **No**

Further Considerations

Is there a violation on this property under Ontario Regulation 163/06?

☒ No ☐ Yes (provide details below) ☐ Don't know

If yes, please provide file # - ENF-

Are *Planning Act* or Municipal approvals required?

☐ No ☐ Don't know

☒ Yes (check all that apply)

☐ Official Plan Amendment ☐ Minor Variance ☒ Zoning ☐ Consent

☒ Draft Plan of Subdivision ☐ Building Permit ☐ Site Plan ☐ Septic ☐ Other

Do you authorize LTC to circulate approved permit to Municipal Planning & Building Officials? ☐ No ☒ Yes

Are there any other required Approvals? (e.g. MNRF, Fisheries and Oceans Canada)

☒ No ☐ Yes (please select below) ☐ Don't know

☐ MNRF ☐ Parks Canada ☐ DFO

Notice of Collection

Pursuant to the *Municipal Freedom of Information and Protection of Privacy Act,* the personal information contained on this form is collected under the authority of the *Conservation Authorities Act*. This information is used to assess applications and, where approved, issue the Development, Interference with Wetlands & Alterations to Shorelines and Watercourses permit. Information on this form may be disclosed to Government and Municipal agencies for review and comment, or to members of the public through the Freedom of Information process. Questions about the collection of information should be directed to the Chief Administrative Officer, Lower Trent Conservation, 714 Murray Street, Trenton, ON, K8V 0N1, 613-394-4829.

Any false or misleading statement made on this application will render null and void any permission granted.

I, the owner, Jim Pillsworth (Name) of 2852243 Ontario Inc (Organization (if any))

solemnly declare that to my best knowledge and belief, all of the above information, plans and submissions to be true, valid and current. I further accept the aforementioned inclusions, terms, and conditions to be binding upon the registered owner(s) of the property and all assigned agents, contractors, and/or constructors acting on my behalf. My signature acknowledges the right to exercise binding authority.

*Signature of Owner: [redacted]	Date: March 7, 2023

* Signature or written authorization from the property owner is mandatory

Signature of Agent:	Date: March 7, 2023

GENERAL CONDITIONS

1. By signing this application, consent is given to Lower Trent Conservation (herein referred to as LTC), its employees and other persons as required by LTC, to access the property for the purpose of inspection, obtaining information, and/or monitoring any and all works, activities, and/or construction pertaining to the property in addition to the works as approved under cover of any permit issued by LTC.

2. The owner and agent agree:
   a. To indemnify and save harmless LTC and its officers, employees, or agents, from and against all damages, loss, costs, claims, demands, actions and proceedings, arising out of or resulting from any act or omission of the owner and/or agent or any of their employees or contractors relating to any of the particulars, terms, or conditions of this permission;
   b. This permission shall not release the owner/agent from any legal liability or obligation and remains in force subject to all limitations, requirements, and liabilities imposed by law; and,
   c. All complaints arising from the execution of the works authorized under this permission shall be reported immediately by the owner/agent to LTC. The owner/agent shall indicate any action which has been taken, or is planned to be taken, if any, with regard to each complaint.

3. Permits granted by LTC are not transferrable and are issued to the current owner of the property only.

4. The owner/agent agrees that, should the works be carried out contrary to the terms of this permission, LTC may enter onto the property and cause the terms to be satisfied at the expense of the owner.

5. The works shall be carried out as per the approved plans and specifications submitted in support of the application and as amended by the approval of this permission.

6. The owner/agent agrees to install and maintain all sediment controls as directed by LTC staff, until all disturbed areas have been stabilized.

7. All disturbed areas shall be seeded, sodded, or stabilized in a manner acceptable to LTC as soon as possible, and prior to the expiry of this permission.

8. The owner/agent agrees to maintain all existing drainage patterns, and not to obstruct external drainage from other adjacent private or municipal lands.

9. The owner/agent agrees to contact LTC once the development has commenced so an inspection of the development can be undertaken.

10. Permits granted by LTC do not replace building permits or any other permits or approvals issued through Municipal offices and/or other levels of Government. A permit under Ontario Regulation 163/06 does not constitute LTC approval of any related *Planning Act* applications. Separate approval of all related applications must be obtained from their respective agency and LTC.

11. Permits issued by LTC are valid for a period of two (2) years from the date of issue. After a permit has expired, a new application must be submitted. The current fee schedule during submission applies.

12. It is the responsibility of the owner/agent to ensure that a valid permit is in effect at the time the work is occurring.

LANDOWNER AUTHORIZATION FORM

Subject Property		
Civic Address: 37B Durham St N, Colborne		
Municipality: Cramahe		
Assessment Roll Number: 14110120301161000000		
Lot: 29	Concession: 2	Ward:

If an application is to be submitted by a solicitor or agent on behalf of the owner(s), this Landowner Authorization must be completed and signed by the owner(s). If the owner is a corporation acting without agent or solicitor, the application must be signed by an officer of the corporation and the corporation's seal (if any) must be affixed.

If the application is to be prepared by a solicitor or agent, authorization should not be given until the application and its attachments have been examined and approved by you, the owner(s).

I/we Jim Pilsworth

hereby authorize Jewell Engineering

to provide as my agent any required authorization or consents, to submit the enclosed application to Lower Trent Conservation, and to appear on my behalf at any hearing(s) of the application and to provide any information or material required by the Lower Trent Conservation Board of Directors relevant to the application for purposes of obtaining a permit to develop, interfere with a wetland or alter a shoreline or watercourse, in accordance with the requirements of Ontario Regulation 163/06 as amended.

Signature of Owner: [redacted] Date: March 7 2023

Signature of Agent: Date: March 7, 2023

SUBMISSION REQUIREMENTS

Permit applications may be submitted by email to permits@ltc.on.ca. Application fees will be invoiced by email. If no email address is available, other payment options will be discussed. Current application fees can be found on our fee schedule at www.ltc.on.ca or contact Lower Trent Conservation at 613-394-4829. Applications will not be processed until the fee is paid in full. **The application fee is non-refundable.**

FOR OFFICE USE ONLY

Application File Number:	Permit File Number:
Subwatershed:	Regulated Feature:
Permit application rec'd:	Application complete:
Deposit Required: Ontario Land Surveyor ($500) ☐ Yes ☐ No	Coastal Engineer ($1,000) ☐ Yes ☐ No
Amendment request rec'd:	Amended application complete:

Fee Required:

☐ Routine	$100
☐ Minor	$220
☐ Standard	$550
☐ Complex (require review of 1 technical study)	$825
☐ Complex (require review of 2 or more technical studies)	$1,100
☐ Permit amendment (administrative)	$100
☐ Permit amendment (significant) - 1/2 original application fee	_____
☐ Compliance permit - double the application fee	_____
☐ Restoration agreement - double the application Fee	_____
☐ Deposit	_____

Amount Received: _____ Date Received: _____

Method of Payment: ☐ Cheque ☐ Credit Card ☐ Cash

Deposit Returned: _____ Date Returned: _____

☐ **Permission for Minor Works:**

- ☐ Undertake minor landscaping involving the placement, removal or re-grading of material up to 20m³ (minor fill)
- ☐ Minor shoreline protection up to 20m³
- ☐ Undertake watercourse or shoreline alteration involving less than 20m² (minor alteration)
- ☐ Construct a non-habitable accessory structure up to 10m²
- ☐ Construct a habitable addition up to 10m²
- ☐ Construct a deck up to 23m²
- ☐ Install a pool up to 10m²

☐ **Permission for Standard or Complex Permit:**

- ☐ Construct, reconstruct, erect or place a building or structure (greater than 10m²)
- ☐ Change building/structure so that it increases its size by 10m² or more, or increases the number of dwelling units
- ☐ Temporary or permanent placing, dumping or removal of any material originating on the site or elsewhere greater than 20m³
- ☐ Change or interfere with a wetland
- ☐ Change or interfere with a watercourse
- ☐ Shoreline protection work
- ☐ Construct a deck greater than 23m²
- ☐ Install a pool greater than 10m²

Permit Approval:

Amendment:

STORMWATER MANAGEMENT REPORT

Eastfields Subdivision

Colborne, ON

Issued for Final Approval

February 27, 2023

Prepared by

Bryon Keene, P.Eng.

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Revision Summary

September 2022

First submission SWM Report issued for redline draft plan revision.

February 2023

SWM Report issued for final approval.

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1 Introduction and Background

Fidelity Group is proposing to construct the Eastfields development that comprises approximately 19.5ha in Colborne, ON (see Figure 1-1). The 212-unit residential development is situated west of Durham St N and north of King St E (County Road 2).

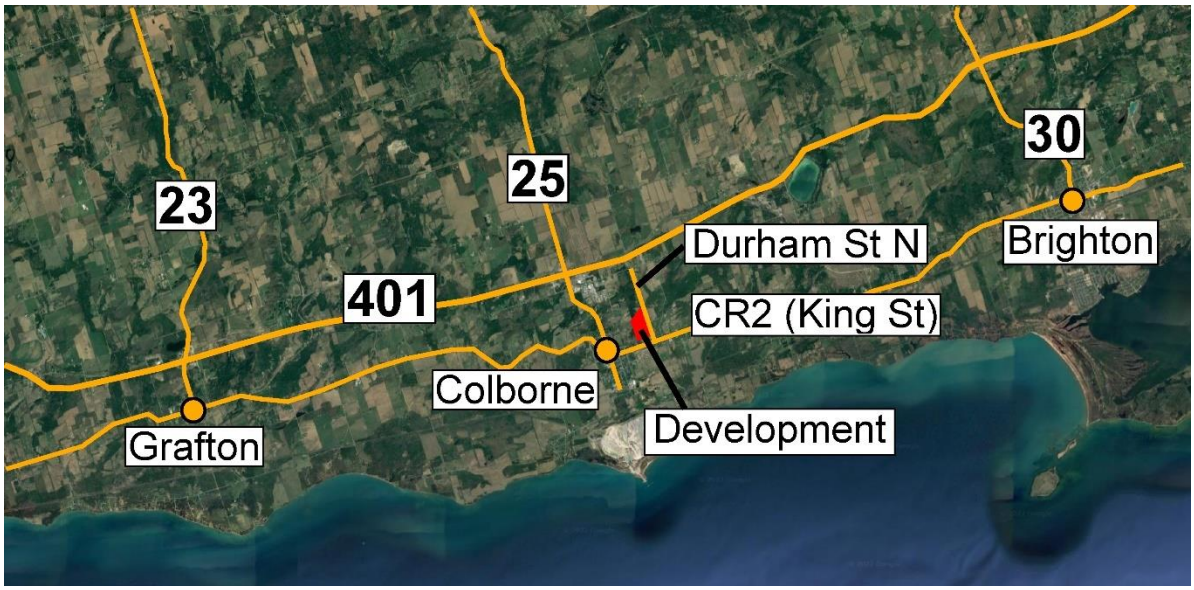


Figure 1-1: Development Site Location (Google, Maxar Tech 2018)

2 Existing Conditions

The development lands have a moderate slope (between 2 and 10 percent in many places), with the steepest lands towards the northwest. The north part of the site drains towards a wetland on site, and a smaller south portion drains towards Colborne Creek in the south. The wetland drains to the same watercourse as the lands to the south, ultimately discharging to Lake Ontario 3.5 kilometres to the southwest (see Appendix B for pre-development catchment plan). The creek has a contributing area of approximately 8.67km^2 at the confluence of the tributary to the main creek.

A portion of the existing development on Durham St N drains to the Durham St N storm sewer. Runoff in the storm sewer receives treatment through use of an OGS unit before discharging to Colborne Creek.

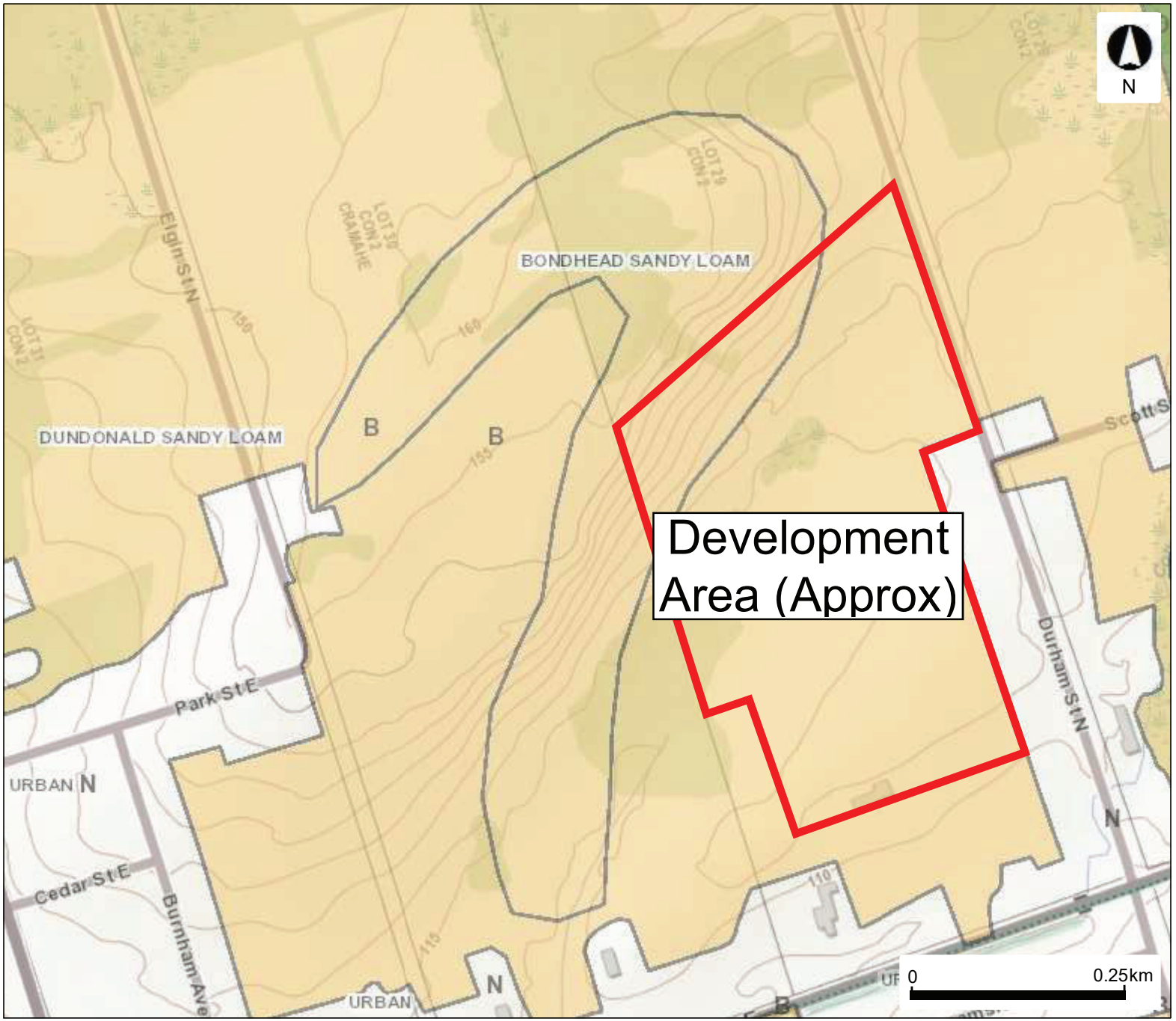
As shown in Figure 2-1 below, the lands are mostly agricultural fields with tree cover in the wetland area and to the north of the site. In total, approximately 17ha of external lands contribute to the wetland and its receiving watercourse.

Figure 2-1: Site Overview (Google, Maxar Tech 2015)

2.1 Soils

Soils descriptions were reviewed from the Soil Survey of Northumberland County (Agriculture Canada and the Ontario Agricultural College, 1974). Figure 2-2 shows the soil distribution in the Village of Colborne from OMAFRA (2022).

Eastfields - Hydrologic Soil Groups



Legend

- Soil Name Label
- Hydrologic Soil Group
  - A - High
  - B - Moderate
  - C - Slow
  - D - Very Slow

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Map Created: 9/7/2022
Map Center: 44.01258 N, -77.8813 W

Soils found on the site include:

- Bondhead Sandy Loam
    - This soil has good drainage with a mixture of sand and silt, with some clay present at depths of 10-14 inches and abundant, angular gravel below 14 inches. This soil is classed as Hydrologic Soil Group B.
- Dundonald Sandy Loam
    - This soil is primarily sand (approximately 50% in top layer and 62-78% below), with increasing amounts of gravel and pebbles at depths below 22 inches. This soil is also classed as HSG B.

Figure 2-3 (from the 1997 MTO Drainage Management Manual) outlines the classifications of Hydrologic Soils Groups.

Hydrologic Soil Group

The hydrologic soil group is used to classify soils into groups of various runoff potential.

The Soil Conservation Service (SCS) classifies bare thoroughly wet soils into four hydrologic soil groups (A, B, C and D). SCS descriptions of the four groups, modified slightly to suit Ontario conditions, are as follows: (Design Chart 1.09)

A: High infiltration and transmission rates when thoroughly wet, eg. deep, well drained to excessively-drained sands and gravels. These soils have a low runoff potential.

B: Moderate infiltration and transmission rates when thoroughly wet, such as moderately deep to deep open textured loam.

C: Slow infiltration and transmission rates when thoroughly wet, eg. fine to moderately fine-textured soils such as silty clay loam.

D: Very slow infiltration and transmission rates when thoroughly wet, eg. clay loams with a high swelling potential. These soils have the highest runoff potential.

In Ontario, soils have been found to lie between the main groups given above, and have therefore been interpolated as AB, BC, CD as appropriate, such as Guelph loam, which is classified as BC.

Figure 2-3: MTO Drainage Management Manual – Description of Hydrologic Soils Groups

2.2 Targets

Jewell consulted with Lower Trent Conservation to discuss the stormwater management objectives for the development.

The stormwater management plan focuses on three environmental objectives when considering the treatment and conveyance of stormwater runoff. The objectives are to mitigate impacts to flooding, water quality, and erosion of the receiving system.

Quantity Control

- Ensure the development doesn't increase peak flows in Colborne Creek.

Quality Control

- Follow the Ministry of Environment guidelines to provide adequate quality treatment to runoff to ensure effluent meets **Enhanced** quality control objectives.

Sediment and Erosion Control

- Minimize the potential for erosion of soils,
- Mitigate the release of sediment offsite.

3 Proposed Conditions

The development has a natural divide that splits the site into two drainage areas. The north area drains naturally towards the wetland that bisects the site, either directly to the wetland or to a channel that flows towards the west and splits the wetland down the middle. The south catchment area drains to the creek running along the south of the site before it crosses under King Street. Discharge from the wetland area will discharge into the creek where the flows are conveyed to Lake Ontario (see figures in Appendix B for pre- and post-development catchment plans).

A storm sewer network will convey the minor flows towards two quantity and quality treatment facilities (justification for the provision of quantity treatment is provided in Section 4.1). A stormwater management pond is proposed to be located at the south end of the wetland, and this pond will collect runoff from the majority of the development, plus a portion of external lands to the north. Runoff from south of the divide will receive primary grit removal through an OGS unit, and quantity treatment will be provided through an underground storage system (EZStorm units). The runoff will drain to the existing storm sewer running south along Durham St, receive final polishing through a second OGS unit, and discharge into Colborne Creek.

The quantity control facilities will limit the post-development peak flows to the pre-development levels.

Runoff exceeding the 5-Yr peak flows will be conveyed along the streets to the SWMF, EZ Storm units, or the wetland

During the Timmins event, the pond will discharge to the wetland through the spillway. The EZStorm units will fill to capacity, and additional runoff will drain across the road surface to the creek downstream at King St E.

4 Hydrologic Modelling

4.1 Model Inputs

Jewell developed an OTTHYMO model to determine the impact of the development on the flows in the creek. Three pre-development catchments were established using the following inputs to model the pre-development conditions:

Table 4-1: Pre-Development OTTHYMO Inputs

Catchment	Area (ha)	Slope (%)	RC	CN	Longest Flow (m)	Tp (hr)
101a	12.80	8.5	0.25	62	528	0.35
101b	21.11	1.2	0.25	71	850	0.85
100	8.90	4.8	0.25	65	330	0.33

Catchments 101a and 101b flow towards the wetland discharging to Node A, and catchment 100 discharges to Colborne Creek to the south.

The three NASHYD catchments were divided in the post-development model (Table 4-2). The undeveloped areas remained as NASHYD catchments (undeveloped areas, or areas with low imperviousness), whereas STANDHYD inputs were used to model developed areas (Table 4-3). STANDHYD inputs focus on percent imperviousness, length of impervious area, and initial abstraction. Note that Block 143 (apartment block) has been modelled as undeveloped land and included in Catchment 607. Due to the topography of this catchment, an independent SWM plan will be required for the apartment block as part of the Site Plan Application.

Table 4-2: Post-Development NASHYD Inputs

Catchment	Area (ha)	Slope (%)	RC	CN	Longest Flow (m)	Tp (hr)	Minor to	Major to
600	5.11	8	0.25	62	381	0.31	Pond	
601	3.97	14	0.25	62	297	0.22	Wetland	
602	2.04	9	0.25	65	250	0.24	Wetland	
603	5.79	2	0.30	70	354	0.42	Wetland	
606	1.28	16	0.30	62	253	0.19	Wetland	
607	5.35	4	0.25	65	205	0.29	Durham/King St	
608	1.38	16	0.30	62	206	0.17	Pond	Wetland
Wetland	4.05	1	0.20	58	310	0.56	Node A	

Jewell used a runoff coefficient of 0.25 to represent the pre-development catchments. Several catchments deviate from 0.25 for the following reasons:

- 603 – Raised to 0.30 due to steeper slope to north and little vegetated cover
- 606, 608 – Raised to 0.30 due to steep slope to north (approx. 16%)
- Wetland – Set to 0.20 to reflect the low rational method runoff coefficients for lakes and wetlands (0.05), and flat topography (1-2%)

Table 4-3: Post-Development STANDHYD Inputs

Catchment	Area (ha)	XIMP %	TIMP %	Length (m)	Imp IA (mm)	Perv IA (mm)	Minor to	Major to
100	3.76	50	60	158	2	5	Pond	
200	0.46	30	40	55	2	5	Pond	Wetland
201	3.10	30	40	144	2	5	Pond	
300	0.66	20	30	66	2	5	Wetland	
301	0.18	20	30	35	2	5	Wetland	
302	0.90	25	37	77	2	5	Wetland	
303	0.53	10	15	59	2	5	Wetland	
400	0.35	30	40	48	2	5	Pond	EZStorm
401	0.19	20	30	36	2	5	Pond	EZStorm
402	1.91	40	50	113	2	5	EZStorm	
604	0.44	15	30	54	2	5	Pond	
605	0.71	15	30	69	2	5	EZStorm	
Pond	0.76	58	66	71	2	5	Wetland	

The pervious and impervious lengths were calculated using the following formula:

$$L = \sqrt{\frac{10{,}000 * A}{1.5}}$$

Where:
L is the length of pervious and impervious cover in metres, and
A is the area of the catchment in hectares.

The model uses Horton's Infiltration to represent the permeability of the soil throughout the rainfall event. The values used in the model come directly from the MTO Drainage Management Manual Chart 1.13, HSG C:

- F_0 = Initial infiltration rate = 125 mm/h
- F_C = Final infiltration rate = 5 mm/h

- DCAY = Decay constant = 2, 1/h
- F = Accumulated moisture at beginning of event = 5mm
- DPSP = Depression storage over pervious area = 2mm

Although the site is covered in HSG B soil, Jewell used the HSG C parameters as a conservative estimate of post-development runoff.

Jewell shifted the catchment 602 hydrograph by 5 minutes (one timestep in OTTHYMO) to account for routing through the ~300m channel along Durham St.

4.2 Minor System

The runoff from catchments 200, 608, 400, and 401 will be split into major and minor flows. The minor flows will enter the development's storm sewer network to the respective treatment facility, while the major flows will drain via overland flow to receive quantity treatment or drain uncontrolled.

The storm sewer system was designed following the Rational Method. The Rational Method is the accepted design tool for sizing storm sewer systems (MOE, 2008). The 5Yr design event is completed using the IDF parameters from the MTO IDF curves.

$$Q = \frac{1}{360} CiA$$

Where:

Q = Peak Flow in m^3/s
C = Runoff Coefficient
i = Rainfall Intensity in mm/hr
A = Area in hectares

The peak flows for the four catchments mentioned above are given below (Table 4-4).

Table 4-4: Determination of DUHYD Peak Flows

Catchment	C	t_c (min)	i (mm/h)	A (ha)	DUHYD (L/s)
200	0.45	16	71	0.46	126
400	0.45	15	74	0.35	32
401	0.40	15	74	0.19	16
608	0.30	15	74	1.38	85

4.3 Modelling Results

The OTTHYMO model was completed for the 25mm, 5Yr, and 100Yr events.

The 25mm event simulated was the 4hr Chicago distribution event as recommended in the SWM Planning & Design Manual (Ministry of the Environment, 2003). The 5- and 100-Yr events were simulated using the 4hr Chicago distribution, and 12- and 24-hr SCS type II distribution with the MTO IDF curves (see Appendix A).

After running the three events, Jewell concluded the following:

- The 12hr SCS type II event produced the greatest storage requirement in the pond, however all three events were stored with surplus capacity (i.e., the pond's full storage was never used).
- The 4hr Chicago event produced the greatest storage requirement in the EZStorm units, with the units filling to capacity during this event.

Since the EZStorm units had minimal surplus capacity during the 4hr Chicago event, Jewell proceeded with the 4hr Chicago event as the critical event.

The results of the OTTHYMO model indicate that the post-development uncontrolled peak flows exceed the pre-development targets as shown in Table 4-5 and Figures 4-1, 4-2 below (see OTTHYMO outputs in Appendix F for further details).

Table 4-5: Pre-Development vs Post-, Uncontrolled Peak Flows

Event	Node	Pre-Development Q (m^3/s)	Post- Development, Uncontrolled Q (m^3/s)
5Yr, 4hr Chicago	Node A	0.36	1.48
	Durham St N	0.15	0.34
100Yr, 4hr Chicago	Node A	0.97	3.06
	Durham St N	0.41	0.93

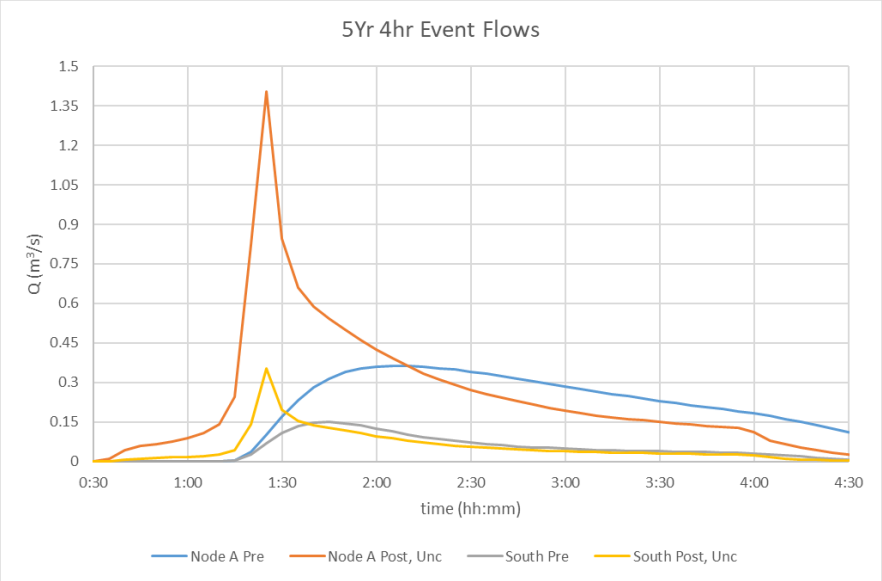


Figure 4-1: Pre-Development vs. Post-Development Uncontrolled, 5Yr 4hr Event

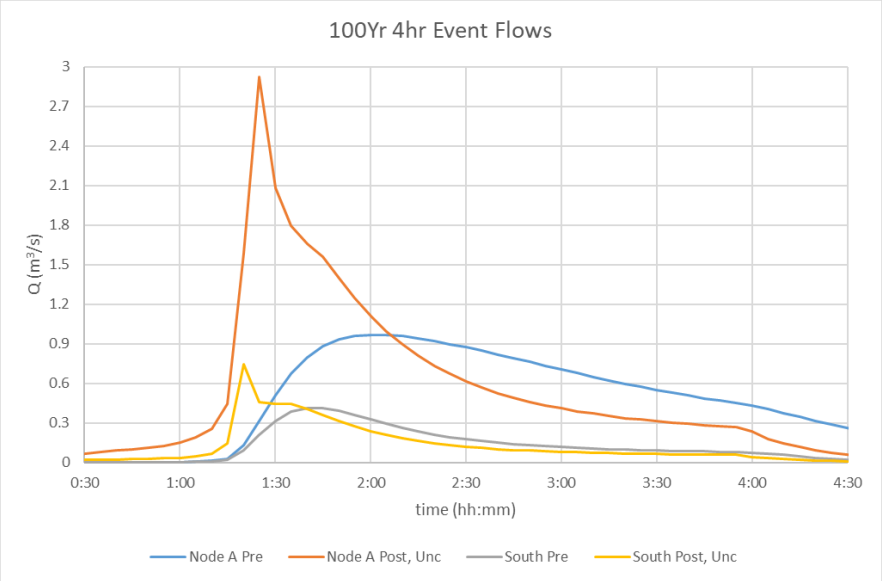


Figure 4-2: Pre-Development vs. Post-Development Uncontrolled, 100Yr 4hr Event

The uncontrolled peak flows are approx. two to four times that of the pre-development flows, which is a clear indication that quantity controls are required. Jewell recommends the construction of a stormwater management facility (wet pond), in addition to EZStorm units, to control the post-development runoff to the target flows.

5 Stormwater Management Controls

5.1 Selection of Preferred Technologies

The pre-development area draining to the wetland is approximately 34ha (roughly 15ha of which is from the development lands). Due to the large contributing area, Jewell selected a wet pond SWMF to provide both quality and quantity treatment to runoff.

The 2003 MOE SWM Planning and Design Manual stipulates that the following technologies are appropriate for contributing areas exceeding 5 hectares:

- Wet pond
- Dry pond
- Wetland

A wet pond was selected as this facility can provide ***Enhanced*** quality treatment to runoff, as well as providing the required quantity control.

For the south catchment area, Jewell selected EZStorm units for quantity control. These chambers were selected as the contributing area is approximately 2ha. Space is limited in the south area as the land is dense with development, so EZStorm chambers were selected as no surface space is used. An OGS unit will be placed upstream of the EZStorm units to provide ***Enhanced*** quality treatment.

An existing STC 300 OGS unit is located on Durham St, immediately upstream of the storm sewer discharge. Jewell recommends the removal of the existing OGS unit, and replacing it with two OGS units in series:

- A FD-5HC will be placed immediately upstream of the EZStorm units to provide grit removal for the runoff entering the underground storage. This primary polishing will prevent the accumulation of sediment in the EZStorm units.
- A second OGS will replace the existing unit on Durham St N. The second unit will be a DD-10, which will provide Enhanced treatment overall to the contributing area.

See Section 5.4 for more details.

5.2 Quantity Control Targets

The pre-development targets, indicated in the model as catchments 100 (a and b) and 101, are analyzed separately to ensure that the peak flows in the main creek, as well as the wetland, are not increased compared to pre-development levels.

Figures 5-1 and 5-2 demonstrate the facilities' ability to limit post-development peaks to the pre-development targets.

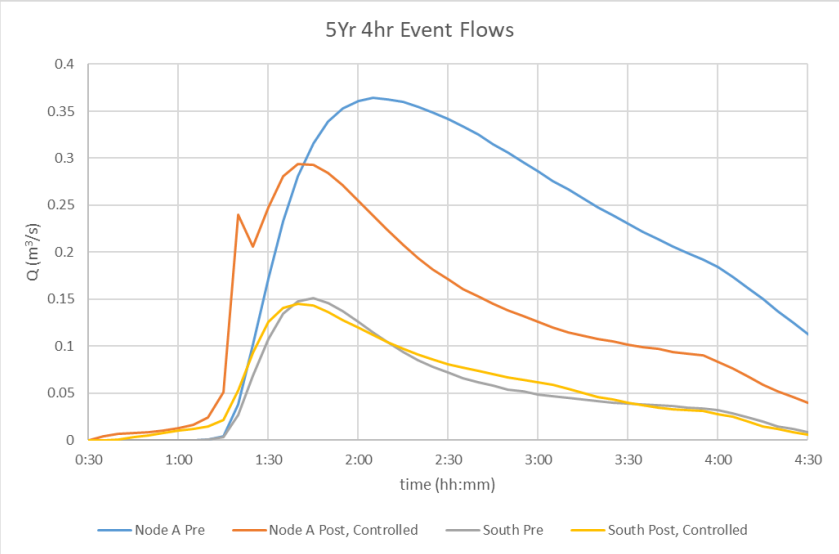


Figure 5-1: Pre-Development vs. Post-Development Controlled, 5Yr 4hr Event

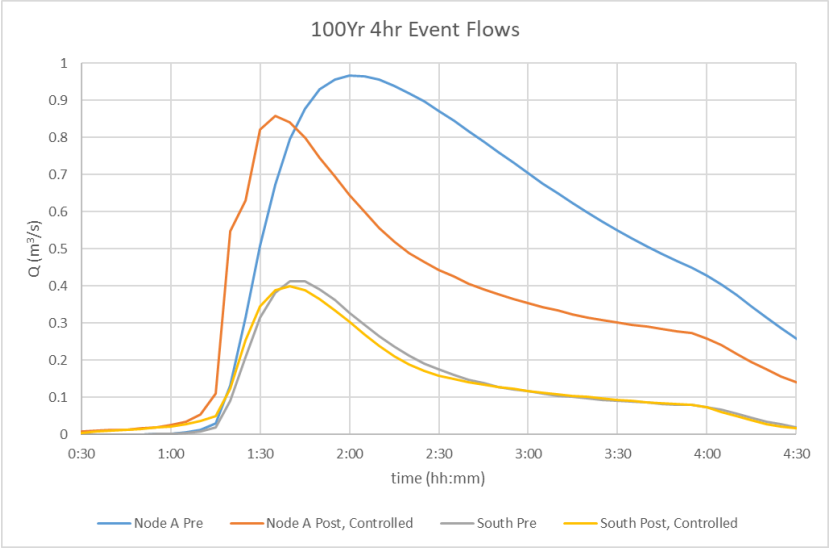


Figure 5-2: Pre-Development vs. Post-Development Controlled, 100Yr 4hr Event

Sizing for the two facilities is provided in the following section.

5.3 Facility Sizing – Wet Pond

The proposed wet pond facility will have a total volume of approximately 7,273 m^3. Three outlets will control the discharge from the facility.

- Outlet 1 – 0.11m diameter circular orifice, with invert at 112.0m
- Outlet 2 – 0.60m diameter circular orifice, with invert at 112.9m
- Outlet 3 – 2.0m broad-crested spillway, with invert at 113.5m

5.3.1 Quality Treatment

The SWMF was sized to provide quality treatment during the 25mm event. Jewell determined storage requirements for the facility with orifice and weir sizing, which is included below in Table 5-1.

Table 5-1: Pond Sizing

	Elevation (m)	Storage (m^3)		
		Required	Provided	Used
Bottom of Pond	110.8	-	-	-
Permanent Pool	112.0	1,319	2,456	-
Extended Detention	112.4	868	1,093	868
Active Storage	113.7	-	5,587	3,784
Top of Berm	114.1	-	7,273	-

The permanent pool elevation was set to 112.0m to ensure the facility could discharge to the wetland without the wetland backfilling the facility during high water conditions.

A 0.11m diameter orifice is proposed with invert at the elevation of the permanent pool which will discharge the pond at a peak rate of 13 L/s during the 25-mm event. This event will discharge over a period of 29 hours, exceeding the 24hr minimum (see Appendix C). The SMWF's contributing area will receive ***Enhanced*** quality treatment as the minimum permanent pool and minimum discharge requirements are met. The 25mm event storage peaks at a stage of approximately 112.32m.

5.3.2 Quantity Treatment

Two outlets are proposed to control the discharge above the extended detention storage. A 0.60m orifice with an invert of 112.9m will allow runoff to discharge at a greater rate than the quality control orifice, up to a stage of 113.5m where the spillway will engage. A 2.0m weir will be required to act as a spillway, and bypass flows in the event of outlet obstruction.

With the quantity controls provided, the peak discharge rates to the wetland (Node A) are as follows (Table 5-2).

Table 5-2: Node A Pre- vs Post-Development Peak Flows

Event	Node A (L/s)		Post < Pre?
	Pre-Dev.	Post-Dev.	
5Yr 4hr	364	294	✓
100Yr 4hr	967	858	✓

The SMWF will control the post-development peak of the north catchments to the pre-development peak, therefore **the quantity control target is achieved**.

5.3.3 Emergency Spillway

The pond was designed for events up to the 100Yr event. The maximum stage for the 100Yr event is 113.23m, resulting in a freeboard of 0.87m (exceeding the 0.3m minimum). For events exceeding the 100Yr event, and/or obstruction of an outlet, the freeboard will be used and the spillway will be used to a greater extent.

The pond is able to convey the entire 100Yr unattenuated peak flow (2.305 m^3/s) by conveying 2.172 m^3/s through the two orifice plates plus the broad crested weir, and spilling an additional 0.133 m^3/s broadly towards the wetland.

5.4 Facility Sizing – OGS Units, LID, and EZStorm Units

A series of OGS units, LID technologies, and EZStorm units are proposed to provide quality and quantity treatment to runoff from the south catchments. The EZStorms will treat the flows from catchment 402, as well as the major flows from 400 and 401 which cannot be directed to the wet pond due to topographic constraints.

5.4.1 Quality Treatment – OGS Unit, LID Technologies

An OGS unit (FD-5HC) is proposed to provide pre-treatment (grit removal) to the south areas. In addition to the OGS, technologies such as enhanced swales and vegetated contact will provide an overall treatment of 65% TSS removal (Table 5-3).

Table 5-3: South Catchments – Weighted TSS Removal

Area (ha)	TSS Removal			
	OGS	Swales	Vegetated Contact	Combined
0.28	72%			72%
0.34	72%			72%
0.30	72%			72%
0.49		65%	70%	89%
0.26				0%

Area (ha)	TSS Removal			
	OGS	Swales	Vegetated Contact	Combined
0.33	72%			72%
0.03	72%		70%	92%
0.055				0%
2.085			Average	65.4%

The combined treatment is calculated by

$$Treatment = 1 - [TSS_0 * (1 - A) * (1 - B) * (1 - C)]$$

where

TSS_0 is the initial TSS concentration
A is the TSS removal of Technology A (OGS unit)
B is the TSS removal of Technology B (Swales)
C is the TSS removal of Technology C (Vegetated Contact).

After receiving primary polishing and quantity control, the Eastfields runoff combines with the runoff from Durham St N, and receives final treatment in a DD-10 OGS unit. The proposed DD-10 will replace the existing STC 300 unit. In total, the contributing area to the DD-10 unit is 4.31ha.

Table 5-4: South Development - Combined TSS Removal

Area (ha)	Pre-treatment TSS Removal	Durham St N OGS – TSS Removal	Combined TSS Removal
2.085	65%	77%	92%
0.655	60%	77%	90.8%
1.57	N/A	77%	77%
Total – 4.31			**86.3%**

The areas contributing to Durham St N receive an average treatment of 86%, therefore ***Enhanced*** quality treatment is provided.

5.4.2 Quantity Treatment

The EZStorm units will be placed in the south Boulevard of Street A immediately west of the intersection with Durham St N. The units will provide a total volume of approximately 433 m^3 (2 units high, 74 long, and 7 wide), which includes the storage in the 600mm pipe downstream (connecting the EZStorm units and the control structure). The peak discharge from the storage system will be limited to 179 L/s which provides the required quantity treatment to achieve the pre-development target (Table 5-4). The stage-storage-discharge curve is provided in Appendix D.

Table 5-5: South Catchments Pre- vs Post-Development Peak Flows

Event	Durham St N (L/s)		Post < Pre?
	Pre-Dev.	Post-Dev.	
5Yr 4hr	151	145	✓
100Yr 4hr	412	399	✓

The EZStorm units will control the post-development peak of the south catchments to the pre-development peak, therefore **the quantity control target is achieved**.

5.5 Climate Change Event

Jewell ran the design event with the 2073 IDF curves to demonstrate the technologies' ability to provide quantity control for future storm events (Table 5-5). The following table summarizes the pre- and post-development peak flows in the 4hr Chicago event with the Climate Change IDFs (see detailed output in Appendix G):

Table 5-6: Climate Change Events – Peak Flows

Event	North Catchment Peak Flows, m^3/s		South Catchment Peak Flows, m^3/s		Post < Pre?
	Pre-Development	Post-Dev., Controlled	Pre-Development	Post-Dev., Controlled	
5Yr, 4hr CC	0.41	0.33	0.17	0.16	✓
100Yr, 4hr CC	1.03	0.91	0.44	0.42	✓

5.6 Conveyance Features

For the proposed development, Jewell used swales and culverts of varying specification to convey runoff. The conveyance features were sized as per Table 5-6 below.

Table 5-7: Conveyance Features Sizing

*	Location	Description**	RC	t_c	i	A	Peak Q	Slope	Capacity	Sufficient Capacity?
				min	mm/h	ha	L/s	%	L/s	
1	Catchment 402 and 605 Swale	V bottom, 0.3m deep	0.50	15	123	1.20	205	7.65	407	✓
2	Street B Culvert	750mm concrete, HW/D=1.25	0.36	37	66	12.70	836	N/A	850	✓
3	Wetland Ditch	1m flat bottom, 0.3m deep	0.36	37	66	12.84	845	0.5	975	✓
4	Catchment 302 Swale	1m flat bottom, 0.3m deep	0.56	15	123	0.51	98	2.0	545	✓

*	Location	Description**	RC	t_c	i	A	Peak Q	Slope	Capacity	Sufficient Capacity?
				min	mm/h	ha	L/s	%	L/s	
5	Catchment 600 Swale	1m flat bottom, 0.3m deep	0.25	15	123	4.00	341	1.0	386	✓
6	Catchment 601 Swale	1m flat bottom, 0.3m deep	0.25	15	123	3.50	298	1.0	386	✓

*See Appendix B, Page 2 for conveyance feature locations.
**Swales listed above have 3:1 side slopes.

The features have a capacity greater than the 100Yr peak flows as demonstrated, therefore adequate conveyance is provided.

6 Maintenance

The stormwater management features adopted by this plan include:

1) Wet Pond SWMF
2) OGS Units – FD-5HC and DD-10
3) EZStorm Units
4) Enhanced Swales
5) Vegetated Contact

During the first few years of operation, the developer will retain the responsibility of maintenance and will gain the experience of how the technologies perform at Eastfields. It will be important for this knowledge to be transferred to the municipality who will be the ultimate owners and operators of the facilities. The OGS Unit and pond forebay will help to focus sediment removal activities in locations that are accessible by the municipal road allowance. Sediment will collect in underground structures that may be easily removed by vacuum trucks.

6.1 Wet Pond SWMF

Good maintenance is important to ensure the proposed SWMF functions as designed. Some very simple maintenance practices are recommended that include both surveillance and general cleaning/trash removal. Some maintenance activities, such as sediment removal, take place at very infrequent intervals. The ability of the wet pond to collect sediment will diminish over time as the volume of sediment storage accumulates. Major maintenance of a facility is triggered when the effectiveness of TSS removal is reduced by 5%.

6.1.1 Routine Maintenance

Once per month the pond operators should perform a visual check including observations of:

- trash or debris collecting in the pond
- water level between events (comparing with expected levels)
- signs of leaks or material loss
- presence of public safety measures (ensuring they are still in place)

Pond operators should remove any trash that may be impeding the pond outlet structures. Additionally, grass and weeds should be cut as needed. During and after a large rainfall event the operator should also perform a visual check to see that pond elevations are within expected levels.

- Permanent Pool – 112.0m
- Quality Event storage – 112.4m
- Top of Active Storage – 113.23m (during 100Yr, 4hr event)
- Top of Berm – 114.10

6.1.2 Infrequent Maintenance

The pond will collect sediment in proportion to the construction activity or winter road maintenance of the upstream catchment area. Vehicle access will be provided to the forebay area to allow pumping to remove the water and sediment.

6.1.3 Troubleshooting

Some basic issues that can develop with a pond and the remedies are described below.

Symptom – Pond is not emptying

The outflow pipe may become blocked with debris and should be monitored after every large runoff event. Observe that the pond is not overfilling and that it is emptying out between events. Full storage for the 100-yr event should be 113.23m. Orifices have been selected to be as large as possible to allow smaller debris to pass through.

Symptom – Pond does not fill

The orifice and weir sizes should impose ponding during large runoff events. If the pond does not hold water during large events check to see the orifice plates have not been tampered with or removed.

Symptom – Pond routinely overfills

If the stored water discharges through the emergency spillway during typical rainfall events, the cause is blockage of the orifice plate and/or weir. The outlet structures should be checked for blockage by debris and cleaned if necessary. Grating on outlet pipes may also clog with vegetation and can also be a cause of poor outflow. The grating may be cleaned by raking.

6.2 OGS Units – FD-5HC and DD-10

An FD-5HC OGS unit will be placed immediately upstream of the EZStorm units. It has a sediment storage capacity of 0.84m^3, and an oil storage capacity of 1.14m^3.

The DD-10 OGS unit will be installed on Durham St N in place of the existing STC 300 unit, approx. 30m upstream of the discharge to Colborne Creek. It has a sediment storage capacity of 6.65m^3, and an oil storage capacity of 3.98m^3.

The units have separate access points for cleanout of oils and sediment, ensuring disposal of materials can be conducted separately. For more O&M information, the product brochure is provided in Appendix I.

6.3 EZStorm Units

Sediment deposition is expected in EZStorm chambers as polishing and infiltration of runoff occurs. Access to the units is provided through hatches, which can be used for maintenance or cleanout. Annual inspections are recommended to observe structure condition and sediment accumulation.

If debris has entered the chambers, it may block the outlet structure downstream. Chambers can be flushed from the surface using a high-pressure sewer cleaning device. Similarly, inspections are completed from the surface using a sewer inspection camera.

If maintenance staff observe that water is accumulated within the chambers more than 24 hours after an event has passed, they should check to see if the outlet structure and/or discharge pipe are obstructed. Municipal staff should lift the hatches and check for

- Accumulation of sediment
- Debris
- Retained Water

Further operations and maintenance information is included in Appendix J.

6.4 Enhanced Swales

Enhanced grassed swales rely on healthy grass cover and benefit from infiltration; therefore, the grass should be watered as necessary and mowed to keep the grass height between 75 mm and 150 mm. Other maintenance activities, such as weed control, removal of accumulated sediment, and trash removal, will need to be carried out to ensure the facilities continue to provide quality treatment to runoff. In addition, proper maintenance will ensure the swales can convey runoff without overtopping. The frequency of these maintenance activities will vary based on experience.

6.5 Vegetated Contact

Maintenance activities for vegetated areas include the following (Credit Valley Conservation and Toronto and Region Conservation Authority, 2010):

- Inspect for vegetation density (80% minimum coverage), damage by foot or vehicle traffic, accumulation of trash or sediment
- Water and mow vegetation regularly, maintain 50 to 150mm vegetation height
- Repair eroded or sparsely vegetated areas.

The main areas of vegetated contact in the development will occur as runoff drains over lawns. Property owners will mow lawns, remove trash and debris, and repair erosion as part of regular property upkeep.

7 Erosion and Sediment Control

Typical site development requires removal of some vegetated cover. While it is the intention to reduce vegetation removal, exposed soils from the work will be at risk of eroding into the receiving drainage system. Measures will need to be put in place to reduce erosion during construction, and for a period of up to one year after construction is completed. Typical sediment and erosion control measures include:

- Siltation fencing.
- Strawbale check dams.
- Rip-rap check dams.
- Filter sock inserts in catch basins.

Controls are to be placed downstream of all active work areas and upstream of protected receivers. Controls should also be placed around stockpiles of topsoil and fill materials.

Typical OPSDs provide good instruction on the correct placement and construction of the controls. The controls provide some protection if they are properly maintained, but they should be considered last-resort measures. The most effective means of control are those which prevent or reduce erosion at the source. This would include diligent stabilization of exposed areas immediately after grading is completed. Stabilization measures include sod, erosion blankets, or rip-rap and filter cloth on steep slopes, as well as topsoil and hydroseed on gently sloped areas (with slope 10% or less).

The site developer and contractor should actively maintain the new drainage works to remove accumulations of sediment within catch basin sumps.

A silt fence should be located along the upland perimeter of all sensitive features during the construction process, which should be maintained until the lands have stabilized or as directed by the municipality. There would be benefit in maintaining this silt fence for up to 2 growing seasons.

8 Conclusions

Fidelity Group is proposing to construct a development of approximately 212 residential units west of Durham St N in Colborne, ON. This development has an area of approximately 19.5 hectares. An additional 23.4 hectares of external lands are conveyed in this stormwater design. The following SWM treatment methodologies are proposed for the development:

- Main SWMF – Wet Pond (to Node A)
  - Permanent Pool – 2,456 m^3 (1,319 m^3 required)
  - Active Storage – 5,587 m^3 (3,784 m^3 used)
  - ***Enhanced*** quality treatment provided
- EZStorm units (to Durham St)
  - Maximum storage – 433 m^3 (including 600mm pipe downstream)
  - Peak discharge – 179 L/s
  - Pre-treatment provided through FD-5HC OGS unit upstream.
- Durham St OGS
  - DD-10 unit proposed to replace existing STC 300
- Block 143 (Apartment Block) – on-site SWM controls as part of future site plan application.

The post-development peak flows will be limited to the pre-development peaks, for each point of discharge.

Table 8-1: Summary of Peak Flows

Event	Node A (m^3/s)		Durham St N (m^3/s)		Post <= Pre?
	Pre-Dev.	Post-Dev.	Pre-Dev.	Post-Dev.	
5Yr, 4hr	0.36	0.29	0.15	0.15	✓
5Yr, 4hr CC	0.41	0.33	0.17	0.16	✓
100Yr, 4hr	0.97	0.86	0.41	0.40	✓
100Yr, 4hr CC	1.03	0.91	0.44	0.42	✓

Proper inspection and maintenance procedures are required to ensure the facilities function as intended.

Treatment to the south portion of the development will occur through a treatment train approach. Enhanced swales, vegetated contact, and an FD-5HC OGS unit will provide pre-treatment to runoff from the proposed development lands draining to Durham St N. Runoff from these areas will combine with Durham St N, and receive additional treatment through a DD-10 unit, which will replace the existing STC 300. An overall treatment of 86% will be provided, resulting in ***Enhanced*** quality treatment.

Erosion and sediment controls will be required to limit sediment transport to the receiving watercourse.

Prepared by

Andrew Rosenthal, EIT
Jewell Engineering Inc.

Reviewed by

Bryon Keene, P.Eng.
Jewell Engineering Inc.

9 References

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APPENDIX A

MTO IDF Curves

Ontario IDF CURVE LOOKUP

Active coordinate

44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Retrieved: Thu, 19 Jan 2023 16:22:56 GMT

Location summary

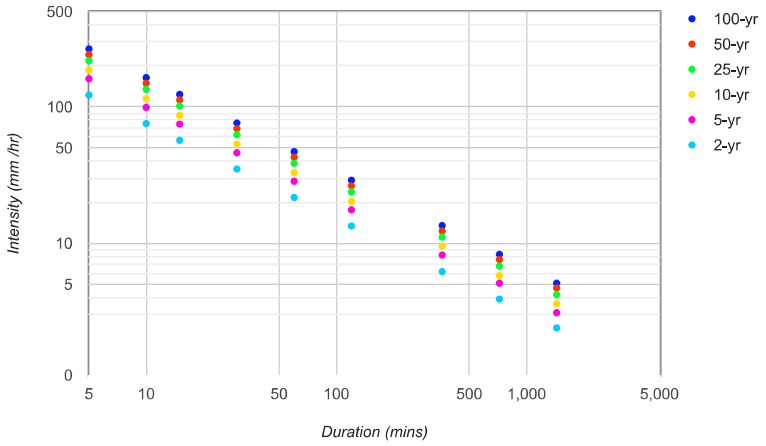
These are the locations in the selection.

IDF Curve: 44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Results

An IDF curve was found.

Coordinate: 44.012500, -77.879167
IDF curve year: 2023



Coefficient summary

IDF Curve: 44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Retrieved: Thu, 19 Jan 2023 16:22:56 GMT

Data year: 2010
IDF curve year: 2023

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	122.2	75.4	56.9	35.1	21.7	13.4	6.2	3.9	2.4
5-yr	160.8	99.2	74.8	46.1	28.5	17.6	8.2	5.1	3.1
10-yr	186.4	114.9	86.6	53.4	33.0	20.3	9.5	5.8	3.6
25-yr	218.2	134.5	101.4	62.5	38.6	23.8	11.1	6.8	4.2
50-yr	242.1	149.2	112.5	69.3	42.8	26.4	12.3	7.6	4.7
100-yr	265.9	163.9	123.5	76.2	47.0	29.0	13.5	8.3	5.1

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.2	12.6	14.2	17.6	21.7	26.8	37.2	46.8	57.6
5-yr	13.4	16.5	18.7	23.1	28.5	35.2	49.2	61.2	74.4
10-yr	15.5	19.2	21.6	26.7	33.0	40.6	57.0	69.6	86.4
25-yr	18.2	22.4	25.4	31.3	38.6	47.6	66.6	81.6	100.8
50-yr	20.2	24.9	28.1	34.6	42.8	52.8	73.8	91.2	112.8
100-yr	22.2	27.3	30.9	38.1	47.0	58.0	81.0	99.6	122.4

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Ontario IDF CURVE LOOKUP

Active coordinate

44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Retrieved: Thu, 19 Jan 2023 16:24:16 GMT

Location summary

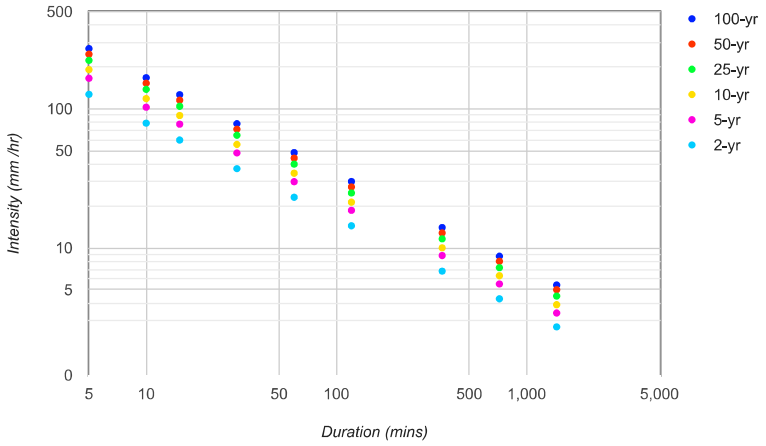
These are the locations in the selection.

IDF Curve: 44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Results

An IDF curve was found.

Coordinate: 44.012500, -77.879167
IDF curve year: 2073



Coefficient summary

IDF Curve: 44° 0' 45" N, 77° 52' 44" W (44.012500,-77.879167)

Retrieved: Thu, 19 Jan 2023 16:24:16 GMT

Data year: 2010
IDF curve year: 2073

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	127.0	78.8	59.6	37.1	23.1	14.4	6.8	4.3	2.7
5-yr	165.6	102.6	77.5	48.1	29.9	18.6	8.8	5.5	3.4
10-yr	191.2	118.3	89.4	55.4	34.4	21.3	10.0	6.3	3.9
25-yr	223.0	137.9	104.2	64.5	40.0	24.8	11.6	7.2	4.5
50-yr	246.8	152.6	115.2	71.3	44.2	27.4	12.8	8.0	5.0
100-yr	270.7	167.3	126.3	78.1	48.4	30.0	14.0	8.7	5.4

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.6	13.1	14.9	18.6	23.1	28.8	40.8	51.6	64.8
5-yr	13.8	17.1	19.4	24.1	29.9	37.2	52.8	66.0	81.6
10-yr	15.9	19.7	22.4	27.7	34.4	42.6	60.0	75.6	93.6
25-yr	18.6	23.0	26.1	32.3	40.0	49.6	69.6	86.4	108.0
50-yr	20.6	25.4	28.8	35.6	44.2	54.8	76.8	96.0	120.0
100-yr	22.6	27.9	31.6	39.0	48.4	60.0	84.0	104.4	129.6

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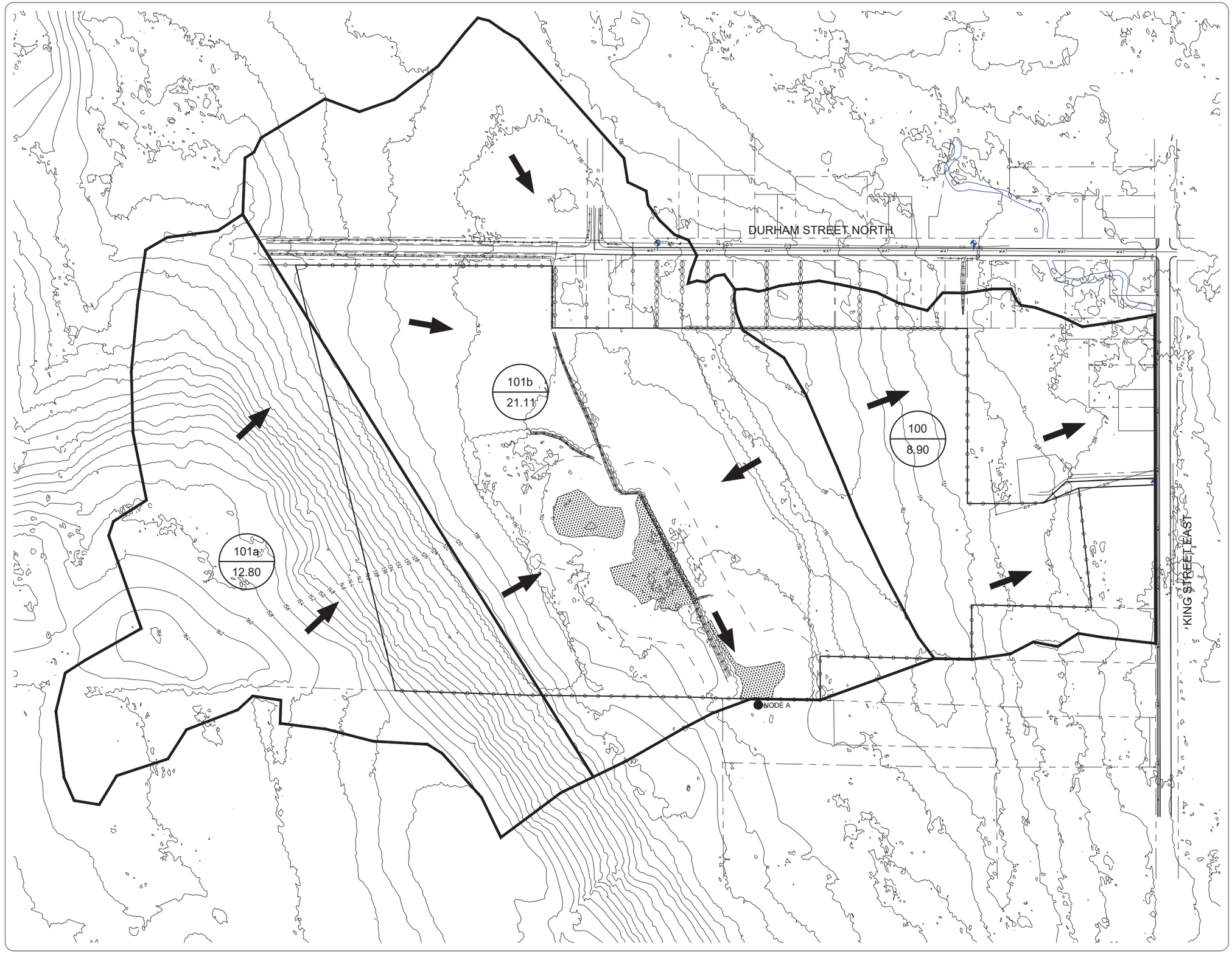
APPENDIX B

Catchment Area Drawing, OTTHYMO Schematic

09/30/2022



GENERAL NOTES:

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- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

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- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY

LEGEND

100 / 8.90 — CATCHMENT ID # / CATCHMENT AREA (ha)

FLOW DIRECTION

JEWELL ENGINEERING

EASTFIELDS SUBDIVISION
COLBORNE

FIDELITY GROUP OF COMPANIES
TOWNSHIP OF CRAMAHE

CATCHMENT PLAN
PRE-DEVELOPMENT

DRAWN BY: JGH	PROJECT NO: 210-5024	
DESIGNED BY: JGH/AMR	DATE: September 2022	
CHECKED BY: AMR	SCALE: HORIZONTAL - N/A VERTICAL - N/A	
APPROVED BY: AMR	CONTRACT NO:	DRAWING NO: B-1

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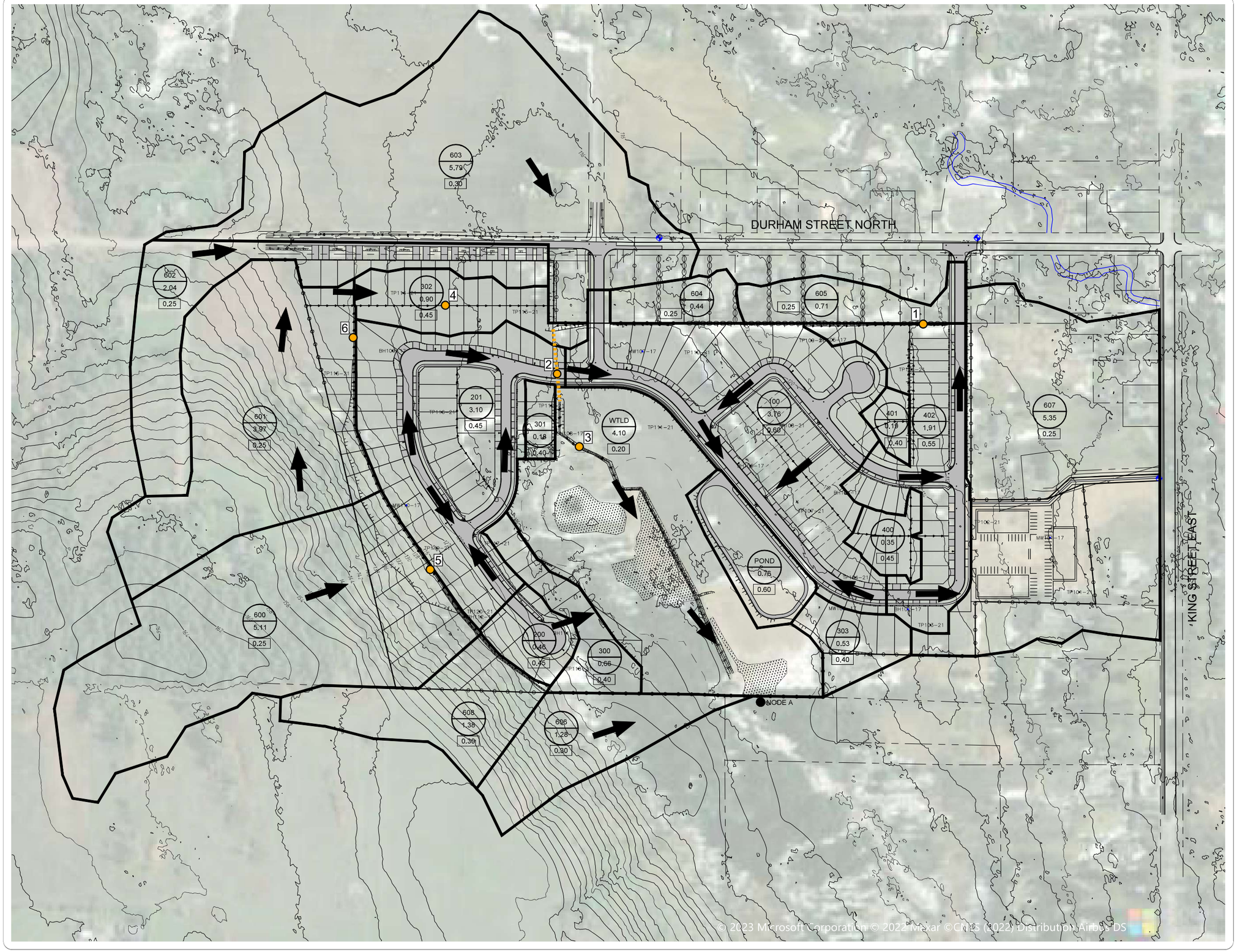
01/23/2023



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** DRAWINGS ARE NOT TO BE SCALED **

REVISIONS

NO.	DATE	DESCRIPTION	BY

LEGEND

- 607 / 5.30 — CATCHMENT ID # / CATCHMENT AREA (ha)
- 0.25 — RUNOFF COEFFICIENT
- FLOW DIRECTION
- SIZED CONVEYANCE FEATURE
- 750mm CONCRETE CULVERT

JEWELL ENGINEERING

EASTFIELDS SUBDIVISION
COLBORNE

FIDELITY GROUP OF COMPANIES
TOWNSHIP OF CRAMAHE

CATCHMENT PLAN
POST-DEVELOPMENT

DRAWN BY: JGH	PROJECT NO: 210-5024
DESIGNED BY: JGH/AMR	DATE: January 2023
CHECKED BY: AMR	SCALE: HORIZONTAL - N/A, VERTICAL - N/A
APPROVED BY: AMR	CONTRACT NO:
	DRAWING NO: B-2

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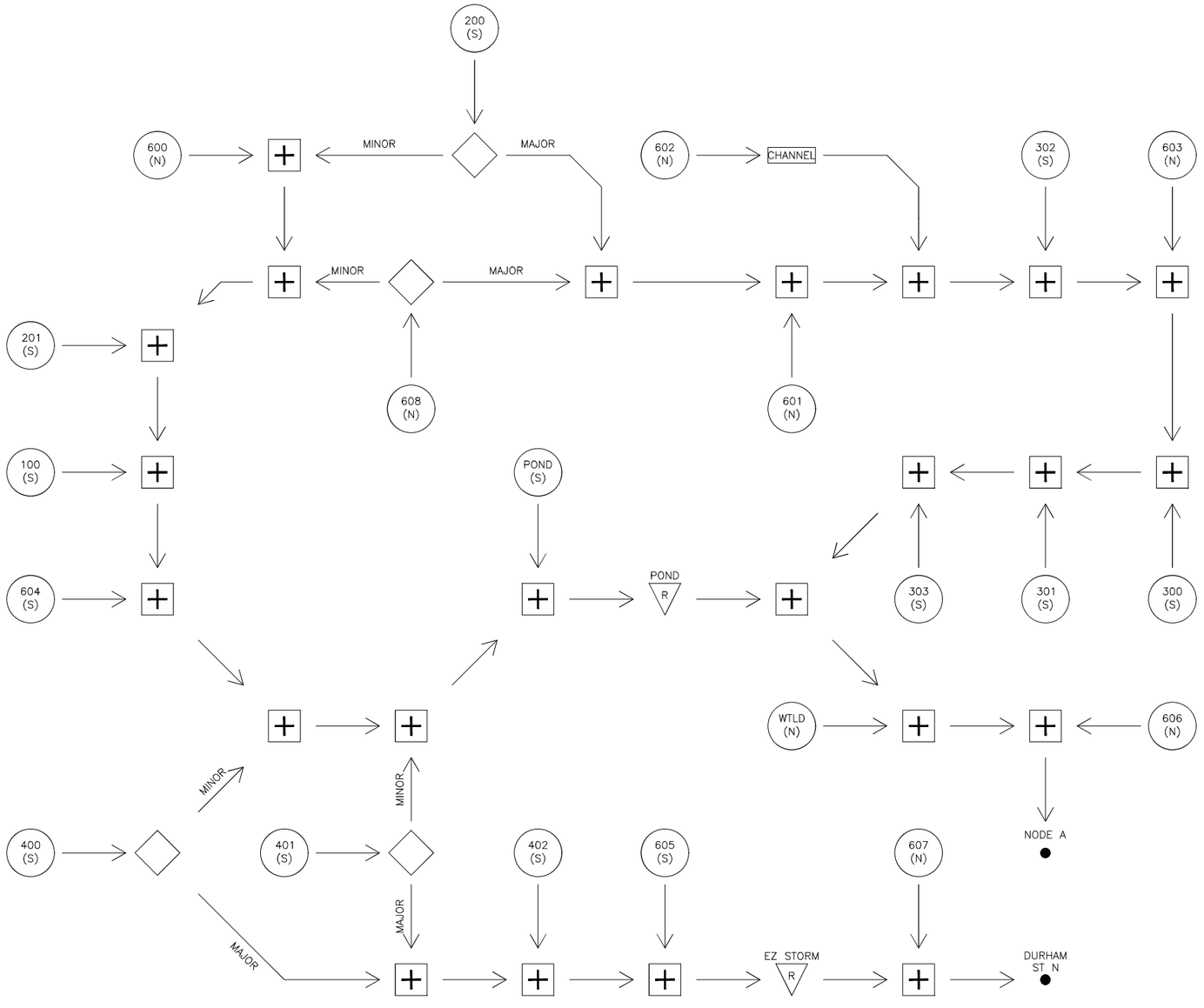
01/30/2023



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REVISIONS

NO.	DATE	DESCRIPTION	BY

LEGEND

- 600 (N) — CATCHMENT ID NASHYD
- 100 (S) — CATCHMENT ID STANDHYD
- R — RESERVOIR
- DRAINAGE CATCHMENT
- DUHYD

JEWELL ENGINEERING

EASTFIELDS SUBDIVISION
COLBORNE

FIDELITY GROUP OF COMPANIES
TOWNSHIP OF CRAMAHE

OTTHYMO SCHEMATIC

DRAWN BY: JGH	PROJECT NO: 210-5024		
DESIGNED BY: AJR	DATE: January 2023		
CHECKED BY: BK	SCALE: HORIZONTAL - N/A VERTICAL - N/A		
APPROVED BY: BK	CONTRACT NO:	DRAWING NO: B-3	

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APPENDIX C

Facility Sizing – Wet Pond

Determine Stage - Storage - Discharge Relationship

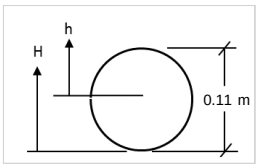
Active Storage Calculations

Full Storage Elevation (m)	**113.7**	
Depth of Active Storage (m)	**1.7**	
Bottom of Active Storage (m)	**112**	
Active Volume (cu.m)	**5,587**	*(approx)*

Select Storage Value Method **User Defined**

Select Stage Increment (m) **0.1** *(not less than 0.01 m)*

Outlet 1	Outlet 2	Outlet 3
Use Outet 1 ? **Yes**	Use Outet 2 ? **Yes**	Use Outlet 3 ? **Yes**
Orifice	**Orifice**	**Broad Crested Weir**
Formula	Formula	Formula
$Q = CA_o(2gh)^{0.5}$	Q = CAo(2gh)^(0.5)	Q = 1.67LH13/2
Invert = 112.00 m	**Invert =** 112.90 m	**Invert =** 113.50 m
Coeff = 0.60	**Coeff =** 0.60	**Length** 2.0 m
Orifice Dia = 0.110 m	**Orifice Dia =** 0.60 m	
Circular? Yes *(Select Yes or No)*		*(No End Contractions)*
Area = 0.010 m^2	Area = 0.231	
Obvert = 112.11 m	Obvert = 113.50	



					Low Flow Outlet (Orifice)			Orifice			Emergency Spillway		Total
Elevation	Length	Width	Incr Vol	Cum vol	Weir (H)	Head (h)	Flow (Q)	Head (H)	Head (h)	Flow (Q)	Head (H)	Flow (Q)	Discharge
m	m	m	m3	m3	m	m	cms	m	m	cms	m	cms	cms
112.0			0	0	0.000	-0.055	0.000	0.000	-0.300	0.000	0.000	0.000	0.000
112.1			261	261	0.100	0.045	0.005	0.000	-0.300	0.000	0.000	0.000	0.005
112.2			269	530	0.200	0.145	0.010	0.000	-0.300	0.000	0.000	0.000	0.010
112.3			277	807	0.300	0.245	0.013	0.000	-0.300	0.000	0.000	0.000	0.013
112.4			286	1,093	0.400	0.345	0.015	0.000	-0.300	0.000	0.000	0.000	0.015
112.5			294	1,387	0.500	0.445	0.017	0.000	-0.300	0.000	0.000	0.000	0.017
112.6			302	1,689	0.600	0.545	0.019	0.000	-0.300	0.000	0.000	0.000	0.019
112.7			311	2,000	0.700	0.645	0.020	0.000	-0.300	0.000	0.000	0.000	0.020
112.8			319	2,319	0.800	0.745	0.022	0.000	-0.300	0.000	0.000	0.000	0.022
112.9			328	2,647	0.900	0.845	0.023	0.000	-0.300	0.000	0.000	0.000	0.023
113.0			337	2,984	1.000	0.945	0.025	0.100	-0.200	0.004	0.000	0.000	0.029
113.1			345	3,329	1.100	1.045	0.026	0.200	-0.100	0.025	0.000	0.000	0.051
113.2			354	3,683	1.200	1.145	0.027	0.300	0.000	0.068	0.000	0.000	0.095
113.3			363	4,046	1.300	1.245	0.028	0.400	0.100	0.135	0.000	0.000	0.163
113.4			372	4,418	1.400	1.345	0.029	0.500	0.200	0.240	0.000	0.000	0.269
113.5			381	4,798	1.500	1.445	0.030	0.600	0.300	0.337	0.000	0.000	0.367
113.6			390	5,188	1.600	1.545	0.031	0.700	0.400	0.389	0.100	0.106	0.526
113.7			399	5,587	1.700	1.645	0.032	0.800	0.500	0.435	0.200	0.299	0.766
113.8			408	5,995	1.800	1.745	0.033	0.900	0.600	0.476	0.300	0.549	1.058
113.9			417	6,412	1.900	1.845	0.034	1.000	0.700	0.514	0.400	0.845	1.394
114			426	6,838	2.000	1.945	0.035	1.100	0.800	0.550	0.500	1.181	1.766
114.1			435	7,273	2.100	2.045	0.036	1.200	0.900	0.583	0.600	1.552	2.172

Forebay Sizing

Eastfields Development

Andrew Rosenthal, EIT
2023/02/01

Permanent Pool Dimensions

Length (m)=	90	Side Slope (X:1) =	3
Width (m)=	12	Depth (m) =	1.20
Bot Width (m) =	4.8		

Select Forebay Length (m) = 28

Assume 1/3 of Permanent Pool Length

Calculate Settling Length (m) = **10.1** OK

Equation 4.5 (MOE, 2003)

$$\sqrt{\quad}$$

Where:

r =	2.33	= L:W ratio of forebay
Q_p =	0.013	= Peak Outflow Rate during Quality Event (cms)
V_s =	0.0003	= Settling Velocity for 0.15mm dia particle

Calculate Dispersion Length (m) = **16.1** OK

Equation 4.6 (MOE, 2003)

$$\frac{\quad}{\quad}$$

Where:

Q =	1.209	= Inlet Flow Rate (cms)	Select an inlet flow rate from the incoming storm sewer. Defaults to 5-yr from Stage Discharge table
d =	1.2	= Depth of Permanent Pool in Forebay (m)	This is automatically selected from the Pond Sizing sheet
V_f =	0.5	= Maximum Velocity in the Forebay (m/s)	Given from MOE, 2003

Min. Forebay Deep Zone Bottom Width (m) = **2.0** OK

Equation 4.7 (MOE, 2003)

$$\frac{\quad}{\quad}$$

Where:

Dist = 16.1 = Dispersion Length (m) *from Equation 4.6*

Check Average Inflow Velocity < 0.15 (m/s) **0.12** OK

$$\frac{}{}$$

Where:

V =	Average Velocity in Forebay (m/s)	
Q =	1.209	= Inlet Flow Rate (cms)
A =	10.08	= Cross-sectional Area (m^2)

Check on Quality Drawdown Time

Top of Extended Detention	**112.5**	**Pond Control =**	**Orifice**
Top of Permanent Pool	**112**	**Orifice Size =**	**0.11 m**

Select Time Step (min)	**5**
Select Depth at "Empty" (m)	**0.05**
Starting Volume (m^3)	**868**

Results

Drawdown Time (min) **1735**

or **28.9 hrs**

Time	WSEL	Extended Detention	Depth	Outflow	Volume Released	Volume Remaining
min	m	m^3	m	cms	m^3	m^3
0	112.32	868.0	0.321	0.013	3.9	864.1
5	112.32	864.1	0.320	0.013	3.9	860.2
10	112.32	860.2	0.319	0.013	3.9	856.3
15	112.32	856.3	0.317	0.013	3.9	852.5
20	112.32	852.5	0.316	0.013	3.9	848.6
25	112.31	848.6	0.315	0.013	3.9	844.7
30	112.31	844.7	0.313	0.013	3.8	840.9
35	112.31	840.9	0.312	0.013	3.8	837.1
40	112.31	837.1	0.311	0.013	3.8	833.2
45	112.31	833.2	0.309	0.013	3.8	829.4
50	112.31	829.4	0.308	0.013	3.8	825.6
55	112.31	825.6	0.307	0.013	3.8	821.8
60	112.31	821.8	0.305	0.013	3.8	818.0
			. . .			
1675	112.05	140.1	0.054	0.003	0.8	139.3
1680	112.05	139.3	0.053	0.003	0.8	138.5
1685	112.05	138.5	0.053	0.003	0.8	137.7
1690	112.05	137.7	0.053	0.003	0.8	136.9
1695	112.05	136.9	0.052	0.003	0.8	136.1
1700	112.05	136.1	0.052	0.003	0.8	135.3
1705	112.05	135.3	0.052	0.003	0.8	134.6
1710	112.05	134.6	0.052	0.003	0.8	133.8
1715	112.05	133.8	0.051	0.003	0.8	133.0
1720	112.05	133.0	0.051	0.003	0.8	132.3
1725	112.05	132.3	0.051	0.003	0.8	131.5
1730	112.05	131.5	0.050	0.003	0.8	130.7
1735	112.05	130.7	0.050	0.002	0.7	130.0

APPENDIX D

Facility Sizing – OGS and EZStorm Units

Hydro First Defense® - HC

Hydro International

Rev. 12.5

Project Name:	**Eastfields**	*Report Date:*	**2023/02/23**
Street:	**Durham St N**	*City:*	**Colborne**
Province:	**ON**	*Country:*	
Designer:	**A.Rosenthal, EIT**	*email:*	**arosenthal@jewelleng.ca**

Paste

Treatment Parameters:

Structure ID:		
TSS Goal:	72	% Removal
TSS Particle Size:	NJDEP / ETV	
Area:	1.28	ha
Percent Impervious:		
Rational C value:	0.46	Calc. Cn
Rainfall Station:	Belleville, ONT	MAP
Peak Storm Flow:		L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	60.0%	>90%
FD-4HC	70.0%	>90%
FD-5HC	**72.0%**	**>90%**
FD-6HC	76.0%	>90%
FD-8HC	83.0%	>90%
FD-10HC	87.0%	>90%

Model Specification:

Model:	**FD-5HC**	
Diameter:	1500	mm
Peak Flow Capacity:	566.00	L/s
Sediment Storage:	0.84	m^3
Oil Storage:	1136.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:	750	mm	*OK*
Inlet Pipe 1 Size:	525	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*
Rim Level:	100.000	m	Calc Invs.
Outlet Pipe Invert:		m	*OK*
Invert Pipe 1:		m	*OK*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

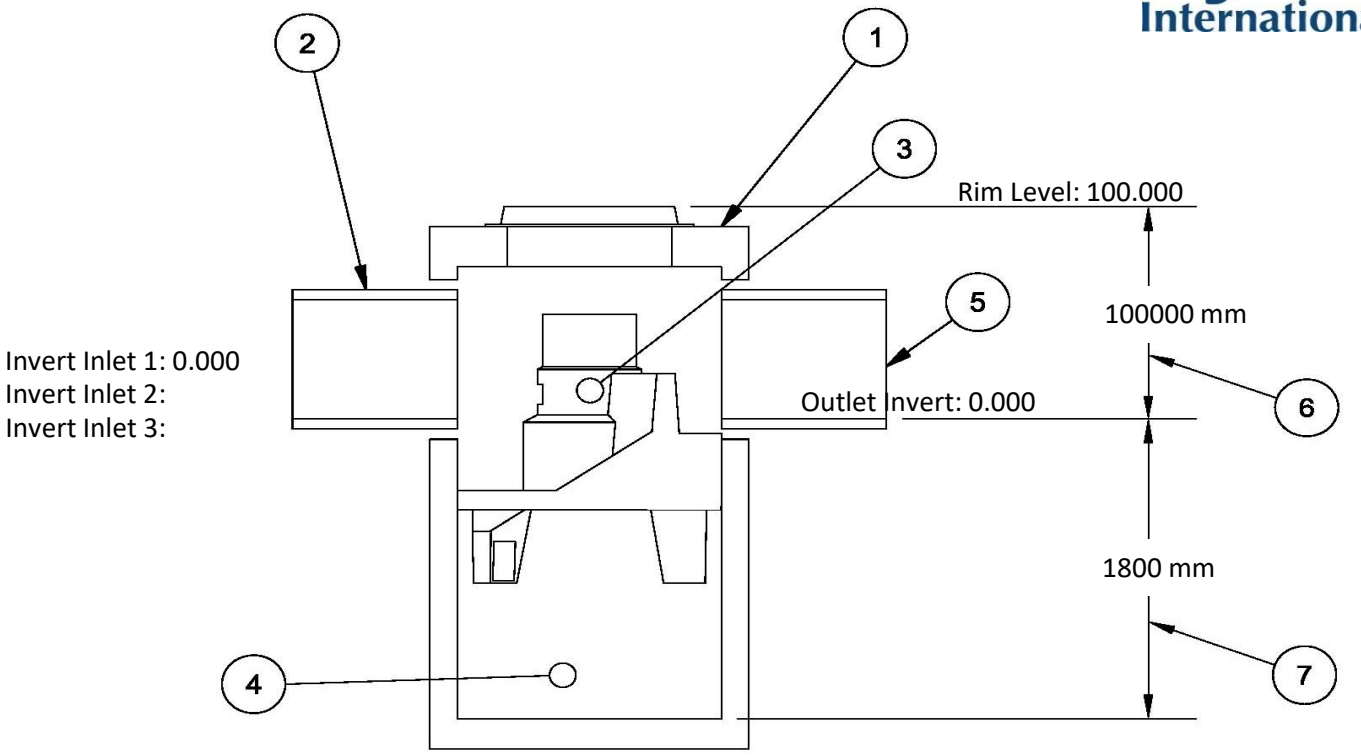
Designer Notes:

Net Annual Removal Model: FD-5HC

Intensity[1]	Fraction of Rainfall[1]	FD-5HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
0.50	0.4%	94.1%	0.4%
1.00	13.2%	86.7%	11.5%
1.50	14.0%	82.3%	11.5%
2.00	14.0%	79.2%	11.0%
2.50	3.6%	76.8%	2.7%
3.00	2.5%	74.8%	1.9%
3.50	8.4%	73.1%	6.2%
4.00	5.1%	71.7%	3.6%
4.50	1.6%	70.4%	1.1%
5.00	5.1%	69.3%	3.5%
6.00	4.8%	67.3%	3.2%
7.00	4.5%	65.6%	3.0%
8.00	3.5%	64.2%	2.3%
9.00	2.4%	62.9%	1.5%
10.00	2.5%	61.8%	1.5%
20.00	9.7%	54.3%	5.2%
30.00	2.8%	49.9%	1.4%
40.00	0.9%	46.8%	0.4%
50.00	0.4%	44.4%	0.2%
100.00	0.6%	36.9%	0.2%
150.00	0.1%	0.0%	0.0%
200.00	0.0%	0.0%	0.0%
Total Net Annual Removal Efficiency:			**72.0%**
Total Annual Runoff Volume Treated:			**>90%**

1. Rainfall Data: 1960:2007, HLY03, Belleville, ONT, 6150700 & 6150689.
2. Based in NJDEP / ETV PSD, NJDEP Test Protocols 2013.
3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Hydro First Defense® - HC



All drawing elevations are metres.

FD-5HC Specification

1	Vortex Chamber Diameter	1500	mm
2	Inlet Pipe Diameter	525	mm
3	Oil Storage Capacity	1136.00	L
4	Min. Provided Sediment Storage Capacity	0.84	m^3
5	Outlet Pipe Diameter	750	mm
6	Height(Final Grade to Outlet Invert)	100000	mm
7	Sump Depth(Outlet Invert to Sump)	1800	mm
	Total Depth	**101800**	**mm**

Notes:

Hydro Downstream Defender®

Net Annual Water Quality Worksheet

Rev. 12.5

Hydro International

Project Name:	**Eastfields**	*Report Date:*	**2023/02/23** Paste
Street:	**Durham St N**	*City:*	**Colborne**
Province:	**ON**	*Country:*	
Designer:	**A.Rosenthal, EIT**	*email:*	**arosenthal@jewelleng.ca**

Treatment Parameters

Structure ID:		
TSS Goal:	77	% Removal
TSS Particle Size:	NJDEP / ETV	
Area:	4.31	ha
Percent Impervious:		
Rational C value:	0.46 Calc Cn	
Rainfall Station:	Belleville, ONT MAP	
Peak Storm Flow:		L/s
Peak Storm Return:		yrs

RESULTS SUMMARY

Model	TSS	Volume
DD4	45.0%	>90%
DD6	60.0%	>90%
DD8	69.0%	>90%
DD10	**77.0%**	**>90%**
DD12	82.0%	>90%

Model Specification

Select Model	**DD10**		
Diameter:	3000	mm	
Peak Flow Capacity:	708.00	L/s	OK
Sediment Storage:	6.65	m^3	
Oil Storage:	3975.00	L	

Installation Configuration

Placement:	Offline		
Outlet Pipe Size:	600	mm	*750 to 600 matched invert coupler required*
Inlet Pipe 1 Size:	600	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Rim Level:	100.000	m	Calc Invs.
Outlet Pipe Invert:		m	*OK*
Invert Pipe 1:		m	*OK*
Invert Pipe 2:		m	

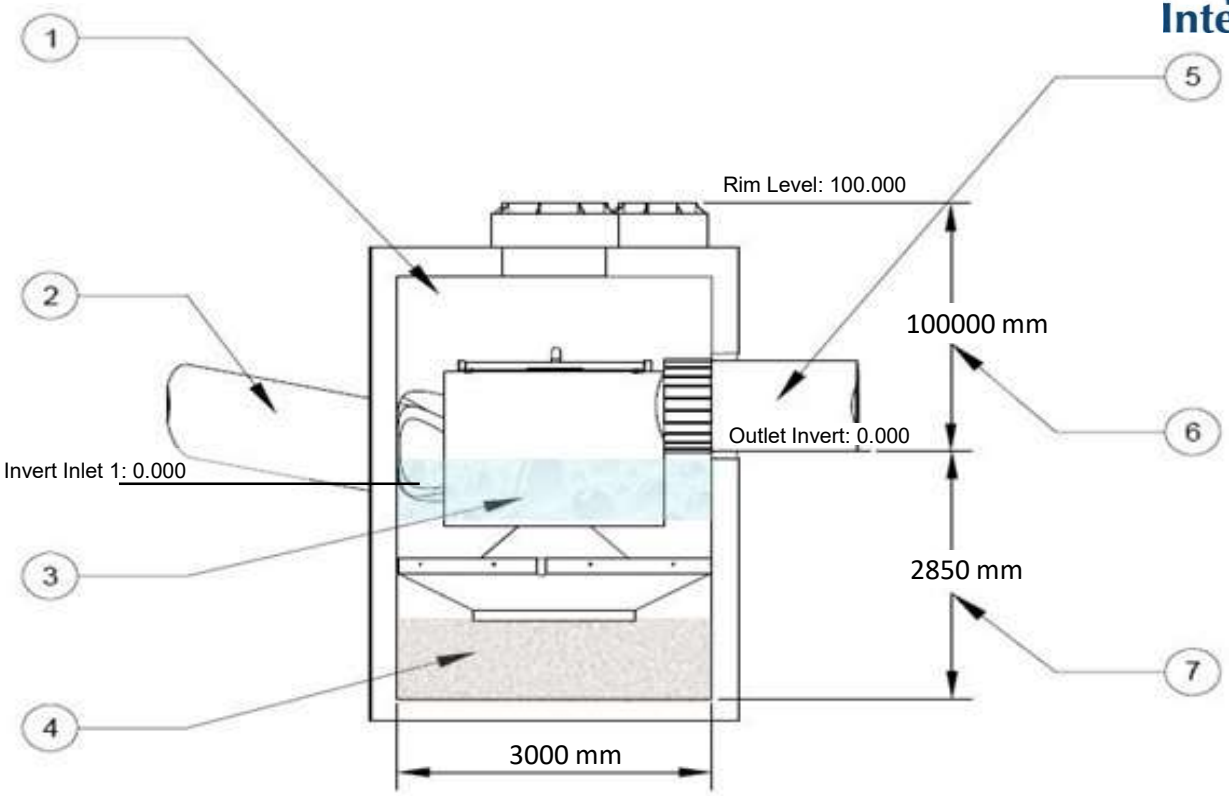
Net Annual Removal Model: DD10

Intensity[1]	Fraction of Rainfall[1]	DD10 Removal Efficiency[2]	Weighted Net Annual Efficiency[4]
(mm/hr)	(%)	(%)	(%)
0.50	0.4%	100.0%	0.42%
1.00	13.2%	100.0%	13.23%
1.50	14.0%	93.6%	13.06%
2.00	14.0%	87.2%	12.17%
2.50	3.6%	82.5%	2.93%
3.00	2.5%	78.9%	2.00%
3.50	8.4%	76.0%	6.41%
4.00	5.1%	73.5%	3.73%
4.50	1.6%	71.4%	1.12%
5.00	5.1%	69.6%	3.52%
6.00	4.8%	66.5%	3.18%
7.00	4.5%	64.1%	2.88%
8.00	3.5%	62.0%	2.18%
9.00	2.4%	60.2%	1.47%
10.00	2.5%	58.7%	1.46%
20.00	9.7%	49.5%	4.78%
30.00	2.8%	44.8%	1.24%
40.00	0.9%	41.7%	0.39%
50.00	0.4%	39.5%	0.18%
100.00	0.6%	33.3%	0.19%
150.00	0.1%	0.0%	0.00%
200.00	0.0%	0.0%	0.00%
Total Net Annual Removal Efficiency:			**77.0%**
Total Annual Runoff Volume Treated:			**>90%**

1. Rainfall Data: 1960:2007, HLY03, Belleville, ONT, 6150700 & 6150689.
2. Based in NJDEP / ETV PSD, NJDEP Test Protocols 2013.
3. Rainfall adjusted to 5 min peak intensity based on hourly average.
4. Factored to account for bypass flow.

Designer Notes:

Hydro Downstream Defender®



All drawing elevations are metres.

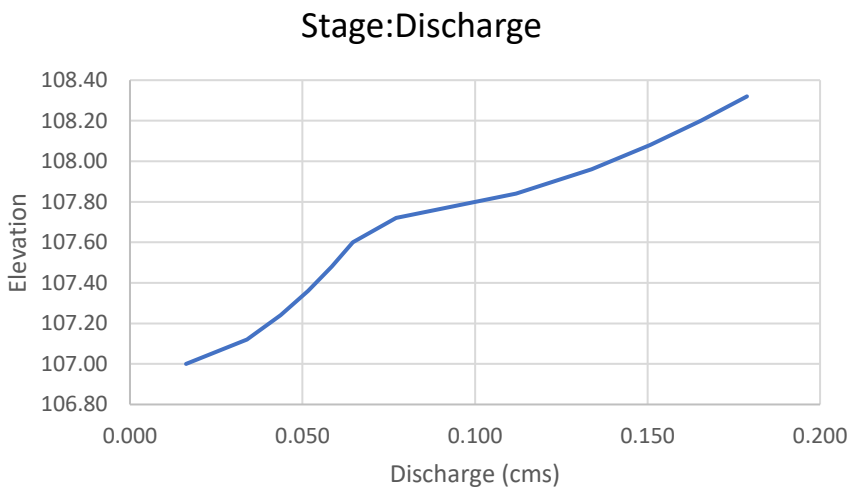
DD10 Specification

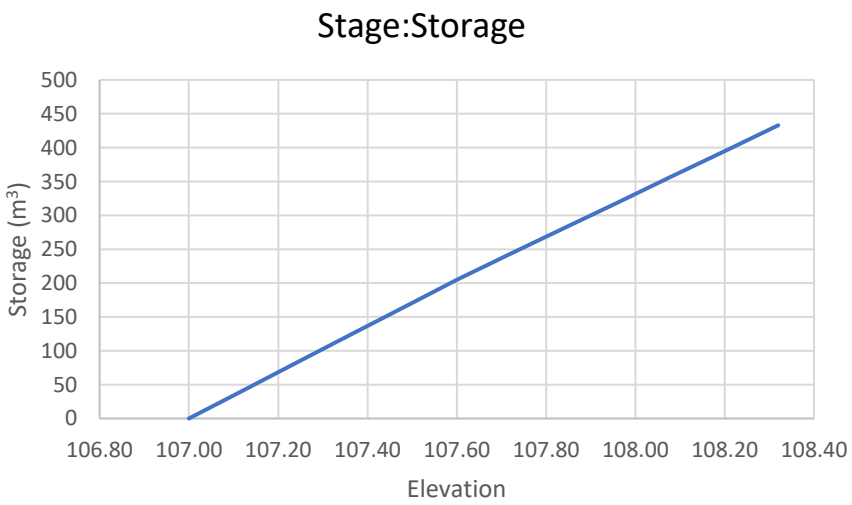
1	Vortex Chamber Diameter	3000	mm
2	Inlet Pipe Diameter	600	mm
3	Oil Storage Capacity	3975	L
4	Min. Provided Sediment Storage Capacity	6.65	m^3
5	Outlet Pipe Diameter	600	mm
6	Rim to Outlet Invert	100000	mm
7	Outlet Invert to Sump	2850	m
	Total Depth	**102850**	**mm**

Notes:

The Downstream Defender is certified by Canada ETV

Stage (m)	Storage (m^3)	Discharge (m^3/s)	Notes
106.84	-	0	Invert of 195mm orifice
107.00	0	0.016	Bottom of EZStorm storage
107.12	41	0.034	
107.24	82	0.044	
107.36	123	0.052	
107.48	164	0.058	
107.60	205	0.065	Invert of 255mm orifice
107.72	243	0.077	
107.84	281	0.112	
107.96	319	0.134	
108.08	357	0.151	
108.20	395	0.166	
108.32	433	0.179	Top of EZStorm storage





APPENDIX E

OTTHYMO Outputs – Quality Event

```
==============================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                       TIME: 10:10:41


COMMENTS: _____________________________________________________________


------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                    Eastfields Development
*
*                    25mm Event
*                    January 30, 2023
*                    Andrew Rosenthal, EIT
*
*                    Updated catchments and logic based on detailed grading
*
*                    LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                    25mm Quality Event
*******************************************************************************

--------------------
|    READ STORM    |    Filename: QUALITY.STM
| Ptotal= 25.00 mm |    Comments: 4 Hr Chicago 25mm
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .08    1.73 |  1.08    7.10 |  2.08    4.61 |  3.08    2.28
                 .17    1.83 |  1.17   10.69 |  2.17    4.21 |  3.17    2.19
                 .25    1.94 |  1.25   23.51 |  2.25    3.88 |  3.25    2.11
                 .33    2.07 |  1.33   68.86 |  2.33    3.61 |  3.33    2.04
                 .42    2.23 |  1.42   29.90 |  2.42    3.38 |  3.42    1.97
                 .50    2.41 |  1.50   17.13 |  2.50    3.18 |  3.50    1.91
```

.58	2.64	1.58	12.05	2.58	3.00	3.58	1.86
.67	2.92	1.67	9.35	2.67	2.84	3.67	1.80
.75	3.28	1.75	7.68	2.75	2.70	3.75	1.75
.83	3.74	1.83	6.55	2.83	2.58	3.83	1.70
.92	4.41	1.92	5.73	2.92	2.47	3.92	1.66
1.00	5.41	2.00	5.10	3.00	2.37	4.00	1.62

---

* Catchment 600

CALIB			
NASHYD (0001)	Area (ha)= 5.11	Curve Number (CN)= 62.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .31		

Unit Hyd Qpeak (cms)= .63

PEAK FLOW (cms)= .02 (i)
TIME TO PEAK (hrs)= 1.75
RUNOFF VOLUME (mm)= 2.26
TOTAL RAINFALL (mm)= 25.00
RUNOFF COEFFICIENT = .09

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)= 5.11
ID= 1 PCYC= 56	QPEAK (cms)= .02 (i)
DT= 5.0 min	TPEAK (hrs)= 1.75
	VOLUME (mm)= 2.26

Filename: EF600.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Catchment 200

CALIB			
STANDHYD (0001)	Area (ha)= .46		
ID= 2 DT= 5.0 min	Total Imp(%)= 40.00	Dir. Conn.(%)= 30.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	.18	.28
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	2.00
Length	(m)=	55.00	55.00
Mannings n	=	.013	.250
Max.eff.Inten.	(mm/hr)=	49.38	.00
over	(min)	10.00	235.00
Storage Coeff.	(min)=	1.92 (ii)	236.19 (ii)
Unit Hyd. Tpeak	(min)=	5.00	240.00
Unit Hyd. peak	(cms)=	.31	.01

TOTALS

```
     PEAK FLOW       (cms)=        .03          .00           .03 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08          1.42
     RUNOFF VOLUME    (mm)=      23.00          .00          6.14
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =        .92          .00           .25

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC= 35 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   6.14
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .03      1.42    6.14
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .03      1.42    6.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .02     1.75     2.26
        + ID2= 3 (0001):      .46      .03     1.42     6.14
```

```
          ================================================
          ID = 2 (0001):     5.57      .03     1.42     2.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 608
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .01 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   2.23
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .09

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .01      1.58    2.23
     ======================================================
     MAJOR SYS.(ID= 5):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):   1.38       .01      1.58    2.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 5   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 5> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
```

```
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     5.57      .03     1.42     2.58
        + ID2= 3 (0001):     1.38      .01     1.58     2.23
          ================================================
          ID = 1 (0001):     6.95      .04     1.42     2.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       420.00
     Storage Coeff.  (min)=       3.42 (ii)  420.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00       425.00
     Unit Hyd. peak  (cms)=        .26          .01
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .15          .00          .15 (iii)
     TIME TO PEAK    (hrs)=       1.50          .17         1.50
     RUNOFF VOLUME    (mm)=      23.00          .00         6.89
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .28

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
| ID= 2   PCYC= 51 |   QPEAK     (cms)=    .15 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=   6.89
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.95      .04     1.42     2.51
        + ID2= 2 (0001):     3.10      .15     1.50     6.89
          ================================================
          ID = 3 (0001):    10.05      .18     1.50     3.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       445.00
     Storage Coeff.  (min)=       3.62 (ii)  444.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00       445.00
     Unit Hyd. peak  (cms)=        .25          .01
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .30          .00          .30 (iii)
     TIME TO PEAK    (hrs)=       1.50          .17         1.50
     RUNOFF VOLUME    (mm)=      23.00          .00        11.49
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0001):     3.76      .30     1.50    11.49
        + ID2= 3 (0001):    10.05      .18     1.50     3.86
          ================================================
          ID = 2 (0001):    13.81      .48     1.50     5.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       235.00
     Storage Coeff.  (min)=       1.90 (ii)  233.60 (ii)
     Unit Hyd. Tpeak (min)=       5.00       235.00
     Unit Hyd. peak  (cms)=        .32          .01
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .01 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08         1.42
     RUNOFF VOLUME    (mm)=      23.00          .00         2.61
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .10

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC= 25 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   2.61
  Filename: EF604.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .44      .01     1.42     2.61
        + ID2= 2 (0001):    13.81      .48     1.50     5.94
          ================================================
          ID = 3 (0001):    14.25      .48     1.50     5.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 400
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .14          .21
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      48.00        48.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       220.00
     Storage Coeff.  (min)=       1.77 (ii)  217.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00       220.00
     Unit Hyd. peak  (cms)=        .32          .01
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33          .00         1.33
     RUNOFF VOLUME    (mm)=      23.00          .00         5.76
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .35
| ID= 1   PCYC= 29 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   5.76
  Filename: EF400.TXT
  Comments:
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .02      1.33    5.76
     ==================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 2):    .35       .02      1.33    5.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .35      .02     1.33     5.76
        + ID2= 3 (0001):    14.25      .48     1.50     5.84
          ==================================================
          ID = 1 (0001):    14.60      .49     1.50     5.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       185.00
     Storage Coeff.  (min)=       1.49 (ii)  183.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00       185.00
     Unit Hyd. peak  (cms)=        .33          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .01 (iii)
     TIME TO PEAK    (hrs)=       1.33          .00         1.33
     RUNOFF VOLUME    (mm)=      23.00          .00         2.99
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .12

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .
```

```
       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC= 20 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   2.99
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .01      1.33    2.99
     ================================================
     MAJOR SYS.(ID= 5):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .19       .01      1.33    2.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.60      .49     1.50     5.84
        + ID2= 3 (0001):      .19      .01     1.33     2.99
          ================================================
          ID = 8 (0001):    14.79      .49     1.50     5.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 5> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 1> IS ALSO DRY
--------------------------------------------------------------------------------
*                  Catchment 402
```

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .96          .95
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     113.00       113.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       365.00
     Storage Coeff.  (min)=       2.96 (ii)  363.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00       365.00
     Unit Hyd. peak  (cms)=        .28          .01
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .13          .00           .13 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08          1.42
     RUNOFF VOLUME    (mm)=      23.00          .00          9.19
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =        .92          .00           .37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .13 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   9.19
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 = HYDROGRAPH 0001
          ID1= 1 (0001):      .00      .00      .00     5.84
        + ID2= 2 (0001):     1.91      .13     1.42     9.19
          ================================================
```

```
          ID = 3 (0001):     1.91      .13     1.42     9.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 605
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .21          .50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      69.00        69.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       270.00
     Storage Coeff.  (min)=       2.20 (ii)  270.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00       275.00
     Unit Hyd. peak  (cms)=        .30          .01
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08         1.42
     RUNOFF VOLUME    (mm)=      23.00          .00         2.92
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .12

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .71
| ID= 1   PCYC= 31 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   2.92
  Filename: EF605.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .71      .02     1.42     2.92
        + ID2= 3 (0001):     1.91      .13     1.42     9.19
          ================================================
          ID = 2 (0001):     2.62      .15     1.42     7.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.62
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .15 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   7.49
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
     **** WARNING: NO STORAGE REQUIRED, RELEASE > INFLOW  PEAK

--------------------------------------------------------------------------------
************************************************************
*                    Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .077       .024
                            .034       .004   |     .134       .032
                            .052       .012   |     .166       .040
                            .065       .021   |     .179       .043

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      2.62       .15      1.42       7.49
     OUTFLOW: ID= 1 (0001)      2.62       .04      1.58       7.48

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 27.99
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .01

--------------------------------------------------------------------------------
************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.62
| ID= 1   PCYC= 56 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=   7.48
  Filename: EFSTOUT.TXT
```

Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* South Undeveloped, 607

CALIB					
NASHYD (0001)	Area (ha)=	5.35	Curve Number (CN)=	62.0
ID= 2 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.29		

Unit Hyd Qpeak (cms)= .70

PEAK FLOW (cms)= .02 (i)
TIME TO PEAK (hrs)= 1.75
RUNOFF VOLUME (mm)= 2.26
TOTAL RAINFALL (mm)= 25.00
RUNOFF COEFFICIENT = .09

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	5.35
ID= 2 PCYC= 56	QPEAK (cms)=	.02 (i)
DT= 5.0 min	TPEAK (hrs)=	1.75
	VOLUME (mm)=	2.26

Filename: EF607.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---

* Total to South

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	2.62	.04	1.58	7.48
	+ ID2= 2 (0001):	5.35	.02	1.75	2.26
	ID = 3 (0001):	7.97	.06	1.75	3.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

SAVE HYD (0001)	AREA (ha)=	7.97
ID= 3 PCYC= 56	QPEAK (cms)=	.06 (i)
DT= 5.0 min	TPEAK (hrs)=	1.75
	VOLUME (mm)=	3.97

Filename: EFSOUTH.TXT
Comments: Post-dev to South /z4

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
*                   Pond Catchment
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .50          .26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      71.00        71.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       275.00
     Storage Coeff.  (min)=       2.24 (ii)  275.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00       280.00
     Unit Hyd. peak  (cms)=        .30          .01
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .08          .00           .08 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08          1.42
     RUNOFF VOLUME    (mm)=      23.00          .00         13.33
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =        .92          .00           .53

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond inflow

--------------------
| ADD HYD   (0001) |
|   1 +  8 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .76      .08     1.42    13.33
        + ID2= 8 (0001):     14.79      .49     1.50     5.80
          ================================================
          ID = 2 (0001):     15.55      .53     1.50     6.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.55
| ID= 2   PCYC= 56 |   QPEAK     (cms)=    .53 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=   6.17
```

```
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
************************************************************
*                   Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .015       .109
                            .005       .026   |     .017       .139
                            .010       .053   |     .000       .000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     15.55       .53      1.50       6.17
     OUTFLOW: ID= 8 (0001)     15.55       .01      4.17       6.08

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.40
                   TIME SHIFT OF PEAK FLOW         (min)=160.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .08

--------------------------------------------------------------------------------
************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.55
| ID= 8   PCYC=548 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   4.17
--------------------   VOLUME      (mm)=   6.08
  Filename: EFSWMFQ.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 601
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69

     PEAK FLOW       (cms)=    .02 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   2.26
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .09

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC= 53 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   2.26
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

--------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0002 = HYDROGRAPH 0001
          ID1= 1 (0001):     3.97      .02     1.67     2.26
        + ID2= 9 (0001):      .00      .00      .00      .00
          ================================================
          ID = 2 (0001):     3.97      .02     1.67     2.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 602
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32

     PEAK FLOW       (cms)=    .01 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   2.51
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .10

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 1 (0001):    2.04      .01      1.67      2.51
    SHIFT ID= 3 (0001):    2.04      .01      1.75      2.51

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
```

```
| ID= 3   PCYC= 53 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.75
--------------------   VOLUME     (mm)=   2.51
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     3.97      .02     1.67     2.26
        + ID2= 3 (0001):     2.04      .01     1.75     2.51
          ================================================
          ID = 1 (0001):     6.01      .03     1.67     2.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       290.00
     Storage Coeff.  (min)=       2.35 (ii)  289.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00       290.00
     Unit Hyd. peak  (cms)=        .30          .01
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .04 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08         1.42
     RUNOFF VOLUME    (mm)=      23.00          .00         5.74
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   5.74
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.01      .03     1.67     2.34
        + ID2= 2 (0001):      .90      .04     1.42     5.74
          ================================================
          ID = 3 (0001):     6.91      .05     1.42     2.79

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   1.92
     RUNOFF VOLUME    (mm)=   3.09
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .12

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC= 61 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.92
--------------------   VOLUME     (mm)=   3.09
  Filename: EF603.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.79      .03     1.92     3.09
        + ID2= 3 (0001):     6.91      .05     1.42     2.79
          ================================================
          ID = 2 (0001):    12.70      .06     1.75     2.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 300
--------------------
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=    .66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      66.00        66.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       265.00
     Storage Coeff.  (min)=       2.14 (ii)  263.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       265.00
     Unit Hyd. peak  (cms)=        .31          .01
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.42          .08         1.42
     RUNOFF VOLUME    (mm)=      23.00          .00         4.04
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .16

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .66
| ID= 1   PCYC= 34 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   4.04
  Filename: EF300.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .66      .02     1.42     4.04
        + ID2= 2 (0001):    12.70      .06     1.75     2.92
          ================================================
          ID = 3 (0001):    13.36      .08     1.42     2.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 301
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      35.00        35.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      49.38          .00
               over (min)        10.00       180.00
     Storage Coeff.  (min)=       1.47 (ii)  180.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00       185.00
     Unit Hyd. peak  (cms)=        .33          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .01 (iii)
     TIME TO PEAK    (hrs)=       1.33          .00         1.33
     RUNOFF VOLUME    (mm)=      23.00          .00         2.99
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.00
     RUNOFF COEFFICIENT   =        .92          .00          .12

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .18
| ID= 1   PCYC= 20 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   2.99
  Filename: EF301.TXT
  Comments:
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 3 = 2		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	.18	.01	1.33	2.99
	+ ID2= 3 (0001):	13.36	.08	1.42	2.98
	ID = 2 (0001):	13.54	.09	1.42	2.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 303

CALIB		
STANDHYD (0001)	Area (ha)=	.53
ID= 1 DT= 5.0 min	Total Imp(%)=	15.00 Dir. Conn.(%)= 10.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.08	.45	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	59.00	59.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	49.38	.00	
over	(min)	10.00	245.00	
Storage Coeff.	(min)=	2.01 (ii)	246.35 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	250.00	
Unit Hyd. peak	(cms)=	.31	.01	
				TOTALS
PEAK FLOW	(cms)=	.01	.00	.01 (iii)
TIME TO PEAK	(hrs)=	1.42	.08	1.42
RUNOFF VOLUME	(mm)=	23.00	.00	1.63
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	.92	.00	.07

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	.53
ID= 1 PCYC= 23	QPEAK (cms)=	.01 (i)

```
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   1.63
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .53      .01     1.42     1.63
        + ID2= 2 (0001):     13.54      .09     1.42     2.98
          ================================================
          ID = 3 (0001):     14.07      .10     1.42     2.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):     14.07      .10     1.42     2.93
        + ID2= 8 (0001):     15.55      .01     4.17     6.08
          ================================================
          ID = 1 (0001):     29.62      .10     1.42     4.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .01 (i)
     TIME TO PEAK    (hrs)=   2.17
     RUNOFF VOLUME    (mm)=   1.93
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .08

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC= 61 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.17
```

```
--------------------   VOLUME     (mm)=   1.93
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.62      .10     1.42     4.45
        + ID2= 2 (0001):     4.10      .01     2.17     1.93
          ================================================
          ID = 3 (0001):    33.72      .10     1.42     4.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 606
--------------------
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .01 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   2.22
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =    .09

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
| ID= 1   PCYC= 50 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=   2.22
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     1.28      .01     1.58     2.22
        + ID2= 3 (0001):    33.72      .10     1.42     4.15
          ================================================
```

```
          ID = 2 (0001):    35.00      .10     1.42     4.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  35.00
| ID= 2   PCYC=548 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=   4.08
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

 FINISH
==============================================================================
```

APPENDIX F

OTTHYMO Outputs – 5Yr and 100Yr Chicago Events

```
================================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                      TIME: 10:10:41


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                   Eastfields Development
*
*                   5Yr Event
*                   January 30, 2023
*                   Andrew Rosenthal, EIT
*
*                   Updated catchments and logic based on detailed grading
*
*                   LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                   Pre-Development, 5Yr 4hr Chicago
*******************************************************************************
*                   IDF Values from MTO Lookup Tool
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 578.169
| Ptotal= 44.02 mm |                          B=   1.500
--------------------                          C=    .722
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9997
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	160.80	149.67
10.	99.20	99.14
15.	74.80	76.39
30.	46.10	47.89
60.	28.50	29.55
120.	17.60	18.07
360.	8.20	8.22
720.	5.10	4.99
1440.	3.10	3.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	3.28	1.08	11.46	2.08	7.88	3.08	4.22
.17	3.46	1.17	16.33	2.17	7.29	3.17	4.07
.25	3.65	1.25	34.23	2.25	6.79	3.25	3.94
.33	3.88	1.33	149.67	2.33	6.37	3.33	3.82
.42	4.14	1.42	43.58	2.42	6.00	3.42	3.71
.50	4.45	1.50	24.93	2.50	5.68	3.50	3.61
.58	4.82	1.58	18.15	2.58	5.40	3.58	3.51
.67	5.27	1.67	14.54	2.67	5.15	3.67	3.42
.75	5.83	1.75	12.27	2.75	4.92	3.75	3.33
.83	6.57	1.83	10.68	2.83	4.72	3.83	3.25
.92	7.58	1.92	9.51	2.92	4.54	3.92	3.17
1.00	9.05	2.00	8.61	3.00	4.37	4.00	3.10

---

* 100

CALIB					
NASHYD (0001)	Area (ha)=	8.90	Curve Number (CN)=	65.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.33		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Unit Hyd Qpeak (cms)= 1.03

PEAK FLOW (cms)= .15 (i)
TIME TO PEAK (hrs)= 1.75
RUNOFF VOLUME (mm)= 8.55
TOTAL RAINFALL (mm)= 44.02
RUNOFF COEFFICIENT = .19

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	8.90
ID= 1 PCYC= 61	QPEAK (cms)=	.15 (i)
DT= 5.0 min	TPEAK (hrs)=	1.75
	VOLUME (mm)=	8.55

Filename: EHSouPre.TXT
Comments: Pre-Development to South /z3

```
     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101a
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  12.80   Curve Number    (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   1.40

     PEAK FLOW       (cms)=    .19 (i)
     TIME TO PEAK    (hrs)=   1.75
     RUNOFF VOLUME    (mm)=   7.72
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .18

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101b
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  21.11   Curve Number    (CN)= 71.0
|ID= 2 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .85

     Unit Hyd Qpeak  (cms)=    .95

     PEAK FLOW       (cms)=    .25 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  10.53
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .24

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    12.80      .19     1.75     7.72
        + ID2= 2 (0001):    21.11      .25     2.50    10.53
          ================================================
          ID = 3 (0001):    33.91      .36     2.08     9.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  33.91
| ID= 3   PCYC= 90 |   QPEAK     (cms)=    .36 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
```

```
--------------------   VOLUME     (mm)=   9.47
  Filename: EFNorPre.TXT
  Comments: 101, Pre-development to Node A /z1

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
********************************************************************************
*                    Post-Development, 5Yr 4hr Chicago
********************************************************************************
*                    Catchment 600
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=   5.11   Curve Number    (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .63

     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   7.71
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .18

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.11
| ID= 1   PCYC= 58 |   QPEAK     (cms)=    .08 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   7.71
  Filename: EF600.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Catchment 200
--------------------
| CALIB              |
| STANDHYD  (0001) |   Area     (ha)=    .46
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .18          .28
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      55.00        55.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         5.12
               over (min)        10.00        30.00
     Storage Coeff.  (min)=       1.47 (ii)   29.52 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .33          .04
```

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=        .06          .00            .06 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75           1.33
     RUNOFF VOLUME    (mm)=      41.76         2.19          14.05
     TOTAL RAINFALL   (mm)=      44.02        44.02          44.02
     RUNOFF COEFFICIENT   =        .95          .05            .32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  14.05
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .06      1.33   14.05
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .06      1.33   14.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .08     1.67     7.71
        + ID2= 3 (0001):      .46      .06     1.33    14.05
```

```
          ================================================
          ID = 2 (0001):     5.57      .09     1.67     8.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 608
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=   7.66
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .17

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .03      1.50    7.66
     ======================================================
     MAJOR SYS.(ID= 5):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):   1.38       .03      1.50    7.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 5   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 5> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
```

```
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
          ID1= 2 (0001):      5.57       .09      1.67      8.23
        + ID2= 3 (0001):      1.38       .03      1.50      7.66
          ================================================
          ID = 1 (0001):      6.95       .11      1.67      8.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         2.05
               over (min)        10.00        75.00
     Storage Coeff.  (min)=       2.62 (ii)   74.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=        .29          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .34          .01          .34 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.58         1.42
     RUNOFF VOLUME    (mm)=      41.76         2.19        13.92
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .05          .32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
| ID= 2   PCYC= 61 |   QPEAK     (cms)=    .34 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  13.92
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.95      .11     1.67     8.12
        + ID2= 2 (0001):     3.10      .34     1.42    13.92
          ================================================
          ID = 3 (0001):    10.05      .43     1.42     9.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         3.44
               over (min)        10.00        65.00
     Storage Coeff.  (min)=       2.77 (ii)   64.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=        .28          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .68          .01          .68 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.42         1.42
     RUNOFF VOLUME    (mm)=      41.76         2.98        22.27
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .07          .51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.76      .68     1.42    22.27
        + ID2= 3 (0001):    10.05      .43     1.42     9.91
```

```
          ================================================
          ID = 2 (0001):    13.81     1.11     1.42    13.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         7.74
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.45 (ii)   24.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .33          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .00          .03 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      41.76         2.66         7.90
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .06          .18

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC= 36 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   7.90
  Filename: EF604.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .44      .03     1.33     7.90
        + ID2= 2 (0001):     13.81     1.11     1.42    13.28
          ================================================
          ID = 3 (0001):     14.25     1.12     1.42    13.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 400
--------------------
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=    .35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .14          .21
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      48.00        48.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         6.14
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.35 (ii)   25.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .33          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .04 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75         1.33
     RUNOFF VOLUME    (mm)=      41.76         2.19        13.81
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .05          .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .35
| ID= 1   PCYC= 45 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  13.81
  Filename: EF400.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
```

```
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)      (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .04      1.33   13.81
     ====================================================
     MAJOR SYS.(ID= 4):    .02       .01      1.33   13.81
     MINOR SYS.(ID= 2):    .33       .03      1.33   13.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .33      .03     1.33    13.81
        + ID2= 3 (0001):    14.25     1.12     1.42    13.11
          ================================================
          ID = 1 (0001):    14.58     1.13     1.42    13.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         6.68
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.14 (ii)   20.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .34          .05
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      41.76         1.95         8.15
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .04          .19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
```

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC= 27 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   8.15
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .02      1.33    8.15
     ================================================
     MAJOR SYS.(ID= 5):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .19       .02      1.33    8.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.58     1.13     1.42    13.13
        + ID2= 3 (0001):      .19      .02     1.33     8.15
          ================================================
          ID = 8 (0001):    14.77     1.14     1.42    13.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 5> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 = HYDROGRAPH 0004
          ID1= 4 (0001):      .02      .01     1.33    13.81
        + ID2= 5 (0001):      .00      .00      .00      .00
          ================================================
          ID = 1 (0001):      .02      .01     1.33    13.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
```

```
*                   Catchment 402
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .96          .95
     Dep. Storage     (mm)=        2.00         5.00
     Average Slope     (%)=        2.00         2.00
     Length            (m)=      113.00       113.00
     Mannings n           =        .013         .250

     Max.eff.Inten.(mm/hr)=       96.62         3.63
               over (min)         10.00        50.00
     Storage Coeff.  (min)=        2.26 (ii)   51.84 (ii)
     Unit Hyd. Tpeak (min)=        5.00        55.00
     Unit Hyd. peak  (cms)=         .30          .02
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .29          .01          .29 (iii)
     TIME TO PEAK    (hrs)=        1.42         2.25         1.42
     RUNOFF VOLUME    (mm)=       41.76         2.52        18.10
     TOTAL RAINFALL   (mm)=       44.02        44.02        44.02
     RUNOFF COEFFICIENT   =         .95          .06          .41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .29 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  18.10
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .02      .01     1.33    13.81
        + ID2= 2 (0001):     1.91      .29     1.42    18.10
          ================================================
          ID = 3 (0001):     1.93      .29     1.42    18.05
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 605

CALIB	
STANDHYD (0001)	Area (ha)= .71
ID= 1 DT= 5.0 min	Total Imp(%)= 30.00 Dir. Conn.(%)= 15.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.21	.50	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	69.00	69.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	96.62	6.45	
over	(min)	10.00	30.00	
Storage Coeff.	(min)=	1.68 (ii)	30.99 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	35.00	
Unit Hyd. peak	(cms)=	.32	.04	
				TOTALS
PEAK FLOW	(cms)=	.04	.01	.04 (iii)
TIME TO PEAK	(hrs)=	1.33	1.83	1.33
RUNOFF VOLUME	(mm)=	41.76	2.66	8.50
TOTAL RAINFALL	(mm)=	44.02	44.02	44.02
RUNOFF COEFFICIENT	=	.95	.06	.19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)= .71
ID= 1 PCYC= 48	QPEAK (cms)= .04 (i)
DT= 5.0 min	TPEAK (hrs)= 1.33
	VOLUME (mm)= 8.50

Filename: EF605.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)				
1 + 3 = 2	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	.71	.04	1.33	8.50

```
        + ID2= 3 (0001):     1.93      .29     1.42    18.05
          ================================================
          ID = 2 (0001):     2.64      .31     1.42    15.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.64
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .31 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  15.49
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT      .04        1.25
           INFLOW HYD. PEAKS AT      .31        1.42
           STOP  CONTROLLING AT      .17        1.48

           REQUIRED STORAGE VOLUME (ha.m.)=    .0063
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0409
           % OF HYDROGRAPH TO STORE       =  15.3959

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .17  (cms).

--------------------------------------------------------------------------------
**************************************************************
*                    Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .077       .024
                            .034       .004   |     .134       .032
                            .052       .012   |     .166       .040
                            .065       .021   |     .179       .043

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)        2.64       .31      1.42      15.49
     OUTFLOW: ID= 1 (0001)        2.64       .06      1.67      15.48

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.67
                    TIME SHIFT OF PEAK FLOW         (min)= 15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
**************************************************************
```

```
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.64
| ID= 1   PCYC= 59 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  15.48
  Filename: EFSTOUT.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   South Undeveloped, 607
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.35   Curve Number   (CN)= 62.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=    .70

     PEAK FLOW       (cms)=    .09 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   7.71
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .18

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.35
| ID= 2   PCYC= 58 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   7.71
  Filename: EF607.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Total to South

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     2.64      .06     1.67    15.48
        + ID2= 2 (0001):     5.35      .09     1.67     7.71
          ================================================
          ID = 3 (0001):     7.99      .15     1.67    10.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   7.99
| ID= 3   PCYC= 59 |   QPEAK     (cms)=    .15 (i)
```

```
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  10.27
  Filename: EFSOUTH.TXT
  Comments: Post-dev to South /z4

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond Catchment
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .50          .26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      71.00        71.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62        21.11
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.71 (ii)    9.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .18          .01          .18 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      41.76         2.85        25.41
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .06          .58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond inflow

--------------------
| ADD HYD   (0001) |
|   1 +  8 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .76      .18     1.33    25.41
        + ID2= 8 (0001):    14.77     1.14     1.42    13.06
          ================================================
          ID = 2 (0001):    15.53     1.21     1.42    13.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.53
| ID= 2   PCYC= 61 |   QPEAK     (cms)=   1.21 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  13.67
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
****************************************************************
*                   Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .051       .333
                            .005       .026   |     .163       .405
                            .010       .053   |     .367       .480
                            .015       .109   |     .526       .519
                            .017       .139   |    1.058       .600
                            .020       .200   |    1.394       .641
                            .023       .265   |    2.172       .727

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     15.53      1.21      1.42      13.67
     OUTFLOW: ID= 8 (0001)     15.53       .02      4.17      13.58

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.62
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .19

--------------------------------------------------------------------------------
****************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.53
| ID= 8   PCYC=769 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   4.17
--------------------   VOLUME     (mm)=  13.58
  Filename: EFSWMFQ.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 601
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69
```

```
     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   7.70
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .17

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC= 54 |   QPEAK     (cms)=    .08 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=   7.70
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

--------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0002 = HYDROGRAPH 0001
          ID1= 1 (0001):     3.97      .08     1.58     7.70
        + ID2= 9 (0001):      .00      .00      .00      .00
          ================================================
          ID = 2 (0001):     3.97      .08     1.58     7.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 602
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32

     PEAK FLOW       (cms)=    .04 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   8.52
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
```

```
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |       AREA     QPEAK     TPEAK      R.V.
-------------------       (ha)     (cms)     (hrs)      (mm)
          ID= 1 (0001):    2.04      .04      1.58      8.52
    SHIFT ID= 3 (0001):    2.04      .04      1.67      8.52

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
| ID= 3   PCYC= 55 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   8.52
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     3.97      .08     1.58     7.70
        + ID2= 3 (0001):     2.04      .04     1.67     8.52
          ==========================================================
          ID = 1 (0001):     6.01      .12     1.58     7.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         4.96
               over (min)        10.00        35.00
     Storage Coeff.  (min)=       1.80 (ii)   36.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=        .32          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .00          .09 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.92         1.33
     RUNOFF VOLUME    (mm)=      41.76         2.43        12.22
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .06          .28

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  12.22
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.01      .12     1.58     7.98
        + ID2= 2 (0001):      .90      .09     1.33    12.22
          ================================================
          ID = 3 (0001):     6.91      .13     1.58     8.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .10 (i)
     TIME TO PEAK    (hrs)=   1.83
     RUNOFF VOLUME    (mm)=  10.16
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .23

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC= 64 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.83
--------------------   VOLUME     (mm)=  10.16
  Filename: EF603.TXT
```

Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 3 = 2	ID1= 1 (0001):	5.79	.10	1.83	10.16
	+ ID2= 3 (0001):	6.91	.13	1.58	8.53
	ID = 2 (0001):	12.70	.22	1.67	9.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 300

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= .66	Total Imp(%)= 30.00	Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.20	.46	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	66.00	66.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	96.62	3.34	
over	(min)	10.00	40.00	
Storage Coeff.	(min)=	1.64 (ii)	38.76 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	40.00	
Unit Hyd. peak	(cms)=	.32	.03	
				TOTALS
PEAK FLOW	(cms)=	.05	.00	.05 (iii)
TIME TO PEAK	(hrs)=	1.33	1.92	1.33
RUNOFF VOLUME	(mm)=	41.76	1.95	9.87
TOTAL RAINFALL	(mm)=	44.02	44.02	44.02
RUNOFF COEFFICIENT	=	.95	.04	.22

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001) ID= 1 PCYC= 48 DT= 5.0 min	AREA (ha)= .66	QPEAK (cms)= .05 (i)	TPEAK (hrs)= 1.33

```
--------------------   VOLUME     (mm)=   9.87
  Filename: EF300.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .66      .05     1.33     9.87
        + ID2= 2 (0001):    12.70      .22     1.67     9.27
          ================================================
          ID = 3 (0001):    13.36      .22     1.67     9.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 301
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      35.00        35.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         6.68
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.12 (ii)   20.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .34          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      41.76         1.95         8.15
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .04          .19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .18
```

```
| ID= 1   PCYC= 27 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
-------------------   VOLUME     (mm)=   8.15
  Filename: EF301.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .18      .02     1.33     8.15
        + ID2= 3 (0001):    13.36      .22     1.67     9.30
          ================================================
          ID = 2 (0001):    13.54      .23     1.67     9.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Catchment 303
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .53
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  10.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .45
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      59.00        59.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      96.62         1.15
               over (min)        10.00        55.00
     Storage Coeff.  (min)=       1.53 (ii)   54.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=        .33          .02
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.17         1.33
     RUNOFF VOLUME    (mm)=      41.76          .99         4.52
     TOTAL RAINFALL   (mm)=      44.02        44.02        44.02
     RUNOFF COEFFICIENT   =        .95          .02          .10

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .53
| ID= 1   PCYC= 37 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   4.52
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .53      .02     1.33     4.52
        + ID2= 2 (0001):    13.54      .23     1.67     9.29
          ================================================
          ID = 3 (0001):    14.07      .23     1.67     9.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):    14.07      .23     1.67     9.11
        + ID2= 8 (0001):    15.53      .02     4.17    13.58
          ================================================
          ID = 1 (0001):    29.60      .24     1.67    11.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .04 (i)
     TIME TO PEAK    (hrs)=   2.08
     RUNOFF VOLUME    (mm)=   6.71
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .15

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC= 66 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
--------------------   VOLUME     (mm)=   6.71
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.60      .24     1.67    11.32
        + ID2= 2 (0001):     4.10      .04     2.08     6.71
          ================================================
          ID = 3 (0001):    33.70      .27     1.75    10.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 606
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=   7.68
     TOTAL RAINFALL   (mm)=  44.02
     RUNOFF COEFFICIENT   =    .17

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
| ID= 1   PCYC= 52 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=   7.68
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     1.28      .03     1.50     7.68
        + ID2= 3 (0001):    33.70      .27     1.75    10.76
          ================================================
          ID = 2 (0001):    34.98      .29     1.67    10.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  34.98
| ID= 2   PCYC=769 |   QPEAK     (cms)=    .29 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  10.65
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

```
==============================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                      TIME: 10:10:41


COMMENTS: _____________________________________________________________


------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                   Eastfields Development
*
*                   100Yr Event
*                   January 30, 2023
*                   Andrew Rosenthal, EIT
*
*                   Updated catchments and logic based on detailed grading
*
*                   LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                   Pre-Development, 100Yr 4hr Chicago
*******************************************************************************
*                   IDF Values from MTO Lookup Tool
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 960.077
| Ptotal= 72.29 mm |                          B=   1.500
--------------------                          C=    .724
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9997
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	265.90	247.60
10.	163.90	163.82
15.	123.50	126.14
30.	76.20	78.98
60.	47.00	48.66
120.	29.00	29.72
360.	13.50	13.50
720.	8.30	8.18
1440.	5.10	4.96

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	5.36	1.08	18.77	2.08	12.89	3.08	6.88
.17	5.64	1.17	26.78	2.17	11.92	3.17	6.65
.25	5.96	1.25	56.30	2.25	11.10	3.25	6.44
.33	6.33	1.33	247.60	2.33	10.41	3.33	6.24
.42	6.76	1.42	71.73	2.42	9.80	3.42	6.05
.50	7.26	1.50	40.93	2.50	9.28	3.50	5.88
.58	7.87	1.58	29.77	2.58	8.82	3.58	5.72
.67	8.60	1.67	23.83	2.67	8.41	3.67	5.57
.75	9.53	1.75	20.09	2.75	8.04	3.75	5.43
.83	10.74	1.83	17.49	2.83	7.71	3.83	5.30
.92	12.39	1.92	15.57	2.92	7.41	3.92	5.17
1.00	14.81	2.00	14.08	3.00	7.13	4.00	5.05

---

* 100

CALIB					
NASHYD (0001)	Area (ha)=	8.90	Curve Number (CN)=	65.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.33		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Unit Hyd Qpeak (cms)= 1.03

PEAK FLOW (cms)= .41 (i)
TIME TO PEAK (hrs)= 1.67
RUNOFF VOLUME (mm)= 21.95
TOTAL RAINFALL (mm)= 72.29
RUNOFF COEFFICIENT = .30

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	8.90
ID= 1 PCYC= 63	QPEAK (cms)=	.41 (i)
DT= 5.0 min	TPEAK (hrs)=	1.67
	VOLUME (mm)=	21.95

Filename: EHSouPre.TXT
Comments: Pre-Development to South /z3

```
     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101a
--------------------
| CALIB              |
| NASHYD    (0001)   |   Area     (ha)=  12.80   Curve Number    (CN)= 62.0
|ID= 1 DT= 5.0 min   |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   1.40

     PEAK FLOW       (cms)=    .52 (i)
     TIME TO PEAK    (hrs)=   1.75
     RUNOFF VOLUME    (mm)=  20.08
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101b
--------------------
| CALIB              |
| NASHYD    (0001)   |   Area     (ha)=  21.11   Curve Number    (CN)= 71.0
|ID= 2 DT= 5.0 min   |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .85

     Unit Hyd Qpeak  (cms)=    .95

     PEAK FLOW       (cms)=    .63 (i)
     TIME TO PEAK    (hrs)=   2.42
     RUNOFF VOLUME    (mm)=  26.20
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .36

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    12.80      .52     1.75    20.08
        + ID2= 2 (0001):    21.11      .63     2.42    26.20
          ================================================
          ID = 3 (0001):    33.91      .97     2.00    23.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  33.91
| ID= 3   PCYC= 95 |   QPEAK     (cms)=    .97 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.00
```

```
--------------------   VOLUME     (mm)=  23.89
  Filename: EFNorPre.TXT
  Comments: 101, Pre-development to Node A /z1

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
********************************************************************************
*                   Post-Development, 100Yr 4hr Chicago
********************************************************************************
*                   Catchment 600
--------------------
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   5.11   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .63

     PEAK FLOW       (cms)=    .22 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=  20.07
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.11
| ID= 1   PCYC= 60 |   QPEAK     (cms)=    .22 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  20.07
  Filename: EF600.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 200
--------------------
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=    .46
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .18          .28
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      55.00        55.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        90.73
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.20 (ii)   10.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
```

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=        .09          .04            .10 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      69.87        12.96          30.03
     TOTAL RAINFALL   (mm)=      72.29        72.29          72.29
     RUNOFF COEFFICIENT   =        .97          .18            .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  30.03
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .10      1.33   30.03
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .10      1.33   30.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .22     1.67    20.07
        + ID2= 3 (0001):      .46      .10     1.33    30.03
```

```
          ================================================
          ID = 2 (0001):     5.57      .25     1.58    20.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
*                   Catchment 608
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .09 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=  19.98
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .09      1.50   19.98
     ====================================================
     MAJOR SYS.(ID= 5):    .01       .00      1.50   19.98
     MINOR SYS.(ID= 3):   1.37       .09      1.50   19.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .01
| ID= 5   PCYC= 19 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  19.98
  Filename: EF608maj.TXT
  Comments: 608 major

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 = HYDROGRAPH 0001
          ID1= 4 (0001):      .00      .00      .00      .00
```

```
        + ID2= 5 (0001):      .01      .00     1.50    19.98
          ================================================
          ID = 9 (0001):      .01      .00     1.50    19.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     5.57      .25     1.58    20.89
        + ID2= 3 (0001):     1.37      .09     1.50    19.98
          ================================================
          ID = 1 (0001):     6.94      .33     1.58    20.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        36.29
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       2.14 (ii)   24.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .31          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .59          .12          .61 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.75         1.42
     RUNOFF VOLUME    (mm)=      69.87        12.96        30.01
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .18          .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
```

```
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .61 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  30.01
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.94      .33     1.58    20.71
        + ID2= 2 (0001):     3.10      .61     1.42    30.01
          ================================================
          ID = 3 (0001):    10.04      .87     1.42    23.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        42.69
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       2.26 (ii)   24.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .30          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.18          .12          1.20 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.75          1.42
     RUNOFF VOLUME    (mm)=      69.87        14.23         42.03
     TOTAL RAINFALL   (mm)=      72.29        72.29         72.29
     RUNOFF COEFFICIENT   =        .97          .20           .58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.76     1.20     1.42    42.03
        + ID2= 3 (0001):    10.04      .87     1.42    23.58
          ================================================
          ID = 2 (0001):    13.80     2.07     1.42    28.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        66.41
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.19 (ii)   11.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .04          .06 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      69.87        13.67        21.90
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .19          .30

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC= 45 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  21.90
```

Filename: EF604.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	.44	.06	1.33	21.90
	+ ID2= 2 (0001):	13.80	2.07	1.42	28.61
	ID = 3 (0001):	14.24	2.11	1.42	28.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 400

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= .35 Total Imp(%)= 40.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.14	.21	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	48.00	48.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	159.67	90.73	
over	(min)	10.00	10.00	
Storage Coeff.	(min)=	1.11 (ii)	9.72 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	.34	.11	
				TOTALS
PEAK FLOW	(cms)=	.07	.03	.09 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	69.87	12.96	30.03
TOTAL RAINFALL	(mm)=	72.29	72.29	72.29
RUNOFF COEFFICIENT	=	.97	.18	.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001) ID= 1 PCYC= 48	AREA (ha)= .35 QPEAK (cms)= .09 (i)

```
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  30.03
  Filename: EF400.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .09      1.33   30.03
     ==================================================
     MAJOR SYS.(ID= 4):    .08       .06      1.33   30.03
     MINOR SYS.(ID= 2):    .27       .03      1.33   30.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .27      .03     1.33    30.03
        + ID2= 3 (0001):    14.24     2.11     1.42    28.40
          ================================================
          ID = 1 (0001):    14.51     2.14     1.42    28.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        86.29
               over (min)       10.00        10.00
     Storage Coeff.  (min)=        .93 (ii)   10.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .02          .04 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      69.87        12.58        22.15
```

```
     TOTAL RAINFALL   (mm)=      72.29        72.29          72.29
     RUNOFF COEFFICIENT   =        .97          .17            .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC= 31 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  22.15
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .04      1.33   22.15
     ====================================================
     MAJOR SYS.(ID= 5):    .04       .02      1.33   22.15
     MINOR SYS.(ID= 3):    .15       .02      1.33   22.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.51     2.14     1.42    28.43
        + ID2= 3 (0001):      .15      .02     1.33    22.15
          ================================================
          ID = 8 (0001):    14.66     2.16     1.42    28.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 4 (0001):      .08      .06     1.33    30.03
```

```
        + ID2= 5 (0001):      .04      .02     1.33    22.15
          ================================================
          ID = 1 (0001):      .12      .07     1.33    27.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 402
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .96          .95
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     113.00       113.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        48.47
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.85 (ii)   19.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .32          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .50          .08          .52 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.33
     RUNOFF VOLUME    (mm)=      69.87        13.47        36.01
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .19          .50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .52 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  36.01
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .12      .07     1.33    27.24
        + ID2= 2 (0001):     1.91      .52     1.33    36.01
          ================================================
          ID = 3 (0001):     2.03      .59     1.33    35.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 605
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .21          .50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      69.00        69.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        66.41
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       1.38 (ii)   12.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .06          .09 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      69.87        13.67        22.10
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .19          .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .71
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  22.10
  Filename: EF605.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .71      .09     1.33    22.10
        + ID2= 3 (0001):     2.03      .59     1.33    35.47
          ================================================
          ID = 2 (0001):     2.74      .68     1.33    32.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.74
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .68 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  32.01
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT      .00         .34
           INFLOW HYD. PEAKS AT      .68        1.33
           STOP  CONTROLLING AT      .17        1.66

           REQUIRED STORAGE VOLUME (ha.m.)=    .0269
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0879
           % OF HYDROGRAPH TO STORE       =  30.5620

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .17  (cms).

--------------------------------------------------------------------------------
************************************************************
*                   Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .000       .000     |     .077       .024
                          .034       .004     |     .134       .032
                          .052       .012     |     .166       .040
                          .065       .021     |     .179       .043

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      2.74       .68      1.33      32.01
     OUTFLOW: ID= 1 (0001)      2.74       .15      1.67      32.01
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.56
                    TIME SHIFT OF PEAK FLOW         (min)= 20.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .04

--------------------------------------------------------------------------------
********************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.74
| ID= 1   PCYC= 63 |   QPEAK     (cms)=    .15 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  32.01
  Filename: EFSTOUT.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    South Undeveloped, 607
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.35   Curve Number   (CN)= 62.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=    .70

     PEAK FLOW       (cms)=    .25 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=  20.07
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.35
| ID= 2   PCYC= 60 |   QPEAK     (cms)=    .25 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  20.07
  Filename: EF607.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Total to South

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     2.74      .15     1.67    32.01
        + ID2= 2 (0001):     5.35      .25     1.67    20.07
          ================================================
          ID = 3 (0001):     8.09      .40     1.67    24.11
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| SAVE HYD  (0001) |   AREA       (ha)=   8.09
| ID= 3   PCYC= 63 |   QPEAK     (cms)=    .40 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
                     VOLUME      (mm)=  24.11
```

Filename: EFSOUTH.TXT
Comments: Post-dev to South /z4

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
*                   Pond Catchment
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.50	.26	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	71.00	71.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	159.67	103.53	
over	(min)	10.00	10.00	
Storage Coeff.	(min)=	1.40 (ii)	8.07 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	.33	.13	
				TOTALS
PEAK FLOW	(cms)=	.30	.05	.32 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	69.87	13.97	46.39
TOTAL RAINFALL	(mm)=	72.29	72.29	72.29
RUNOFF COEFFICIENT	=	.97	.19	.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
*                   Pond inflow

| ADD HYD   (0001) |
|   1 +  8 =  2    |          AREA    QPEAK    TPEAK     R.V.
                             (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .76      .32     1.33    46.39
```

```
        + ID2= 8 (0001):    14.66     2.16     1.42    28.37
          ================================================
          ID = 2 (0001):    15.42     2.31     1.42    29.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.42
| ID= 2   PCYC= 60 |   QPEAK     (cms)=   2.31 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  29.26
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
************************************************************
*                    Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000       .000    |     .051       .333
                           .005       .026    |     .163       .405
                           .010       .053    |     .367       .480
                           .015       .109    |     .526       .519
                           .017       .139    |    1.058       .600
                           .020       .200    |    1.394       .641
                           .023       .265    |    2.172       .727

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     15.42      2.31      1.42      29.26
     OUTFLOW: ID= 8 (0001)     15.42       .11      3.67      28.99

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.94
                   TIME SHIFT OF PEAK FLOW         (min)=135.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .37

--------------------------------------------------------------------------------
************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.42
| ID= 8   PCYC=961 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   3.67
--------------------   VOLUME     (mm)=  28.99
  Filename: EFSWMFQ.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Catchment 601
--------------------
```

```
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69

     PEAK FLOW       (cms)=    .22 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=  20.05
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC= 56 |   QPEAK     (cms)=    .22 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
-------------------   VOLUME     (mm)=  20.05
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

-------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.97      .22     1.58    20.05
        + ID2= 9 (0001):      .01      .00     1.50    19.98
          ================================================
          ID = 2 (0001):     3.98      .22     1.58    20.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 602
-------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32

     PEAK FLOW       (cms)=    .12 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=  21.92
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .30

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 1 (0001):    2.04      .12      1.58     21.92
    SHIFT ID= 3 (0001):    2.04      .12      1.67     21.92

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
| ID= 3   PCYC= 57 |   QPEAK     (cms)=    .12 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  21.92
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     3.98      .22     1.58    20.05
        + ID2= 3 (0001):     2.04      .12     1.67    21.92
          ================================================
          ID = 1 (0001):     6.02      .33     1.58    20.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        63.45
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.47 (ii)   14.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .15          .07          .17 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
```

```
     RUNOFF VOLUME    (mm)=      69.87        13.32          27.46
     TOTAL RAINFALL   (mm)=      72.29        72.29          72.29
     RUNOFF COEFFICIENT   =        .97          .18            .38

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .17 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  27.46
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.02      .33     1.58    20.69
        + ID2= 2 (0001):      .90      .17     1.33    27.46
          ================================================
          ID = 3 (0001):     6.92      .40     1.58    21.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .27 (i)
     TIME TO PEAK    (hrs)=   1.83
     RUNOFF VOLUME    (mm)=  25.43
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .35

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
```

```
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC= 66 |   QPEAK     (cms)=    .27 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.83
--------------------   VOLUME     (mm)=  25.43
  Filename: EF603.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.79      .27     1.83    25.43
        + ID2= 3 (0001):     6.92      .40     1.58    21.57
          ================================================
          ID = 2 (0001):    12.71      .61     1.67    23.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 300
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      66.00        66.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        57.53
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.34 (ii)   13.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .05          .10 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      69.87        12.58        24.04
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .17          .33

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .66
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  24.04
  Filename: EF300.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .66      .10     1.33    24.04
        + ID2= 2 (0001):    12.71      .61     1.67    23.33
          ================================================
          ID = 3 (0001):    13.37      .66     1.58    23.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 301
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      35.00        35.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        86.29
               over (min)       10.00        10.00
     Storage Coeff.  (min)=        .92 (ii)    9.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .02          .03 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      69.87        12.58        21.99
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .17          .30

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .18
| ID= 1   PCYC= 30 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  21.99
  Filename: EF301.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .18      .03     1.33    21.99
        + ID2= 3 (0001):    13.37      .66     1.58    23.36
          ================================================
          ID = 2 (0001):    13.55      .67     1.58    23.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 303
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .53
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .45
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      59.00        59.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     159.67        47.07
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.25 (ii)   13.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .04          .05 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      69.87        11.11        16.55
     TOTAL RAINFALL   (mm)=      72.29        72.29        72.29
     RUNOFF COEFFICIENT   =        .97          .15          .23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
```

```
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .53
| ID= 1   PCYC= 39 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  16.55
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .53      .05     1.33    16.55
        + ID2= 2 (0001):    13.55      .67     1.58    23.34
          ================================================
          ID = 3 (0001):    14.08      .70     1.58    23.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                  Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):    14.08      .70     1.58    23.09
        + ID2= 8 (0001):    15.42      .11     3.67    28.99
          ================================================
          ID = 1 (0001):    29.50      .72     1.58    26.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                  Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .11 (i)
     TIME TO PEAK    (hrs)=   2.08
     RUNOFF VOLUME    (mm)=  17.80
```

```
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .25

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC= 70 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
--------------------   VOLUME     (mm)=  17.80
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.50      .72     1.58    26.14
        + ID2= 2 (0001):     4.10      .11     2.08    17.80
          ================================================
          ID = 3 (0001):    33.60      .78     1.58    25.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 606
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=  20.01
     TOTAL RAINFALL   (mm)=  72.29
     RUNOFF COEFFICIENT   =    .28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
| ID= 1   PCYC= 53 |   QPEAK     (cms)=    .08 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  20.01
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     1.28      .08     1.50    20.01
        + ID2= 3 (0001):    33.60      .78     1.58    25.12
          ================================================
          ID = 2 (0001):    34.88      .86     1.58    24.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  34.88
| ID= 2   PCYC=961 |   QPEAK     (cms)=    .86 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=  24.93
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

APPENDIX G

OTTHYMO Outputs – Climate Change Events

```
================================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                      TIME: 10:10:41


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                   Eastfields Development
*
*                   5Yr Climate Change Event
*                   January 30, 2023
*                   Andrew Rosenthal, EIT
*
*                   Updated catchments and logic based on detailed grading
*
*                   LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                   Pre-Development, 5Yr 4hr CC Chicago
*******************************************************************************
*                   IDF Values from MTO Lookup Tool
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 580.949
| Ptotal= 46.98 mm |                          B=   1.500
--------------------                          C=    .711
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9996
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	165.60	153.52
10.	102.60	102.33
15.	77.50	79.16
30.	48.10	49.98
60.	29.90	31.06
120.	18.60	19.14
360.	8.80	8.82
720.	5.50	5.39
1440.	3.40	3.30

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	3.64	1.08	12.43	2.08	8.60	3.08	4.65
.17	3.83	1.17	17.58	2.17	7.97	3.17	4.50
.25	4.04	1.25	36.25	2.25	7.43	3.25	4.36
.33	4.29	1.33	153.52	2.33	6.97	3.33	4.22
.42	4.57	1.42	45.94	2.42	6.58	3.42	4.10
.50	4.90	1.50	26.61	2.50	6.24	3.50	3.99
.58	5.30	1.58	19.50	2.58	5.93	3.58	3.88
.67	5.79	1.67	15.69	2.67	5.66	3.67	3.78
.75	6.40	1.75	13.28	2.75	5.42	3.75	3.69
.83	7.20	1.83	11.60	2.83	5.20	3.83	3.60
.92	8.28	1.92	10.35	2.92	5.00	3.92	3.51
1.00	9.86	2.00	9.38	3.00	4.82	4.00	3.43

---

* 100

CALIB					
NASHYD (0001)	Area (ha)=	8.90	Curve Number (CN)=	65.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.33		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Unit Hyd Qpeak (cms)= 1.03

PEAK FLOW (cms)= .17 (i)
TIME TO PEAK (hrs)= 1.75
RUNOFF VOLUME (mm)= 9.73
TOTAL RAINFALL (mm)= 46.98
RUNOFF COEFFICIENT = .21

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	8.90
ID= 1 PCYC= 61	QPEAK (cms)=	.17 (i)
DT= 5.0 min	TPEAK (hrs)=	1.75
	VOLUME (mm)=	9.73

Filename: EHSouPre.TXT
Comments: Pre-Development to South /z3

```
     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101a
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  12.80   Curve Number    (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   1.40

     PEAK FLOW       (cms)=    .21 (i)
     TIME TO PEAK    (hrs)=   1.75
     RUNOFF VOLUME    (mm)=   8.80
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101b
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  21.11   Curve Number    (CN)= 71.0
|ID= 2 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .85

     Unit Hyd Qpeak  (cms)=    .95

     PEAK FLOW       (cms)=    .28 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  11.94
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .25

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    12.80      .21     1.75     8.80
        + ID2= 2 (0001):    21.11      .28     2.50    11.94
          ================================================
          ID = 3 (0001):    33.91      .41     2.08    10.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  33.91
| ID= 3   PCYC= 91 |   QPEAK     (cms)=    .41 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
```

```
--------------------   VOLUME     (mm)=  10.76
  Filename: EFNorPre.TXT
  Comments: 101, Pre-development to Node A /z1

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
********************************************************************************
*                   Post-Development, 5Yr 4hr CC Chicago
********************************************************************************
*                   Catchment 600
--------------------
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   5.11   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .63

     PEAK FLOW       (cms)=    .09 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   8.79
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.11
| ID= 1   PCYC= 59 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   8.79
  Filename: EF600.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 200
--------------------
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=    .46
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .18          .28
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      55.00        55.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         7.39
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.45 (ii)   25.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .33          .04
```

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=        .06          .00            .06 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75           1.33
     RUNOFF VOLUME    (mm)=      44.69         2.64          15.25
     TOTAL RAINFALL   (mm)=      46.98        46.98          46.98
     RUNOFF COEFFICIENT   =        .95          .06            .32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  15.25
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .06      1.33   15.25
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .06      1.33   15.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .09     1.67     8.79
        + ID2= 3 (0001):      .46      .06     1.33    15.25
```

```
          ================================================
          ID = 2 (0001):     5.57      .10     1.67     9.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 608
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .04 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=   8.73
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .04      1.50    8.73
     ======================================================
     MAJOR SYS.(ID= 5):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):   1.38       .04      1.50    8.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 5   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 5> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
```

```
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     5.57      .10     1.67     9.33
        + ID2= 3 (0001):     1.38      .04     1.50     8.73
          ================================================
          ID = 1 (0001):     6.95      .13     1.67     9.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         2.84
               over (min)        10.00        65.00
     Storage Coeff.  (min)=       2.59 (ii)   65.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=        .29          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .35          .01          .35 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.50         1.42
     RUNOFF VOLUME    (mm)=      44.69         2.64        15.13
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .06          .32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
| ID= 2   PCYC= 60 |   QPEAK     (cms)=    .35 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  15.13
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.95      .13     1.67     9.21
        + ID2= 2 (0001):     3.10      .35     1.42    15.13
          ================================================
          ID = 3 (0001):    10.05      .45     1.42    11.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         4.67
               over (min)        10.00        55.00
     Storage Coeff.  (min)=       2.73 (ii)   57.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=        .29          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .70          .01          .70 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.33         1.42
     RUNOFF VOLUME    (mm)=      44.69         3.42        23.97
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .07          .51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.76      .70     1.42    23.97
        + ID2= 3 (0001):    10.05      .45     1.42    11.03
```

```
          ================================================
          ID = 2 (0001):    13.81     1.15     1.42    14.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         9.04
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.44 (ii)   23.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .33          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .01          .03 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      44.69         3.10         8.74
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .07          .19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC= 37 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   8.74
  Filename: EF604.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .44      .03     1.33     8.74
        + ID2= 2 (0001):     13.81     1.15     1.42    14.56
          ================================================
          ID = 3 (0001):     14.25     1.16     1.42    14.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 400
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .14          .21
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      48.00        48.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         7.39
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       1.34 (ii)   23.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .33          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .04 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.67         1.33
     RUNOFF VOLUME    (mm)=      44.69         2.64        15.25
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .06          .32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .35
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  15.25
  Filename: EF400.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)      (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .04      1.33   15.25
     ==========================================================
     MAJOR SYS.(ID= 4):    .02       .01      1.33   15.25
     MINOR SYS.(ID= 2):    .33       .03      1.33   15.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .33      .03     1.33    15.25
        + ID2= 3 (0001):    14.25     1.16     1.42    14.38
          ================================================
          ID = 1 (0001):    14.58     1.18     1.42    14.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         8.21
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.13 (ii)   19.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .34          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.33
     RUNOFF VOLUME    (mm)=      44.69         2.39         9.12
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .05          .19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
```

```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC= 28 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   9.12
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .02      1.33    9.12
     ================================================
     MAJOR SYS.(ID= 5):    .00       .00      1.33    9.12
     MINOR SYS.(ID= 3):    .19       .02      1.33    9.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.58     1.18     1.42    14.40
        + ID2= 3 (0001):      .19      .02     1.33     9.12
          ================================================
          ID = 8 (0001):    14.76     1.18     1.42    14.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 4 (0001):      .02      .01     1.33    15.25
        + ID2= 5 (0001):      .00      .00     1.33     9.12
          ================================================
          ID = 1 (0001):      .03      .01     1.33    14.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 402
--------------------
```

```
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .96          .95
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     113.00       113.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         4.75
               over (min)        10.00        45.00
     Storage Coeff.  (min)=       2.24 (ii)   46.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=        .30          .02
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .30          .01          .30 (iii)
     TIME TO PEAK    (hrs)=       1.42         2.17         1.42
     RUNOFF VOLUME    (mm)=      44.69         2.97        19.56
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .06          .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .30 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  19.56
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                  Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .03      .01     1.33    14.81
        + ID2= 2 (0001):     1.91      .30     1.42    19.56
          ================================================
          ID = 3 (0001):     1.94      .30     1.42    19.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Catchment 605
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .21          .50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      69.00        69.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         7.53
               over (min)        10.00        30.00
     Storage Coeff.  (min)=       1.66 (ii)   29.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .32          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .01          .04 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75         1.33
     RUNOFF VOLUME    (mm)=      44.69         3.10         9.32
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .07          .20

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .71
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   9.32
  Filename: EF605.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .71      .04     1.33     9.32
        + ID2= 3 (0001):     1.94      .30     1.42    19.50
          ================================================
```

```
          ID = 2 (0001):     2.65      .32     1.42    16.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.65
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .32 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  16.77
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT      .05        1.25
           INFLOW HYD. PEAKS AT      .32        1.42
           STOP  CONTROLLING AT      .17        1.48

           REQUIRED STORAGE VOLUME (ha.m.)=    .0068
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0444
           % OF HYDROGRAPH TO STORE       =  15.3597

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .17  (cms).

--------------------------------------------------------------------------------
**************************************************************
*                   Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .077       .024
                            .034       .004   |     .134       .032
                            .052       .012   |     .166       .040
                            .065       .021   |     .179       .043

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      2.65       .32      1.42      16.77
     OUTFLOW: ID= 1 (0001)      2.65       .06      1.67      16.76

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.62
                   TIME SHIFT OF PEAK FLOW         (min)= 15.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .02

--------------------------------------------------------------------------------
**************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.65
```

```
| ID= 1   PCYC= 59 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
-------------------   VOLUME     (mm)=  16.76
  Filename: EFSTOUT.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   South Undeveloped, 607
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.35   Curve Number   (CN)= 62.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=    .70

     PEAK FLOW       (cms)=    .10 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=   8.79
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.35
| ID= 2   PCYC= 58 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   8.79
  Filename: EF607.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Total to South

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     2.65      .06     1.67    16.76
        + ID2= 2 (0001):     5.35      .10     1.67     8.79
          ================================================
          ID = 3 (0001):     8.00      .16     1.67    11.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   8.00
| ID= 3   PCYC= 59 |   QPEAK     (cms)=    .16 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  11.42
```

```
  Filename: EFSOUTH.TXT
  Comments: Post-dev to South /z4

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond Catchment
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .50          .26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      71.00        71.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73        24.41
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.69 (ii)    9.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .18          .01          .19 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      44.69         3.29        27.30
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .07          .58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond inflow

--------------------
| ADD HYD   (0001) |
|   1 +  8 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .76      .19     1.33    27.30
        + ID2= 8 (0001):    14.76     1.18     1.42    14.33
          ==========================================
          ID = 2 (0001):    15.52     1.26     1.42    14.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.52
```

```
| ID= 2   PCYC= 60 |   QPEAK     (cms)=   1.26 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  14.96
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
****************************************************************
*                    Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------        (cms)     (ha.m.)   |    (cms)     (ha.m.)
                              .000       .000   |      .051       .333
                              .005       .026   |      .163       .405
                              .010       .053   |      .367       .480
                              .015       .109   |      .526       .519
                              .017       .139   |    1.058       .600
                              .020       .200   |    1.394       .641
                              .023       .265   |    2.172       .727

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      15.52      1.26      1.42      14.96
     OUTFLOW: ID= 8 (0001)      15.52       .02      4.17      14.86

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.63
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .21

--------------------------------------------------------------------------------
****************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.52
| ID= 8   PCYC=801 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   4.17
--------------------   VOLUME     (mm)=  14.86
  Filename: EFSWMFQ.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Catchment 601
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69

     PEAK FLOW       (cms)=    .09 (i)
     TIME TO PEAK    (hrs)=   1.58
```

```
     RUNOFF VOLUME    (mm)=   8.78
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC= 55 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=   8.78
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

--------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 9> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0002 = HYDROGRAPH 0001
          ID1= 1 (0001):     3.97      .09     1.58     8.78
        + ID2= 9 (0001):      .00      .00      .00      .00
          ================================================
          ID = 2 (0001):     3.97      .09     1.58     8.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 602
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32

     PEAK FLOW       (cms)=    .05 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=   9.70
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .21

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |      AREA     QPEAK     TPEAK      R.V.
```

```
--------------------      (ha)      (cms)      (hrs)       (mm)
          ID= 1 (0001):    2.04       .05       1.58       9.70
    SHIFT ID= 3 (0001):    2.04       .05       1.67       9.70

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
| ID= 3   PCYC= 55 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=   9.70
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     3.97      .09     1.58     8.78
        + ID2= 3 (0001):     2.04      .05     1.67     9.70
          ================================================
          ID = 1 (0001):     6.01      .13     1.58     9.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         5.87
               over (min)        10.00        35.00
     Storage Coeff.  (min)=       1.78 (ii)   34.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=        .32          .03
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .09          .01          .09 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.83         1.33
     RUNOFF VOLUME    (mm)=      44.69         2.88        13.29
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .06          .28

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
```

```
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  13.29
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.01      .13     1.58     9.09
        + ID2= 2 (0001):      .90      .09     1.33    13.29
          ================================================
          ID = 3 (0001):     6.91      .15     1.58     9.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .11 (i)
     TIME TO PEAK    (hrs)=   1.83
     RUNOFF VOLUME    (mm)=  11.53
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .25

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC= 64 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.83
--------------------   VOLUME     (mm)=  11.53
  Filename: EF603.TXT
  Comments:
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 3 = 2		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	5.79	.11	1.83	11.53
	+ ID2= 3 (0001):	6.91	.15	1.58	9.64
	ID = 2 (0001):	12.70	.24	1.67	10.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 300

CALIB		
STANDHYD (0001)	Area (ha)=	.66
ID= 1 DT= 5.0 min	Total Imp(%)=	30.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.20	.46	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	66.00	66.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	99.73	4.69	
over	(min)	10.00	35.00	
Storage Coeff.	(min)=	1.62 (ii)	34.03 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	35.00	
Unit Hyd. peak	(cms)=	.32	.03	
				TOTALS
PEAK FLOW	(cms)=	.05	.00	.05 (iii)
TIME TO PEAK	(hrs)=	1.33	1.83	1.33
RUNOFF VOLUME	(mm)=	44.69	2.39	10.82
TOTAL RAINFALL	(mm)=	46.98	46.98	46.98
RUNOFF COEFFICIENT	=	.95	.05	.23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)		AREA	(ha)=	.66
ID= 1 PCYC= 48		QPEAK	(cms)=	.05 (i)
DT= 5.0 min		TPEAK	(hrs)=	1.33
		VOLUME	(mm)=	10.82

Filename: EF300.TXT

Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0001):	.66	.05	1.33	10.82
	+ ID2= 2 (0001):	12.70	.24	1.67	10.50
	ID = 3 (0001):	13.36	.25	1.67	10.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 301

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= .18 Total Imp(%)= 30.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.05	.13	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	35.00	35.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	99.73	8.21	
over	(min)	10.00	20.00	
Storage Coeff.	(min)=	1.11 (ii)	18.81 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	20.00	
Unit Hyd. peak	(cms)=	.34	.06	
				TOTALS
PEAK FLOW	(cms)=	.02	.00	.02 (iii)
TIME TO PEAK	(hrs)=	1.33	1.58	1.33
RUNOFF VOLUME	(mm)=	44.69	2.39	8.96
TOTAL RAINFALL	(mm)=	46.98	46.98	46.98
RUNOFF COEFFICIENT	=	.95	.05	.19

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00

(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001) ID= 1 PCYC= 27 DT= 5.0 min		
	AREA (ha)=	.18
	QPEAK (cms)=	.02 (i)
	TPEAK (hrs)=	1.33

```
--------------------   VOLUME     (mm)=   8.96
  Filename: EF301.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .18      .02     1.33     8.96
        + ID2= 3 (0001):    13.36      .25     1.67    10.52
          ================================================
          ID = 2 (0001):    13.54      .26     1.67    10.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 303
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .53
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .45
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      59.00        59.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      99.73         2.03
               over (min)        10.00        45.00
     Storage Coeff.  (min)=       1.51 (ii)   43.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=        .33          .03
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .02 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.00         1.33
     RUNOFF VOLUME    (mm)=      44.69         1.44         5.31
     TOTAL RAINFALL   (mm)=      46.98        46.98        46.98
     RUNOFF COEFFICIENT   =        .95          .03          .11

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .53
| ID= 1   PCYC= 39 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=   5.31
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .53      .02     1.33     5.31
        + ID2= 2 (0001):    13.54      .26     1.67    10.50
          ================================================
          ID = 3 (0001):    14.07      .26     1.67    10.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):    14.07      .26     1.67    10.30
        + ID2= 8 (0001):    15.52      .02     4.17    14.86
          ================================================
          ID = 1 (0001):    29.59      .27     1.67    12.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .04 (i)
     TIME TO PEAK    (hrs)=   2.08
     RUNOFF VOLUME    (mm)=   7.67
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .16

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
```

```
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC= 67 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
--------------------   VOLUME     (mm)=   7.67
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.59      .27     1.67    12.57
        + ID2= 2 (0001):     4.10      .04     2.08     7.67
          ================================================
          ID = 3 (0001):    33.69      .31     1.75    11.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                    Catchment 606
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .03 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=   8.75
     TOTAL RAINFALL   (mm)=  46.98
     RUNOFF COEFFICIENT   =    .19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
| ID= 1   PCYC= 52 |   QPEAK     (cms)=    .03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=   8.75
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0001):     1.28      .03     1.50     8.75
        + ID2= 3 (0001):    33.69      .31     1.75    11.98
          ================================================
          ID = 2 (0001):    34.97      .33     1.67    11.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  34.97
| ID= 2   PCYC=801 |   QPEAK     (cms)=    .33 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  11.86
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

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================================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                      TIME: 10:10:41


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                   Eastfields Development
*
*                   100Yr Climate Change Event
*                   January 30, 2023
*                   Andrew Rosenthal, EIT
*
*                   Updated catchments and logic based on detailed grading
*
*                   LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                   Pre-Development, 100Yr 4hr CC Chicago
*******************************************************************************
*                   IDF Values from MTO Lookup Tool
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 963.129
| Ptotal= 75.36 mm |                          B=   1.500
--------------------                          C=    .717
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =   .33

                    The CORRELATION coefficient is =  .9996
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	270.70	251.67
10.	167.30	167.17
15.	126.30	129.05
30.	78.10	81.17
60.	48.40	50.24
120.	30.00	30.83
360.	14.00	14.11
720.	8.70	8.60
1440.	5.40	5.23

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	5.72	1.08	19.77	2.08	13.64	3.08	7.33
.17	6.02	1.17	28.07	2.17	12.62	3.17	7.08
.25	6.36	1.25	58.41	2.25	11.76	3.25	6.86
.33	6.75	1.33	251.67	2.33	11.03	3.33	6.65
.42	7.20	1.42	74.20	2.42	10.40	3.42	6.46
.50	7.73	1.50	42.68	2.50	9.85	3.50	6.27
.58	8.37	1.58	31.17	2.58	9.37	3.58	6.11
.67	9.14	1.67	25.03	2.67	8.94	3.67	5.95
.75	10.12	1.75	21.14	2.75	8.55	3.75	5.80
.83	11.38	1.83	18.44	2.83	8.20	3.83	5.66
.92	13.11	1.92	16.43	2.92	7.88	3.92	5.52
1.00	15.64	2.00	14.88	3.00	7.59	4.00	5.40

---

* 100

CALIB					
NASHYD (0001)	Area (ha)=	8.90	Curve Number (CN)=	65.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.33		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Unit Hyd Qpeak (cms)= 1.03

PEAK FLOW (cms)= .44 (i)
TIME TO PEAK (hrs)= 1.75
RUNOFF VOLUME (mm)= 23.63
TOTAL RAINFALL (mm)= 75.36
RUNOFF COEFFICIENT = .31

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)=	8.90
ID= 1 PCYC= 63	QPEAK (cms)=	.44 (i)
DT= 5.0 min	TPEAK (hrs)=	1.75
	VOLUME (mm)=	23.63

Filename: EHSouPre.TXT
Comments: Pre-Development to South /z3

```
     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101a
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  12.80   Curve Number    (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .35

     Unit Hyd Qpeak  (cms)=   1.40

     PEAK FLOW       (cms)=    .55 (i)
     TIME TO PEAK    (hrs)=   1.75
     RUNOFF VOLUME    (mm)=  21.66
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    101b
--------------------
| CALIB              |
| NASHYD    (0001) |   Area     (ha)=  21.11   Curve Number    (CN)= 71.0
|ID= 2 DT= 5.0 min |   Ia       (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .85

     Unit Hyd Qpeak  (cms)=    .95

     PEAK FLOW       (cms)=    .68 (i)
     TIME TO PEAK    (hrs)=   2.42
     RUNOFF VOLUME    (mm)=  28.14
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .37

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    12.80      .55     1.75    21.66
        + ID2= 2 (0001):    21.11      .68     2.42    28.14
          ================================================
          ID = 3 (0001):    33.91     1.03     2.00    25.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  33.91
| ID= 3   PCYC= 96 |   QPEAK     (cms)=   1.03 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.00
```

```
--------------------   VOLUME     (mm)=  25.69
  Filename: EFNorPre.TXT
  Comments: 101, Pre-development to Node A /z1

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
********************************************************************************
*                   Post-Development, 100Yr 4hr CC Chicago
********************************************************************************
*                   Catchment 600
--------------------
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   5.11   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

     Unit Hyd Qpeak  (cms)=    .63

     PEAK FLOW       (cms)=    .24 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=  21.65
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.11
| ID= 1   PCYC= 61 |   QPEAK     (cms)=    .24 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  21.65
  Filename: EF600.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 200
--------------------
| CALIB             |
| STANDHYD  (0001) |   Area    (ha)=    .46
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .18          .28
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      55.00        55.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        96.19
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.19 (ii)   10.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
```

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=        .10          .04            .11 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      72.91        13.74          31.49
     TOTAL RAINFALL   (mm)=      75.36        75.36          75.36
     RUNOFF COEFFICIENT   =        .97          .18            .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  31.49
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .11      1.33   31.49
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .11      1.33   31.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .24     1.67    21.65
        + ID2= 3 (0001):      .46      .11     1.33    31.49
```

```
          ================================================
          ID = 2 (0001):     5.57      .27     1.58    22.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
*                   Catchment 608
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .09 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=  21.57
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .09      1.50   21.57
     ================================================
     MAJOR SYS.(ID= 5):    .02       .01      1.50   21.57
     MINOR SYS.(ID= 3):   1.36       .09      1.42   21.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .02
| ID= 5   PCYC= 19 |   QPEAK     (cms)=    .01 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  21.57
  Filename: EF608maj.TXT
  Comments: 608 major

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 = HYDROGRAPH 0001
          ID1= 4 (0001):      .00      .00      .00      .00
```

```
        + ID2= 5 (0001):      .02      .01     1.50    21.57
          ================================================
          ID = 9 (0001):      .02      .01     1.50    21.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     5.57      .27     1.58    22.46
        + ID2= 3 (0001):     1.36      .09     1.42    21.57
          ================================================
          ID = 1 (0001):     6.93      .35     1.58    22.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        38.48
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       2.12 (ii)   24.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .31          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .60          .13          .62 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.75         1.42
     RUNOFF VOLUME    (mm)=      72.91        13.74        31.47
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .18          .42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
```

```
| ID= 2   PCYC= 50 |   QPEAK     (cms)=    .62 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  31.47
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.93      .35     1.58    22.28
        + ID2= 2 (0001):     3.10      .62     1.42    31.47
          ================================================
          ID = 3 (0001):    10.03      .89     1.42    25.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        45.74
               over (min)       10.00        25.00
     Storage Coeff.  (min)=       2.25 (ii)   24.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .30          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.20          .12        1.22 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.75        1.42
     RUNOFF VOLUME    (mm)=      72.91        15.96       44.40
     TOTAL RAINFALL   (mm)=      75.36        75.36       75.36
     RUNOFF COEFFICIENT   =        .97          .21         .59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.76     1.22     1.42    44.40
        + ID2= 3 (0001):    10.03      .89     1.42    25.12
          ================================================
          ID = 2 (0001):    13.79     2.12     1.42    30.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        70.92
               over (min)       10.00        10.00
     Storage Coeff.  (min)=       1.18 (ii)   10.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .05          .05          .06 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      72.91        14.60        23.35
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .19          .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  23.35
```

Filename: EF604.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	.44	.06	1.33	23.35
	+ ID2= 2 (0001):	13.79	2.12	1.42	30.38
	ID = 3 (0001):	14.23	2.16	1.42	30.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 400

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= .35 Total Imp(%)= 40.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.14	.21	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	48.00	48.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	162.93	96.19	
over	(min)	10.00	10.00	
Storage Coeff.	(min)=	1.10 (ii)	9.65 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	.34	.11	
				TOTALS
PEAK FLOW	(cms)=	.07	.04	.09 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	72.91	13.74	31.49
TOTAL RAINFALL	(mm)=	75.36	75.36	75.36
RUNOFF COEFFICIENT	=	.97	.18	.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001) ID= 1 PCYC= 48	AREA (ha)= .35 QPEAK (cms)= .09 (i)

```
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  31.49
  Filename: EF400.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .09      1.33   31.49
     ==================================================
     MAJOR SYS.(ID= 4):    .08       .06      1.33   31.49
     MINOR SYS.(ID= 2):    .27       .03      1.33   31.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .27      .03     1.33    31.49
        + ID2= 3 (0001):    14.23     2.16     1.42    30.16
          ================================================
          ID = 1 (0001):    14.50     2.20     1.42    30.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        91.64
               over (min)       10.00        10.00
     Storage Coeff.  (min)=        .92 (ii)    9.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .02          .04 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      72.91        13.36        23.42
```

```
     TOTAL RAINFALL   (mm)=      75.36        75.36          75.36
     RUNOFF COEFFICIENT   =        .97          .18            .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC= 32 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  23.42
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .04      1.33   23.42
     ====================================================
     MAJOR SYS.(ID= 5):    .05       .02      1.33   23.42
     MINOR SYS.(ID= 3):    .14       .02      1.33   23.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.50     2.20     1.42    30.19
        + ID2= 3 (0001):      .14      .02     1.33    23.42
          ================================================
          ID = 8 (0001):    14.64     2.21     1.42    30.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 4 (0001):      .08      .06     1.33    31.49
```

```
        + ID2= 5 (0001):      .05      .02     1.33    23.42
          ================================================
          ID = 1 (0001):      .13      .08     1.33    28.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 402
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .96          .95
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     113.00       113.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        51.59
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       1.84 (ii)   18.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .32          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .51          .09          .53 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58         1.33
     RUNOFF VOLUME    (mm)=      72.91        14.33        37.75
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .19          .50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .53 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  37.75
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .13      .08     1.33    28.61
        + ID2= 2 (0001):     1.91      .53     1.33    37.75
          ================================================
          ID = 3 (0001):     2.04      .60     1.33    37.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 605
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .21          .50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      69.00        69.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        70.92
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.37 (ii)   12.60 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .07          .09 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      72.91        14.60        23.35
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .19          .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .71
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .09 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  23.35
  Filename: EF605.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .71      .09     1.33    23.35
        + ID2= 3 (0001):     2.04      .60     1.33    37.17
          ================================================
          ID = 2 (0001):     2.75      .70     1.33    33.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.75
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .70 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  33.60
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT      .00         .35
           INFLOW HYD. PEAKS AT      .70        1.33
           STOP  CONTROLLING AT      .17        1.68

           REQUIRED STORAGE VOLUME (ha.m.)=    .0294
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0924
           % OF HYDROGRAPH TO STORE       =  31.7812

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .17  (cms).

--------------------------------------------------------------------------------
**************************************************************
*                   Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000       .000    |     .077       .024
                           .034       .004    |     .134       .032
                           .052       .012    |     .166       .040
                           .065       .021    |     .179       .043

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)       2.75       .70      1.33      33.60
     OUTFLOW: ID= 1 (0001)       2.75       .16      1.67      33.59
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.08
                    TIME SHIFT OF PEAK FLOW         (min)= 20.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .04

--------------------------------------------------------------------------------
****************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.75
| ID= 1   PCYC= 63 |   QPEAK     (cms)=    .16 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  33.59
  Filename: EFSTOUT.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    South Undeveloped, 607
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.35   Curve Number   (CN)= 62.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=    .70

     PEAK FLOW       (cms)=    .26 (i)
     TIME TO PEAK    (hrs)=   1.67
     RUNOFF VOLUME    (mm)=  21.65
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.35
| ID= 2   PCYC= 60 |   QPEAK     (cms)=    .26 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  21.65
  Filename: EF607.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                    Total to South

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     2.75      .16     1.67    33.59
        + ID2= 2 (0001):     5.35      .26     1.67    21.65
          ================================================
          ID = 3 (0001):     8.10      .42     1.67    25.69
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| SAVE HYD  (0001) |   AREA       (ha)=   8.10
| ID= 3   PCYC= 63 |   QPEAK     (cms)=    .42 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
                     VOLUME      (mm)=  25.69
```

Filename: EFSOUTH.TXT
Comments: Post-dev to South /z4

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

* Pond Catchment

```
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	.50	.26	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	2.00	
Length	(m)=	71.00	71.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	162.93	109.31	
over	(min)	10.00	10.00	
Storage Coeff.	(min)=	1.39 (ii)	8.01 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	.33	.13	
				TOTALS
PEAK FLOW	(cms)=	.30	.05	.33 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	72.91	15.28	48.64
TOTAL RAINFALL	(mm)=	75.36	75.36	75.36
RUNOFF COEFFICIENT	=	.97	.20	.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
Fo (mm/hr)=125.00 K (1/hr)= 2.00
Fc (mm/hr)= 5.00 Cum.Inf. (mm)= 5.00
(ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

* Pond inflow

```
| ADD HYD   (0001) |
|   1 +  8 =  2    |
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	.76	.33	1.33	48.64

```
        + ID2= 8 (0001):    14.64     2.21     1.42    30.12
          ================================================
          ID = 2 (0001):    15.40     2.36     1.42    31.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.40
| ID= 2   PCYC= 61 |   QPEAK     (cms)=   2.36 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.42
--------------------   VOLUME     (mm)=  31.03
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
************************************************************
*                   Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000       .000    |     .051       .333
                           .005       .026    |     .163       .405
                           .010       .053    |     .367       .480
                           .015       .109    |     .526       .519
                           .017       .139    |    1.058       .600
                           .020       .200    |    1.394       .641
                           .023       .265    |    2.172       .727

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     15.40      2.36      1.42      31.03
     OUTFLOW: ID= 8 (0001)     15.40       .13      3.50      30.76

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.60
                   TIME SHIFT OF PEAK FLOW         (min)=125.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .38

--------------------------------------------------------------------------------
************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.40
| ID= 8   PCYC=964 |   QPEAK     (cms)=    .13 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   3.50
--------------------   VOLUME     (mm)=  30.76
  Filename: EFSWMFQ.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 601
--------------------
```

```
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69

     PEAK FLOW       (cms)=    .23 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=  21.62
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC= 56 |   QPEAK     (cms)=    .23 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=  21.62
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

--------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.97      .23     1.58    21.62
        + ID2= 9 (0001):      .02      .01     1.50    21.57
          ================================================
          ID = 2 (0001):     3.99      .23     1.50    21.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 602
--------------------
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32

     PEAK FLOW       (cms)=    .12 (i)
     TIME TO PEAK    (hrs)=   1.58
     RUNOFF VOLUME    (mm)=  23.60
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .31

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 1 (0001):    2.04      .12      1.58     23.60
    SHIFT ID= 3 (0001):    2.04      .12      1.67     23.60

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
| ID= 3   PCYC= 57 |   QPEAK     (cms)=    .12 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.67
--------------------   VOLUME     (mm)=  23.60
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     3.99      .23     1.50    21.62
        + ID2= 3 (0001):     2.04      .12     1.67    23.60
          ==========================================================
          ID = 1 (0001):     6.03      .35     1.58    22.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        67.37
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       1.46 (ii)   13.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .15          .07          .17 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
```

```
     RUNOFF VOLUME    (mm)=      72.91        14.15          28.84
     TOTAL RAINFALL   (mm)=      75.36        75.36          75.36
     RUNOFF COEFFICIENT   =        .97          .19            .38

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC= 48 |   QPEAK     (cms)=    .17 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  28.84
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.03      .35     1.58    22.29
        + ID2= 2 (0001):      .90      .17     1.33    28.84
          ================================================
          ID = 3 (0001):     6.93      .42     1.58    23.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .29 (i)
     TIME TO PEAK    (hrs)=   1.83
     RUNOFF VOLUME    (mm)=  27.32
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .36

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
```

```
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC= 67 |   QPEAK     (cms)=    .29 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.83
--------------------   VOLUME     (mm)=  27.32
  Filename: EF603.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.79      .29     1.83    27.32
        + ID2= 3 (0001):     6.93      .42     1.58    23.14
          ================================================
          ID = 2 (0001):    12.72      .65     1.67    25.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
*                   Catchment 300
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      66.00        66.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        61.09
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       1.33 (ii)   12.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .05          .11 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50         1.33
     RUNOFF VOLUME    (mm)=      72.91        13.36        25.27
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .18          .34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .66
| ID= 1   PCYC= 48 |   QPEAK     (cms)=    .11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.33
--------------------   VOLUME     (mm)=  25.27
  Filename: EF300.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .66      .11     1.33    25.27
        + ID2= 2 (0001):    12.72      .65     1.67    25.05
          ================================================
          ID = 3 (0001):    13.38      .70     1.58    25.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 301
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      35.00        35.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     162.93        91.64
               over (min)       10.00        10.00
     Storage Coeff.  (min)=        .91 (ii)    9.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .34          .11
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .03          .02          .03 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      72.91        13.36        23.26
     TOTAL RAINFALL   (mm)=      75.36        75.36        75.36
     RUNOFF COEFFICIENT   =        .97          .18          .31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SAVE HYD (0001)	AREA (ha)= .18
ID= 1 PCYC= 31	QPEAK (cms)= .03 (i)
DT= 5.0 min	TPEAK (hrs)= 1.33
	VOLUME (mm)= 23.26

Filename: EF301.TXT
Comments:

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0001)		AREA	QPEAK	TPEAK	R.V.
1 + 3 = 2		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	.18	.03	1.33	23.26
	+ ID2= 3 (0001):	13.38	.70	1.58	25.06
	ID = 2 (0001):	13.56	.71	1.58	25.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---

* Catchment 303

CALIB			
STANDHYD (0001)	Area (ha)= .53		
ID= 1 DT= 5.0 min	Total Imp(%)= 15.00	Dir. Conn.(%)= 10.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	.08	.45	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	2.00	2.00	
Length (m)=	59.00	59.00	
Mannings n =	.013	.250	
Max.eff.Inten.(mm/hr)=	162.93	50.38	
over (min)	10.00	15.00	
Storage Coeff. (min)=	1.24 (ii)	12.97 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	.33	.08	
			TOTALS
PEAK FLOW (cms)=	.04	.04	.05 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.50
RUNOFF VOLUME (mm)=	72.91	11.89	17.59
TOTAL RAINFALL (mm)=	75.36	75.36	75.36
RUNOFF COEFFICIENT =	.97	.16	.23

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:

```
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .53
| ID= 1   PCYC= 40 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  17.59
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .53      .05     1.50    17.59
        + ID2= 2 (0001):    13.56      .71     1.58    25.03
          ================================================
          ID = 3 (0001):    14.09      .75     1.58    24.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                  Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):    14.09      .75     1.58    24.75
        + ID2= 8 (0001):    15.40      .13     3.50    30.76
          ================================================
          ID = 1 (0001):    29.49      .77     1.58    27.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                  Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .12 (i)
     TIME TO PEAK    (hrs)=   2.08
     RUNOFF VOLUME    (mm)=  19.22
```

```
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .26

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC= 70 |   QPEAK     (cms)=    .12 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   2.08
--------------------   VOLUME     (mm)=  19.22
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.49      .77     1.58    27.86
        + ID2= 2 (0001):     4.10      .12     2.08    19.22
          ================================================
          ID = 3 (0001):    33.59      .84     1.58    26.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 606
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .08 (i)
     TIME TO PEAK    (hrs)=   1.50
     RUNOFF VOLUME    (mm)=  21.58
     TOTAL RAINFALL   (mm)=  75.36
     RUNOFF COEFFICIENT   =    .29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
| ID= 1   PCYC= 53 |   QPEAK     (cms)=    .08 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.50
--------------------   VOLUME     (mm)=  21.58
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     1.28      .08     1.50    21.58
        + ID2= 3 (0001):    33.59      .84     1.58    26.80
          ================================================
          ID = 2 (0001):    34.87      .91     1.58    26.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  34.87
| ID= 2   PCYC=964 |   QPEAK     (cms)=    .91 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   1.58
--------------------   VOLUME     (mm)=  26.61
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

APPENDIX H

OTTHYMO Outputs – Timmins Event

```
================================================================================

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    I N T E R H Y M O
       O   O    T      T    H   H   Y Y   MM MM  O   O   * * * 1989a * * *
       O   O    T      T    HHHHH    Y    M M M  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO             01673

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  Input   filename: ef.dat
  Output  filename: ef.out
  Summary filename: ef.sum



DATE: 01-25-2023                       TIME: 10:10:41


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
*
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

*
*                    Eastfields Development
*
*                    Timmins Event
*                    January 30, 2023
*                    Andrew Rosenthal, EIT
*
*                    Updated catchments and logic based on detailed grading
*
*                    LGI, LGP from L=SQRT(A/1.5)
*
*******************************************************************************
*                    Post-Development, Timmins Event
*******************************************************************************

--------------------
|    READ STORM    |    Filename: TIMMINS.STM
| Ptotal=193.00 mm |    Comments: *12 HOUR - Timmins STORM
--------------------
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                1.00   15.00 |  4.00    3.00 |  7.00   43.00 | 10.00   13.00
                2.00   20.00 |  5.00    5.00 |  8.00   20.00 | 11.00   13.00
                3.00   10.00 |  6.00   20.00 |  9.00   23.00 | 12.00    8.00

--------------------------------------------------------------------------------
```

```
*                   Catchment 600
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.11   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .31

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

     Unit Hyd Qpeak  (cms)=    .63

     PEAK FLOW       (cms)=    .36 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 102.26
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .53

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.11
| ID= 1   PCYC=158 |   QPEAK     (cms)=    .36 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 102.26
  Filename: EF600.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 200
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .46
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .18          .28
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      55.00        55.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        45.10
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.03 (ii)   13.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .03          .05 (iii)
     TIME TO PEAK    (hrs)=       6.58         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33       104.14       129.81
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .54          .67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .46
| ID= 2   PCYC=149 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 129.81
  Filename: EF200.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .126 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .46       .05      7.08  129.81
     ================================================
     MAJOR SYS.(ID= 4):    .00       .00       .00     .00
     MINOR SYS.(ID= 3):    .46       .05      7.08  129.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .00
| ID= 4   PCYC=  0 |   QPEAK     (cms)=    .00 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=    .00
--------------------

***** WARNING:  THIS HYDROGRAPH IS DRY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.11      .36     7.00   102.26
        + ID2= 3 (0001):      .46      .05     7.08   129.81
          ================================================
          ID = 2 (0001):     5.57      .41     7.00   104.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 608
--------------------
```

```
| CALIB             |
| NASHYD    (0001) |   Area    (ha)=   1.38   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .17

     Unit Hyd Qpeak  (cms)=    .31

     PEAK FLOW       (cms)=    .10 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 101.92
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .53

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .085 |
| #of Inlets=    1 |
| Total(cms)=   .1 |      AREA     QPEAK     TPEAK    R.V.
--------------------       (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.38       .10      7.00  101.92
     ================================================
     MAJOR SYS.(ID= 5):    .03       .02      7.00  101.92
     MINOR SYS.(ID= 3):   1.35       .09      6.42  101.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .03
| ID= 5   PCYC= 86 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 101.92
  Filename: EF608maj.TXT
  Comments: 608 major

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  9    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH 0001 <ID= 4> IS DRY.
*** W A R N I N G :  HYDROGRAPH 0001 = HYDROGRAPH 0001
          ID1= 4 (0001):      .00      .00      .00      .00
        + ID2= 5 (0001):      .03      .02     7.00   101.92
          ================================================
          ID = 9 (0001):      .03      .02     7.00   101.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     5.57      .41     7.00   104.54
        + ID2= 3 (0001):     1.35      .09     6.42   101.92
          ================================================
          ID = 1 (0001):     6.92      .50     7.00   104.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 201
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.10
|ID= 2 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.24         1.86
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     144.00       144.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        45.08
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       3.62 (ii)   24.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .25          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .11          .21          .32 (iii)
     TIME TO PEAK    (hrs)=       7.00         7.25         7.17
     RUNOFF VOLUME    (mm)=     190.33       104.14       129.95
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .54          .67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.10
| ID= 2   PCYC=164 |   QPEAK     (cms)=    .32 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.17
--------------------   VOLUME     (mm)= 129.95
  Filename: EF201.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------------------------------------------------------------------
*                   Add 201 to 200min, 608min, 600

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.92      .50     7.00   104.03
        + ID2= 2 (0001):     3.10      .32     7.17   129.95
          ================================================
          ID = 3 (0001):    10.02      .81     7.08   112.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 100
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.26         1.50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     158.00       158.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        48.73
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       3.83 (ii)   25.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=        .25          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .22          .18          .40 (iii)
     TIME TO PEAK    (hrs)=       7.08         7.25         7.17
     RUNOFF VOLUME    (mm)=     190.33       107.39       148.83
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .56          .77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Add 100 to main

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.76      .40     7.17   148.83
```

```
        + ID2= 3 (0001):    10.02      .81     7.08   112.05
          ================================================
          ID = 2 (0001):    13.78     1.21     7.08   122.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
*                   Catchment 604
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .31
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      54.00        54.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        47.18
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.01 (ii)   13.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .04          .05 (iii)
     TIME TO PEAK    (hrs)=       6.50         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33       106.14       118.61
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .55          .61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .44
| ID= 1   PCYC=150 |   QPEAK     (cms)=    .05 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 118.61
  Filename: EF604.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------

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```
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):       .44      .05     7.08   118.61
        + ID2= 2 (0001):     13.78     1.21     7.08   122.09
          ================================================
          ID = 3 (0001):     14.22     1.26     7.08   121.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 400
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.00   Dir. Conn.(%)=  30.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .14          .21
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      48.00        48.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        45.10
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       1.87 (ii)   12.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .32          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .03          .04 (iii)
     TIME TO PEAK    (hrs)=       6.42         7.00         7.00
     RUNOFF VOLUME    (mm)=     190.33       104.14       129.77
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .54          .67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .35
| ID= 1   PCYC=147 |   QPEAK     (cms)=    .04 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 129.77
  Filename: EF400.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .032 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):    .35       .04      7.00  129.77
     ==================================================
     MAJOR SYS.(ID= 4):    .01       .01      7.00  129.77
     MINOR SYS.(ID= 2):    .34       .03      6.33  129.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):      .34      .03     6.33   129.77
        + ID2= 3 (0001):    14.22     1.26     7.08   121.98
          ================================================
          ID = 1 (0001):    14.56     1.29     7.08   122.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 401
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .19
|ID= 2 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .06          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      36.00        36.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        44.05
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.58 (ii)   10.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .02          .02 (iii)
     TIME TO PEAK    (hrs)=       6.33         7.00         7.00
     RUNOFF VOLUME    (mm)=     190.33       102.96       120.13
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .53          .62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
```

```
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .19
| ID= 2   PCYC=146 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 120.13
  Filename: EF401.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD     (0001) |
| Inlet Cap.= .016 |
| #of Inlets=    1 |
| Total(cms)=   .0 |      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 2):    .19       .02      7.00  120.13
     ================================================
     MAJOR SYS.(ID= 5):    .01       .00      7.00  120.13
     MINOR SYS.(ID= 3):    .18       .02      6.25  120.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  8    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    14.56     1.29     7.08   122.16
        + ID2= 3 (0001):      .18      .02     6.25   120.13
          ================================================
          ID = 8 (0001):    14.74     1.31     7.08   122.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   4 +  5 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 4 (0001):      .01      .01     7.00   129.77
        + ID2= 5 (0001):      .01      .00     7.00   120.13
          ================================================
          ID = 1 (0001):      .02      .01     7.00   125.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 402
```

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.91
|ID= 2 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .96          .95
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=     113.00       113.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        46.55
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       3.13 (ii)   21.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .27          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .11          .21 (iii)
     TIME TO PEAK    (hrs)=       6.92         7.17         7.17
     RUNOFF VOLUME    (mm)=     190.33       105.59       139.42
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .55          .72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.91
| ID= 2   PCYC=159 |   QPEAK     (cms)=    .21 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.17
--------------------   VOLUME     (mm)= 139.42
  Filename: EF402.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                  Add to 400, 401 major (flows to Street A)

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .02      .01     7.00   125.21
        + ID2= 2 (0001):     1.91      .21     7.17   139.42
          ================================================
          ID = 3 (0001):     1.93      .21     7.00   139.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
*                   Catchment 605
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  15.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .21          .50
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      69.00        69.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        47.18
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.33 (ii)   15.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .30          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .06           .08 (iii)
     TIME TO PEAK    (hrs)=       6.58         7.08          7.08
     RUNOFF VOLUME    (mm)=     190.33       106.14        118.62
     TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
     RUNOFF COEFFICIENT   =        .99          .55           .61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .71
| ID= 1   PCYC=152 |   QPEAK     (cms)=    .08 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 118.62
  Filename: EF605.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .71      .08     7.08   118.62
        + ID2= 3 (0001):     1.93      .21     7.00   139.28
```

```
          ================================================
          ID = 2 (0001):     2.64      .29     7.00   133.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.64
| ID= 2   PCYC=159 |   QPEAK     (cms)=    .29 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 133.72
  Filename: EFSTIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| COMPUTE VOLUME   |
| ID= 2   (0001)   |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT      .00         .26
           INFLOW HYD. PEAKS AT      .29        7.00
           STOP  CONTROLLING AT      .17        7.64

           REQUIRED STORAGE VOLUME (ha.m.)=    .0550
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .3530
           % OF HYDROGRAPH TO STORE       =  15.5798

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .17  (cms).

--------------------------------------------------------------------------------
**************************************************************
*                   Route through EZStorm Units
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000       .000   |     .077       .024
                            .034       .004   |     .134       .032
                            .052       .012   |     .166       .040
                            .065       .021   |     .179       .043
     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.
     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.
     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.
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     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.
     **** WARNING : STORAGE-DISCHARGE TABLE WAS EXCEEDED.

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     2.64       .29      7.00     133.72
     OUTFLOW: ID= 1 (0001)     2.64       .21      7.33     133.71

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 74.50
                   TIME SHIFT OF PEAK FLOW         (min)= 20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .06

--------------------------------------------------------------------------------
****************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.64
| ID= 1   PCYC=172 |   QPEAK     (cms)=    .21 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.33
--------------------   VOLUME     (mm)= 133.71
  Filename: EFSTOUT.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   South Undeveloped, 607
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.35   Curve Number   (CN)= 62.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .29

     Unit Hyd Qpeak  (cms)=    .70

     PEAK FLOW       (cms)=    .39 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 102.25
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .53

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.35
| ID= 2   PCYC=157 |   QPEAK     (cms)=    .39 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 102.25
  Filename: EF607.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Total to South

--------------------
```

```
| ADD HYD   (0001) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     2.64      .21     7.33   133.71
        + ID2= 2 (0001):     5.35      .39     7.00   102.25
          ================================================
          ID = 3 (0001):     7.99      .58     7.08   112.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   7.99
| ID= 3   PCYC=172 |   QPEAK     (cms)=    .58 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 112.63
  Filename: EFSOUTH.TXT
  Comments: Post-dev to South /z4

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Pond Catchment
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  58.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .50          .26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      71.00        71.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        48.09
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.37 (ii)   15.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .30          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .05          .03          .09 (iii)
     TIME TO PEAK    (hrs)=       6.67         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33       106.88       155.14
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .55          .80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
*                    Pond inflow

--------------------
| ADD HYD   (0001) |
|   1 +  8 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .76      .09     7.08   155.14
        + ID2= 8 (0001):    14.74     1.31     7.08   122.14
          ================================================
          ID = 2 (0001):    15.50     1.39     7.08   123.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.50
| ID= 2   PCYC=165 |   QPEAK     (cms)=   1.39 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 123.76
  Filename: EFSMWFIN.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
****************************************************************
*                    Route through SWMF
--------------------
| RESERVOIR (0001) |
| IN= 2---> OUT= 8 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .000        .000   |     .051       .333
                           .005        .026   |     .163       .405
                           .010        .053   |     .367       .480
                           .015        .109   |     .526       .519
                           .017        .139   |    1.058       .600
                           .020        .200   |    1.394       .641
                           .023        .265   |    2.172       .727

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     15.50      1.39      7.08     123.76
     OUTFLOW: ID= 8 (0001)     15.50      1.11      7.33     123.23

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 79.28
                    TIME SHIFT OF PEAK FLOW         (min)= 15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=   .61

--------------------------------------------------------------------------------
****************************************************************
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  15.50
| ID= 8   PCYC=*** |   QPEAK     (cms)=   1.11 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.33
--------------------   VOLUME     (mm)= 123.23
  Filename: EFSWMFQ.TXT
```

```
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
*                   Catchment 601
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   3.97   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .22

     Unit Hyd Qpeak  (cms)=    .69

     PEAK FLOW       (cms)=    .29 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 102.16
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .53

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   3.97
| ID= 1   PCYC=153 |   QPEAK     (cms)=    .29 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 102.16
  Filename: EF601.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
*                   Add 200maj, 608maj, 601

--------------------
| ADD HYD   (0001) |
|   1 +  9 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     3.97      .29     7.00   102.16
        + ID2= 9 (0001):      .03      .02     7.00   101.92
          ================================================
          ID = 2 (0001):     4.00      .31     7.00   102.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
*                   Catchment 602
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   2.04   Curve Number   (CN)= 65.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .24

     Unit Hyd Qpeak  (cms)=    .32
```

```
     PEAK FLOW       (cms)=    .16 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 108.15
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .56

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
*                   Route 602
--------------------
| SHIFT HYD (0001) |
| IN= 1---> OUT= 3 |
| SHIFT=  5.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 1 (0001):    2.04      .16      7.00    108.15
    SHIFT ID= 3 (0001):    2.04      .16      7.08    108.15

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   2.04
| ID= 3   PCYC=154 |   QPEAK     (cms)=    .16 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 108.15
  Filename: EF602.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   2 +  3 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 2 (0001):     4.00      .31     7.00   102.16
        + ID2= 3 (0001):     2.04      .16     7.08   108.15
          ==========================================
          ID = 1 (0001):     6.04      .47     7.00   104.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 302
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .90
|ID= 2 DT= 5.0 min |   Total Imp(%)=  37.00   Dir. Conn.(%)=  25.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .57
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      77.00        77.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        46.14
```

```
               over (min)       10.00        15.00
     Storage Coeff.  (min)=       2.49 (ii)   16.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .29          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .03          .07          .10 (iii)
     TIME TO PEAK    (hrs)=       6.67         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33       105.20       126.37
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .55          .65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .90
| ID= 2   PCYC=153 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 126.37
  Filename: EF302.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     6.04      .47     7.00   104.18
        + ID2= 2 (0001):      .90      .10     7.08   126.37
          ================================================
          ID = 3 (0001):     6.94      .57     7.00   107.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 603
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   5.79   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .42

     Unit Hyd Qpeak  (cms)=    .53

     PEAK FLOW       (cms)=    .45 (i)
     TIME TO PEAK    (hrs)=   7.08
     RUNOFF VOLUME    (mm)= 118.46
```

```
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .61

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   5.79
| ID= 1   PCYC=165 |   QPEAK     (cms)=    .45 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 118.46
  Filename: EF603.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     5.79      .45     7.08   118.46
        + ID2= 3 (0001):     6.94      .57     7.00   107.06
          ================================================
          ID = 2 (0001):    12.73     1.01     7.00   112.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 300
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .66
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      66.00        66.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        44.05
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.27 (ii)   15.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=        .30          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .02          .06          .07 (iii)
     TIME TO PEAK    (hrs)=       6.58         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33       102.96       120.31
     TOTAL RAINFALL   (mm)=     193.00       193.00       193.00
     RUNOFF COEFFICIENT   =        .99          .53          .62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .66
| ID= 1   PCYC=152 |   QPEAK     (cms)=    .07 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 120.31
  Filename: EF300.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .66      .07     7.08   120.31
        + ID2= 2 (0001):    12.73     1.01     7.00   112.24
          ================================================
          ID = 3 (0001):    13.39     1.08     7.00   112.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 301
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .05          .13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      35.00        35.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        44.05
               over (min)        10.00        10.00
     Storage Coeff.  (min)=       1.55 (ii)   10.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .33          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00          .02          .02 (iii)
     TIME TO PEAK    (hrs)=       6.33         7.00         7.00
     RUNOFF VOLUME    (mm)=     190.33       102.96        120.14
     TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
     RUNOFF COEFFICIENT   =        .99          .53           .62
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .18
| ID= 1   PCYC=146 |   QPEAK     (cms)=    .02 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
--------------------   VOLUME     (mm)= 120.14
  Filename: EF301.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .18      .02     7.00   120.14
        + ID2= 3 (0001):    13.39     1.08     7.00   112.64
          ================================================
          ID = 2 (0001):    13.57     1.10     7.00   112.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 303
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .53
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  10.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .08          .45
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         2.00
     Length            (m)=      59.00        59.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.00        40.32
               over (min)        10.00        15.00
     Storage Coeff.  (min)=       2.12 (ii)   14.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=        .31          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .05          .06 (iii)
     TIME TO PEAK    (hrs)=       6.50         7.08         7.08
     RUNOFF VOLUME    (mm)=     190.33        97.76        106.84
     TOTAL RAINFALL   (mm)=     193.00       193.00        193.00
```

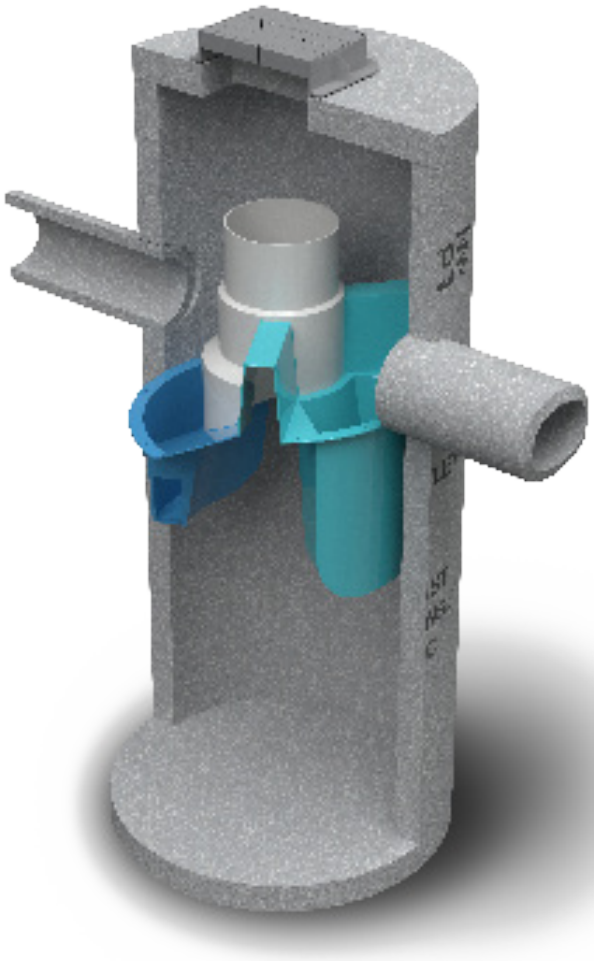
```
     RUNOFF COEFFICIENT   =        .99          .51           .55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS LESS THAN 20%
               YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) HORTONS EQUATION SELECTED FOR RAINFALL LOSSES:
            Fo   (mm/hr)=125.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  5.00     Cum.Inf.   (mm)=  5.00
      (ii) COMPUTATIONAL TIME STEP SHOULD BE SMALL OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=    .53
| ID= 1   PCYC=150 |   QPEAK     (cms)=    .06 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
--------------------   VOLUME     (mm)= 106.84
  Filename: EF303.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):      .53      .06     7.08   106.84
        + ID2= 2 (0001):    13.57     1.10     7.00   112.74
          ================================================
          ID = 3 (0001):    14.10     1.16     7.00   112.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Add flows from pond

--------------------
| ADD HYD   (0001) |
|   3 +  8 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (0001):    14.10     1.16     7.00   112.52
        + ID2= 8 (0001):    15.50     1.11     7.33   123.23
          ================================================
          ID = 1 (0001):    29.60     2.14     7.08   118.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Wetland Area
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   4.10   Curve Number   (CN)= 58.0
|ID= 2 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=    .56

     Unit Hyd Qpeak  (cms)=    .28

     PEAK FLOW       (cms)=    .23 (i)
     TIME TO PEAK    (hrs)=   7.25
     RUNOFF VOLUME    (mm)=  94.49
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .49

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   4.10
| ID= 2   PCYC=170 |   QPEAK     (cms)=    .23 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.25
--------------------   VOLUME     (mm)=  94.49
  Filename: WLAREA.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):    29.60     2.14     7.08   118.13
        + ID2= 2 (0001):     4.10      .23     7.25    94.49
          ================================================
          ID = 3 (0001):    33.70     2.37     7.08   115.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
*                   Catchment 606
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   1.28   Curve Number   (CN)= 62.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .19

     Unit Hyd Qpeak  (cms)=    .26

     PEAK FLOW       (cms)=    .10 (i)
     TIME TO PEAK    (hrs)=   7.00
     RUNOFF VOLUME    (mm)= 102.03
     TOTAL RAINFALL   (mm)= 193.00
     RUNOFF COEFFICIENT   =    .53

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=   1.28
```

```
| ID= 1   PCYC=150 |   QPEAK     (cms)=    .10 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.00
-------------------   VOLUME     (mm)= 102.03
  Filename: EF606.TXT
  Comments:

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0001) |
|   1 +  3 =  2    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     1.28      .10     7.00   102.03
        + ID2= 3 (0001):    33.70     2.37     7.08   115.25
          ================================================
          ID = 2 (0001):    34.98     2.46     7.08   114.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| SAVE HYD  (0001) |   AREA       (ha)=  34.98
| ID= 2   PCYC=*** |   QPEAK     (cms)=   2.46 (i)
| DT= 5.0 min      |   TPEAK     (hrs)=   7.08
-------------------   VOLUME     (mm)= 114.77
  Filename: EFNODEA.TXT
  Comments: Post-dev to Node A /z2

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================
```

APPENDIX I

O+M Information – OGS Units



Operation and Maintenance Manual

First Defense® High Capacity and First Defense®Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

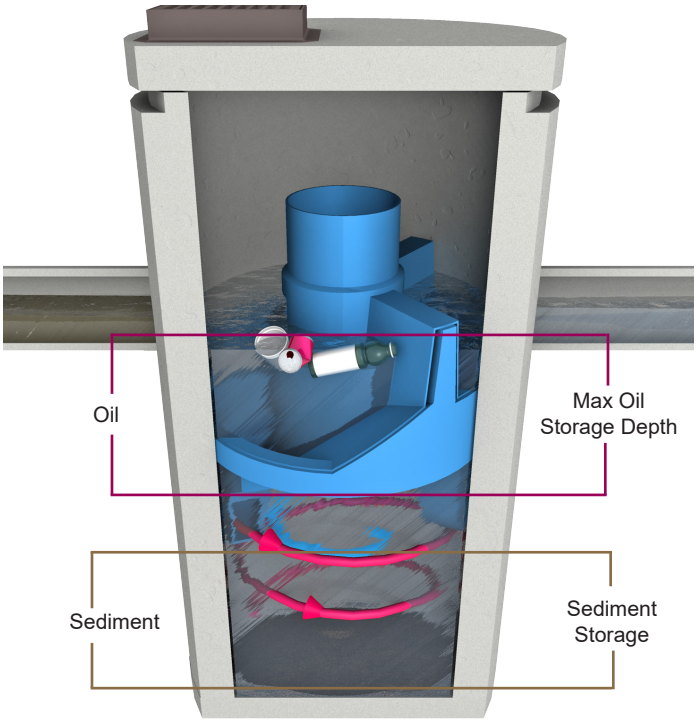


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

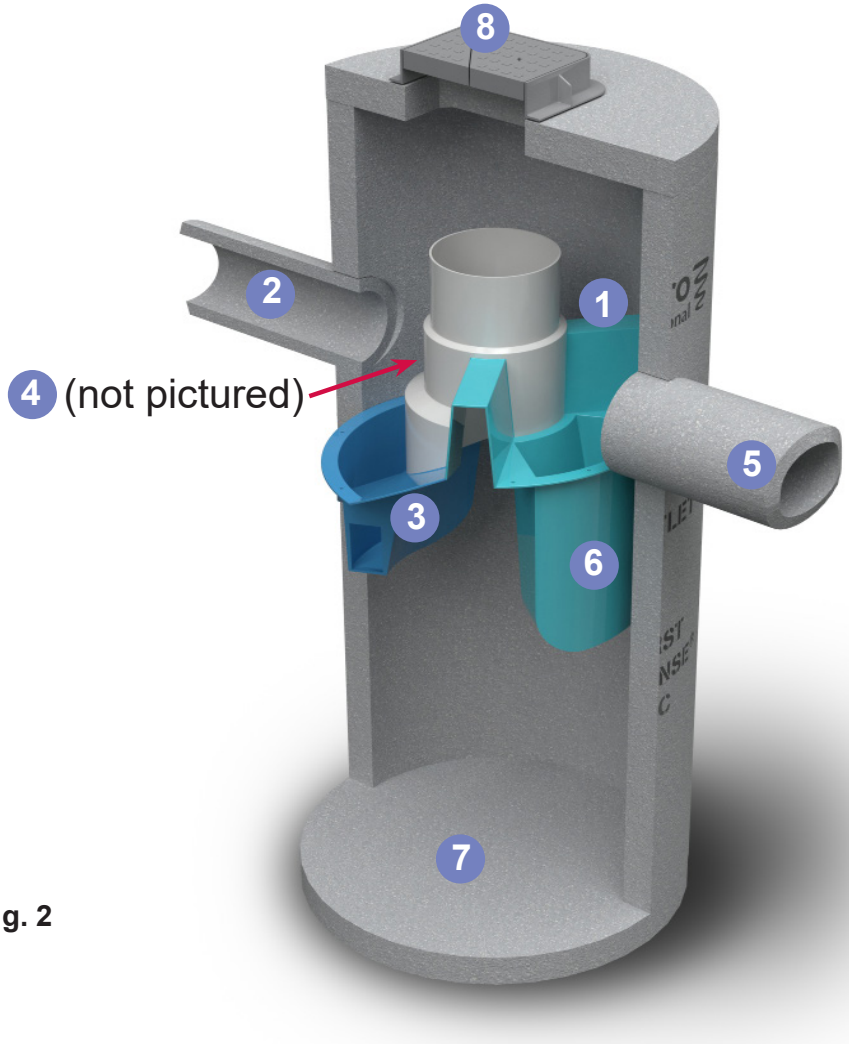


Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

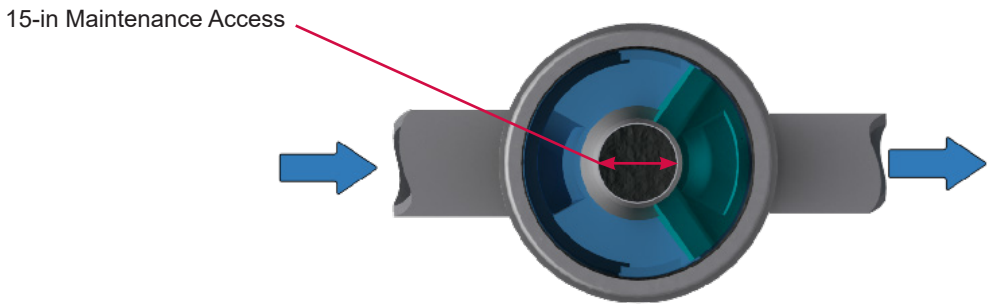


Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): [3-FT] [4-FT] [5-FT] [6-FT] [7-FT] [8-FT] [10-FT]

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

First Defense® Inspection and Maintenance Log

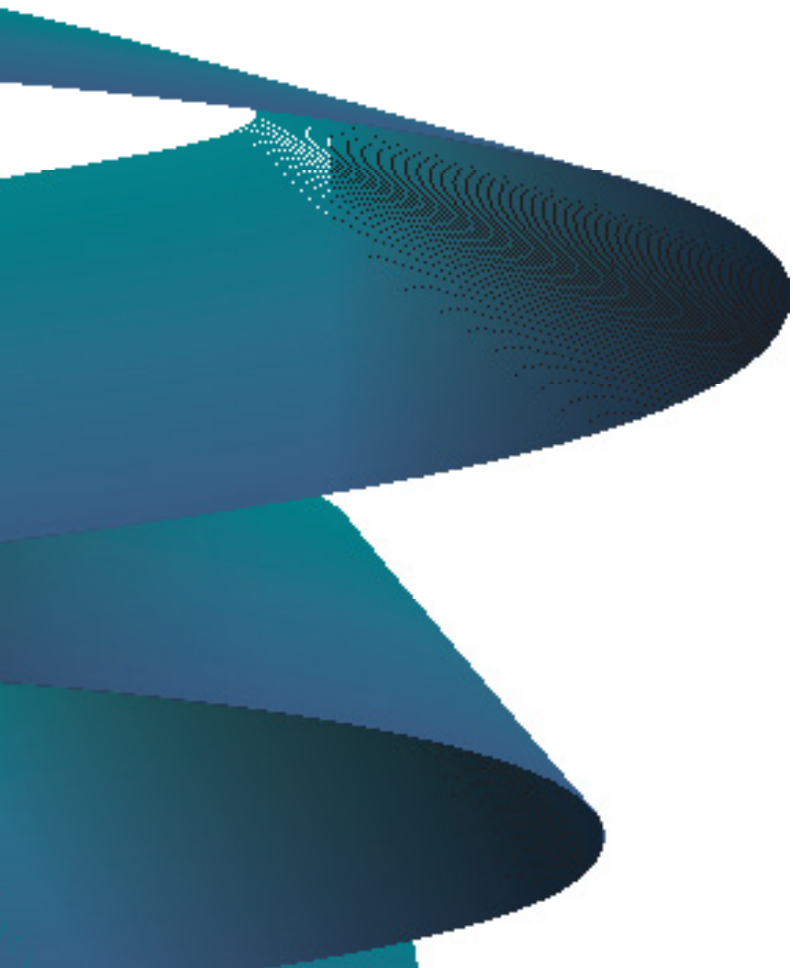
Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Notes

Hydro International



Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

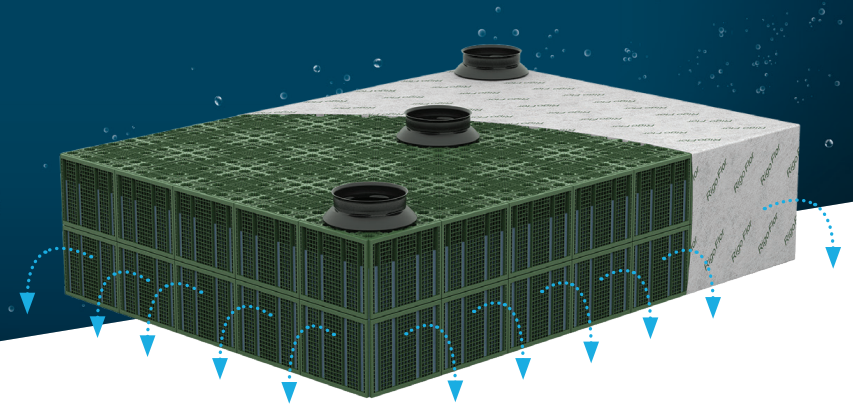
Turning Water Around...®

APPENDIX J

O+M Information – EZStorm Units

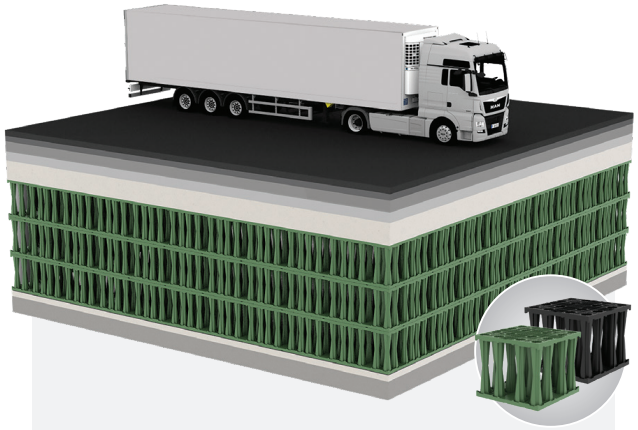
EZStorm

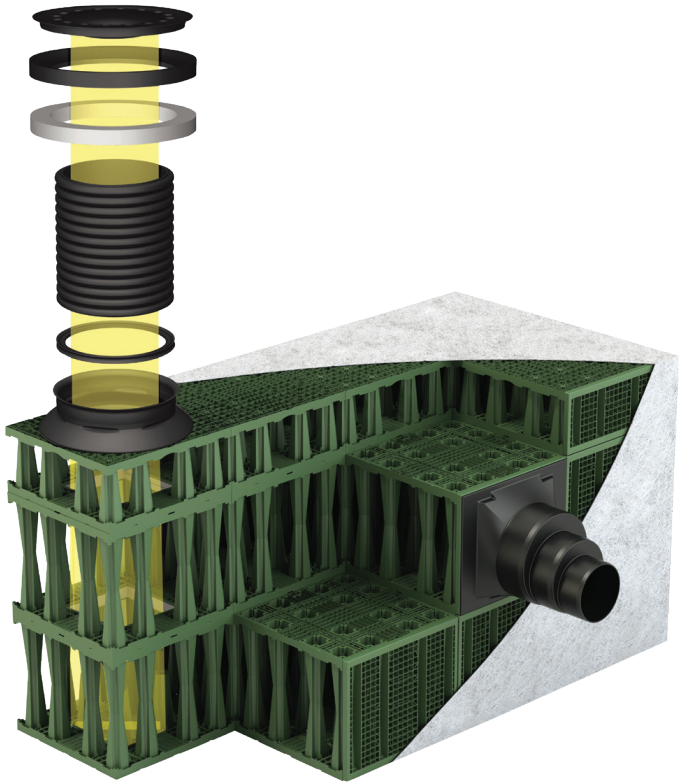
Underground retention and detention



STORMWATER MANAGEMENT

Protection of the receiving environment





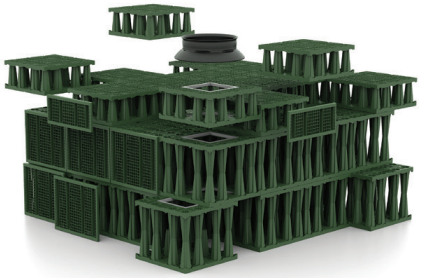
EZStorm is a simple and innovative solution to retain or infiltrate stormwater.

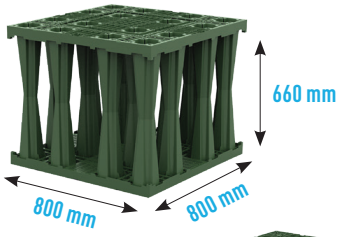
The **EZStorm** is a modular block system with many design options. Each block is composed of two half-elements that are assembled on-site before installation.

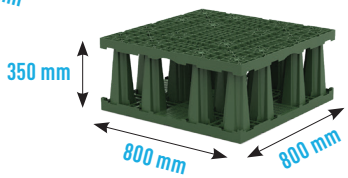
Thanks to its superior mechanical strength, **EZStorm** can be installed under heavy or light roadways, offering multiple applications such as roads, parking lots, bike paths, pedestrian walkways, gardens, and parks.

nextstorm.ca

Phone. : 450 373-8262 Toll-free : 1 877 565-6260
TeleFax : 450 373-0042 Email : info@nextstorm.ca





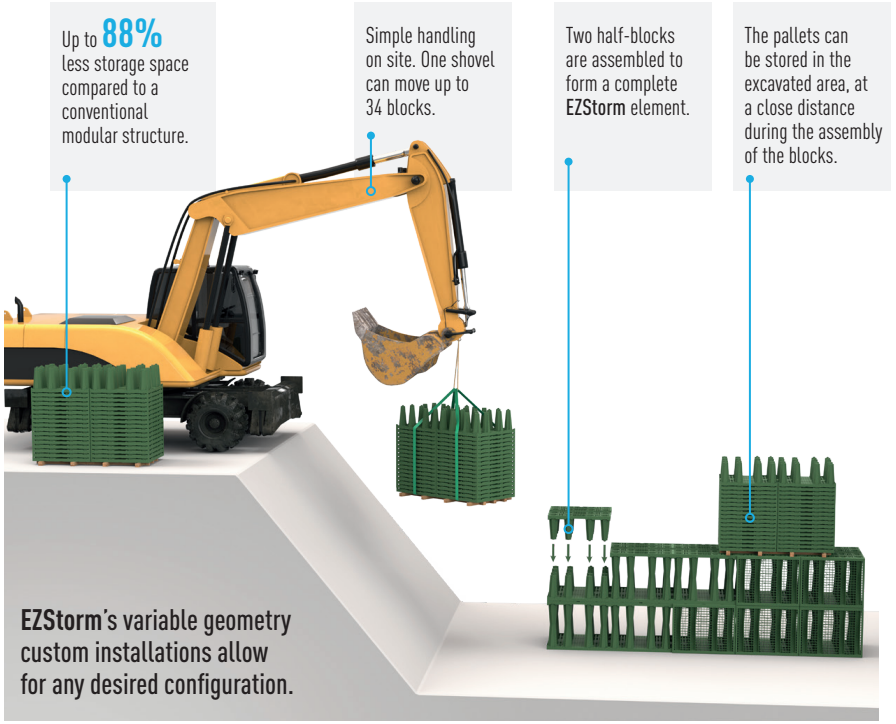


Excavation volume reduced by **10%** to **35%** compared to gravel solutions.

ADVANTAGES

- Ultra Lightweight Geocellular Structure (ULGS) offers **96% void ratio**, which minimizes the footprint and excavation volumes.
- With custom-made installations with variable geometry, all configurations are possible using **EZStorm** modules.
- The polypropylene structure can support a CL-625, H-25, or HS-20 load (up to 20 tons per axle under conditions).
- Due to its superior structural capacity, **EZStorm** can be installed to a depth of 6 m with a maximum backfill of 4 m under conditions.
- Quick and easy assembly and installation require less labor. The EZStorm system can be connected to pipes of various diameters.
- EZStorm half-blocks offer a solution for low coverage and allow the height of a structure to be modulated in combination with full blocks.
- 100% inspectable in all directions and easy to maintain.
- Few accessories required

IMPLEMENTATION OF THE BASIN



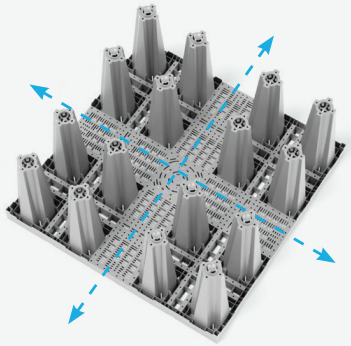
INSPECTION AND MAINTENANCE

The **EZStorm** system was developed to facilitate inspection and cleaning operations directly from the ground surface. It is 100% inspectable and offers complete visibility in all directions.

INSPECTION

EZStorm blocks are designed with cross tunnels for easy checking of the basin.

Camera inspection and hydrocuring are therefore possible in 2 directions and 4 dimensions.



CLEANING

The **EZStorm** tanks can be clean and flushed using a high-pressure sewer cleaning device. The entire cleaning process can be performed from the ground surface and does not require any intervention inside the basin.

CAMBIUM

Environmental

Geotechnical

Building Sciences

Construction Monitoring

Telephone
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Website
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P.O. Box 325
194 Sophia Street
Peterborough, ON
K9H 1E5

Locations
Peterborough
Kingston
Barrie
Oshawa

Laboratory
Peterborough

Professional Engineers Ontario

APGO

April 3, 2023

2852243 Ontario Inc.
Fidelity Engineering & Construction
512 Purdy Road
Colborne, ON K0K 1S0

Attn: Jim Pillsworth
Sent by email to: jpillsworth@fidelityeng.com

Re: Environmental Impact Study Review for Eastfields Residential Development, Colborne, Ontario
Cambium Reference 6697-003

Dear Jim Pillsworth,

Cambium Inc. (Cambium) is pleased to provide 2852243 Ontario Inc. (the Client) the following Environmental Impact Study (EIS) Review for the Eastfields Residential Development in Colborne, Ontario (the Site). The Site is legally described as Part of Lot 182, Reid Plan and Part of Lot 29, Concession 2, Township of Cramahe, Ontario. The Site fronts on Durham Street North, approximately 38 m north of Scott Street. The Client is pursuing Draft Plan Approval for a Plan of Subdivision including 212 new residential lots, per the enclosed Redline Draft Plan (RFA, April 3, 2023). The Site is located in the Colborne settlement area in Ecoregion 6E.

An EIS was prepared for the proposed subdivision by Lakeside Green Environmental Consulting (LGEC), dated June 2017. The EIS (LGEC 2017) provided mention of a drainage feature on the Site, but did not assess the hydrologic or thermal regime, aquatic habitat, or fish community associated with this feature. Furthermore, no mitigation measures were recommended to protect the ecological or hydrologic characteristics of this feature.

A review of the EIS was conducted by Lower Trent Conservation (LTC), and comments were provided in a letter dated July 28, 2017. The letter indicated that the EIS report addressed LTC's concerns, with one outstanding comment:

> *Drainage ditch should be recognized as a watercourse; therefore a surface water feature is present on site.*

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Supplemental work to address the drainage feature was subsequently conducted by Cambium and detailed in a letter dated November 24, 2022. Additional comments received from LTC, dated February 14, indicated the need to address two additional branches that feed into the main drainage feature on the Site.

This letter provides Cambium's assessment of the drainage features on the Site and an evaluation of reasonably anticipated ecological impacts to the feature, positive or negative, that may arise as a result of the proposed development, to guide the planning decision-making process and address approval authority requirements.

POLICY CONTEXT

Provincial Policy Statement

Section 2.1 of the Provincial Policy Statement (PPS) (Ministry of Municipal Affairs and Housing, 2020) protects the form and function of natural heritage features as defined by the PPS, which includes fish habitat. Development in fish habitat shall only be permitted in accordance with provincial and federal requirements.

Section 2.2 of the PPS protects the quality and quantity of water, including the form and hydrologic function of sensitive surface water features and sensitive ground water features. Focus is given to maintaining hydrologic linkages and functions at the watershed scale to minimize potential negative impacts, including cross-jurisdictional and cross-watershed impacts of development. Mitigative measures and/or alternative development approaches should be considered for development near water features.

Conservation Authority Regulation

"Conservation Authorities are local watershed management agencies that deliver services and programs to protect and manage impacts on water and other natural resources in partnership with all levels of government, landowners and many other organizations" (Conservation Ontario, 2021). Conservation Authorities each have their own Ontario Regulation under the *Conservation Authorities Act, 1990*. In general, they regulate development within and adjacent

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to river or stream valleys, Great Lakes and inland lakes shorelines, watercourses, hazardous lands (flood, erosion, unstable soils) and wetlands.

Lower Trent Conservation (LTC) regulates these features under Ontario Regulation 167/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.

The LTC Regulation 163/06 Policy Document defines 'watercourse' as "an identifiable depression in the ground in which a flow of water regularly or continuously occurs".

Fisheries Act

Works within and adjacent to lakes, watercourses, and other bodies of water containing fish have the potential to impact fish and/or fish habitat. As a result of amendments to the federal Fisheries Act in 2019, projects near water that could potentially impact fish or fish habitat may require Fisheries and Oceans Canada (DFO) review. The primary purpose of the review is to determine whether harmful alteration, disruption, or destruction (HADD) of fish habitat, as defined by the Act, can be avoided. The DFO Fisheries Protection Program provides a Decision Framework and guidance material applicable to these reviews (available on-line at www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html). If it is determined that "HADD" may be unavoidable, the project should be submitted to DFO for review and determination of project approach and conditions of approval.

CHARACTERIZATION OF NATURAL FEATURES AND FUNCTIONS

Data acquired through a background information review and field investigations are summarized in the following sections. Field investigations, carried out by Cambium staff to assess the drainage feature on the Site, are summarized in Table 1.

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Table 1 Summary of Field Investigations

Date	Time On Site	Weather	Observer	Activities
2021-12-03	12:00-14:00	1°C, sunny	K. Domsic	Surface Water and Drainage Feature Mapping Aquatic Habitat Assessment
2023-02-21	10:15-11:30	-1°C, cloudy	K. Domsic	Surface Water and Drainage Feature Mapping Aquatic Habitat Assessment

Feature Mapping

No provincially mapped watercourses are present on the Site (see Figure 1, enclosed). A watercourse is mapped as originating on adjacent lands, approximately 45 m west of the Site. The watercourse conveys flows in a southwesterly direction and outlets to Colborne Creek, downstream of King Street East and Kensington Avenue, approximately 375 m southwest of the Site.

Historical aerial imagery from the National Air Photo Library, dated August 12, 1962, shows no visible watercourse on the Site (see Photo A17791-053, enclosed); it appears that the upper reach of the mapped watercourse, west (downstream) of the Site, is consistent with the natural condition of this system. As such, we understand that the feature on the Site is of man-made origin.

Six distinct watercourse reaches (i.e., segments) were identified on the Site, as detailed in Table 2, and depicted on Figure 1. Representative photos of each reach are enclosed. Overall, the watercourse channel on the Site is highly uniform in terms of its morphological structure (i.e., characterized by an excavated drainage course).

Reach 1 originates as a roadside ditch, south of the driveway at 89 Durham Street North, just north of the Site (Reach 1; Photos 1-2) and flows in a southerly direction along the west side of the road. This feature also receives some flow from the equalization culvert under Durham Street North at the downstream end of Reach 1. The downstream end of the culvert was perched 4 cm at the time of the field investigations. These observations are consistent with the catchment mapping provided in Appendix A of the Stormwater Management Report for the Site (Jewell Engineering, 2022).

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Reach 2 begins at the eastern property boundary, immediately north of the existing residences on Durham Street North and flows in a southwesterly direction through the agricultural fields that comprise the majority of the Site (see Photos 3-6). Flow is somewhat constricted by a partially buried culvert under at an existing farm crossing at the conjunction of Reaches 2 and 3. The culvert could not be fully measured, but appeared to be approximately 0.3 m in diameter. Downstream of the crossing, the watercourse continues in a southwesterly direction to the western boundary of the Site.

Along Reach 3 (Photos 7-9), a berm separates the watercourse from the wetland and pond to the north. Reach 3A is a drainage branch that flows south, entering the upstream portion of Reach 3, near the east edge of the wetland (Photos 10-11). Reach 3B is a drainage branch that flows northward, entering the downstream portion of Reach 3 near the east edge of a cedar forest (Photos 12-13).

Reach 4 (Photo 14-15) is located along the southern edge of a cedar forest. Viewed from the property boundary, the dug feature appears to connect to the mapped watercourse downstream via an unmapped channel dominated by wetland vegetation, on adjacent lands to the west (Photo 16).

Surface Water and Aquatic Habitat

A summary of channel dimensions and characteristics for each reach are provided in Table 2. Surface water was present and flowing in a southwesterly direction throughout the feature on the Site, at the time of the field investigations. It should be noted that there had been snow accumulation, followed by warm rainy weather, facilitating a snow melt event in the 24 hours preceding the field investigations in 2021. No signs of groundwater inputs (e.g., iron floc, watercress) were observed. The results of the geotechnical studies undertaken by Cambium further indicate that the local water table does not influence this feature (Cambium 2022, submitted under separate cover). Given the limited sources of flow on the Site (primarily roadside drainage), Reaches 1-4 are unlikely to exhibit a permanent flow regime; however, field data to support an 'intermittent flow' classification on the Site is not available at this time. Reaches

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3A and 3B exhibit 'intermittent flow' characteristics (surface water limited to occasional pockets at the time of the field investigations; no discernable flow observed).

Downstream of the Site (as viewed from the west boundary of the Site), the watercourse transitions into a natural, meandering channel through a grass-dominated wetland. The flow path was visible but fully choked / densely vegetated with grasses (Photo 16).

Further downstream of the Site, the channel as viewed from the intersection of King Street East and Kensington Avenue exhibited a more defined structure with a wetted width of approximately 0.5 m to 1.0 m and maximum depth of approximately 5 cm to 15 cm. Substrates in this area included a mix of sand, gravel, and cobble (Photos 17-18).

Colborne Creek was observed upstream and downstream of Kensington Avenue. Flow volumes were substantially greater in this reach, which had a wetted width of several metres, and maximum depth of approximately 1 m (unmeasured due to access limitations) (Photos 19-20).