Comment Summary – January 13, 2025 (5th Submission)

Zoning By-law Amendment Application – WDD Main St. Inc.

Consultant	Comments
NPG – Township Planning Consultant	See letter attached
GEI - Engineers	See letter attached
Township Hydrogeologist	See letter attached

January 31, 2025

Lynne Banks
7404 Wellington Road 34,
Puslinch, Ontario

Dear Lynne Banks,

RE: **NPG Comments**
Main St
RE: Application for Zoning By-law Amendment & Draft Plan of Subdivision

NPG Planning Solutions Inc. (NPG) has been retained to provide comments regarding a Zoning By-law Amendment Application and a Draft Plan of Subdivision Application proposing a residential subdivision consisting of 21 detached dwelling lots, environmental protection lands, a stormwater management pond and a municipal road. The Subject Lands are approximately 23.10 hectares in size and have frontage along Highway 6, Main St and Ochs St. The Subject Lands are currently vacant and are in proximity to residential uses to the north and west, and agricultural and natural lands to the east and south.

This is the fifth submission for a Zoning By-law Amendment application. As part of this submission, NPG has reviewed the following documents:

- Updated Zoning By-law and Schedule prepared by Weston Consulting;
- Comment Response Matrix prepared by Weston Consulting, dated January 2025;
- Hydrology Response Letter prepared by Englobe, dated December 20, 2024;
- Functional Servicing & Preliminary Stormwater Report prepared by Crozier, dated December 2024;
- Civil Engineering Drawing Package prepared by Crozier, dated December 20, 2024; and
- Cover Letter prepared by Weston Consulting, dated January 10, 2025.

Comments:

1. The updated Zoning By-law and Schedule proposes to rezone the single detached dwellings a site-specific Urban Residential zone (UR-XX), the Stormwater Management Block another site-specific Urban Residential zone (UR-YY), in addition to revising the extent of the Natural Environment Zone (NE) and the Environmental protection Overlay. It is noted that the Draft Zoning By-law does not specifically prohibit any uses for the UR-

YY zone. We are working towards determining the appropriate zones, their extent and site-specific regulations through the application process and coordination with relevant agencies and consultants.

2. We understand that a Draft Plan of Subdivision was also submitted to the County of Wellington. We will provide comments related to this application, through the County.

Sincerely,

[redacted]

Jesse Auspitz, MCIP, RPP
Principal Planner
NPG Planning Solutions Inc.
jauspitz@npgsolutions.ca

January 31, 2025
Project No. 2402578 / 122006-002

VIA EMAIL: lbanks@puslinch.ca

Lynne Banks
Township of Puslinch
4704 Wellington Road 34
Puslinch, ON N0B 2J0

Re: Zoning By-Law Amendment 5th Submission
11 Main Street (Morriston)
Puslinch, ON

Dear Ms. Banks:

Following our review of fifth submission documents for Zoning By-Law Amendment and Draft Plan of Subdivision Application received on January 14, 2025, we are providing comments related to the proposed residential subdivision on the subject lands located at 11 Main Street in the Township of Puslinch. The Draft Plan of Subdivision submitted identifies twenty-one (21) residential lots. Twenty (20) of the lots front a proposed right-of-way, connected to an extension of Ochs Street, while one (1) lot fronts Main Street.

The fourth submission was received on November 22, 2024, with review comments provided on December 13, 2024.

The following fifth submission documents were received and reviewed:

- Fifth Submission Cover Letter, prepared by Weston Consulting, dated January 10, 2025.
- Comments Response Matrix, prepared by Weston Consulting, dated January 2025.
- Functional Servicing and Preliminary Stormwater Management Report, prepared by Crozier Consulting, dated December 2024.
- Engineering Plans (Rev. 4), prepared by Crozier Consulting, dated December 20, 2024, including:
    - Fig. 1 - Preliminary Site Servicing Plan (East)
    - Fig. 2 - Preliminary Site Servicing Plan (West)
    - Fig. 3 - Site Grading Plan (East)
    - Fig. 4 - Site Grading Plan (West)
    - Fig. 5 - External Grading Plan (Ochs Street)
    - Fig. 6 - Pre-Development Drainage Plan
    - Fig. 7 - Post-Development Drainage Plan
    - Fig. 8 - Storm Design Sheet Drainage Plan

We defer detailed review of the remaining documents to Township staff and other consultants.

Based on our fourth submission comments and review of fifth submission documents identified above, all of our previous comments have been addressed satisfactorily for acceptance of the Zoning ByLaw Amendment and Draft Plan of Subdivision applications. We are agreeable to the Zoning By-Law Amendment and Draft Plan of Subdivision applications being considered complete at this time. The Completed/Approved Matters Table below identifies some items which are to be addressed at the time of detailed design.

Deficiencies/Outstanding Matters

No.	Matter	Document	Date Identified	Comment

Additional Commentary

No.	Comment
1.	GEI Comment (February 9, 2024) Please provide a copy of the review comments as received by Conservation Halton. Crozier Comment (September 2024) Acknowledged.
2.	GEI Comment (September 2024) As there is no quality control for Catchment 202, the Township and future homeowners should be made aware that it will not be acceptable for driveways, parking areas etc. to be extended into the rear parts of the proposed lots in the future. Crozier Comment (November 2024) Acknowledged.

Completed/Approved Matters

No.	Matter	Document	Date Identified	Comment
1.	Right-of-way Profiles	Grading Plans	April 20, 2023	GEI Comment (April 20, 2023) The proposed development proposes an 18m wide rural cross section complete with roadside ditches and reduced pavement widths. A 20m wide urban cross-section complete with curb and gutter, storm sewer system and sidewalk is required per Township of Puslinch Municipal Development Standards and Township of Puslinch Standard Drawing 102 (STD-102). Please revise for the next submission. Crozier Response (January 2024) All drawings have been updated with a 20 m urban right-of-way per Standard Drawing 102 (STD-102). Storm sewer has been incorporated to direct stormwater runoff to the proposed stormwater management facility. GEI Comment (February 9, 2024) Accepted, no further comment.
2.	Cul-de-sac Radius	Grading Plans	April 20, 2023	GEI Comment (April 20, 2023) As per Township of Puslinch Municipal Development Standards, the cul-de-sac bulb right-of-way radius shall be revised from 18m to 20m. Crozier Response (January 2024) The cul-de-sac radius has been revised from 18m to 20m. GEI Comment (February 9, 2024) Accepted, no further comment.
3.	Quality Control	Functional Servicing & Preliminary SWM Report	April 20, 2023, February 9, 2024, September 27, 2024	GEI Comment (April 20, 2023) The FSR needs to demonstrate how Enhanced quality control is met (i.e. 80% total suspended solid removal). It appears that a treatment train is not created as grassed swales are the only method of quality control for the runoff being infiltrated. An additional mechanism such as but not limited to an oil/grit separator would be required to have a treatment train. Crozier Response (January 2024) Enhanced quality control will be met through the implementation of an oil grit separator upstream of the proposed stormwater management facility. The stormwater management facility will provide additional settling to meet the enhanced quality control requirements.

No.	Matter	Document	Date Identified	Comment
				GEI Comment (February 9, 2024) The Functional Servicing & Preliminary SWM Report states that quality control will be provided by an oil grit separator in series with dry pond settling. However, the MOE SWMPD Manual states that dry ponds should not be used for combined quantity and quality control unless a forebay is included. Table 4.8 lists the forebay requirement for dry ponds. Conversely, Puslinch Municipal Development Standards support the use of oil-grit separators as part of a treatment train, not the only method of treatment. Please provide additional discussion on the treatment train proposed. Crozier Response (September 2024) Enhanced quality control will be met through the implementation of an oil grit separator upstream of the proposed stormwater management facility. The stormwater management facility will provide additional settling to meet the enhanced quality control requirements based on MOE criteria. Additional design sheets have been prepared to show the combination of the dry pond and oil-grit separator. Based on the New Jersey Stormwater Best Management Practices Manual Table 4.1 extended detentions (dry ponds) provide a TSS removal rate of 60%. Through a combination of the dry pond (60% TSS) and oil-grit separator (50% TSS) a total TSS removal of 80% will be met. Additionally, following treatment from the OGS and Dry Pond treated stormwater will outlet through a level spreader and then travel at least 30 meters overland through the existing woodlot prior to discharging to the watercourse. This flow path will provide additional TSS removal. Details will be provided through detailed design of the subdivision. GEI Comment (September 27, 2024) Please revise the stormwater quality control section using **local design criteria** (Ontario MECP criteria rather than New Jersey). MOE SWMPD Manual Table 3.2 provides the storage volumes required for dry ponds to provide 60% TSS removal, and while this calculation is used in the Extended Detention calculation in Appendix D, Appendix F should also be updated accordingly. Please provide calculations based on an MECP approved methodology to support that 80% TSS removal is provided by a combination of the dry pond and OGS.

No.	Matter	Document	Date Identified	Comment
				The Erosion Control Volume Calculations in Appendix D should be based on a drainage area of 3.50 ha plus the areas of EX2 and EX3, which also contribute. During the detailed design stage, information should be provided to support the TSS removal capabilities of the Stormceptor EFO8 system based on specific site conditions. <u>Crozier Response (November 2024)</u> We have provided the Stormceptor sizing report to provide more details on the TSS removal efficiency of the OGS. We have assumed 50% removal rate with the OGS. Additionally, the dry pond has been designed with an extended detention to provide 60% TSS removal per MOE design criteria. Following treatment from the dry pond, stormwater will outlet through a level spreader and will travel overland through existing woodlot, which will provide additional TSS removal. Through the combination of these quality controls measures, 80% removal has been provided. The MECP does not provide methodology for treatment train efficiency, please advise if GEI is aware of methodology to apply, if the provided method is not acceptable. <u>GEI Comment (December 13, 2024)</u> No further comment.
4.	Infiltration Water Quality	Functional Servicing & Preliminary SWM Report	April 20, 2023, February 9, 2024, September 27, 2024, December 13, 2024, January 31, 2025	<u>GEI Comment (April 20, 2023)</u> The proponent should be cognizant of any potential impacts of infiltrating road runoff which contains chlorides and other pollutants. There could be a potential for contaminant spills or oils to be infiltrated in the ground via the proposed infiltration trenches (no oil/grit separator is proposed in the FSR). We recommend infiltration of 'clean' runoff only (i.e. infiltration of building rooftop runoff and/or grassed areas only). In addition, the proposed drinking water wells are located at the front of the lot in close proximity to the infiltration trenches which introduces further concerns regarding infiltration of possible roadway contaminants. We defer to the Township Hydrogeologist and Wellington Source Water Protection for comments on the infiltration water quality and the effect on drinking water wells. <u>Crozier Response (January 2024)</u> Based on the Hydrogeological Report the soils on-site are not conducive to infiltration (10 mm/hr infiltration rates); therefore, lot level infiltration has not been proposed. All

No.	Matter	Document	Date Identified	Comment
				infiltration trenches have been removed and replace with storm sewer and an end of pipe stormwater management facility. GEI Comment (February 9, 2024) The response to this comment states that infiltration is not proposed while the Hydrogeological Report recommends lot level soakaway pits for roof runoff. Please coordinate and revise reports accordingly. Crozier Response (September 2024) The in-situ hydraulic conductivity of the soils on-site ranged from 1.18 x 10-6 to 1.21 x 10-6 m/s which correlates to an infiltration rate of approximately 10 mm/hr. Therefore, the soils onsite are not conducive to infiltration, and it is recommended that end of pipe LID practices are not implemented onsite to meet the water balance objectives. Additional topsoil over the lots could also be implemented to increase void storage within the lots without having directing stormwater to a specific infiltration system. Lot level soak away pits are not being proposed for this subdivision. However, the design has been revised to include an infiltration facility downstream of the dry SWM facility to address the water balance. Details will be provided at detailed design but the footprint shown on the attached Figures is based on sufficient retention to balance the water budget for the site. GEI Comment (September 27, 2024) Infiltration facilities require 1.2 m frost cover depth and 1 m separation with groundwater per MOE SWMPD Manual criteria. The proposed facility is 1 m in depth while the maximum depth is 0.6 m per MOE SWMPD Manual criteria. Please show relevant elevations on the Servicing Plan including top of infiltration facility, bottom of infiltration facility, frost cover depth, groundwater separation, inlet elevation and outlet elevation. Clearly show how flow is to be transferred from the pond outlet to the infiltration facility. Crozier Response (November 2024) Relevant elevations have been provided on the updated servicing plan. Given the available space and required infiltration volume, 0.6 m depth is not achievable. Given the MOE SWMPD Manual is outdated, it is our opinion that the 1.0 m storage depth is acceptable and has been approved for other projects in Ontario. Please provide rationale for the 0.6 m request.

No.	Matter	Document	Date Identified	Comment
				GEI Comment (December 13, 2024) Please provide a detail for the infiltration facility to show frost cover depth, groundwater separation, inlet and outlet elevations. If using a 1.0 m storage depth, please provide a reference to an alternate guideline/best practice to support the proposed design. Crozier Response (January 2025) An updated open bottom infiltration system has been proposed with a storage depth of 0.6 m. Preliminary details are provided on the revised drawing set. Specific manufacturer details will be provided during detailed design. GEI Comment (January 31, 2025) Acknowledged. Top and bottom elevations will need to be adjusted during detailed design to ensure 1.2 m cover at the end of the infiltration system. Specific details regarding the infiltration system will be reviewed during detailed design.
5.	Infiltration Trenches / Galleries	Servicing Plans / FSR	April 20, 2023	GEI Comment (April 20, 2023) The FSR proposes surface ponding up to 0.3 m in the roadside ditches and subsurface storage/infiltration in a series of longitudinal infiltration galleries located below the proposed roadside ditches. While this concept could work in principle for a flat area, we express concerns in the ability to capture and store the runoff when some of the roads are graded at close to an 8% slope. The stormwater management calculations assume that 0.3 m ponding is available throughout the roadside ditches and that the sub-surface galleries can fill up with water. Even with the construction of check dams, terracing or elevated culverts as mentioned in the FSR, due to the steepness of the roads, the volume potential outlined in the stormwater management calculations would be extremely challenging to achieve. Furthermore, it is unclear how the 0.3 m ponding in the ditch is proposed to work with driveway culverts. The Town is not in support of a roadside ditch system in urban centers and hamlets, let alone a roadside ditch system that has the potential to pond water for prolonged periods of time.

No.	Matter	Document	Date Identified	Comment
				Additional concerns with the location of infiltration galleries and utility infrastructure – this will introduce a maintenance concern for the Township. Crozier Response (January 2024) Acknowledged. All infiltration trenches have been removed and replace with storm sewer and an end of pipe stormwater management facility. GEI Comment (February 9, 2024) Accepted, no further comment.
6.	Post-Development Drainage Plan	FSR	April 20, 2023	GEI Comment (April 20, 2023) Please label the imperviousness of the external areas on the Post-Development Plan for consistency. Crozier Response (January 2024) The Post-development Drainage Plan has been revised to include the imperviousness of the external drainage catchments. GEI Comment (February 9, 2024) Accepted, no further comment.
7.	Roadway Grade	Grading Plan	April 20, 2023	GEI Comment (April 20, 2023) Please note that the maximum allowable roadway grade is 6% in the Township of Puslinch. Crozier Response (January 2024) Maximum allowable roadway grades have been maintained everywhere possible. There are a few minor locations where the maximum grade exceeds 6%. GEI Comment (February 9, 2024) The proposed “Street B” contains a grade of 7.6%. Please revise. Ochs Street contains grades of 8%. Please revise or provide cross-sections to justify deviation from the Township standard (see comment #19). Crozier Response (September 2024) The grading of the internal roadway has been revised. GEI Comment (September 27, 2024) Accepted, no further comment.

8.	Ochs Street Labels	Plans	April 20, 2023	GEI Comment (April 20, 2023) Please label Ochs Street on all plans. Crozier Response (January 2024) Ochs Street has been labelled on all plans. GEI Comment (February 9, 2024) Accepted, no further comment.
9.	Infiltration Gallery Detail	Grading Plan	April 20, 2023	GEI Comment (April 20, 2023) The function of the 150mm diameter perforated pipe and surface ponding capability of the system is questionable. It appears that the 150mm diameter perforated pipe would convey the drainage prior to the ability of the system to pond on the surface or use the last 150mm of storage in the gallery. Inconsistencies between the FSR and infiltration gallery detail with respect to gallery and overflow pipe dimensions. (i.e. FSR states 1.0m deep gallery with 100mm diameter overflow pipe, detail shows 0.9m deep gallery with 150mm diameter overflow pipe). The notes regarding placing sod on top of geotextile wrapped media need further clarification as the topsoil is not proposed to be wrapped in geotextile. Crozier Response (January 2024) Acknowledged. All infiltration trenches have been removed and replace with storm sewer and an end of pipe stormwater management facility. GEI Comment (February 9, 2024) Accepted, no further comment.
10.	Quantity Control of Stormwater	Functional Servicing & Preliminary SWM Report	April 20, 2023, February 9, 2024, September 27, 2024, December 13, 2024, January 31, 2025	GEI Comment (April 20, 2023) The post-development 2-year storm event does not appear to match pre-development flow rates. Please revise. Crozier Response (January 2024) The stormwater management modelling has been revised to incorporate the quantity controls within the proposed stormwater management facility. Based on the modelling the post-development flows have been reduced to the pre-development flows for all storm events. Details of the outlet control structure will be included during the detailed design stage. GEI Comment (February 9, 2024) The design of the outlet control structure will impact volume of storage required. Please provide preliminary

				design of the structure or provide discussion on the volume of storage provided versus storage required. <u>Crozier Response (September 2024)</u> Detailed outlet control structure sizing has been completed and is included in Appendix D. <u>GEI Comment (September 2024)</u> Please indicate the size, location and elevation of the proposed orifice on the Servicing Plan. Based on Appendix D calculations, the proposed orifice size is to be 50 mm. Per Table 4.8 in the MOE SWMPD Manual, the minimum orifice size for a dry pond is 75 mm with a preferred diameter of 100 mm, as small orifices can be clogged easily. Please revise calculations to adhere to MECP criteria or describe how a 50 mm diameter orifice would be protected. At detailed design, please provide a detail for the outlet control structure. <u>Crozier Response (November 2024)</u> Noted. Orifice size has been increased to a diameter of 75 mm. Additionally, a CSP guard has been proposed to minimize clogging of the orifice. Please see revised drawings for details. <u>GEI Comment (December 13, 2024)</u> The top of grate/lid elevation on Detail 3 on the Preliminary Site Servicing Plan (East) does not appear to match the plan view on the drawing, or the Storage-Outflow Calculations Table in Appendix D. The outlet pipe in the detail does not match the plan view drawing. Additionally, the Emergency Overflow Detail shows a crest elevation of 314.25, whereas tables in the report and Appendix D state that the overflow weir elevation is at 313.90. It is also not clear on the Preliminary Site Servicing Plan (East) where the emergency overflow weir is located. <u>Crozier Response (January 2025)</u> All elevations have been updated and are reflected accurately on report, drawings and calculations. <u>GEI Comment (January 31, 2025)</u> No further comment.
11.	External Areas	Functional Servicing & Preliminary SWM Report	April 20, 2023	<u>GEI Comment (April 20, 2023)</u> Please confirm if the external catchments are to be conveyed through the site in the proposed development. In

				the Visual OTTHYMO (VO) model, the external catchments are added in at the end of the model while the report text it states that the catchments will drain through the site to Bronte Creek. If these areas are conveyed through the site, the stormwater management calculations (quality and quantity control) need to demonstrate that the proposed stormwater management system can handle the conveyance of the two external areas without surcharging the system. <u>Crozier Response (January 2024)</u> The VO model and Functional Servicing and Stormwater Management Report have been updated to discuss the external catchment flows in greater detail. All storm events from Catchment EX1 are directed to a low-lying depression area located in the eastern corner of the Old Morriston Baseball Diamond. An earth berm along the south and east property limits of the baseball diamond allows stormwater to pond within the park limits. If the storage limits are reached, stormwater will drain southwest between the Lot 1 and Lot 2 towards the Bronte Creek tributary via sheet flow, consistent with predevelopment conditions. Note, a figure has been prepared and included in Appendix D of the revised report outlining this scenario. All storm events from Catchment EX2 are to be conveyed through the site by the proposed storm sewer infrastructure and internal roadway towards the proposed stormwater management facility, ultimately outletting to the Bronte Creek tributary. The stormwater modelling has been updated to reflect this scenario. Storm sewer design sheets will be completed at the detailed design stage to ensure the proposed storm sewer network can accept the additional external flows. <u>GEI Comment (February 9, 2024)</u> Based on the grades shown in the Site Grading Plan at the property line along external catchment EX1, stormwater ponding at the corner of this external catchment will flow onto the site and enter the proposed storm sewer network. Additionally, Ochs Street in external catchment EX2 appears to be draining towards the existing Badenoch Street right-of-way rather than the proposed site. Please review and account for in stormwater management calculations. For clarity, add overland flow arrows to both external catchments in the drainage area plans (Figures 6 and 7). <u>Crozier Response (September 2024)</u> Acknowledged. The external catchment areas have been refined and are illustrated on Figures 6 and 7. SWM calculations have been updated accordingly. Overland flow

				arrows are also provided to demonstrate overland flow direction. GEI Comment (September 27, 2024) No further comment.
12.	Stormwater Model – Visual OTTHYMO	FSR – VO Schematics	April 20, 2023	GEI Comment (April 20, 2023) Please replace the wording of the "Post-Development" schematic title to reflect a post-development uncontrolled scenario. Please replace the wording of the "Post-Development w/ Mitigation" to be "Post Development Controlled". This will make it consistent with Table 8 in the report and will make ultimate conditions clear. Crozier Response (January 2024) The Visual OTTHYMO and schematics has been updated to reflected Table 8. GEI Comment (February 9, 2024) Accepted, no further comment.
13.	Fire Storage Tank	Servicing Plans	April 20, 2023	GEI Comment (April 20, 2023) Please give representation to the location of the fire storage tank on the Servicing Plans. Crozier Response (January 2024) The location of the fire storage tank has been represented on the Site Servicing Plans (Figure 1). GEI Comment (February 9, 2024) Accepted, no further comment.
14.	FSR Text	FSR	April 20, 2023	GEI Comment (April 20, 2023) Please review the text presented in Section 7.3 paragraph four describing imperviousness. Crozier Response (January 2024) Section 7.3 has been reviewed and revised to account for the removal of the infiltration trenches and the implementation of the end of pipe stormwater management facility. GEI Comment (February 9, 2024) Accepted, no further comment.
15.	External Area Topography	Engineering Plans	February 9, 2024	GEI Comment (February 9, 2024) The FSR states that, based on existing LiDAR contour mapping, runoff from external catchment EX1 ponds along

				existing berms and then drains southwest towards Bronte Creek. Please show these existing contours and berms on the Engineering Plans to confirm that this flow route will be maintained. Additional topographic survey may be required on the adjacent lands. <u>Crozier Response (September 2024)</u> The existing contour mapping (LiDAR) has been added to the engineering drawing set to show the external runoff drainage conditions. <u>GEI Comment (September 2024)</u> The LiDAR mapping does not appear to show the berms. Please provide **topographic data** for the existing ball diamond area (EX1) to show the low-lying depression area where ponding reportedly currently occurs per the report, and the existing berms. Please demonstrate the conditions under which it can be expected that the existing storage limits will be exceeded, and stormwater will flow onto the subject lands. Please clearly show how these flows will be routed around the development, specifically lots 1 and 2, to the Bronte Creek outlet. Please demonstrate that flows from EX1 will not enter the proposed stormwater facility. As previously discussed, site visit photos may be helpful to show the extents of existing surface ponding in the park area under typical conditions. <u>Crozier Response (November 2024)</u> Refer to FIG 4 a proposed a swale within the drainage easement to control flows from EX1 and route between Lots 1 and 2 has been added. We suggest that a topographic survey to be completed on the Morriston Ball Park during the detailed design phase and not as part of Draft Plan Approval. We also note that access to approval will be required by the Township prior to completion of any survey on adjacent lands. We have provided site photos of the park in Appendix H to demonstrate existing topography and drainage conditions. <u>GEI Comment (December 13, 2024)</u> The topographic survey should be completed at detailed design and the Grading Plans updated accordingly to clearly identify top of berm, bottom of berm and ponding limits. The Township has already granted access approval to the Ball Diamond and any other Township lands for surveying purposes.

				No further comment at this time.
16.	Drainage Easement	Engineering Plans	February 9, 2024, and September 27, 2024	GEI Comment (February 9, 2024) Please confirm ownership of the small rectangular parcel in the south corner of catchment EX1. Please note that a drainage easement will be required between Lots 1 and 2 for the overland flow route from EX1 to the Bronte Creek tributary. Crozier Response (September 2024) Acknowledged. GEI Comment (September 27, 2024) Please indicate any required **drainage easements** on the engineering plans. Crozier Response (November 2024) Drainage easements have been identified on the drawings. GEI Comment (December 13, 2024) No further comment.
17.	Ponding at Catchbasin	Engineering Plans	February 9, 2024, September 27, 2024	GEI Comment (February 9, 2024) The Site Grading Plan shows that proposed catchbasin CB 36 has a T/G elevation of 316.89, which is 1.5m lower than the adjacent curb elevation proposed. Considering the proximity of CB 36 to the property line, there is concern that stormwater will pond onto the neighbouring property at catchment EX2. Please show that the storm sewer leaving CB 36 will have the capacity to convey the flow generated by EX2 with ponding contained to the subject property up to and including the 100yr storm event. Additional topographic survey may be required on the adjacent lands. Crozier Response (September 2024) CB 27 (formerly CB 36) and the receiving storm sewer system have been designed to convey the 100-year storm event. The sizing was complete utilizing Visual Otthymo and Flowmaster. Further details will be provided at detailed design. GEI Comment (September 2024) Per Puslinch development standards, storm sewers are to be designed using the rational method and a **storm sewer design sheet** is to be provided to demonstrate that the 100-year storm can be conveyed. The first reach of the storm sewer in the cul-de-sac bulb should have a slope of

				at least 1%, currently it is shown as 0.5%. All other storm sewer should have a slope of at least 0.5%. As discussed with Crozier staff, additional topographic data may be required to show the 100-year storm event ponding limits at detailed design. <u>Crozier Response (November 2024)</u> Sewers have been designed to convey the minor system (5-year event). Major storms are proposed to be conveyed via overland flow within the right-of-way and will spill into the pond at low point in the development. The first reach of storm sewer in the cul-de-sac bulb has been adjusted to 1%. <u>GEI Comment (December 13, 2024)</u> We note that one stretch of storm sewer (CBMH 11 – DCBMH 12) has a slope of 0.4%, which is lower than Township standards, however the flow velocity is within the allowable range per Township Standards. No further comment.
18.	Proposed Sidewalk	Engineering Plans	February 9, 2024	<u>GEI Comment (February 9, 2024)</u> The Badenoch Street right-of-way includes an existing sidewalk that should be continued into the proposed development. Sidewalk is required on one side of local residential streets per Township of Puslinch Municipal Development standards. Please indicate proposed sidewalk on the Engineering Plans, including Ochs Street. <u>Crozier Response (September 2024)</u> Acknowledged. The proposed sidewalk is indicated on the draft plan and engineering plans. <u>GEI Comment (September 27, 2024)</u> No further comment.
19.	Ochs Street Cross-Section	Engineering Plans	February 9, 2024	<u>GEI Comment (February 9, 2024)</u> Please provide cross-sections for the proposed Ochs Street right-of-way, including proposed retaining walls and swales due to their close proximity to existing buildings. <u>Crozier Response (September 2024)</u> Cross-sections of the proposed Ochs Street right-of-way have been prepared and can be referenced on Figure 5. <u>GEI Comment (September 27, 2024)</u> No further comment.

20.	Well Setback	Engineering Plans	February 9, 2024	GEI Comment (February 9, 2024) The well location shown in Lot 21 does not appear to meet the 15m minimum setback from the septic bed in Lot 17. Additionally, OBC 8.2.1.6.A specifies a 5m setback from structures and 3m setback from property lines. Please revise. Crozier Response (September 2024) Acknowledged. The well has been relocated. GEI Comment (September 27, 2024) No further comment.
21.	Conservation Regulation Limit	Engineering Plans	February 9, 2024, and September 27, 2024	GEI Comment (February 9, 2024) Please show the approximate regulation limit of Conservation Halton on the Engineering Plans. Crozier Response (September 2024) Conservation Halton regulation limits are available on their online portal. The Engineering Plans indicate the linework associated with the natural hazards only. Considering their regulation limits can change, we suggest leaving this information off of the engineered plans. GEI Comment (September 27, 2024) Engineering Plans should show all relevant property and regulatory limits. Please show the latest **Conservation Halton regulation limit** on the plans. Crozier Response (November 2024) Property and regulatory limits are shown on the revised engineering materials. GEI Comment (December 13, 2024) No further comment.
22.	Storm Parameters	Functional Servicing & Preliminary SWM Report	February 9, 2024	GEI Comment (February 9, 2024) The IDF curve parameters are outdated. Please revise stormwater quantity control calculations using the latest City of Guelph Development Engineering Manual. Crozier Response (September 2024) Acknowledged. The updated Guelph IDF parameters have been used. GEI Comment (September 27, 2024) No further comment.

23.	Qualified Professional	Engineering Plans	February 9, 2024	GEI Comment (February 9, 2024) All reports and drawings are to be signed and sealed by a qualified professional for future submissions. Crozier Response (September 2024) Acknowledged. GEI Comment (September 27, 2024) No further comment.
24.	Internal Road Geometry Figure	Traffic Impact Study	February 9, 2024	GEI Comment (February 9, 2024) Section 10 of the TIS needs to be revised using the Township of Puslinch 20m wide urban road cross-section. Additionally, the TIS states that the proposed right-of-way is 18m wide. Please revise to 20m to be consistent with the engineering reports and drawings. Crozier Response (September 2024) Report has been updated to reflect the proposed 20 metre right-of way for Street A. GEI Comment (September 27, 2024) No further comment.
25.	Proposed Streets	Draft Plan	September 27,2024	GEI Comment (September 27, 2024) The Draft Plan in previous submissions showed two proposed streets while the latest submission shows only one proposed street. Why has Street B been removed? How will emergency access be provided to the subdivision if Street A is blocked? The Township Public Works department should be consulted regarding the feasibility of a cul-de-sac of this length. The Catchment 201 and 202 paragraphs of Section 6.2 of the FSSWM report still refer to Street B and may need to be updated. Crozier Comment (November 2024) The cul-de-sac and public road has been designed according to Town standards. Town fire reviewed the draft plan and did not advise of any concerns. GEI Comment (December 13, 2024) We note that a second fire water storage tank has been added to the Preliminary Site Servicing Plans per Township Fire Service requirements. No further comment.

26.	Inconsistencies	Functional Servicing & Preliminary SWM Report	September 27, 2024	GEI Comment (September 27, 2024) The following inconsistencies should be corrected in future submissions: 1. Third paragraph of page 1 refers to first and second submissions but should refer to second and third submissions respectively in this case. 2. The volume in Table 1 should be 2160 m^3 per the appendix and not 5400 m^3. 3. Per the appendix, the additional flow area – floor area in Table 2 should be 1800 L/day, for a total flow per unit of 3800 L/day. The flow per day should also be updated in the following paragraph. 4. Table 3 should be updated per the appendix. Using a flow per day of 3800 L/day, a minimum stone area of 76 m^2 is calculated in the appendix, rather than 72 m^2. As 72 m^2 is the reported provided amount, this will need to be increased slightly. Likewise, the minimum sand area calculated in the appendix is 190 m^2. The provided sand area is shown as 368 m^2 on drawings but reported as 352 m^2 in the appendix. 5. There are inconsistencies between the catchment names used in Tables 6 and 7, the model and drainage plans, i.e. catchments 101A and 101B modelled as catchments 101 and 103, EX3 and EX4 not included on the pre-development plan, labelling for EX catchments are different in the model. Can these names be made more consistent? 6. Notes 1 and 2 below Table 8 should state that runoff from EX3 is also included. 7. In Table 9 the total contributing area to the dry pond should also include the areas of EX2 and EX3. The labelling of this table needs to be clearer – the required volume of 384 m^3 calculated is based on a quality requirement of 110 m^3/ha and not an extended detention requirement of 40 m^3/ha. Likewise, it should be clearer what the provided volume of 462 m^3 represents. 8. In Table 11 it states that the required storage is 93 m^3, whereas the appendix seems to differ. 9. Please confirm that the infiltration target in bullet 5 of the Stormwater Management section on page 15 matches the appendix. 10. The top of grade elevations for HW1 and HW2 on the Servicing Plan do not match the grading plan. 11. Some of the labels for the areas of the Type A dispersion beds on the drawings do not match the calculations and information provided in the report appendix.

				Crozier Response (November 2024) 1. Acknowledged. 2. Acknowledged, 3. Noted. Report and appendix have been updated to be accurate. 4. Noted. Report and appendix have been updated to be accurate. 5. Noted. Report and appendix have been updated for consistency. 6. Noted. 7. Extended detention calculation has been updated to include EX2 and EX3 and report updated accordingly. 8. Noted. Table 11 has been updated. 9. Infiltration target has been confirmed. 10. Grade elevations have been corrected. 11. Calculations and labels have been updated for consistency. GEI Comment (December 13, 2024) No further comment.
27.	Flow Directions	Functional Servicing & Preliminary SWM Report	September 27, 2024	GEI Comment (September 27, 2024) 1. The Catchment EX4 paragraph of Section 6.2 describes post-development flows from this catchment being conveyed via proposed storm sewer infrastructure and internal roadway within the Ochs Street extension to existing storm sewer on Badenoch Street. There does not appear to be proposed storm sewer on Ochs Street within EX4, and flows are directed towards Badenoch Street via the roadway. 2. The second last paragraph of page 7 states that 100-year flows from catchment 201 are conveyed to the SWM facility. Catchments EX2 and EX3 are also conveyed to the SWM facility. 3. The EX4 row of Table 5 states the outlet for these flows is the Bronte Creek Tributary. Is this true for flows conveyed to Badenoch Street? 4. Bullet 2 of the Stormwater Management section on page 15 should reference that EX3 is also conveyed to the SWM facility. Crozier Response (November 2024) 1. Section 6.2 has been updated accordingly. 2. Noted. 3. Flows from EX4 will be conveyed to Badenoch Street. Table 5 has been updated accordingly. 4. Noted.

				GEI Comment (December 13, 2024) No further comment.
28.	Model Outputs	Functional Servicing & Preliminary SWM Report	September 27, 2024	GEI Comment (September 27, 2024) For future submissions can model outputs for all storms including the 25 mm storm be provided? The pre-development peak flows for the 50- and 100-year storms and uncontrolled post-development peak flows for the 10-to-100-year storms appear to be less than for the regional events. It would be useful to review the model outputs to see why this is the case. The regional storm controlled post-development peak flow is greater than the pre-development peak flow. Can this be addressed briefly in terms of impacts to the downstream receiver, and how stormwater control measures being taken will help mitigate the impacts. Crozier Response (November 2024) Model output files have been provided for all storm events. An emergency overflow spillway has been proposed to convey the regional event to the Bronte Creek tributary. GEI Comment (December 13, 2024) No further comment.
29.	Percolation Time	Functional Servicing & Preliminary SWM Report	September 27,2024	GEI Comment (September 27, 2024) A percolation time of 20min./cm., is used in the septic system sizing calculations in Appendix B, whereas the report states that a value of 30min./cm. was to be used. At detailed design, please use a value justified in the report. Crozier Response (November 2024) Noted. Material has been updated to be consistent. GEI Comment (December 13, 2024) No further comment.
30.	Construction North	Drawing Set	September 27,2024	GEI Comment (September 27, 2024) At detailed design, it may be helpful to label construction north on the drawing set as the report refers to directions on the subject lands that aren't necessarily accurate. Crozier Comment (November 2024) Noted. GEI Comment (December 13, 2024) No further comment.

31.	Values in Tables	Functional Servicing & Preliminary SWM Report	December 13, 2024 and January 31, 2025	GEI Comment (December 13, 2024) The following inconsistencies/errors should be reviewed: 1. In Table 6, the area of EX1 is shown as 5.22 ha but elsewhere it is shown as 5.17 ha. 2. The percent imperviousness of EX2 (pre-development) is modelled as 36.9%, but Table 6 and the figures show 37.2% imperviousness. 3. All pre-development peak flow rates in Table 8 do not appear to match the model outputs. 4. The required storage for the regional high water level should be updated from 1127 m^3 to 1149 m^3 in Table 10. Crozier Response (January 2025) All mistakes/inconsistencies have been fixed. GEI Comment (January 31, 2025) Acknowledged. No further comment.

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

GEI Consultants Canada Ltd.

[redacted]

Parth Lad, E.I.T.
Technical Specialist

[redacted]

Andrea Reed, P.Eng.
Project Engineer

Project: 24001.001

January 31, 2025

Township of Puslinch
7404 Wellington Road 34
Puslinch, Ontario N0B 2J0

Attention: Lynne Banks
Development and Legislative Coordinator

RE: Hydrogeological Review Comments - 5th Submission
WDD Main Street Inc. - 11 Main Street, Morriston (Puslinch), Ontario
Proposed Residential Subdivision
Zoning By-law Amendment / Draft Plan of Subdivision Application

Wellington Hydrogeology Ltd. is pleased to provide hydrogeological comments on the above-noted submission for 11 Main Street (Lot 31, Concession 8) in the hamlet of Morriston, Township of Puslinch, Ontario (the site).

The following previous hydrogeological review comments were provided:

- Harden Environmental Services Ltd., dated April 13, 2023 (1st Submission).
- Harden Environmental Services Ltd., dated February 2, 2024 (2nd Submission).
- Wellington Hydrogeology Ltd., dated September 20, 2024 (3rd Submission).
- Wellington Hydrogeology Ltd., dated December 13, 2024 (4th Submission).

Revised hydrogeological review comments are provided herein based on the 5th submission responses and documents.

Documents Reviewed

We reviewed the following documents in preparation of these hydrogeological comments:

1. C.F. Crozier & Associates Inc. (Crozier). 2024. Functional Servicing & Preliminary Stormwater Management Report, 11 Main Street, Estate Residential Development, Township of Puslinch, County of Wellington. CFCA File No. 2366-6537, dated December 2024 (Rev. 4).
2. Englobe Corp. (Englobe). 2024a. Hydrogeological Assessment, 11 Main Street, Puslinch, ON. Project No. T1220482.003, dated August 28, 2024, signed by Paul L. Raepple, P.Geo. and R. Baker Wohayeb, P.Eng.
3. Englobe Corp. (Englobe). 2024b. Addendum to Hydrogeological Investigation, Results of O. Reg. 169/03 Schedule 2 Sampling, Proposed Residential Development – 11 Main Street, Puslinch, Ontario. Project T1220482.003, dated December 2, 2024.
4. Englobe. 2024c. Results of Test Well Drilling and Aquifer Testing, Proposed Residential Subdivision – 11 Main Street, Puslinch, Ontario. Project T1220482.003, dated November 19, 2024.
5. Englobe. 2024d. Additional Dwelling Units and Home Based Businesses, Proposed Residential Subdivision – 11 Main Street, Puslinch, Ontario. Project T1220482.003, dated November 19, 2024.
6. Englobe. 2024e. Response to Wellington Hydrogeology Comments, Proposed Residential Development – 11 Main Street, Puslinch, Ontario. Project T1220482.004, dated December 20, 2024, signed by Paul L. Raepple, P.Geo.
7. Englobe. 2024f. Additional Dwelling Units and Home-Based Businesses, Groundwater and Surface Water Impacts with Sewage Disposal, Proposed Residential Subdivision – 11 Main Street, Puslinch, Ontario. Project T1220482.004, dated December 20, 2024, signed by Paul L. Raepple, P.Geo. (attachment within Englobe, 2024e letter).
8. MECP Regulation 903 Well Records for Test Well 1 (MECP Well Tag Number A321825), Test Well 2 (MECP Well Tag Number A399867) and Test Well 3 (MECP Well Tag Number A321827).

9. Niagara Soil Solutions Ltd. 2022. Phase One Environmental Site Assessment, Vacant Lot, Northside Hwy 6, Morriston, ON. NSSL File No. NS2212-01, dated March 2022, signed by John Monkman, P.Eng. and Jodie Glasier, EP.

10. Niagara Soil Solutions Ltd. 2024. Phase One Environmental Site Assessment-rev, Vacant Lot, Northside Hwy 6, Morriston, ON. NSSL File No. 2212-01, dated August 2024, signed by Jodie Glasier, EP and Philip Adene, P.Geo.

11. Terraprobe Inc. (Terraprobe). 2023a. Hydrogeological Assessment, Proposed Residential Development, 11 Main Street, Puslinch, Ontario. File No. 1-22-0482-46, dated February 23, 2023, signed by Alaa Alborno, EIT and Narjes Alijani, P.Geo.

12. Terraprobe. 2023b. Addendum – Hydrogeological Assessment, Proposed Residential Development, 11 Main Street, Puslinch, Ontario. Project No. A1220482.002, dated December 21, 2023, signed by Paul L. Raepple, P.Geo.

13. Terraprobe. 2023c. Nitrate Loading Impact Assessment, Proposed Residential Development, 11 Main Street, Puslinch, Ontario. File No. T1220482.0020, dated February 23, 2023, signed by Alaa Alborno, B.Eng., EIT and Narjes Alijani, M.Sc., P.Geo.

Background – Site and Proposed Development

Based on our review, we understand that:

- The site is an irregularly shaped parcel with a total area of 23.1 ha (57.1 acres).
- Surrounding properties include residential subdivision developments to the north and west, vacant lands (wooded lots) to the south and agricultural/residential property to the east.
- The proposed subdivision on the site includes 21 single detached dwellings with lot sizes from 0.197 to 0.382 ha and one level of basement for each dwelling.
- The development will be serviced with individual private supply wells and septic systems.
- A stormwater management block will manage runoff from the site.

Hydrogeological Comments – Priority (Water Supply)

Total Coliforms in New Supply Wells: Water quality results from the three test wells indicated the presence of total coliforms within two of the test wells. The ODWS Maximum Acceptable Concentration (MAC) for total coliforms is 0. Englobe (2024e) indicated that TW1 (BH2) was not chlorinated prior to testing, and that TW2 (BH1) was chlorinated but that the disinfection

procedures were inadequate or that contamination occurred with installation of the test pump, resulting in total coliform detections.

If these wells are to be used for water supply the proponent must demonstrate that they meet ODWS MAC. Well disinfection is required in accordance with R.R.O. 1990, Reg. 903 (the "Wells Regulation"), including shock chlorination, thorough flushing of the well to remove free chlorine residual (using appropriate test methods) and resampling for bacterial parameters. Refer to the Wells Regulation for detailed methods. [Note: This can be deferred to the detailed design stage if necessary.]

ODWS Water Quality Parameters: The water quality results exceeded the ODWS aesthetic objectives and operational guidelines for hardness, total dissolved solids (TDS), total iron, total manganese and colour. Nitrates were present at levels up to 1.88 mg/L, but were below the ODWS MAC of 10 mg/L. Elevated chloride was present at levels up to 193 mg/L (below the ODWS aesthetic objective of 250 mg/L), with sodium levels of up to 90.2 mg/L (below the ODWS aesthetic objective of 250 mg/L but exceeding the Medical Officer of Health Reporting Limit of 20 mg/L). The extended O. Reg. 169/03 Schedule 2 results for TW3 (BH4), including the additional analysis for microcystins, did not exceed the regulation limits.

The elevated hardness, TDS, iron and manganese are common, and generally naturally occurring, in groundwater in Puslinch and southwestern Ontario. The elevated nitrate and chloride levels, as well as some other chemical parameters in the extended analysis (e.g., naphthalene, phenol, o-cresol, m&p-cresol, barium), were below regulation limits but suggest anthropogenic impacts (e.g., from septic systems and road salt application) to the upper bedrock aquifer from existing upgradient development.

No further clarification is requested.

Upper vs. Lower Bedrock Aquifers: The hydrostratigraphy of the site includes overburden sediments, the upper bedrock aquifer (Guelph Formation) and the lower bedrock aquifer (Gasport Formation). Local supply wells typically source water from the Guelph Formation, but some wells obtain water from the lower Gasport Formation. Given the identification of nitrates, chloride and other anthropogenic contaminants within the upper bedrock aquifer (Guelph Formation), a competent aquitard may not be present between the overburden and the upper bedrock aquifer, and the Guelph Formation is not interpreted to be protected by isolation at the site.

The table below summarizes the water quality results for wells installed in the overburden, upper bedrock and surface water from Englobe (2024a, 2024c). Note that the concentrations of nitrate,

chloride and sodium are elevated in the test wells on the site and upgradient private wells, both installed within the upper bedrock aquifer (Guelph Formation).

Table 1: Summary of Englobe Water Quality Results

Parameter	ODWS	Monitoring Wells (Overburden)				Test Wells (Upper Bedrock)			Private Wells (Upper Bedrock, upgradient)			
		BH1	BH2	BH3	BH6	BH2	BH1	BH4	RWx	RWx	RWx	RWx
Nitrate	10.0	0.37	1.54	6.10	1.66	1.74-1.88	0.88-0.94	0.72-0.79	2.75-3.02	0.79-1.01	2.86-3.11	3.14-3.43
Chloride	250	34.4	17.3	202	4.70	190-193	171-175	105-108	n/a	n/a	n/a	n/a
Sodium	200 / 20	12.2	10.4	117	3.99	86.8-90.2	77.1-78	45.5-47.8	73.1-73.4	56.1-59.3	72.7-73.2	77.7-78.1

Note: All concentrations are in mg/L.

Terraprobe (2023c) estimated nitrate concentrations downgradient of each lot boundary up to 10.34 mg/L with tertiary treatment (20 mg/L in effluent) and up to 8.19 mg/L with advanced tertiary treatment (15 mg/L nitrate in effluent). These concentrations are estimated for the saturated overburden soils; concentrations in the upper bedrock aquifer may also increase without isolation. Depending on the degree of hydraulic connection between the overburden and the upper bedrock aquifer, nitrate concentrations in the upper bedrock aquifer could approach levels similar to those predicted in shallow groundwater.

Englobe (2024e) recommended "utilizing the lower bedrock aquifer for potable water supply be considered on a lot-by-lot basis, during well drilling, where sufficient low permeable soils are not identified overlying the lower bedrock aquifer." Englobe further suggests that "where low permeable overburden deposits (hydraulic conductivity less than 10^{-5} cm/sec) are identified with a thickness of less than 10 m that the well casing be extended through the upper bedrock aquifer, and at least 1.5 m into the lower bedrock aquifer to mitigate potential water quality impacts to the potable supply well for the subject lot. [This recommendation] was taken from Section 22.5.24 of the MECP Guidelines for Sewage Works, as rationale for low permeable environments and geological isolation of underlying aquifer systems relating to groundwater impacts from sewage disposal systems."

The thickness of the clay unit, providing an aquitard over the upper bedrock aquifer, is variable across the site. The test well records show variability in clay thickness overlying the upper limestone bedrock, as summarized below:

- TW1: Sand and gravel to gravel 0.3-9.8 mbgs; clay with gravel 9.8-13.1 (3.3 m); clay 13.1-22.9 mbgs (9.8 m); limestone at 22.9 mbgs.
- TW2: sand to gravel 0.0-10.7 mbgs (10.7 m); clay 10.7-14.0 mbgs (3.3 m); gravel with sand 14.0-18.9 mbgs (4.9 m); limestone at 18.9 mbgs.
- TW3: Sand to sand and gravel 0.3-12.8 mbgs; clay 12.8-26.2 mbgs (13.4 m); clay with gravel 26.2-27.1 mbgs (0.9 m); gravel 27.1-28.0 mbgs (0.9 m); limestone at 28.0 mbgs.

The well logs for TW1 and TW3 show a >10m clay unit present overlying the bedrock aquifer, but the well log for TW2 shows a clay unit only 3.3 m thick. Based on Englobe's recommendation for the 10 m thickness of low permeability overburden, TW2 and other wells less than 10 m of aquitard is identified above the bedrock would need to be drilled deeper into the lower bedrock aquitard (Gasport Formation).

We agree that this approach may be protective of water quality on an individual lot basis. This approach would need to be implemented for the remaining wells servicing individual lots (i.e., drillers would need to understand and adhere to this approach). If the Township is unable to implement this approach, drilling deeper into the lower bedrock aquifer by default is recommended as an alternative.

Please note that wells installed in the lower bedrock must be cased and sealed into the lower unit; multiaquifer wells (i.e., wells that are constructed with a screen or open hole extending through both the upper and lower bedrock aquifers) are not permitted. We are currently working on a wells standard which may be implemented by the Township/County in future, including requirements and/or best practices for well installations into the lower aquifer.

Septic Systems and Additional Dwelling Units: The nitrate impact assessment completed by Terraprobe (2023c) assumed a daily sewage flow of 1,000 L/day per lot. Englobe (2024f) indicated that lots 1 and 12 will use standard treatment (20 mg/L nitrate) and the remaining lots will use advanced tertiary treatment (15 mg/L nitrate). Englobe suggested that additional dwelling units (ADUs) may be subject to building code approvals which would consider the capacity of the existing septic system to handle additional sewage. Englobe also suggested that information be provided to lot purchasers with "operational guidelines and maintenance for septic systems indicating proper use and disposal, including what should not be disposed of through the septic system" (e.g., pharmaceuticals, chemicals, salt, etc.) – this would either be provided by the developer, the Township, or source protection policies.

We recommend that the Township include the septic maintenance requirements as a condition on the draft plan of subdivision.

We further request clarification from the proponent on which lots will receive standard tertiary treatment (20 mg/L nitrate) and which lots will receive advanced tertiary treatment (15 mg/L nitrate), as Terraprobe (2023c) indicated that lots 1 and 7 would receive the 20 mg/L level treatment and Englobe (2024f) indicated it would be lots 1 and 12 receiving the 20 mg/L treatment. If there is uncertainty, having all lots receive the advanced treatment (15 mg/L nitrate) is recommended as the default to be protective of water quality.

The remaining hydrogeological comments are to be addressed at the detailed design stage (comments unchanged from previous submission; provided again for reference).

Hydrogeological Comments – Detailed Design Stage

Topography and drainage: Section 3.1 of the Hydrogeological Assessment report indicates that "topography of the site is sloping downwards in a northwest direction. As such, it is anticipated that generated runoff (if not managed) will flow in a northwesterly direction." This interpretation is incorrect based on the Topography Map (Figure 5).

Please revise/clarify (at the detailed design submission stage).

High groundwater table: Groundwater monitoring was completed within the four onsite monitoring wells between August 24 and September 19, 2022. Additional groundwater monitoring was completed on July 18 and August 6, 2024. The highest groundwater elevation measured to date was 312.86 masl at BH3 on July 18, 2024. In the absence of spring freshet monitoring data, the project hydrogeologist interprets the July 2024 measurements as representative of the seasonal high groundwater table due to significant precipitation events preceding the July measurements.

The proponent should complete monthly groundwater level monitoring for at least 12 consecutive months, including the spring freshet, prior to detailed design submission. The design elevations of building foundations, septic leaching beds, SWM facilities and LIDs (e.g., infiltration facilities) must be evaluated in relation to the high water table (required at the detailed design submission stage).

Groundwater contribution to Bronte Creek: Terraprobe (2023a) indicated that further field investigations would be completed to assess the presence of groundwater seepage during seasonal high groundwater conditions. Englobe (2024) did not include details of groundwater seepage or vertical gradients within the updated report.

We recommend the installation of shallow piezometers to monitor baseline conditions and vertical gradients within Bronte Creek on the site, with monitoring completed at the same frequency to groundwater level monitoring on the site (i.e., monthly for at least one year, including the spring groundwater high) (required at the detailed design submission stage).

Groundwater flow direction: Englobe interpreted that a shallow groundwater flow divide was present with the highest groundwater elevation at BH3, with groundwater flow to both the west (toward Bronte Creek) and to the east (toward the tributary of Bronte Creek and associated wetlands). Englobe also noted that residential properties to the north were considered upgradient, suggesting local flow to the south (toward the site) toward surface water features.

We generally concur with this assessment of shallow groundwater flow. On a regional scale, deeper groundwater flow is typically to the south-southeast within Puslinch in the general vicinity of the site – it is recommended that the project hydrogeologist confirm and interpret deeper/regional groundwater flow as well (at the detailed design submission stage).

Shallow groundwater quality: Groundwater quality samples were collected in 2022 from three shallow monitoring wells on the site as part of the nitrate impact assessment report, which were analyzed for nitrate, nitrite, phosphorus, ammonia/ammonium, and pH. Additional analysis was requested to characterize the shallow groundwater quality, including general chemistry, metals and nutrients, with comparison to the Ontario Drinking Water Quality Standards (ODWS).

Englobe collected additional groundwater quality samples from all four monitoring wells on August 6, 2024 for general groundwater chemistry characterization analysis including nutrients, dissolved metals and inorganic parameters, with the results compared to the ODWS. The results showed elevated hardness in all monitoring wells. The sample from BH3 also had elevated total dissolved solids (TDS), sodium, chloride and nitrate relative to the samples from other wells.

Can the project hydrogeologist provide an explanation for the elevated TDS, sodium, chloride and nitrate at BH3? (at the detailed design submission stage)

Surface water quality: Englobe collected a surface water quality sample from Bronte Creek on August 6, 2024, with the results compared to the ODWS. The surface water sample contained elevated concentrations of chloride, sodium, manganese, iron, hardness, TDS, turbidity and colour. The results are indicative of impacts from road deicing salt. We recommend that the surface water quality results also be compared to the Provincial Water Quality Objectives (at the detailed design submission stage) as they are more applicable for evaluating surface water quality.

Bronte Creek impact assessment: Englobe (2024) evaluated the impact of phosphorus and nitrate loading to Bronte Creek. Nitrate concentrations were quantified using a mass balance calculation and are expected to be below the CWQG limit of 2.93 mg/L. Impacts from total phosphorus were not quantified but were not expected to have significant impacts to surface water.

We recommend that the project hydrogeologist quantify the predicted phosphorus concentration at the surface water feature (e.g., using the Robertson attenuation method, dilution or equivalent) (at the detailed design submission stage).

Groundwater recharge facilities: The soakaway pits were designed by Crozier (December 2023) based on the hydraulic conductivity estimates determined by Terraprobe (2023). The infiltration estimates should be confirmed with soil infiltration testing at representative locations and

appropriate depths based on the proposed septic beds and soakaway pits. Infiltration testing will confirm soil conditions and field saturated hydraulic conductivity/infiltration rates. The proposed depths/elevations of subsurface infiltration structures must also be evaluated alongside the annual high groundwater table elevation across the site (required at the detailed design submission stage).

Construction dewatering: The project hydrogeologist must consider the high groundwater table in the assessment of construction dewatering requirements. If groundwater dewatering is required, management of discharge water quantity and quality must be discussed (required at the detailed design submission stage).

Phase One ESA: The Phase One Environmental Site Assessment (ESA) completed by Niagara Soils Solutions Ltd. (March 2022) was updated (August 2024) and the previous recommendation for a Phase Two ESA was changed. The previously identified Areas of Potential Environmental Concern (APEC) related to off-site Potentially Contaminating Activities (PCA) related to metal fabrication and commercial autobody shops was changed to remove the on-site APEC as the off-site welding activities were more than 30 m from the property boundary therefore not interpreted as an APEC. A Phase Two ESA is no longer recommended.

Excess soil management: Any import/export of fill/soil from the site must be conducted in accordance with O. Reg. 406/19: On-Site and Excess Soil Management, the Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) and O. Reg. 153/04, as amended.

We appreciate the opportunity to provide these comments. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

WELLINGTON HYDROGEOLOGY LTD.

Angela Mason, M.Sc., P.Geo., QP_{ESA}
Senior Hydrogeologist and CEO
Cell: 519-831-9696
Email: amason@wellingtonhydrogeology.com

ZONING BY-LAW AMENDMENT to By-law 023/18

for

WDD Main Street Inc.
11 Main Street, Puslinch

Township Rezoning Application D14/___

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER _____

A BY-LAW TO AMEND BY-LAW NUMBER 023/18, AS AMENDED, BEING THE ZONING BY-LAW OF THE TOWNSHIP OF PUSLINCH

WHEREAS, the Council of the Corporation of the Township of Puslinch deem it appropriate and in the public interest to amend By-Law Number 023/18 pursuant to Sections 34 of the Planning Act, R.S.O. 1990 as amended;

NOW THEREFORE THE COUNCIL OF THE CORPORATION OF THE TOWNSHIP OF PUSLINCH ENACTS AS FOLLOWS:

1. That Schedule "A" of By-law 023/18 is hereby amended by rezoning lands legally known as PT LOT 31, CONCESSION 8, TOWNSHIP OF PUSLINCH, AS IN RO722846 & MS8894; LOTS 7 & 8, PLAN 135, DONALD MCEDWARDS PORTION, NORTH OF QUEEN ST, SAVE AND EXCEPT MS53965; S/T THE RIGHTS OF OWNERS OF ADJOINING PARCELS, IF ANY, UNDER IS13908 & ROS585925; TOWNSHIP OF PUSLINCH, within the Township of Puslinch, and municipally referred to as 11 Main Street, from *Urban Residential (UR), Future Development 2 (FD2) and Natural Environment (NE)* zone to *Urban Residential Site-Specific Special Provisions XX (UR-XX)* ZONE, *Urban Residential Site-Specific Special Provisions YY (UR-YY)* ZONE and *Natural Environmental (NE) ZONE* with an "*Environmental Protection (EP)*" overlay as shown on Schedule "A" of this By-law.

2. That Section 14 Site-Specific Special Provisions is amended by adding the following site-specific provision:

No.	Zone Designation	Permitted Uses	Prohibited Uses	Site Specific Special Provision
1	Urban Residential (UR-XX)	Single Detached Dwellings Additional Residential Unit (Attached Detached) Home Business and Private Home Daycare	N/A	Minimum Required Lot Area = 0.19 ha
2	Urban Residential (UR-YY)	Stormwater Management Facilities	N/A	Minimum Required Lot Area = 0.3 ha

3. That the subject land as shown on Schedule "A" to this By-Law shall be subject to all applicable regulations of Zoning By-Law 023/18, as amended.

4. This By-law shall become effective from the date of passage by Council and come into force in accordance with the requirements of the Planning Act, R.S.O. 1990, as amended.

READ A FIRST AND SECOND TIME THIS _____ OF _____, 20__.

_____ _____

MAYOR CLERK

READ A THIRD TIME AND PASSED THIS_____OF_____20__.

_____ _____

MAYOR CLERK

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

EXPLANATION OF BY-LAW NO. _____

By-law Number _____ amends the Township of Puslinch Zoning By-law 23/18 by rezoning PT LOT 31, CONCESSION 8 , TOWNSHIP OF PUSLINCH, AS IN RO722846 & MS88941 ; LOTS 7 & 8, PLAN 135 , DONALD MCEDWARDS PORTION, NORTH OF QUEEN ST, SAVE AND EXCEPT MS53965 ; S/T THE RIGHTS OF OWNERS OF ADJOINING PARCELS, IF ANY, UNDER IS13908 & ROS585925 ; TOWNSHIP OF PUSLINCH, within the Township of Puslinch, and municipally referred to as 11 Main Street from *Urban Residential (UR), Future Development 2 (FD2) and Natural Environment (NE)* zone to *Urban Residential Site-Specific Special Provisions XX (UR-XX)* zone, Urban Residential (UR-YY) zone and *Natural Environmental (NE) zone* with *Environmental Protection (EP) overlay* to permit a 21-lot residential subdivision and conserve the natural features.

The subject property is approximately 23.48 hectares (58.03 acres) in size and is currently vacant.

Within the County's Official Plan, the subject lands are designated as "Residential", "Greenlands" and "Core Greenlands" lands. The Residential designation permits a variety of housing types.

THIS IS "SCHEDULE A"
TO ZONING BY-LAW AMENDMENT NO. _____

- Subject Lands
- Environmental Protection Overlay
- Natural Environment
- Site Specific Exemption
- Urban Residential (spxx)
- Urban Residential (spyy)

0 125 250m

N

Comment Response Matrix

11 Main Street, Township of Puslinch

Weston File: 10779

January, 2025

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1. NPG PLANNING SOLUTIONS		
Jesse Auspitz - jauspitz@npgsolutions.ca – December 13, 2024		
Comment	**Consultant**	**Response**
NPG Planning Solutions Inc. (NPG) has been retained to provide comments regarding a Zoning By-law Amendment Application and a Draft Plan of Subdivision Application proposing a residential subdivision consisting of 21 detached dwelling lots, environmental protection lands, a stormwater management pond and a municipal road. The Subject Lands are approximately 23.10 hectares in size and have frontage along Highway 6, Main St and Ochs St. The Subject Lands are currently vacant and are in proximity to residential uses to the north and west, and agricultural and natural lands to the east and south. This is the fourth submission for this application. NPG has reviewed the following items: • Draft Plan of Subdivisions prepared by Weston Consulting, dated September 3, 2024; • Draft Zoning By-law Amendment prepared by Weston Consulting; • Planning Justification Report Addendum Letter prepared by Weston Consulting dated November 20,2024; • Environmental Impact Study Addendum Letter prepared by Colville, dated November 14,2024; • Functional Servicing and Preliminary Stormwater Management Report prepared Colville dated September 2024; • Servicing Review Letter for additional Residential Units and Home-Based Businesses prepared by Crozier, dated November 15, 2024;	Weston Consulting	Information only.

1. NPG PLANNING SOLUTIONS		
Jesse Auspitz - jauspitz@npgsolutions.ca – December 13, 2024		
• Traffic Review Letter for Additional Residential Units and Home-Based Businesses prepared by GHD, dated November 13, 2024; • Hydrogeological Letter for Additional Residential Units and Home-based Businesses prepared by Englobe, dated November 19,2024; • Comment-Response Matrix prepared by Weston Consulting, dated November 2024.		
<u>Comments for Complete Application:</u> 1. We have no issues with the Township deeming the Zoning By-law Amendment Application complete subject to the Township's Engineering and Hydrogeological Consultant confirming that sufficient information has been provided to make a determination as to whether the site conditions are suitable for the long-term provision of individual on-site sewage services and individual on-site water services without negative impacts.	Weston Consulting	Information only.
<u>Preliminary Comments on Application</u> 2. As previously noted, the Zoning By-law should address the exclusion of uses on the proposed stormwater management pond block. The revised Zoning By-law does not include any language addressing this matter.	Weston Consulting	The ZBA has been updated accordingly to restrict the usage of the stormwater management pond block. The only permitted use includes stormwater management facilities.
3. The Schedule submitted by the Applicant should be revised to make the Environmental Protection Zone Overlay more visible since the overlay hatching is not legible.	Weston Consulting	The Schedule has been revised for legibility.

1. NPG PLANNING SOLUTIONS		
Jesse Auspitz - jauspitz@npgsolutions.ca – December 13, 2024		
4. Conservation Halton recommends their regulated area (wetland features plus the 30-m regulatory setback) be zoned appropriately and be conveyed to public ownership. The current Zoning By-law Amendment Application proposes to zone the wetland features and part of the 30-metre regulatory setback as Natural Environment Zone (NE) and the remaining part of the 30-metre regulatory setback as a site-specific Urban Residential Zone (UR(spXX)). The appropriate zones and their extent will need to be reviewed through the application process.	Weston Consulting	The Environmental Impact Study has provided details related to enhancements in areas where a greater buffer is provided, to compensate for those areas with a reduced setback for the proposed lot lines. Please note, only lot lines are proposed within the buffer.

2. GEI CONSULTANTS		
Parth Lad, Andrea Reed – December 13, 2024		
Comment	**Consultant**	**Response**

Dear Ms. Banks:
 	
Following our review of fourth submission documents for Zoning By-Law Amendment and Draft Plan of Subdivision Application received on November 22, 2024, we are providing comments related to the proposed residential subdivision on the subject lands located at 11 Main Street in the Township of Puslinch. The Draft Plan of Subdivision submitted identifies twenty-one (21) residential lots. Twenty (20) of the lots front a proposed right-of-way, connected to an extension of Ochs Street, while one (1) lot fronts Main Street.
 	
The third submission was received on September 5, 2024, with review comments provided on September 27, 2024.
 	
The following fourth submission documents were received and reviewed:
 	
• Fourth Submission Cover Letter, prepared by Weston Consulting, dated November 20, 2024.
• Comments Response Matrix, prepared by Weston Consulting, dated November 2024.
• Draft Plan of Subdivision, prepared by Weston Consulting, dated September 9, 2024.
• Functional Servicing and Preliminary Stormwater Management Report, prepared by Crozier Consulting, dated November 2024.
• Engineering Plans (Rev. 3), prepared by Crozier Consulting, dated November 15, 2024, including:
  ○ Fig. 1 - Preliminary Site Servicing Plan (East)
  ○ Fig. 2 - Preliminary Site Servicing Plan (West)
	-	Information Only.

2. GEI CONSULTANTS		
Parth Lad, Andrea Reed – December 13, 2024		
○ Fig. 3 - Site Grading Plan (East) ○ Fig. 4 - Site Grading Plan (West) ○ Fig. 5 - External Grading Plan (Ochs Street) ○ Fig. 6 - Pre-Development Drainage Plan ○ Fig. 7 - Post-Development Drainage Plan		
Please provide a detail for the infiltration facility to show frost cover depth, groundwater separation, inlet and outlet elevations. If using a 1.0 m storage depth, please provide a reference to an alternate guideline/best practice to support the proposed design.	Crozier	An updated open bottom infiltration system has been proposed with a storage depth of 0.6m. Preliminary details are provided on the revised drawing set. Specific manufacturer details will be provided during detailed design.
The top of grate/lid elevation on Detail 3 on the Preliminary Site Servicing Plan (East) does not appear to match the plan view on the drawing, or the Storage-Outflow Calculations Table in Appendix D. The outlet pipe in the detail does not match the plan view drawing. Additionally, the Emergency Overflow Detail shows a crest elevation of 314.25, whereas tables in the report and Appendix D state that the overflow weir elevation is at 313.90. It is also not clear on the Preliminary Site Servicing Plan (East) where the emergency overflow weir is located.	Crozier	All elevations have been updated and are reflected accurately on report, drawings and calculations.
The following inconsistencies/errors should be reviewed: 1. In Table 6, the area of EX1 is shown as 5.22 ha but elsewhere it is shown as 5.17 ha.	Crozier	All mistakes/inconsistencies have been fixed.

2. GEI CONSULTANTS		
Parth Lad, Andrea Reed – December 13, 2024		
2. The percent imperviousness of EX2 (pre-development) is modelled as 36.9%, but Table 6 and the figures show 37.2% imperviousness. 3. All pre-development peak flow rates in Table 8 do not appear to match the model outputs. 4. The required storage for the regional high water level should be updated from 1127 m3 to 1149 m3 in Table 10.		

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
Comment	**Consultant**	**Response**
Three test wells were drilled by Aardvark Drilling Inc. on the site between September 24 and 26, 2024. The test wells TW1 (BH2), TW2 (BH1) and TW3 (BH4) were installed to depths of 22.6 to 30.8 mbgs within the top of the limestone bedrock (Guelph Formation), and were cased and grouted to approximately 0.3 m into the bedrock. Overburden was reported as sand and gravel overlying clay and gravel deposits. Englobe completed a pumping test of each of the three test wells at rates of 37.8 L/min over a 6-hour duration. The pumping test was completed as an individual test for TW1 on October 7, 2024 and at TW2 and TW3 pumped concurrently on October 8, 2024. Englobe also completed a well survey of nearby private/residential wells. Water quality sampling (E. coli., total coliforms, nitrate, nitrite and sodium only) was completed at 4 nearby private residential wells on October 7, 2024 and manual groundwater levels were measured at 3 of the private wells before and after the pumping test on October 7, 2024. The drawdown assessment completed by Englobe indicates that the test wells installed in the top of the bedrock (Guelph Formation) are capable of producing sufficient water supply for typical household use without significant interference effects with nearby wells. **Comment 1: We concur with the drawdown assessment completed by Englobe that indicates adequate water supply from the upper bedrock aquifer for residential use.**	Englobe	Water quality results from the nearby private wells (for E. coli., total coliforms, nitrate, nitrite and sodium only) indicated total coliforms in two of the private wells. Elevated nitrates were also present at levels up to 3.43 mg/L, but did not exceed the Ontario Drinking Water Quality Standard (ODWS) Maximum Acceptable Concentration (MAC) of 10 mg/L.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
Comment 2: Please confirm that the results were provided to individual well owners with recommendations for results exceeding the ODWS MAC.	Englobe	Water quality results from the three test wells indicated the presence of total coliforms within two of the test wells. The ODWS MAC for total coliforms is 0.
Comment 3: Please discuss the presence of total coliforms in the test well samples, and whether the total coliform detections were a result of inadequate disinfection of the new supply wells (at the detailed design stage).	Englobe	The O. Reg. 169/03 Schedule 2 results did not evaluate microcystins "since the source is groundwater of which cyanobacteria do not pose an issue (i.e., surface water)."
Comment 3: The MECP have identified the potential presence of cyanobacteria in groundwater within the shallow bedrock aquifer in Puslinch just south of Morriston. Please run the sample for microcystins to confirm that the concentration is below the O.Reg.169/03 standard at the site.	Englobe	The water quality results also exceeded the ODWS aesthetic objectives and operational guidelines for hardness, total dissolved solids (TDS), total iron, total manganese and colour. Nitrates were present at levels up to 1.88 mg/L, but were below the ODWS MAC of 10 mg/L. Elevated chloride was present at levels up to 193 mg/L (below the ODWS aesthetic objective of 250 mg/L), with sodium levels of up to 90.2 mg/L (below the ODWS aesthetic objective of 250 mg/L but exceeding the Medical Officer of Health Reporting Limit of 20 mg/L).

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
		The extended O. Reg. 169/03 Schedule 2 results for TW3 (BH4) did not exceed the regulation limits.
Comment 4: Although local geology suggests isolation of the upper bedrock (Guelph Formation) aquifer on the site, the water quality results from the test wells in the upper bedrock aquifer suggest anthropogenic impacts (e.g., from septic systems, road salt application, etc.). Elevated nitrate and chloride levels were present, though below the appliable standards, and several other chemical parameters in the extended water quality analysis for TW3 (BH4) were elevated (e.g., naphthalene, phenol, o-cresol, m&p-cresol, barium). The addition of individual septic systems on each lot in the proposed development is expected to further concentrate parameters that are already elevated. From a groundwater quality perspective, we are unsure of the feasibility of the upper bedrock aquifer to support the density proposed for this development as well as future development in the surrounding area. It is our recommendation to the Township/County that water supply for this development and other high-density developments on private servicing in Morriston be sourced from the lower bedrock aquifer to ensure isolation from surface contaminants and provide safe and sustainable water supply now and in future. Wells installed in the lower bedrock must be cased and sealed into the lower unit; multiaquifer wells (i.e., wells that are constructed with a screen or open hole extending through both the upper and lower bedrock aquifers) are not permitted.	Englobe	Englobe also provided an assessment of potential additional supply demands for additional dwelling units and home-based businesses and determined that private residential supply wells are expected to be capable of supporting additional dwelling units and/or home-based businesses.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
Comment 5: The letter on water supply for additional dwelling units (ADUs) and/or home-based businesses was related to water supply availability. A separate assessment should be completed for sewage impacts to groundwater and surface water quality resulting from potential ADUs and/or home-based businesses. Lot sizes for the proposed development are already considered small for a rural development on private servicing. Please evaluate the feasibility of further increasing density from a water quality perspective. Within the letter for sewage impacts, please consider that treatment systems are designed to treat for nitrate and/or phosphorus, but that other contaminants may be present within household sewage that may have negative impacts to groundwater and/or surface water (e.g., pharmaceuticals, artificial sweeteners, PFAS, salt, etc.). This will need to be carefully considered by the Township/County for potential future ADUs.		The remaining hydrogeological comments are to be addressed at the detailed design stage (comments unchanged from previous submission; provided again for reference).
Hydrogeological Comments – Detailed Design Stage **Topography and drainage:** Section 3.1 of the Hydrogeological Assessment report indicates that "topography of the site is sloping downwards in a northwest direction. As such, it is anticipated that generated runoff (if not managed) will flow in a northwesterly direction." This interpretation is incorrect based on the Topography Map (Figure 5). Please revise/clarify (at the detailed design submission stage).		To be addressed at detailed design.
High groundwater table: Groundwater monitoring was completed within the four onsite monitoring wells between August 24 and September 19, 2022. Additional groundwater monitoring was completed on July 18 and August 6, 2024. The highest groundwater elevation measured to date was 312.86 masl at BH3 on July 18, 2024. In the absence of spring freshet		To be addressed at detailed design.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
monitoring data, the project hydrogeologist interprets the July 2024 measurements as representative of the seasonal high groundwater table due to significant precipitation events preceding the July measurements. The proponent should complete monthly groundwater level monitoring for at least 12 consecutive months, including the spring freshet, prior to detailed design submission. The design elevations of building foundations, septic leaching beds, SWM facilities and LIDs (e.g., infiltration facilities) must be evaluated in relation to the high water table (required at the detailed design submission stage).		
Groundwater contribution to Bronte Creek: Terraprobe (2023a) indicated that further field investigations would be completed to assess the presence of groundwater seepage during seasonal high groundwater conditions. Englobe (2024) did not include details of groundwater seepage or vertical gradients within the updated report. We recommend the installation of shallow piezometers to monitor baseline conditions and vertical gradients within Bronte Creek on the site, with monitoring completed at the same frequency to groundwater level monitoring on the site (i.e., monthly for at least one year, including the spring groundwater high) (required at the detailed design submission stage).		To be addressed at detailed design.
Groundwater flow direction: Englobe interpreted that a shallow groundwater flow divide was present with the highest groundwater elevation at BH3, with groundwater flow to both the west (toward Bronte Creek) and to the east (toward the tributary of Bronte Creek and associated wetlands). Englobe also noted that residential properties to the north were considered upgradient, suggesting local flow to the south (toward the site) toward		To be addressed at detailed design.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
surface water features. We generally concur with this assessment of shallow groundwater flow. On a regional scale, deeper groundwater flow is typically to the south-southeast within Puslinch in the general vicinity of the site – it is recommended that the project hydrogeologist confirm and interpret deeper/regional groundwater flow as well (at the detailed design submission stage).		
Shallow groundwater quality: Groundwater quality samples were collected in 2022 from three shallow monitoring wells on the site as part of the nitrate impact assessment report, which were analyzed for nitrate, nitrite, phosphorus, ammonia/ammonium, and pH. Additional analysis was requested to characterize the shallow groundwater quality, including general chemistry, metals and nutrients, with comparison to the Ontario Drinking Water Quality Standards (ODWS). Englobe collected additional groundwater quality samples from all four monitoring wells on August 6, 2024 for general groundwater chemistry characterization analysis including nutrients, dissolved metals and inorganic parameters, with the results compared to the ODWS. The results showed elevated hardness in all monitoring wells. The sample from BH3 also had elevated total dissolved solids (TDS), sodium, chloride and nitrate relative to the samples from other wells. Can the project hydrogeologist provide an explanation for the elevated TDS, sodium, chloride and nitrate at BH3? (at the detailed design submission stage)		To be addressed at detailed design.
Surface water quality: Englobe collected a surface water quality sample from Bronte Creek on August 6, 2024, with the results compared to the ODWS. The surface water sample contained elevated concentrations of		To be addressed at detailed design.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
chloride, sodium, manganese, iron, hardness, TDS, turbidity and colour. The results are indicative of impacts from road deicing salt. We recommend that the surface water quality results also be compared to the Provincial Water Quality Objectives (at the detailed design submission stage) as they are more applicable for evaluating surface water quality.		
Bronte Creek impact assessment: Englobe (2024) evaluated the impact of phosphorus and nitrate loading to Bronte Creek. Nitrate concentrations were quantified using a mass balance calculation and are expected to be below the CWQG limit of 2.93 mg/L. Impacts from total phosphorus were not quantified but were not expected to have significant impacts to surface water. We recommend that the project hydrogeologist quantify the predicted phosphorus concentration at the surface water feature (e.g., using the Robertson attenuation method, dilution or equivalent) (at the detailed design submission stage).		To be addressed at detailed design.
Groundwater recharge facilities: The soakaway pits were designed by Crozier (December 2023) based on the hydraulic conductivity estimates determined by Terraprobe (2023). The infiltration estimates should be confirmed with soil infiltration testing at representative locations and appropriate depths based on the proposed septic beds and soakaway pits. Infiltration testing will confirm soil conditions and field saturated hydraulic conductivity/infiltration rates. The proposed depths/elevations of subsurface infiltration structures must also be evaluated alongside the annual high groundwater table elevation across the site (required at the detailed design submission stage).		To be addressed at detailed design.

3. WELLINGTON HYDROGEOLOGY		
Angela Mason – amason@weelingtonhydrogeology.com – December 13, 2024		
Construction dewatering: The project hydrogeologist must consider the high groundwater table in the assessment of construction dewatering requirements. If groundwater dewatering is required, management of discharge water quantity and quality must be discussed (required at the detailed design submission stage).		To be addressed at detailed design.
Phase One ESA: The Phase One Environmental Site Assessment (ESA) completed by Niagara Soils Solutions Ltd. (March 2022) was updated (August 2024) and the previous recommendation for a Phase Two ESA was changed. The previously identified Areas of Potential Environmental Concern (APEC) related to off-site Potentially Contaminating Activities (PCA) related to metal fabrication and commercial autobody shops was changed to remove the on-site APEC as the off-site welding activities were more than 30 m from the property boundary therefore not interpreted as an APEC. A Phase Two ESA is no longer recommended.	-	Acknowledged.
Excess soil management: Any import/export of fill/soil from the site must be conducted in accordance with O. Reg. 406/19: On-Site and Excess Soil Management, the Rules for Soil Management and Excess Soil Quality Standards (Soil Rules) and O. Reg. 153/04, as amended.	Owner	Acknowledged.

4. MINISTRY OF TRANSPORTATION		
Jeremiah Johnston – Jeremiah.johnston@ontario.ca December 6, 2024		
Comment	**Consultant**	**Response**
The Ministry of Transportation (MTO) has completed our review of the 4th submission of the draft plan of subdivision prepared by Weston Consulting dated received November 22nd, 2024, and associated package for 11 Highway 6, Morriston ON. The following outlines MTO comments: The MTO does not oppose the proposed zoning amendments, however the following comments will need to be addressed as conditions of draft plan approval or MTO permit. Blocks and Land Use: MTO has no objections with the proposed block configuration and access as proposed from Ochs Street.	-	Acknowledged.
Stormwater Management: • To ensure that stormwater runoff from this property does not adversely affect our highway drainage system or highway corridor, MTO requires the owner to submit a Storm Water Management Report (SWMR) along with the above-noted grading/drainage plans for the proposed development for our review and approval. MTO Stormwater Management Requirements for Land Development Proposals can be obtained from the following website: https://www.ontario.ca/page/resources-transportation-planners#section-5 o The owner's drainage consultant should refer to the ministry website for applicable IDF curves and the ministry's	Owner/Crozier	Acknowledged.

4. MINISTRY OF TRANSPORTATION		
Jeremiah Johnston – Jeremiah.johnston@ontario.ca December 6, 2024		
Stormwater Management Requirements for Land Development Proposals. http://www.mto.gov.on.ca/IDF_Curves/terms.shtml ○ The owner's drainage consultant shall ensure that all return periods are assessed (2yr, 5yr, 10yr, 25yr, 50yr, 100yr and Regional). • Stormwater Management Blocks are to be assumed and owned by the Township of Puslinch.		
Traffic Impact Review MTO has reviewed the Traffic Impact Study prepared by GHD, dated June 28, 2024, MTO has no further comments on the document.	-	Information Only
Proposed Conditions of Draft Plan Approval The following are MTO's conditions of Draft Approval: 1. That prior to final approval, the owner(s) to submit to the Ministry of Transportation for review and approval, a copy of a Traffic Impact Study.	Owner / GHD	Acknowledged. Condition of Approval.
2. That prior to final approval, the owner(s) to submit to the Ministry of Transportation for review and acceptance a stormwater management report along with grading/drainage plan.	Owner / Crozier	Acknowledged. Condition of Approval.
3. That Prior to final approval, the owner shall submit to the Ministry of Transportation for review and approval a draft copy of the M-Plan for this subdivision.	Owner / Crozier	Acknowledged. Condition of Approval.
4. That prior to final approval, the owners shall provide the Ministry of Transportation for review and approval, the Conditions of Draft Plan	Owner	Acknowledged. Condition of Approval.

4. MINISTRY OF TRANSPORTATION		
Jeremiah Johnston – Jeremiah.johnston@ontario.ca December 6, 2024		
Approval and Draft Subdivision Agreement to ensure our requirements have been incorporated.		
Notes to Draft Plan Approval - Conditions of MTO Permits: The owner should be made aware that under the Public Transportation and Highway Improvement Act (PTHIA), MTO permits are required prior to development of the subject property. The owner shall submit site plans, site-servicing plans, grading plans, and drainage plans for the proposed development to MTO for review and approval. 1. MTO Building and Land Use permit(s) will be required prior to any bulk grading, and subdivision servicing.	Owner	Acknowledged.
2. MTO Building and Land Use permit(s) for will be required for individual residential lots, that fall within the MTO Permit Control Area.	Owner	Acknowledged.

December 20, 2024

Project T1220482.004

Wellington Hydrogeology Ltd.
4662 Sideroad 20N
Guelph, ON
N1H 6J3

Attention: Angela Mason, M.Sc., P.Geo., QP_{ESA}

Subject: **Response to Wellington Hydrogeology Comments**
Proposed Residential Development – 11 Main Street
Puslinch, Ontario

Dear Ms. Mason:

The following provides a response to comments issued by Wellington Hydrogeology Ltd. on behalf of the Township of Puslinch, dated December 13, 2024:

Wellington Hydrogeology Comment 1

We concur with the drawdown assessment completed by Englobe that indicates adequate water supply from the upper bedrock aquifer for residential use.

Englobe Response

Comment noted, further action not required.

Wellington Hydrogeology Comment 2

Please confirm that the results were provided to individual well owners with recommendations for exceeding the ODWS MAC.

Englobe Response

Copies of letters provided to residents participating in the private well monitoring program are provided in the attached enclosures. These letters were provided through email, or a physical letter was mailed if email information was not provided.

Wellington Hydrogeology Comment 3

Please discuss the presence of total coliforms in the test well samples, and whether the total coliform detections were a result of inadequate disinfection of the new supply wells.

Englobe Response

Total coliform concentrations of 9 CFU/100 mL were detected within sample 1 from TW2 (BH1) with the subsequent two collected samples indicating non-detectable levels for total coliform bacteria. Test wells were chlorinated following well drilling and one hour development. It is expected that total coliform bacteria detected within TW2 was due to inadequate disinfection of water supply, or subsequent contamination with test pump installation. Total coliform concentrations in TW1 (BH2) were detected at 1 CFU/100 mL within each of the three collected samples. It was confirmed from the well driller that this well was not chlorinated prior to testing.

Given that these wells were drilled prior to testing, it is expected that any detected coliform bacteria were introduced through drilling. Bacterial contamination of the shallow bedrock aquifer is not expected due to confining low permeability clay deposits observed to range in thickness between 23 m to 47 m within the completed test wells.

Wellington Hydrogeology Comment 4

The MECP have identified the potential presence of cyanobacteria in groundwater within the shallow bedrock aquifer in Puslinch just south of Morriston. Please run the sample for microcystins to confirm the concentration is below the O. Reg. 169/03 standard at the site.

Englobe Response

Groundwater analysis for microcystins is provided in the attached enclosures indicating a non-detectable concentration of <0.1 ug/L.

Wellington Hydrogeology Comment 5

Although local geology suggests isolation of the upper bedrock (Guelph Formation) aquifer on the site, the water quality results from the test wells in the upper bedrock aquifer suggest anthropogenic impacts (e.g., from septic systems, road salt application, etc.). Elevated nitrate and chloride levels were present, through below the applicable standards, and several other chemical parameters in the extended water quality analysis for TW3 (BH4) were elevated (e.g., naphthalene, phenol, 0-cresol, m&p cresol, barium). The addition of individual septic systems on each lot in the proposed development is expected to further concentrate parameters that are already elevated. From a groundwater quality perspective, we are unsure of the feasibility of the upper bedrock aquifer to support the density proposed for this development as well as future development in the surrounding area. It is our recommendation to the Township/County that water supply for this development and other high-density developments on private servicing in Morriston be sourced from the lower bedrock aquifer to ensure isolation from surface contaminants and provide safe and sustainable water supply now and in the future. Wells installed in the lower bedrock aquifer must be cased and sealed into the lower unit; multi-aquifer wells (i.e., wells that are constructed with a screen or open hole extending through both the upper and lower bedrock aquifers) are not permitted.

Englobe Response

While Englobe concurs that the lower bedrock aquifer may provide additional geological isolation from potentially contaminating land use activities including, but not limited to subsurface sewage disposal and road salting application, it is recommended that utilizing the lower bedrock aquifer for potable water supply

be considered on a lot-by-lot basis, during well drilling, where sufficient low permeable soils are not identified overlying the lower bedrock aquifer.

Groundwater quality with respect to O. Reg. 169/03 Schedule 1 and Schedule 2 parameters was found within acceptable limits, with most parameters non-detectable. Concentrations of naphthalene, phenol, 0-cresol, m&p cresol, barium stated by the review are not contaminants of concern from the proposed residential subdivision. Primary parameters of concern relating to land use including nitrate, phosphorus and sodium were not observed to significantly increase with water taking over the duration of the completed pumping test. Furthermore, tertiary treatment for septic systems is proposed for the removal of nitrate/phosphorus to mitigate potential impacts to shallow groundwater, further reducing potential impacts to the shallow bedrock aquifer, at depth, from the proposed residential development.

Groundwater monitoring indicates that the development is situated downgradient from developed areas of Morriston to the north. It is expected that future high-density will be located cross-gradient (east or west) or down-gradient (south) of the proposed development, limiting potential impacts of future development on the proposed residential subdivision.

The upper bedrock aquifer has been shown to provide adequate groundwater yield and quality to support the proposed residential development. It is recommended that the lower bedrock aquifer can be used as an alternative option for supply wells if the upper bedrock aquifer is not observed to have sufficient isolation from land uses at grade. It is recommended by Englobe that during well drilling for remaining proposed residential lots, that where low permeable overburden deposits (hydraulic conductivity less than 10^{-5} cm/sec) are identified with a thickness of less than 10 m that the well casing be extended through the upper bedrock aquifer, and at least 1.5 m into the lower bedrock aquifer to mitigate potential water quality impacts to the potable supply well for the subject lot.

The above recommendation of 10 m thickness was taken from Section 22.5.24 of the MECP Guidelines for Sewage Works, as rationale for low permeable environments and geological isolation of underlying aquifer systems relating to groundwater impacts from sewage disposal systems.

Wellington Hydrogeology Comment 6

The letter on water supply for additional dwelling units (ADUs) and/or home-based businesses was related to water supply availability. A separate assessment should be completed for sewage impacts to groundwater and surface water quality resulting from potential ADUs and/or home-based businesses. Lot sizes for the proposed development are already considered small for a rural development on private servicing. Please evaluate the feasibility of further increasing density from a water quality perspective. Within the letter for sewage impacts, please consider that treatment systems are designed to treat for nitrate and/or phosphorus, but that other contaminants may be present within household sewage that may have negative impacts to groundwater and/or surface water (e.g., pharmaceuticals, artificial sweeteners, PFAS, salt, etc.). This will need to be carefully considered by the Township/County for future potential ADUs.

Englobe Response

A separate ADU/HBB letter considering groundwater and surface water impacts from sewage disposal is provided in the attached enclosures.

If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

Paul L. Raepple, P.Geo.
Senior Hydrogeologist

Enclosures:

Letters Presenting Results of Private Well Monitoring
Laboratory Certificates of Analysis – Microcystins
ADU/HBB Sewage Impacts to Shallow Groundwater and Surface Water

Enclosures

ENGLOBE

November 15, 2024

Project T1220482.004

12 Main Street
Morriston, ON
N0B 2C0

Subject: **Results of Private Well Monitoring**
Pumping Test - Proposed Residential Subdivision
11 Main Street, Morriston
Puslinch, Ontario

This letter provides the results of private well monitoring completed for the above noted residence. A pumping test was completed for a series of three test wells completed for the property identified at the municipal address of 11 Main Street, Morriston. It is proposed to develop the property at 11 Main Street for a privately service residential subdivision consisting for 21 detached residential lots.

Three wells were completed across the property and were tested on October 7th and 8th, 2024 at a rate of 37.8 L/min (10 gallons per minute) each over the duration of six hours to evaluate well yield and to obtain groundwater quality samples.

Groundwater monitoring completed on October 7th and October 8th indicated that the water level within the monitored well did not change over the duration of testing. Groundwater was observed approximately 6.9 to 6.5 m below grade.

The private well at your residence was monitored and sampled as part of the pumping test program. Groundwater quality samples were taken on October 7th prior to the start of the pumping tests, and again on October 8th following the completion of testing. The following table provides a summary of the results of groundwater sampling:

Summary of Results of Groundwater Sampling - 12 Main Street

	E-Coli (CFU/100 mL)	Total Coliforms (CFU/100 ML)	Nitrate (mg/L)	Nitrite (mg/L)	Sodium (mg/L)
07-Oct-24	0	29	2.75	<0.05	73.1
08-Oct-24	0	29	3.02	<0.05	73.4

Total coliforms were detected in the collected groundwater samples, indicating bacteriological contamination of groundwater. It is recommended to disinfect the well and distribution system to remove bacteria. Further information on well disinfection can be obtained from the local health unit.

Sodium levels were detected above 20 mg/L. While the aesthetic limit of sodium is set at 200 mg/L at which level sodium would be detectable by taste, at concentrations above 20 mg/L it should be noted to health practitioners for patients on sodium restricted diets for hypertension, as sodium from groundwater should be considered as a dietary source for health planning purposes.

It should be noted that groundwater samples were obtained from an outside tap bypassing any treatment systems that may be in use for the residence. Results would be indicative of raw groundwater quality from the well.

Groundwater quality was not noted to decline between testing competed prior to the start of testing, from the results of sampling completed following the completion of testing.

Impacts of the completed pumping test were not noted as part of the completed monitoring. If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

Paul Raepple, P.Geo.
Senior Hydrogeologist

November 15, 2024

Project T1220482.004

17 Badenoch Street
Morriston, ON
N0B 2C0

Subject: **Results of Private Well Monitoring**
Pumping Test - Proposed Residential Subdivision
17 Badenoch Street, Morriston
Puslinch, Ontario

This letter provides the results of private well monitoring completed for the above noted residence. A pumping test was completed for a series of three test wells completed for the property identified at the municipal address of 11 Main Street, Morriston. It is proposed to develop the property at 11 Main Street for a privately service residential subdivision consisting for 21 detached residential lots.

Three wells were completed across the property and were tested on October 7th and 8th, 2024 at a rate of 37.8 L/min (10 gallons per minute) each over the duration of six hours to evaluate well yield and to obtain groundwater quality samples.

The private well at your residence was monitored and sampled as part of the pumping test program. Groundwater quality samples were taken on October 7th prior to the start of the pumping tests, and again on October 8th following the completion of testing. The following table provides a summary of the results of groundwater sampling:

Summary of Results of Groundwater Sampling - 17 Badenoch Street

	E-Coli (CFU/100 mL)	Total Coliforms (CFU/100 ML)	Nitrate (mg/L)	Nitrite (mg/L)	Sodium (mg/L)
07-Oct-24	0	0	0.79	<0.05	56.1
08-Oct-24	0	0	1.01	<0.05	59.3

Sodium levels were detected above 20 mg/L. While the aesthetic limit of sodium is set at 200 mg/L at which level sodium would be detectable by taste, at concentrations above 20 mg/L it should be noted to health practitioners for patients on sodium restricted diets for hypertension, as sodium from groundwater should be considered as a dietary source for health planning purposes.

It should be noted that groundwater samples were obtained from an outside tap bypassing any treatment systems that may be in use for the residence. Results would be indicative of raw groundwater quality from the well.

Groundwater quality was not noted to decline between testing competed prior to the start of testing, from the results of sampling completed following the completion of testing.

Impacts of the completed pumping test were not noted as part of the completed monitoring. If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

Paul Raepple, P.Geo.
Senior Hydrogeologist

November 15, 2024

Project T1220482.004

18 Badenoch Street
Morriston, ON
N0B 2C0

Subject: **Results of Private Well Monitoring**
Pumping Test - Proposed Residential Subdivision
18 Badenoch Street, Morriston
Puslinch, Ontario

This letter provides the results of private well monitoring completed for the above noted residence. A pumping test was completed for a series of three test wells completed for the property identified at the municipal address of 11 Main Street, Morriston. It is proposed to develop the property at 11 Main Street for a privately service residential subdivision consisting for 21 detached residential lots.

Three wells were completed across the property and were tested on October 7th and 8th, 2024 at a rate of 37.8 L/min (10 gallons per minute) each over the duration of six hours to evaluate well yield and to obtain groundwater quality samples.

Groundwater monitoring completed on October 7th and October 8th indicated that the water level within the monitored well did not change over the duration of testing. Groundwater was observed approximately 17.3 m below grade.

The private well at your residence was monitored and sampled as part of the pumping test program. Groundwater quality samples were taken on October 7th prior to the start of the pumping tests, and again on October 8th following the completion of testing. The following table provides a summary of the results of groundwater sampling:

Summary of Results of Groundwater Sampling - 18 Badenoch Street

	E-Coli (CFU/100 mL)	Total Coliforms (CFU/100 ML)	Nitrate (mg/L)	Nitrite (mg/L)	Sodium (mg/L)
07-Oct-24	0	35	2.86	<0.05	73.2
08-Oct-24	0	65	3.11	<0.05	72.7

Total coliforms were detected in the collected groundwater samples, indicating bacteriological contamination of groundwater. It is recommended to disinfect the well and distribution system to remove bacteria. Further information on well disinfection can be obtained from the local health unit.

Sodium levels were detected above 20 mg/L. While the aesthetic limit of sodium is set at 200 mg/L at which level sodium would be detectable by taste, at concentrations above 20 mg/L it should be noted to health practitioners for patients on sodium restricted diets for hypertension, as sodium from groundwater should be considered as a dietary source for health planning purposes.

It should be noted that groundwater samples were obtained from an outside tap bypassing any treatment systems that may be in use for the residence. Results would be indicative of raw groundwater quality from the well.

Groundwater quality was not noted to decline between testing competed prior to the start of testing, from the results of sampling completed following the completion of testing.

Impacts of the completed pumping test were not noted as part of the completed monitoring. If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

[redacted]

Paul Raepple, P.Geo.
Senior Hydrogeologist

November 15, 2024

Project T1220482.004

7501 Wellington Road 36
Morriston, ON
N0B 2C0

Subject: **Results of Private Well Monitoring**
Pumping Test - Proposed Residential Subdivision
7501 Wellington Road 36, Morriston
Puslinch, Ontario

This letter provides the results of private well monitoring completed for the above noted residence. A pumping test was completed for a series of three test wells completed for the property identified at the municipal address of 11 Main Street, Morriston. It is proposed to develop the property at 11 Main Street for a privately service residential subdivision consisting for 21 detached residential lots.

Three wells were completed across the property and were tested on October 7th and 8th, 2024 at a rate of 37.8 L/min (10 gallons per minute) each over the duration of six hours to evaluate well yield and to obtain groundwater quality samples.

Groundwater monitoring completed on October 7th and October 8th indicated that the water level within the monitored well did not change over the duration of testing. Groundwater was observed approximately 16.7 to 16.6 m below grade.

The private well at your residence was monitored and sampled as part of the pumping test program. Groundwater quality samples were taken on October 7th prior to the start of the pumping tests, and again on October 8th following the completion of testing. The following table provides a summary of the results of groundwater sampling:

Summary of Results of Groundwater Sampling - 7501 Wellington Road 36

	E-Coli (CFU/100 mL)	Total Coliforms (CFU/100 ML)	Nitrate (mg/L)	Nitrite (mg/L)	Sodium (mg/L)
07-Oct-24	0	0	3.14	<0.05	77.7
08-Oct-24	0	0	3.43	<0.05	78.1

Sodium levels were detected above 20 mg/L. While the aesthetic limit of sodium is set at 200 mg/L at which level sodium would be detectable by taste, at concentrations above 20 mg/L it should be noted to health practitioners for patients on sodium restricted diets for hypertension, as sodium from groundwater should be considered as a dietary source for health planning purposes.

It should be noted that groundwater samples were obtained from an outside tap bypassing any treatment systems that may be in use for the residence. Results would be indicative of raw groundwater quality from the well.

Groundwater quality was not noted to decline between testing competed prior to the start of testing, from the results of sampling completed following the completion of testing.

Impacts of the completed pumping test were not noted as part of the completed monitoring. If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

Paul Raepple, P.Geo.
Senior Hydrogeologist

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

11-November-2024

AGAT Laboratories - Mississauga
Attn : Hina Siddiqui

5835 Coopers Avenue
Mississauga, ON
L4Z 1Y2, Canada

Phone: 905-712-5100 ext 5126
Fax:

Date Rec. : 01 November 2024
LR Report: **CA14058-NOV24**
Reference: PO#: 230157 - AGAT Job #: 24T215439

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Microcystin (Quantitative) ug/L	N-Nitrosodimethylamine mg/L	Nitrilotriacetic acid (NTA) mg/L
1: Analysis Start Date		---	04-Nov-24	06-Nov-24	06-Nov-24
2: Analysis Start Time		---	11:56	14:13	09:23
3: Analysis Completed Date		---	04-Nov-24	08-Nov-24	07-Nov-24
4: Analysis Completed Time		---	14:19	12:37	11:54
5: MDL		---	0.1	0.0004	0.03
6: GW 24T215439 - 6278243 - BH4	31-Oct-24 09:45	15.0	<0.1	< 0.0004	< 0.03

MDL - SGS Method Detection Limit

Note: Sample for microcystin analysis received unpreserved; result maybe unreliable if residual chlorine present.

Method Descriptions

Parameter	Description	SGS Method Code	Reference Method Code
Microcystin (Quantitative)	Microcystin (quantitative using ELISA)	ME-CA-[ENV]MIC-LAK-AN-014	OMOE MCYST-3469
N-Nitrosodimethylamine	SVOC wtr - basic	ME-CA-[ENV]GC-LAK-AN-005	EPA 3510C/8270D
Nitrilotriacetic acid (NTA)	NTA wtr	ME-CA-[ENV]GC-LAK-AN-007	In-House

[redacted]

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety

OnLine LMS

0003923150

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA14058-NOV24**

Quality Control Report

Organic Analysis														
Parameter	Reporting Limit	Unit	Method Blank	Duplicate				LCS / Spike Blank			Matrix Spike / Reference Material			
				Result 1	Result 2	RPD	Acceptance Criteria	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)		
							%		Low	High		Low	High	
NDMA - QCBatchID: GCM0100-NOV24														
N-Nitrosodimethylamine	0.0004	mg/L	< 0.0004			NSS	30	32	20	130	NSS	20	130	
NTA - QCBatchID: GCM0088-NOV24														
Nitrilotriacetic acid (NTA)	0.03	mg/L	< 0.03			ND	30	100	80	120				

Microbiological		
Parameter	Method Blank	Duplicate
Microbiology - QCBatchID: BAC9017-NOV24		
Microcystin (Quantitative)	0.1#<MDL	3

December 20, 2024

Project T1220482.004

Weston Consulting
201 Millway Avenue, Unit 19
Concord, ON L4K 5K8
Attention: Kayly Robbins, MPL, MCIP, RPP, Senior Planner

Subject: **Additional Dwelling Units and Home-Based Businesses**
Groundwater and Surface Water Impacts with Sewage Disposal
Proposed Residential Subdivision – 11 Main Street
Puslinch, Ontario

Dear Ms. Robbins:

This letter provides a discussion regarding private servicing viability for the above noted residential development relating to subsurface sewage disposal systems and potential for impacts to shallow groundwater and surface water considering potential land use for proposed residential lots for additional dwelling units and home-based businesses.

A septic impact assessment was completed as part of the hydrogeological investigation considering nitrate and phosphorus impacts to shallow groundwater and surface water. To limit septic impacts to shallow groundwater within each proposed residential lot tertiary treatment will be implemented ranging from standard treatment (20 mg/L of nitrate) for proposed lots 1 and 12, and advanced tertiary treatment (15 mg/L) for remaining lots. The nitrate impact assessment was based on the daily average sewage flow of 1,000 L/day.

It is expected that potential exists for additional residential waste disposal due to additional dwelling units. Additional dwelling units within the primary residence (i.e., granny flat) are expected to be serviced through the existing septic system, which were designed based on the number of bedrooms, floor area, and number of fixture units. Septic systems should provide sufficient capacity to allow for such uses. If a detached ADU is proposed the building would be subject to the building code and would require additional septic servicing capacity. It is expected that such units would be subject to Township approval provided the ADU and servicing meets with Ontario Building Code standards to limit potential impacts from septic disposal to groundwater and/or surface water.

To limit potential groundwater/surface water contaminants such as pharmaceuticals, artificial sweeteners, PFAS, and salt information should be provided to lot purchasers, either through the developer, or through the Township, through source water planning initiatives such as Policy G-5 of the Hamilton-Halton Source Water Protection Plan. Information would provide lot purchasers with operational guidelines and maintenance for septic systems indicating proper use and disposal, including what should not be disposed of through the septic system, such as the above listed potential contaminants. It is expected that through outreach and education initiatives that septic systems for residential use can be effectively managed, and potential contaminants to shallow groundwater and surface water can be mitigated.

Home based businesses, depending on the type of business is not expected to result in significant groundwater and/or surface water impacts due to sewage disposal. It is expected that home-based

businesses will be consistent with the residential setting, generating residential sewage consistent with the expected land use. It is expected that home-based businesses involving environmentally contaminating activities (i.e., dry cleaning, fuel storage, agricultural applications including significant herbicide, pesticide, fertilizer use, etc.) would not be permitted or licenced by the township.

I trust the above provides the requested clarification regarding the feasibility of additional dwelling units and home-based businesses. If you require additional information, please do not hesitate to contact the undersigned.

Yours very truly,

Englobe Corp.

Paul Raepple, P.Geo.
Senior Hydrogeologist

FUNCTIONAL SERVICING & PRELIMINARYSTORMWATER MANAGEMENT REPORT

11 MAIN STREET
ESTATE RESIDENTIAL DEVELOPMENT

TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

PREPARED FOR:

WDD MAIN STREET

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
55 WYNDHAM STREET NORTH SUITE 215
GUELPH, ON N1H 7T8

DECEMBER 2024

CFCA FILE NO. 2366-6537

CELEBRATING 20 YEARS SINCE 2004 CROZIER

Revision Number	Date	Comments
Rev. 0	February 2023	Issued for First Submission (ZBA)
Rev. 1	December 2023	Issued for Second Submission (ZBA)
Rev. 2	September 2024	Issued for Third Submission (ZBA)
Rev. 3	November 2024	Issued for Fourth Submission (ZBA)
Rev. 4	December 2024	Issued for Fifth Submission (ZBA)

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by WDD Main Street (Owner) to prepare a Functional Servicing and Preliminary Stormwater Management Report in support of Draft Plan Approval for the estate residential development located at 11 Main Street in the Township of Puslinch (Site). The purpose of this report is to demonstrate the proposed development is feasible from a functional servicing and stormwater management perspective and conforms with the requirements of the Township of Puslinch (Town), County of Wellington (County), and Conservation Halton (Conservation Authority).

This report has been completed in accordance with the appropriate design guidelines and Township of Puslinch Pre-consultation Comment Summary dated October 21, 2022. The relevant background studies and reports used in preparation of this report include:

- Conservation Halton Guidelines for Stormwater Management Engineering Submissions (November 2021)
- Fluvial Geomorphological and Meander Belt Width Assessment (February 13, 2023)
- Geotechnical Investigation (Terraprobe Inc., October 3, 2023)
- Hydrogeological Assessment (Englobe, August 28, 2024)
- Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008)
- Ministry of Environment Stormwater Management Planning and Design Manual (March 2003)
- The Ontario Geologic Survey (OGS) database, accessed February 2023
- The Ontario Building Code (OBC) (2012)
- The Township of Puslinch Municipal Development Standards (September 2019)
- Well Record Database, Ministry of the Environment, Conservation and Parks, accessed February 2023

This report has been prepared to address the fourth submission comments received from the reviewing agencies (December 13, 2024) and to support the fifth submission of the Zoning By-Law Amendment Application for the proposed development.

2.0 Site Description

The site encompasses an area of approximately 23.60 ha and currently consists of vacant agricultural fields and forested areas. Most of the site is designated as woodlot and wetlands which leaves approximately 5.98 ha of developable area. The site, located in a residential and agricultural area, is bounded by residential dwellings to the north and west, agricultural lands to the east, and forested and agricultural lands to the south.

According to the Development Concept prepared by Weston Consulting dated May 14, 2024, the proposed estate residential development will consist of the following elements:

- Twenty-one (21) estate residential lots with lot sizes ranging from 0.19 ha to 0.38 ha.
- A 20.0 m wide urban municipal right-of-way with road access to Ochs Street.
- Associated forest, landscape, stormwater management and amenity areas.

The development limits for the proposed development were established based on the following environmental constraints:

- South-western channel 38 m meander belt per the Meander Belt Assessment prepared by Geo Morphix Ltd.
- 10 m offset from the woodlot, staked, and surveyed by Colville Consulting Inc. (September 20, 2022)
- 15 m offset from Regional Floodplain Limits per Conservation Halton HEC-RAS Modelling (BronteReach5, May 14, 2012)

3.0 Soil and Groundwater Conditions

Englobe (formerly Terraprobe) was retained by the Owner to complete a hydrogeological assessment of the proposed residential development. Five (5) boreholes were advanced across the site in August 2022. The boreholes were drilled to depths between 6.1 m and 8.1 m below ground surface (mbgs).

As reported by Terraprobe, the soils encountered consisted of earth fill materials, comprised of sand, with some gravel and trace amounts of rootlets to a depth of 0.8 mbgs.

Underlying the earth fill, silty sand to sand and silt deposits, with trace amounts of clay and gravel was encountered and extended to depths ranging from 0.8 mbgs to the full depth of the borehole. In BH1, a clayey silt deposit with trace amounts of sand was encountered beneath the silty sand to sand and silt layer between 6.1 and 6.6 mbgs. Refer to the Geotechnical Investigation (Terraprobe Inc., October 3, 2023) for the borehole logs and locations.

Referring to Supplementary Standard SB-6 of the 2012 Ontario Building Code (OBC) and the results of the grain size distribution analysis for the soil samples obtained from BH41, BH3, and BH5, the predominant soil is classified as SM-ML soil as described by the Unified Soil Classification System. An SM-ML soil is a silty sand, or sand silt mix with a percolation rate ranging from 8 min/cm to 50 min/cm. Based on the percentage of silt and clay in the soil samples, Crozier assigned a percolation rate of 30 min/cm for this sewage system design.

Monitoring wells were installed in four (4) of the five (5) borehole locations (BH1, BH2, BH3 and BH5) to allow for the measurement of the groundwater levels. Groundwater levels were measured between August 24, 2022 and September 19, 2022. The stabilized groundwater levels ranged from approximately 5.21 m to 6.76 mbgs (311.82 m to 311.42 m above sea level). Refer to the Hydrogeological Assessment (Englobe, August 28, 2024) for additional details.

4.0 Water Servicing

4.1 Water Supply

As the property is in a rural area, there is no municipal water infrastructure available to service the proposed development. The water servicing needs for the proposed development will be provided via private drilled drinking water wells. The depth, size, and locations of the wells will be determined during the detailed design of each individual lot. It should be noted that the groundwater in the area is mostly used by privately drilled groundwater wells.

As part of the response to the Township's comments, Englobe completed a pumping test to determine well capacities within the property. The pumping test was completed in October 2024, the results of which are provided under separate cover.

4.2 Fire Flow Calculations

Preliminary calculations were completed to estimate the required fire storage volume for the proposed development, as there is no municipal water supply for firefighting purposes. The fire storage volume was calculated using the Ontario Fire Marshalls Fire Protection Water Supply Guideline (1999), as is required in Part 3 of the Ontario Building Code.

The fire storage volume was calculated assuming a maximum house footprint of 360 m^2, appropriate separation distances, and assuming a Group C (residential) occupancy. The largest calculated fire storage volume will be provided on-site. **Table 1** below summarizes the preliminary fire storage volumes calculated for the proposed development.

Table 1: Fire Storage Volume Requirements

Lot	Total Area[1] (m^2)	Height (m)	Volume (m^3)	K[1]	S_{side}[2]	Required Fire Storage Volume, Q (L)
Lot 19	360	6.0	2,160	23	1.8	89,400

1. K values for the proposed residential dwellings are assumed based on past similar residential projects.
2. S_{side} values determined from distance to other structures using Figure 1 in Section 6.3 of the Ontario Fire Marshalls Guidelines.

As can be seen from **Table 1**, a storage volume of 89,400 L is the required minimum fire storage volume, and it must be supplied at a rate of 45 L/s for a duration of 0.5 hours. Refer to **Appendix A** for preliminary fire storage volume calculations.

Two fire cisterns have been shown at this preliminary stage to meet the required fire storage volumes and necessary spacing and distribution for the proposed development. The location and size of the fire cisterns can be refined throughout the design process through consultation with the Fire Chief and the Township. Refer to **Figure 1** for the location of the fire cistern.

5.0 Sanitary Servicing

The site is in a rural area that does not currently have municipal sanitary services available and the Township of Puslinch does not anticipate municipal sanitary servicing for this area in the near future. Therefore, the proposed development will be serviced by individual onsite sewage systems.

5.1 Sanitary Design Calculations

It is understood the proposed development will consist of twenty-one (21) residential lots with private servicing and that the proposed residential dwellings will have three (3) to four (4) bedrooms. For the purpose of this assessment, preliminary sewage system design flows were calculated for a typical four (4) bedroom dwelling with 360 m^2 of finished floor area, three (3) bathroom groups and additional fixtures for a total of 45 fixture units.

The preliminary sewage system design flows were calculated in accordance with the Ontario Building Code, Part 8 and are presented below in **Table 2**. Detailed sanitary servicing calculations are found in **Appendix B**.

Table 2: Preliminary Sewage System Design Flows

Unit Type	Number of Bedrooms	Floor Area (m^2)	Number of Fixture Units	Base Flow (L/day)	Additional Flow – Floor Area (L/day)	Additional Flow – Fixture Units (L/day)	Total Flow Per Unit (L/day)
360 m^2 Residential Dwelling	4	360	45	2,000	1,600	1,250	3,600

As shown, the preliminary sewage system design flow for a typical unit will be approximately 3,600 L/day. These flows were calculated based on the information available at the time of this report. If details of the proposed dwellings change (e.g., number of bedrooms, fixtures, and floor area) during detailed design, the sewage system design flows might change, which may affect the size of the onsite sewage systems.

The detailed design of the onsite sewage systems will be confirmed during the building permit stage and building permits will be required for each sewage system prior to construction. Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks. Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA is not required.

5.2 Proposed Individual Sanitary Servicing Strategy

Sanitary servicing for the proposed development will be provided through individual Class 4 onsite sewage systems. The onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed. Due to space limitations, Lot 1 of the development is proposed to be serviced through a shallow buried trench as shown on FIG 2.

5.3 Proposed Sewage System

Nitrate loading calculations were prepared by Terraprobe to determine the effluent concentration of nitrate-nitrogen each sewage system must achieve for the proposed development to meet MECP Guideline D-5-4. Terraprobe has indicated that at least a 62.5% reduction of nitrate-nitrogen (effluent concentration of 15 mg/L) is required. A typical conventional onsite sewage system produces an effluent concentration of nitrate-nitrogen of approximately 40 mg/L. This is insufficient to meet D-5-4 requirements, therefore, advanced treatment with denitrification will be required.

The proposed sewage system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard with 62.5% nitrate-nitrogen reduction, discharging treated effluent to a Type A dispersal bed. A Waterloo Biofilter system (or equivalent) with recirculation is proposed. Sewage will flow from the dwelling to a Waterloo Biofilter anaerobic digester tank. Effluent from the digester tank is pumped to the Waterloo Biofilter basket tank, which is equipped with a patented foam media that effectively treats wastewater prior to discharge to the leaching bed. A portion of the treated effluent is recirculated to the anaerobic digester, providing a 62.5% nitrate-nitrogen reduction. Refer to **Appendix C** for additional information and testing results for this technology.

Treated effluent from the Waterloo Biofilter will be discharged to a Type A dispersal bed sized in accordance with Section 8.7.7. of the OBC (except for Lot 1). The Type A dispersal bed consists of a stone layer equipped with a perforated distribution pipe, underlain by a sand layer. **Table 3** summarizes the preliminary sizing of the Type A Dispersal Bed.

Table 3: Preliminary Type A Dispersal Bed Sizing

Unit Type	Total Flow Per Unit (L/day)	Minimum Stone Area (m^2)	Provided Stone Area (m^2)	Minimum Sand Area (m^2)	Provided Sand Area (m^2)
360 m^2 Residential Dwelling	3,600	72	72	270	270 - 368

The Preliminary Site Servicing Plans (**Figure 1** and **Figure 2**) illustrate the proposed onsite sewage servicing for the proposed development. The conceptual figure illustrates a Waterloo Biofilter configuration; however, it is noted that any treatment unit meeting CAN/BNQ certification requirements with 62.5% nitrate-nitrogen removal may be considered. The details, size, and location of the onsite sewage systems will be determined once individual home designs and building permit applications are prepared.

6.0 Drainage Conditions

The drainage conditions for the site in both pre-development and post-development conditions are outlined in the following sections.

6.1 Existing Drainage Conditions

According to the topographic survey (J.D. Barnes Limited, September 16, 2022) and site reconnaissance, the site currently consists of vacant agricultural fields and forested areas. The site has a drainage split which divides the site into an eastern and western catchment based on this topographic survey.

The western catchment (Catchment 101A) consists primarily of vacant agricultural lands and generally slopes northeast to southwest. Runoff from Catchment 101A is directed via sheet flow to a tributary of Bronte Creek located along the western development limits of the site.

The central catchment (Catchment 101B) consists primarily of vacant agricultural lands and generally slopes northwest to southeast. Runoff from Catchment 101B is directed via sheet flow to a tributary of Bronte Creek located along the western development limits of the site.

The eastern catchment (Catchment 102) consists primarily of vacant agricultural lands and generally slopes northwest to southeast. Runoff from Catchment 101A and 101B is directed via sheet flow to the eastern drainage feature. Correspondence with Geo Morphix (November 23, 2022) indicated the eastern drainage feature does not exhibit a defined channel and outlets to the Bronte Creek tributary located along the southern portion of the site.

There are two (2) external catchments that drain towards the site via overland flow from the north (Catchment EX1 and EX2). Catchment EX1 and EX2 consist of existing residential properties, roadways, landscaped areas, and Old Morriston Baseball Diamond (Catchment EX1 exclusively). Based on existing LiDAR contour mapping and a site visit complete on January 11, 2023, runoff from Catchment EX1 flows from north to south and is directed to a low-lying depression area located in the eastern corner of the Old Morriston Baseball Diamond. An earthen berm along the south and east property limits of the baseball diamond retains stormwater within the park limits. Please refer to Appendix H for site photos illustrating the berm. If the storage limits are reached, stormwater will drain southwest towards the Bronte Creek tributary via sheet flow. Runoff from Catchment EX2 runs from north to south and is directed to the eastern drainage feature via sheet flow through Catchment 102, ultimately outletting to the Bronte Creek tributary. It is recommended that at detailed design, permission from the owner of the Baseball Diamond be obtained to complete a topographic survey to confirm the elevation of the berm.

Table 4 summarizes the pre-development catchment areas and **Figure 6** illustrates the Pre-Development Drainage Plan.

Table 4: Pre-Development Catchment Areas and Percent Impervious

Catchment ID	Land-Use Description	Impervious Area[1] (ha)	Pervious Area (ha)	Total Area (ha)	Percent Impervious (%)	Outlet
101A	Vacant agricultural land and forested area	-	1.26	1.26	0	Bronte Creek Tributary
101B		-	0.76	0.76	0	
102		-	3.96	3.96	0	
Site Total		**-**	**5.98**	**5.98**	**0**	
EX1	Residential properties, roadways, landscaped areas, and a baseball diamond	1.55	3.62	5.17	30.0	Bronte Creek Tributary
EX2	Residential properties, roadways, and landscaped areas	0.52	0.89	1.41	37.2	
External Total		**2.07**	**4.51**	**6.58**	**31.5**	

Note: 1. Impervious area measurements based on Google Earth aerial imaging and is approximate only.

6.2 Proposed Drainage Conditions

Based on the Development Concept prepared by Weston Consulting (October 3, 2023), the proposed development will consist of twenty-one (21) estate residential lots, associated paved internal roadway, and landscaped areas. Access to the proposed development will be provided from the proposed entrance to Ochs Street.

The proposed site grading divides the site into two (2) internal and four (4) external post-development drainage catchment areas as shown on the Post-Development Drainage Plan (**Figure 7**). Details of each drainage catchment are provided in the following section.

- Catchment 201 (A = 3.50 ha) consists of drainage from the proposed building footprints, front yards fronting Street A, landscaped areas and the internal roadways (Street A). Storm events up to and including the 5-year event (minor storm events) will be collected and conveyed by the internal storm sewer system to the proposed stormwater management facility. Storm events greater than the 5-year event (major storm events) will be conveyed overland within the internal roadways (Street A) to the proposed stormwater management facility. The proposed stormwater management facility will provide quantity, quality, and erosion controls for the stormwater runoff from Catchment 201 prior to outletting to the Bronte Creek Tributary, consistent with existing conditions.

- Catchment 202 (A = 2.48 ha) consists of uncontrolled drainage from the proposed building footprints and rear yards along the east side of Street A. All storm events from this catchment are proposed to be conveyed uncontrolled via overland flow towards the Bronte Creek tributary south of the site, consistent with existing conditions.

- Catchment EXT1 (A = 5.22 ha) consists of uncontrolled external drainage from the existing residential properties, roadways, landscaped areas, and a baseball diamond north of the site. Drainage from this catchment is directed to the southwest corner of the park. An earth berm along the south and east property limits of the park, will prevent drainage from this catchment to enter the proposed lots and will be conveyed to the southwest through the drainage easement and proposed swale between Lot 1 and Lot 2 towards the Bronte Creek tributary, consistent with existing conditions. Site photos have been provided in **Appendix H** to show existing earth berm and drainage conditions.

- Catchment EXT2 (A = 0.26 ha) consists of uncontrolled external drainage from the existing residential properties, roadways, and landscaped areas north of the site. All storm events from these catchments are conveyed by the proposed storm sewer infrastructure and internal roadway within the development towards the proposed stormwater management facility, ultimately outletting to the Bronte Creek tributary.

- Catchment EXT3 (A = 0.26 ha) consists of uncontrolled external drainage from the existing residential properties, roadways, and landscaped areas north of the site. All storm events from these catchments are conveyed by the proposed storm sewer infrastructure and internal roadway within the development towards the proposed stormwater management facility, ultimately outletting to the Bronte Creek tributary.

- Catchment EXT4 (A = 0.46 ha) consists of uncontrolled external drainage from the existing residential properties, Ochs Street expansion, and landscaped areas north of the site. All storm events from this catchment are conveyed towards the existing Badenoch Street storm sewer via sheetflow along Ochs Street.

Under the proposed drainage conditions, all storm events up to the 100-year storm from Catchments 201, EXT2, and EXT3 will be conveyed to the proposed stormwater management facility. Following quantity and quality control, stormwater is to be conveyed to the Bronte Creek Tributary.

Table 5 provides details of the catchment areas and percent imperviousness for the post-development conditions.

Table 5: Post-Development Catchment Areas and Percent Impervious

Catchment ID	Catchment Area (ha)	Land Use(s)	Percent Impervious	Outlet
201	3.50	Building footprints, front yards, and internal roadway	58.0	Bronte Creek Tributary
202	2.48	Building footprints and rear yards	36.7	
EXT1	5.22	Residential properties, roadways, landscaped areas, and a baseball diamond	30.0	
EXT2	0.26	Residential properties, roadways, and landscaped areas	42.0	
EXT3	0.26		30.8	
EXT4	0.46		30.4	Badenoch Street Right-of-Way

Refer to the Post-Development Drainage Plan (**Figure 7**) for proposed drainage conditions and the Preliminary Site Servicing and Preliminary Site Grading Plans (**Figures 1-4**) that illustrate the proposed preliminary site servicing and drainage designs.

7.0 Stormwater Management

Stormwater management and site drainage for the proposed development must adhere to the policies and standards of the Township of Puslinch, Conservation Halton, and Ministry of Environment, Conservation, and Parks (MECP).

The stormwater management criteria for the development have been summarized below:

Water Quantity Control

According to the Township of Puslinch Municipal Development Standards (September 2019), water quantity controls are required for the site. The water quantity requirements include controlling the post-development peak runoff rates to the pre-development peak runoff rates for storms up to and including the 100-year event (i.e., 2, 5, 10, 50, 100-year return periods).

Water Quality Control

At least 80% removal of Total Suspended Solids will be provided with "Enhanced Protection" as outlined in the Stormwater Management Planning and Design Manual (MOE, 2003).

Water Balance

Infiltration facilities shall be designed to ensure that, under post-development conditions, infiltration volumes match the pre-development conditions.

Erosion Control

According to Conservation Halton Guidelines for Stormwater Management Engineering Submissions (November 2021), erosion control is recommended such that the 25 mm design storm is retained over at least a 24-hour period.

7.1 Stormwater Modelling Parameters

The Township of Puslinch stormwater management guidelines were referenced to determine the hydrologic parameters for the various catchment areas within the site. The topographic survey prepared by J.D. Barnes Limited (September 16, 2022) and the Hydrogeological Assessment prepared by Englobe (August 28, 2024) were referenced to confirm the land cover, drainage pattern, and on-site soil conditions.

Based on these sources, the hydrologic parameters for pre-development and post-development conditions were determined and are summarized in **Table 6** and **Table 7** below. The detailed hydrologic parameter sheets for each catchment area are included in **Appendix D**.

Table 6: Pre-Development Hydrologic Parameters

Catchment Description	101A[N]	101B[N]	102[N]	EX1[S]	EX2[S]
Drainage Area (ha)	1.26	0.76	3.96	5.17	1.41
Total Imperviousness (%)	-	-	-	30.0	36.9
Directly Connected Imperviousness (%)	-	-	-	20.7	29.1
Curve Number (CN)[1]	67.6	66.9	67.9	80.0	80.0
Time to Peak (hours)	0.14	0.05	0.08	-	-

1. Curve numbers are presented as utilized in VO modeling. CN reflects composite curve number for rural catchments modeled using NASHYD routine and curve number for pervious areas only for urban catchments using STANDHYD routine.
2. Superscript N represents the catchment was modelled using a NASHYD and a superscript S, represents the catchment was modelled using a STANHYD.

Table 7: Post-Development Hydrologic Parameters

Catchment Description	201[S]	202[S]	EXT1[S]	EXT2[S]	EXT3[S]	EXT4[S]
Drainage Area (ha)	3.50	2.48	5.22	0.26	0.26	0.46
Total Imperviousness (%)	58.0	36.7	30.0	42.0	30.8	30.4
Directly Connected Imperviousness (%)	19.9	5.0	20.7	30.5	15.4	21.7
Curve Number (CN)[1]	80.0	80.0	80.0	80.0	80.0	80.0
Time to Peak (hours)	-	-	-	-	-	-

1. Curve numbers are presented as utilized in VO modeling. CN reflects composite curve number for rural catchments modeled using NASHYD routine and curve number for pervious areas only for urban catchments using STANDHYD routine.
2. Superscript N represents the catchment was modelled using a NASHYD and a superscript S, represents the catchment was modelled using a STANDHYD.

7.2 Stormwater Quantity Control

As discussed in Section 7.0, stormwater quantity control requirements for the site include controlling the post-development peak runoff to the pre-development peak runoff for storm events up to and including the 100-year event. According to the Township of Puslinch Municipal Development Standards, the City of Guelph's intensity-duration-frequency data for a 2-year to 100-year Chicago Storm event must be used as the hydraulic parameters for stormwater management modelling with a duration of 3 hours.

Visual OTTHYMO (VO) was used to create pre-development, post-development, and post-development with mitigation scenarios to quantify the site's peak stormwater flows. The associated hydrologic parameters are outlined in **Table 6** and **Table 7**. The pre-development and post-development stormwater flows directed to the Bronte Creek Tributary and the storage requirements are summarized below in **Table 8**. The VO model schematics, modelling results, and output files are included in **Appendix E**.

Table 8: Peak Flows and Target Flows Summary (Discharge towards Bronte Creek Tributary)

Storm (Year)	Pre-Dev. Peak Flow Rate[1] (m^3/s)	Post-Dev. Uncontrolled Peak Flow Rate[2] (m^3/s)	Post-Dev. Controlled Peak Flow Rate[2] (m^3/s)	Storage Volume Required (m^3)	Storage Volume Provided[3] (m^3)
2	0.264	0.478	0.144	554	1,143
5	0.457	0.754	0.249	642	
10	0.651	0.967	0.329	726	
25	0.886	1.283	0.488	823	
50	1.064	1.511	0.632	896	
100	1.248	1.740	0.833	973	
Regional	0.811	0.922	0.915	1,149	

Notes: 1. Includes runoff from Catchment 101A, 101B, 102, and EX2.
2. Includes runoff from Catchment 201, 202, EXT2, and EXT3.
3. 1,143 m^3 of storage is available in the SWM facility.

A *RouteReservoir* component was used in Visual OTTHYMO to model the proposed stormwater management facility and determine the active storage volumes required to control the peak flows for the 2-year to 100-year storm events. The 3-hour Chicago design storm was modelled using the City of Guelph's IDF parameters. To meet quantity control criteria, 973 m^3 of active storage volume is required to control the 100-year 3-hour Chicago design storm. Required active storage volumes for each storm event are summarized above in **Table 8**. The total active storage provided in the stormwater management pond is 1,143 m^3, providing an additional 0.3 m of freeboard to the top of berm (not included in active storage). An emergency overflow weir has been proposed to outlet to the Bronte Creek tributary to convey the expected peak flow from the Regional event. The Visual OTTHYMO input and output files and model schematics have been provided in **Appendix E** and the details of the weir are illustrated on **Figure 1**.

A storm sewer design sheet has been prepared to determine storm pipe sizes throughout the development and has been provided in **Appendix D**.

The proposed stormwater management facility will be a stormwater management dry pond located near the southeast corner of the proposed development and will control post-development peak flows to their pre-development levels or lower (Post-to-Pre control'). The ultimate receiver of the stormwater from the proposed development is the Bronte Creek Tributary which is located east of the proposed development.

Catchment 202 will consist of rooftop and rear-yard drainage from the lots located along the southern and eastern property limits. Drainage from Catchment 201 will be overcontrolled to allow for Catchment 202 to drain uncontrolled to the Bronte Creek Tributary; however, the proposed dry pond will overcontrol the remainder of the site so the total peak flow rate from the site to the Bronte Creek Tributary will remain less than existing conditions.

7.3 Stormwater Quality Control

Stormwater quality controls for the proposed development must incorporate measures to provide "enhanced protection" as outlined by the Township of Puslinch Municipal Development Standards. Enhanced water quality protection involves the removal of at least 80% of the total suspended solids (TSS) from 90% of the annual runoff volume.

Water quality control for Catchment 201 will be provided using an oil-grit separator (Stormceptor EFO8 or approved equivalent) and dry pond in series. The oil-grit-separator is located upstream of the proposed stormwater management dry pond to provide quality control for runoff before discharging into the pond. It is understood the Township recognizes that an OGS unit provides 50% TSS removal. The proposed dry pond will provide 60% TSS removal per MECP standards. Together, the oil-grit separator and dry pond in series will provide 80% TSS removal (50% + 60%x50% = 80%). The water treatment train calculations and OGS sizing report can be found in **Appendix F**.

Catchment 202 will produce only clean runoff (i.e., landscaped and rooftop runoff). Therefore, quality controls are not proposed.

7.4 Stormwater Management Erosion Control

As outlined above, the proposed development is required to provide erosion control in the form of extended detention. The extended detention includes a minimum of 24-hour detention for the 25 mm storm event, per the Conservation Halton Stormwater Management Guidelines.

Erosion control for the proposed stormwater management facility is proposed to be provided by the active storage component of the proposed dry pond. A 25 mm, 3-Hour Chicago storm event was executed in the proposed conditions VO model. The computed runoff depth and required extended detention volume for the SWM dry pond is summarized in **Table 9**.

Table 9: Required Extended Detention Volume

Stormwater Management Facility	**Total Contributing Drainage Area** (ha)	**Criteria**	**Required Volume** (m^3)	**Provided Volume** (m^3)
Dry Pond	4.02	MECP Extended Detention (150 m^3/ha)	603	603
		Erosion Control (25 mm Runoff Volume)	465	

Note: A. Required storage volumes from Table 3.2 of MECP SWM Planning and Design Manual (2003) based on 150 m^3/ha for extended detention.
B. 5 mm runoff volume obtained from VO model

As presented in **Table 9**, the MECP Extended Detention volume requirements exceed the Erosion Control volume requirements requested by Conservation Halton. Therefore, the MECP standards govern the required volume for extended detention in the proposed stormwater management dry pond. The governing volume of 603 m^3 must be detained over a period of 24-hour to 48-hours. Drawdown calculations have been provided in **Appendix D**.

7.5 Stormwater Management Facility Design Requirements

The proposed stormwater management dry pond will provide stormwater quantity, quality, and erosion controls to meet the relevant stormwater criteria outlined in Section 7.0 for the proposed development. The dry pond will provide an active storage component equipped with an outlet structure sized to meet stormwater quantity control and erosion control criteria.

The pond design was prepared to achieve the following Ministry of Environment, Conservation, and Parks design requirements as outline in Table 4.8 of the MECP Stormwater Management Manual:

- The proposed pond will have 4:1 side slopes.
- Mean depth between 1 m – 3 m.
- The dry pond will be designed with an emergency overflow weir to direct flows towards the Bronte Creek tributary.

7.6 Stormwater Management Facility Operating Characteristics

A preliminary stormwater management dry pond design has been completed, demonstrating that the stormwater management block is adequately sized to meet the requirements set by the various regulatory bodies. A summary of the preliminary stormwater management pond's characteristics is shown below in **Table 10**.

Table 10: Stormwater Management Pond Operating Characteristics

Component	**Elevation** (m)	**Storage Required** (m^3)	**Storage Provided** (m^3)
Bottom of Pond	312.35	-	-
Extended Detention	313.52	603	603
Regional High-Water Level	314.05	1,149	1,143
Top of Berm	314.35	-	1,536

As shown above in **Table 10**, the stormwater management facility presented within this report is sufficiently sized to meet all design criteria. Refer to **Appendix D** for detailed stormwater management facility calculations.

7.7 Water Balance

The water balance parameters were established based on the climate data from various Kitchener-Waterloo Weather Stations near the Region of Waterloo International between 1990 – 2020, as well as site topography, soil type, and land cover infiltration factors. The results of the water balance indicate that there is an infiltration deficit of approximately 3,148 m^3/year (3.2 mm storm event) due to an increase in impervious surfaces.

Based on communications with the Hydrogeological Consultant (Englobe, formerly Terraprobe), when applying a safety factor of 2.5, the existing soils at the location of the end-of-pipe LID can facilitate a preliminary infiltration rate of 30 mm/hr. The infiltration rate is to be confirmed with site testing (i.e., test pits and Guelph permeameter or double ring infiltrometer testing) at the detailed design stage.

An infiltration system has been proposed downstream of the pond to meet pre-development infiltration volumes. This will consist of a 350 m^2 Cupolex H.45 system (or equivalent) with a tank depth of 0.45 m, over top of a 0.15 m thick layer of clear stone, providing a total storage depth of 0.6m and a storage volume of 150 m^3. This system is designed to infiltrate 5,292 m^3/year (5 mm storm event), which accounts for 34% of the average cumulative precipitation between the months of April and October. It has been assumed that the months of October to March are not conducive for infiltration due to frozen conditions.

Refer to **Table 11** which outlines the storage volume requirements to meet the water balance requirements.

Table 11: Water Balance Volume Requirements

Storage Requirements	Infiltration System Area (m^2)	Void Ratio	Required Storage (m^3)	Provided Storage (m^3)
Water Balance	350	0.4	147	150

As outlined above in **Table 11**, if the Conservation Authority would like the water balance objectives to be met under post-development conditions, this will require an infiltration trench to store and infiltrate a volume of at least 147 m^3, which will be provided through a proposed infiltration trench. The detailed water balance calculations are presented in **Appendix D**.

7.8 Floodplain Assessment

The Conservation Halton HEC-RAS floodplain modelling for the Bronte Creek Tributary (March 14, 2012) was obtained and reviewed by Crozier. Review of the modeling and the staked wetland and woodlot environmental constraints on the property ultimately determined the wetland and woodlot setbacks that govern the overall development limits for the site.

The Regional floodplain from the Conservation Halton HEC-RAS floodplain model has been delineated on the civil engineering drawings and a 15 m floodplain setback was established based on the Conservation Halton Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document April 27, 2006 (last amended, November 6, 2020). The wetland and woodlot were determined to be the governing development setbacks for the proposed development and, therefore, a detailed floodplain assessment has not been completed at this time. Furthermore, a meeting was held with Conservation Halton staff on July 2023 to discuss if the Conservation Halton HEC-RAS floodplain model delineation was sufficient for the floodplain delineation for the proposed development. Following the meeting, it was noted the Conservation Halton HEC-RAS floodplain model delineation was sufficient for the proposed development. Email excerpts with Conservation Halton staff have been included in **Appendix F**.

8.0 Erosion and Sediment Controls During Construction

The design of the erosion and sediment controls will be completed during the detailed design of the proposed development. The erosion and sediment controls will be required to be installed prior to the beginning of any construction activities. They will be maintained until the site is stabilized or as directed by the Site Engineer and/or Township of Puslinch. Controls will be inspected after each significant rainfall event and maintained in proper working conditions.

Further details on the erosion and control measures that may be implemented have been summarized below:

Sediment Control Silt Fence

Sediment Control Silt Fence will be installed on the perimeter of the site to intercept sheet flow. Additional Sediment Control Silt Fence may be added based on field decisions by the Site Engineer and Owner prior to, during, and following construction.

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the site onto surrounding lands and the perimeter roadway network. All construction traffic will be restricted to this access only.

Rock Check Dams

Rock check dams installed according to OPSD 219.210 should be installed in the proposed swale to protect from erosion conveyance during construction.

The Removals, Erosion and Sediment Control Plan will be refined throughout the planning application process with consultation with the Township and Conservation Authority to ensure potential environmental hazards during construction are minimized.

9.0 Conclusions & Recommendations

This report was prepared in support of the Zoning By-Law Amendment Application for the property located at 11 Main Street in the Township of Puslinch. The proposed development can be serviced for sanitary, water, and stormwater management in accordance with the Township of Puslinch, County of Wellington, and Conservation Halton requirements and standards.

Our conclusions and recommendations include:

Proposed Water and Sanitary Servicing

1. Municipal servicing infrastructure is not available for the Site, therefore, the proposed development will be serviced by individual onsite sewage systems and drilled wells.

2. On-site soils are primarily classified as silty sand to sand and silt deposits. The anticipated T-time for the soil is 30 min/cm. This T-time is an assumed average for the entire site based on the findings outlined in the Hydrogeological Assessment (Englobe, August 28, 2024). At detailed design, it is recommended that detailed groundwater studies are conducted to provide location specific T-Time estimates to support the detailed design of the sewage systems throughout the development. Groundwater was observed to be 5.21 mbgs to 6.76 mbgs. Additional groundwater information is provided in the Hydrogeological Assessment (Englobe, August 28, 2024).

3. The preliminary sewage system design flows are expected to be approximately 3,600 L/d for each lot. Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA issued by the MECP will not be required. Each onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed with a footprint of approximately at least 270 m^2. The advanced treatment system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard and must achieve the denitrification requirement of at least 62.5% nitrate-nitrogen reduction to meet MECP Guideline D-5-4.

4. Individual lots will be serviced with private drilled wells in accordance with O. Reg. 903 for potable water supply.

Stormwater Management

1. The site's stormwater runoff from the developable area (Catchment 201) will be collected and conveyed towards the proposed stormwater management facility by the proposed storm sewer network and internal road network. The proposed dry pond will control the post-development peak flows to the pre-development peak flows prior to outletting towards the Bronte Creek Tributary. Stormwater runoff the Catchment 202 will flow uncontrolled towards to the Bronte Creek Tributary.

2. Stormwater runoff from Catchment EXT1 will continue to be directed around the proposed development towards the Bronte Creek Tributary and stormwater runoff from Catchment EXT2 and EXT3 will be conveyed through the proposed development by the proposed storm sewer system and internal road network to the dry pond.

3. Stormwater quality controls for Catchment 201 will be provided by an oil-grit separator in series with the proposed dry pond to achieve 80% TSS removal.

4. The stormwater management facility will be designed to meet the erosion control requirements and provide a minimum of 24-hour detention for the 25 mm storm event.

5. The preliminary infiltration rate for soils onsite is 30 mm/yr. Therefore, an underground gravel infiltration trench has been proposed with a storage of 150 m^3 per storm event, which meets the infiltration target of 5,292 m^3/year.

Erosion and Sediment Controls

1. Erosion and sediment controls will be implemented prior to construction and maintained to the satisfaction of the Township and Site Engineer until the site is stabilized.

Based on the above conclusions, we recommend the approval of the Zoning By-Law Amendment Application from the perspective of functional servicing and preliminary stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

[redacted]

Cole Martin
Engineering Intern, Land Development

C.F. CROZIER & ASSOCIATES INC.

[redacted]

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APPENDIX A

Fire Flow Calculations

CROZIER CONSULTING ENGINEERS

Project: 11 Main Street
Project NO.: 2366-6537
Date: 2023-01-09
Designed By: BP
Checked By: BW

Adequate Water Supply Calculations (OFM Version)
Part 3 Fire Protection, Occupant Safety and Accessibility of the Ontario Building Code

Building:	Type C (Residential)	360 m²	6 m

References

1. Part 3 of the Ontario Building Code (2012)
2. Fire Protection Water Supply Guideline For Part 3 Of The Ontario Building Code, TG-03-1999 (October 1999)
3. Draft Plan of Subdivision, Weston Consulting (February 6, 2023)

Equation

$$Q = KVS_{Total}$$

Q	Minimum supply of water in litres.
K	Water supply coefficient based upon building occupancy.
V	Total building volume in cubic metres.
S_{TOT}	Total of spatial coefficient values from property line exposures on all sides

Minimum Supply of Water

K =	23.0	C Classification	(reference 1.)
V =	2160 m³		
S_{TOT} =	1.8		

Exposure	Distance (m)	S_{side}
North	40.0	0.0
East	6.0	0.4
South	6.0	0.4
West	30.0	0.0

Q = 89,424 L

Minimum Water Flow Supply Flow Rate

Required minimum water supply flow rate (L/min) (reference 2.)

Floor area ≤ 600 m²:		Yes	
		2700 L/min	Required flow rate
		0.5 hr	Required duration
Q =	**81,000 L**		

Conclusion

Therefore, the minimum water supply for proposed Building Type C (Residential) is **89,424 L**

CROZIER CONSULTING ENGINEERS

Project: 11 Main Street, Puslinch
Project No.: 2366-6537
Created By: AL
Checked By: BW
Date: 2023.02.07
Updated: 2024-07-31

Domestic Water Demand - Ontario Building Code

Peak Sewage Flow	3,600	L/day	
Avg. Daily Demand =	450	L/day	
	0.31	**L/min**	
Peaking Factors			
Max Day =	8.0		
Peak Hour =	12.1		
Average Day =	**0.31**	L/min	
Max Day =	**2.50**	L/min	
Peak Hour =	**3.77**	L/min	

Notes & References

Ontario Building Code - Table 8.2.1.3.B

24-hr day

Based on MECP suggested factor from Table 3-3 MOE Design Guidelines for Drinking Water Systems fewer than 500 people (2008)

Max Day = (Average Day Demand) * (Max Day Factor)

Peak Hour = (Average Day Demand) * (Peak Hour Factor)

Criteria	Average Daily Water Demand (L/min)	Max Day Demand (L/min)	Peak Hourly Demand (L/min)
OBC and MECP Design Guidelines	0.31	2.50	3.77

CROZIER CONSULTING ENGINEERS

Project: 11 Main Street, Puslinch
Project No.: 2124-6029
Prepared By: BP
Checked By: BW
Date: 2022.05.11
Updated: 2024.07.31

WATER DEMAND CALCULATIONS

11 Main Street, Township of Puslinch

Note: Based on Development Concept prepared by Weston Consulting dated February 6, 2023

			References
Population Density	4	persons/unit	Per jobs of similar scope.
Number of Units	23		
Total Population	92	persons	
Average Daily Demand	450	L/cap/day	MOE Design Guidelines for Drinking Water Systems (2008), Section 3.4.2.
	41,400	L/day	
	0.48	**L/s**	
Maximum Daily Demand Peaking Factor	3.6		MOE Design Guidelines for Drinking Water Systems (2008), Section 3.4.5.1, Table 3-3.
Maximum Hourly Demand Peaking Factor	5.4		
Maximum Daily Flow	149,040	L/day	
	1.73	**L/s**	
Peak Hour Flow	223,560	L/day	
	2.59	**L/s**	
Maximum Daily per Unit	6,480	L/day	
	0.08	**L/s**	
Peak Hour Flow per Unit	9,720	L/day	
	0.11	**L/s**	

APPENDIX B

Sanitary Servicing Calculations

CROZIER CONSULTING ENGINEERS

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

Project Name: 11 Main Street
Project Number: 2366-6537

######## 2024-11-07
Designed By: AL
Checked By: KR

input required

Fixtures	Number of Fixtures	Fixture Units per Fixture	Total Fixture Units
Bathroom Group (flush tank)	3	6	18.0
2 Piece Bathroom	2	5.5	11.0
Basement Rough-in	0	6	0.0
Sinks (Domestic Lavatory w. 1/2" trap, kitchen sink, single compartment laundry tray)	5	1.5	7.5
Clothes Washer	1	1.5	1.5
Dishwasher (if not connected to kitchen sink)	1	1	1.0
Shower (from 1 head)	1	1.5	2
Floor drain	1	3	3
Laundry Tub	1	1.5	2
		Total Fixture Units	**45.0**

Assumed fixture units based on similar house sizes

ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

CROZIER CONSULTING ENGINEERS

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2024-11-07
Designed By: AL
Checked By: KR

input required

House Details: 4 bedroom
360.00 m2

References

Description		Number of Units	Additional Flow per Unit (L)	Total Flow (L/day)
Base Flow				2000
Additional Flow				
i) Each bedroom over 5		0	500	0
ii) Area over $200m^2$,				
A) Each $10m^2$ over $200m^2$ to $400m^2$		16	100	1600
B) Each $10m^2$ over $400m^2$ to $600m^2$		0	75	0
C) Each $10m^2$ over $600m^2$		0	50	0
	Total Additional Sewage Flow from Area			1600
iii) Fixture Units over 20		25	50	1250
			Addition flow (greatest of i,ii,iii)	**1600**
			Total Daily Design Sanitary Sewage Flow (L/day):	**3600**

Pre-Treatment Options

Treatment: **WBP Model AD40**, 4000 L/d
Treatment: **ADIPC-11250**
Basket Biofilter Tank: **BT-11250**
Orangeville Precast Concrete Ltd.

Required septic tank size = 7200 L minimum

Propose Level IV Treatment (Y/N): Y

Native Percolation time, T = 30 min/cm — T-time estimated by Crozier

Imported Sand Percolation time = 30 min/cm

Option #1 - Type A Dispersal Bed

	Required		Provided	
Stone area =	72 m^2	(Q/50)	72 m^2	12m x 6m
Sand area =	270 m^2	(QT/400)	368 m^2	16m x 23m

APPENDIX C

Waterloo Biofilter Third-party Verification Studies

WaterNOx-LS Third Party Testing Summary

In the fall of 2016, Waterloo Biofilter Systems Inc. installed their WaterNOx-LS™ denitrification unit at the Bureau de Normalisation du Quebec (BNQ) test site located in Quebec City. The system underwent BNQ 3680-600 test protocol which includes two parts - Period A and Period B. Period A is based on the methodology of NSF/ANSI Standards 40 and 245, containing the same flow patterns and stress tests. Period B provides for a further 6 months of seasonal reliability testing to ensure that the test includes cold weather results.

The WaterNOx-LS is a passive autotrophic denitrification process using sulphur-limestone minerals in a submerged, up-flow configuration. The WaterNOx-LS, which was sized for 1,600 L/day (350 gpd) followed a Waterloo Biofilter nitrifying treatment unit.

Period A Test Results

During Period A wastewater is dosed according to the hydraulic loading specified in NSF-40. Period A includes the wash-day, working-parent, power failure, and vacation period stress tests. All sample results taken during stress tests are included in the analysis. Influent wastewater temperature values ranged from 10.0 °C (50 °F) to 16.5 °C (62 °F) with an average value of 13.3 °C (56 °F). Influent pH averaged 7.9 and effluent pH averaged 7.2.

Table 1 – Period A Results for the WaterNOx-LS

Parameters	Influent	Effluent	Removal
(c)BOD_5	260	6	97.6%
TSS	312	3	99.2%
Fecal Coliforms	2,403,000	4,900	99.8%
$NO_{2,3}$	-	0.20	-
TKN	57.1	4.6	92.0%
TN ($NO_{2,3}$ + TKN)	57.1	4.8	91.6%

n = 123; n = 357 for fecals
All parameters in mg/L except Fecal Coliforms in cfu/100mL
All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 43.0 mg/L to 68.8 mg/L with a six-month average concentration of 57.1 mg/L.

Weekly effluent $NO_{2,3}$ concentrations ranged from < 0.02 mg/L to 3.33 mg/L with a six-month average of 0.20 mg/L. Weekly effluent TKN concentrations ranged from 1.5 mg/L to 16.9 mg/L with a six-month average of 4.6 mg/L. Weekly effluent total nitrogen concentrations ranged from 1.7 mg/L to 17.1 mg/L with a six-month average of 4.8 mg/L. The total nitrogen reduction over the six-month period was 91.6%.

65 Massey Road, Suite C, Guelph ON N1H 7M6 T: 519 856-0757 1-866-366-4329 F: 519 856-0759 www.waterloo-biofilter.com

Period B Test Results

Weekday hydraulic loading is modified during Period B to a strenuous 'working parent' schedule where 40% of the flow is delivered over three hours in the morning, and 60% is delivered over three hours in the evening. All samples taken during Period B are included in the analysis. Influent wastewater temperature values ranged from 10.1 °C (50 °F) to 15.8 °C (60 °F) with an average value of 12.3 °C (54 °F). Influent pH averaged 8.0 and effluent pH averaged 7.1.

Table 2 – Period B Results for the WaterNOx-LS

Parameters	Influent	Effluent	Removal
(c)BOD_5	248	4	98.2%
TSS	304	3	99.1%
Fecal Coliforms	2,142,000	2,800	99.9%
$NO_{2,3}$	-	3.38	-
TKN	60.3	8.5	85.9%
TN ($NO_{2,3}$ + TKN)	60.4	11.9	80.3%

n = 59; n = 118 for fecals
All parameters in mg/L except Fecal Coliforms in cfu/100mL
All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 21.2 mg/L to 85.6 mg/L with a six-month average concentration of 60.4 mg/L.

Weekly effluent $NO_{2,3}$ concentrations ranged from < 0.04 mg/L to 15.2 mg/L with a six-month average of 3.38 mg/L. Weekly effluent TKN concentrations ranged from 1.2 mg/L to 21.2 mg/L with a weekly average of 8.5 mg/L. Weekly effluent total nitrogen concentrations ranged from 3.7 mg/L to 22.2 mg/L with a six-month average of 11.9 mg/L. The total nitrogen reduction over the six-month period was 80.3%.

Conclusion

In summary, the WaterNOx-LS system can successfully remove very high levels of total nitrogen passively, while buffering pH to neutral and keeping cBOD_5 and TSS levels below 10 mg/L.

APPENDIX D

Hydrologic Parameter Sheets & SWM Design

Project: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Checked By:
Date: 2024.06.19

Water Budget Summary
Project Name: 11 Main Street
Water Balance/Water Budget Assessment

Characteristic	Site				
	Pre-Development	Post-Development	Post-Development *with Mitigation*	Change (Pre to Post)	Change (Pre to Post) *with Mitigation*
Inputs (Volumes)					
Precipitation (m^3/yr)	50872	50872	50872	0%	0%
Run-On (m^3/yr)	0	0	0	0%	0%
Other inputs (m^3/yr)	0	0	0	0%	0%
Total Inputs (m^3/yr)	**50872**	**50872**	**50872**	**0**	**0**
Outputs (Volumes)					
Runoff (m^3/yr)*	9603	24891	19599	15288	9996
Evapotranspiration (m^3/yr)	34867	22726	22726	-12140	-12140
Infiltration (m^3/yr)	6402	3254	3254	-3148	-3148
Soakaway Infiltration (m^3/yr)	0	0	**5292**	**0**	**5292**
Total Infiltration (m^3/yr)	**6402**	**3254**	**8547**	-3148	2145
Runoff Pervious Areas (m^3/yr)	9603	4882	4882	-4722	-4722
Runoff Impervious Areas (m^3/yr)	0	20010	14717	20010	14717
Total Runoff (m^3/yr)	9603	24891	19599	15288	9996
Total Outputs (m^3/yr)	**50872**	**50872**	**50872**	0%	0%

CROZIER CONSULTING ENGINEERS

Project Name: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Checked By:
Date: 2024.06.19

Climatic Water Budget - Thornthwaite Method
Project Name: 11 Main Street
*WATERLOO WELLINGTON A - Climate Normals 1971-2000 Station Data

	Degrees	Minutes	Seconds	
Insert Latitude:	43	27	0	*Only Applicable Between Latitudes 40° - 50°

Month	Mean Temperature (◦C)	Heat index	" a "	PET - Potential Evapotranspiration (mm)	Daily Correction Value	Adjusted PET - Potential Evapotranspiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-6.3	0.0	0.49	0.0	0.77	0.0	66.3	66.3	0.0
February	-5.9	0.0	0.49	0.0	0.87	0.0	46.1	46.1	0.0
March	-0.8	0.0	0.49	0.0	0.99	0.0	57.0	57.0	0.0
April	5.9	1.3	0.52	27.0	1.11	30.1	81.2	51.1	0.0
May	12.6	4.1	0.56	60.9	1.23	74.8	80.2	5.4	0.0
June	17.8	6.8	0.61	88.3	1.29	113.7	80.5	0.0	33.2
July	20.2	8.3	0.64	101.1	1.26	127.8	96.2	0.0	31.6
August	19.1	7.6	0.62	95.2	1.17	111.4	67.2	0.0	44.2
September	15.2	5.4	0.59	74.5	1.05	78.0	75.2	0.0	2.8
October	8.8	2.4	0.53	41.5	0.92	38.2	71.0	32.8	0.0
November	2.6	0.4	0.50	11.2	0.81	9.1	74.9	65.8	0.0
December	-2.8	0.0	0.49	0.0	0.75	0.0	54.9	54.9	0.0
Totals		**36.2**	**1.07**			**583.1**	**850.7**	**379.5**	**111.8**

TOTAL WATER DEFICIT = **111.8 mm**
TOTAL WATER SURPLUS (SURPLUS - DEFICIT) = **267.6 mm**
Precipitation Adjustment Factor : **none**

NOTES:
1. Water budget adjusted for latitude and daylight.
2. (◦C) - Represents calculated mean of daily temperatures for the month.
3. Precipitation and Temperature data from the *WATERLOO WELLINGTON A (Station No.6149387) Environment Canada Station Data
4. Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapostranspiration.

Project: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Date: 2024.06.19

Design Storm Determination
Project Name: 11 Main Street
Water Balance/Water Budget Assessment

Days with Precipitation (From Climate Data)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
>= 0.2 mm	13.0	12.3	12.0	11.8	11.0	11.5	14.1	86
>= 5 mm	5.0	4.8	5.1	4.5	4.0	4.8	4.5	33
>= 10 mm	2.4	2.8	2.6	3.0	2.4	2.7	2.6	19
>= 25 mm	0.3	0.4	0.3	1.0	0.5	0.6	0.3	3.45

Available Precipitation

Storm Event (mm)	Total Days Per Year	Incremental Precipitation (mm/yr)	Cumulative Precipitation (mm/yr)
0.2	86	17.1	17.1
5	33	163.2	180.4
10	19	186.1	366.5
25	3.45	86.3	452.8
Total	**140**	**452.8**	

Infiltration Target:	5292	m^3/year	
Contributing Area:	29402	m^2	Impervious Area
Infiltration Target:	107	mm/year	
Runoff Coefficient:	0.90		Impervious runoff coefficient
Design Precipitation:	119	mm/year	(Design Infiltration / Contributing RC)
Therefore Min. Design Storm:	3.2	mm	
Chosen Design Storm:	5	mm	
Required Storage:	147	m^3	Volume per Storm Event

CROZIER CONSULTING ENGINEERS

Project Name: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Checked By:
Date: 2024.06.19

Water Budget - Post-Development *with Mitigation*
Project Name: 11 Main Street
Water Balance/Water Budget Assessment

Post-development pervious area.
Post-development impervious area.

Catchment Designation	Site - Post-Development		
	Pervious Area	Impervious Area	Totals
Area (m^2)	30398	29402	59800
Pervious Area (m^2)	30398	0	30398
Impervious Area (m^2)	0	29402	29402
Infiltration Factors			
Topography Infiltration Factor	0.10	0	
Soil Infiltration Factor	0.20	0	
Land Cover Infiltration Factor	0.10	0	
MOE Infiltration Factor	0.40	0.00	
Actual Infiltration Factor	0.40	0.00	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0.00	1.00	
Inputs (per Unit Area)			
Precipitation (mm/yr)	851	851	851
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	**851**	**851**	**851**
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	268	851	554
Net Surplus (mm/yr)	268	851	554
Evapotranspiration (mm/yr) *	583	170	380
Infiltration (mm/yr)	107	0	54
Soakaway Infiltration (mm/yr)	0	180	88
Total Infiltration (mm/yr)	107	180	143
Runoff Pervious Areas (mm/yr)	161	0	82
Runoff Impervious Areas (mm/yr)	0	501	246
Total Runoff (mm/yr)	161	501	328
Total Outputs (mm/yr)	**851**	**851**	**851**
Difference (Inputs- Outputs)	**0**	**0**	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	25860	25012	50872
Run-On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	**25860**	**25012**	**50872**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	8136	25012	33148
Net Surplus (m^3/yr)	8136	25012	33148
Evapotranspiration (m^3/yr) *	17724	5002	22726
Infiltration (m^3/yr)	3254	0	3254
Underground Storage Infiltration (m^3/yr)	0	5292	5292
Total Infiltration (m^3/yr)	3254	5292	8547
Runoff Pervious Areas (m^3/yr)	4882	0	4882
Runoff Impervious Areas (m^3/yr)	0	14717	14717
Total Runoff (m^3/yr)	4882	14717	19599
Total Outputs (m^3/yr)	**25860**	**25012**	**50872**
Difference (Inputs- Outputs)	**0**	**0**	**0**

5292 Proposed Infiltration via Mitigation

Pre-Development Total Infiltration:
107 mm/yr

Note:
0 mm
Precipitation available between Apr-Oct (non-winter months). Therefore available for infiltration into non-frozen soil

Pre-Development Total Infiltration:
6402 m3/yr

NOTES:
* Evaporation from impervious areas was assumed to be 20% of precipitation.

Project Name: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Checked By:
Date: 2024.07.02

Water Budget - Post-Development *without Mitigation*
Project Name: 11 Main Street
Water Balance/Water Budget Assessment

Post-development pervious area.
Post-development impervious area.

Note: Site land use areas consistent with Post-Development SWM hydrologic modeling & calculations

Catchment Designation	Site - Post-Development		
	Pervious Area	Impervious Area	Totals
Area (m^2)	30398	29402	59800
Pervious Area (m^2)	30398	0	30398
Impervious Area (m^2)	0	29402	29402
Infiltration Factors			
Topography Infiltration Factor	0.10	0	
Soil Infiltration Factor	0.20	0	
Land Cover Infiltration Factor	0.10	0	
MOE Infiltration Factor	0.40	0.00	
Actual Infiltration Factor	0.40	0.00	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0.00	1.00	
Inputs (per Unit Area)			
Precipitation (mm/yr)	851	851	851
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	**851**	**851**	**851**
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	268	851	554
Net Surplus (mm/yr)	268	851	554
Evapotranspiration (mm/yr) *	583	170	380
Infiltration (mm/yr)	107	0	54
Soakaway Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	107	0	54
Runoff Pervious Areas (mm/yr)	161	0	82
Runoff Impervious Areas (mm/yr)	0	681	335
Total Runoff (mm/yr)	161	681	416
Total Outputs (mm/yr)	**851**	**851**	**851**
Difference (Inputs- Outputs)	**0**	**0**	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	25860	25012	50872
Run-On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	**25860**	**25012**	**50872**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	8136	25012	33148
Net Surplus (m^3/yr)	8136	25012	33148
Evapotranspiration (m^3/yr) *	17724	5002	22726
Infiltration (m^3/yr)	3254	0	3254
Soakaway Infiltration (m^3/yr)	0	0	0
Total Infiltration (m^3/yr)	3254	0	3254
Runoff Pervious Areas (m^3/yr)	4882	0	4882
Runoff Impervious Areas (m^3/yr)	0	20010	20010
Total Runoff (m^3/yr)	4882	20010	24891
Total Outputs (m^3/yr)	**25860**	**25012**	**50872**
Difference (Inputs- Outputs)	**0**	**0**	**0**

Pre-Development Total Infiltration:
6402 m3/yr

NOTES:
* Evaporation from impervious areas was assumed to be 0% to be conservative, as there will be some evaporation.

Project Name: 11 Main Street
Project No: 2366-6357
Modelled By: DK
Checked By:
Date: 2024.07.02

Water Budget - Pre-Development
Project Name: 11 Main Street
Water Balance/Water Budget Assessment

Pre-development pervious area.
Pre-development impervious area.

Note: Site land use areas consistent with Pre-Development SWM hydrologic modeling & calculations

Catchment Designation	Site - Pre-Development		
	Pervious Area	Impervious	Totals
Area (m^2)	59800	0	59800
Pervious Area (m^2)	59800	0	59800
Impervious Area (m^2)	0	0	0
Infiltration Factors			
Topography Infiltration Factor	0.10	0	
Soil Infiltration Factor	0.20	0	
Land Cover Infiltration Factor	0.10	0	
MOE Infiltration Factor	0.40		
Actual Infiltration Factor	0.40	0	
Run-off Coefficient	0.25	0.90	
Runoff from Impervious Surfaces *	0	0.90	
Inputs (per Unit Area)			
Precipitation (mm/yr)	851	851	851
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	**851**	**851**	**851**
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	268	766	268
Net Surplus (mm/yr)	268	766	268
Evapotranspiration (mm/yr) *	583	170	583
Infiltration (mm/yr)	107	0	107
Soakaway Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	107	0	107
Runoff Pervious Areas (mm/yr)	161	0	161
Runoff Impervious Areas (mm/yr)	0	681	0
Total Runoff (mm/yr)	161	681	161
Total Outputs (mm/yr)	**851**	**851**	**851**
Difference (Inputs- Outputs)	**0**	**0**	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	50872	0	50872
Run-On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	**50872**	**0**	**50872**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	16005	0	16005
Net Surplus (m^3/yr)	16005	0	16005
Evapotranspiration (m^3/yr) *	34867	0	34867
Infiltration (m^3/yr)	6402	0	6402
Soakaway Infiltration (m^3/yr)	0	0	0
Total Infiltration (m^3/yr)	6402	0	6402
Runoff Pervious Areas (m^3/yr)	9603	0	9603
Runoff Impervious Areas (m^3/yr)	0	0	0
Total Runoff (m^3/yr)	9603	0	9603
Total Outputs (m^3/yr)	**50872**	**0**	**50872**
Difference (Inputs- Outputs)	**0**	**0**	**0**

CROZIER CONSULTING ENGINEERS

Project: 11 Main Street
Project No.: 2366-6537
Created By: CM
Checked By: TF
Date: 2024.11.08

Erosion Control Volume Calculations (MECP)

Area Name	**Drainage Area**			
Area to Pond =	4.02	ha	Percent Impervious	55.2%
Extended detention (MECP) =	603	m^3	Percent Pervious	44.8%

Extended Detention Volume:

Greater of :	Dry Pond Detention:	V =	150 m^3 / ha	(MECP requirement)
		V =	603 m^3	
	Detention of 25mm Runoff:	Depth =	11.56	(from VO model)
	(Runoff volume based on 25mm VO Model)	V =	465 m^3	

Required Extended Detention Volume = 603 m^3

CROZIER CONSULTING ENGINEERS

Project No:	2366-6537
Project:	11 Main Street
File:	Extended Detention
Design by:	CM
Checked by:	TF
Date:	2024.11.08

Extended Detention Specifications

(Per MECP)

Extended Detention Volume (Area x runoff from 25mm event)		603
t (drawdown time - seconds, *hours in italics*)	*24.0*	86400
Ao (cross section area of orifice - sqm)		0.0044
h (maximum water elevation above orifice for extended detention- m)		1.17
C (discharge coefficient)		0.64
Ap (average surface area for extended detention - sqm)		857

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

Ao = 0.008 sqm d = 98 mm

Extended Detention Orifice Diameter (as designed) d = **75** mm

ACTUAL DRAWDOWN TIME

* Neglecting tailwater conditions*

Extended Detention Volume Used	603
d (orifice diameter, mm)	75
h (maximum head acting on orifice for extended detention, m)	1.17
Ao (cross section area of orifice, m^2)	0.0044
C (discharge coefficient)	0.64
Ap (average surface area for extended detention, m^2)	850

t = 2*Ap*(h^0.5)/(C*Ao*(g*2)^0.5)

t (hours) 41

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME 101A
D.A. AREA (ha) 2.02

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 101A

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic Group	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	2.02
				0
				0
				0
Total Area				2.02

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*On-site soils silty sand with poor hydraulic conductivity per Terraprobe Hydrogeological Assessment (February 2023)

Impervious Landuses Present:

	Gravel		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0		0		0		0		0		0	0
Subtotal	0		0		0		0		0			

Pervious Landuses Present:

	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.16	36	0.00	30	0		0		1.86	70	2.02	136.01
Subtotal	0.16		0.00		0		0		1.86			

Composite Area Calculations		
	Total Pervious Area	2.02
	Total Impervious Area	0.00
	% Impervious	0.00%
	Composite Curve Number	67.3
	Total Area Check	2.02

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
				Dumfries Sandy Loam*								
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.16	1.59	0.30	0.16		0		0		0	0.05
Meadow	8	0	0		0.00		0		0		0	0
Wetland	16	0	0		0.00		0		0		0	0
Lawn	5	0	0		0.00		0		0		0	0
Cultivated	7	1.86	13.03	0.45	1.86		0		0		0	0.84
Impervious	2	0	0		0.00		0		0		0	0
Composite		2.02	7.24	Composite Runoff Coefficient								0.44

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Sheet Flow	111	6.70	6.04%	2.7	0.66	0.05	0.03	0.03	0.07	0.05	0.21	0.14

Appropriate calculated time to peak:	0.14	Appropriate Method:	Airport

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2024.04.30
By: DK/TF

D.A. NAME **101B**
D.A. AREA (ha) **0.76**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 101B

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic Group	% Area	Area
Dumfries Sandy Loam*	DUF	AB	100	0.76
				0
				0
				0
Total Area				0.76

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*On-site soils silty sand with poor hydraulic conductivity per Terraprobe Hydrogeological Assessment (February 2023)

Impervious Landuses Present:												
	Gravel		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0		0		0		0		0		0	0
Subtotal	0		0		0		0		0			

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.07	36	0		0		0		0.69	70	0.76	50.82
Subtotal	0.07		0		0		0		0.69			

Composite Area Calculations		
	Total Pervious Area	0.76
	Total Impervious Area	0.00
	% Impervious	0.00%
	Composite Curve Number	66.9
	Total Area Check	0.76

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
				Dumfries Sandy Loam*								
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.07	0.70	0.30	0.07		0		0		0	0.02
Meadow	8	0	0		0.00		0		0		0	0
Wetland	16	0	0		0.00		0		0		0	0
Lawn	5	0	0		0.00		0		0		0	0
Cultivated	7	0.69	4.83	0.45	0.69		0		0		0	0.31
Impervious	2	0	0		0.00		0		0		0	0
Composite		0.76	7.28	Composite Runoff Coefficient								0.44

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Sheet Flow	103	4.40	4.27%	2.7	0.56	0.05	0.03	0.03	0.08	0.05	0.23	0.15

Appropriate calculated time to peak:	0.05	Appropriate Method:	Bransby Williams

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **102**
D.A. AREA (ha) **3.96**

Hydrologic Parameters: CALIB NASHYD Command
Pre Development Drainage Area: Catchment 102

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic Group	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	3.96
				0
				0
				0
Total Area				3.96

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*On-site soils silty sand with poor hydraulic conductivity per Terraprobe Hydrogeological Assessment (February 2023)

Impervious Landuses Present:												
	Gravel		Sidewalk		Driveway		Building		SWMF		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0		0		0		0		0		0	0
Subtotal	0.00		0		0		0.00		0			

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.25	36	0		0		0		3.71	70	3.96	268.79
Subtotal	0.25		0		0		0		3.71			

Composite Area Calculations		
	Total Pervious Area	3.96
	Total Impervious Area	0.00
	% Impervious	0.00%
	Composite Curve Number	67.9
	Total Area Check	3.96

Initial Abstraction and Tp Calculations

Initial Abstraction				Composite Runoff Coefficient								
				Dumfries Sandy Loam*								
Landuse	IA (mm)	Area (ha)	A * IA	RC	Area	RC	Area	RC	Area	RC	Area	A*RC
Woodland	10	0.25	2.48	0.30	0.25		0		0		0	0.07
Meadow	8	0	0		0.00		0		0		0	0.00
Wetland	16	0	0		0		0		0		0	0.00
Lawn	5	0	0		0		0		0		0	0.00
Cultivated	7	3.71	25.99	0.45	3.71		0		0		0	1.67
Impervious	1.5	0	0		0		0		0		0	0.00
Composite		3.96	7.19	Composite Runoff Coefficient								0.44

Time to Peak Inputs						Uplands			Bransby Williams		Airport	
Flow Path Description	Length (m)	Drop (m)	Slope (%)	$V/S^{0.5}$	Velocity (m/s)	Tc (hr)	Tp(hr)	TOTAL Tp (hr)	Tc (hr)	Tp(hr)	Tc (hr)	Tp(hr)
Sheet Flow	165	13.00	7.88%	2.7	0.76	0.06	0.04	0.04	0.09	0.06	0.23	0.16

Appropriate calculated time to peak:	0.06	Appropriate Method:	Bransby Williams

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **EX1**
D.A. AREA (ha) **5.22**

Hydrologic Parameters: CALIB STANDHYD Command
External Drainage Area: Catchment EX1

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	5.22
				0
				0
				0
Total Area Check				5.22

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*External soils assumed to be silty sand with poor hydraulic conductivity.

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.21	98	0.35	91	0.52	98	0.49	98	0.00	98	1.57	150.9
Subtotal Area	0.21		0.35		0.52		0.49		0.00		1.57	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		3.66	50	0.00		3.66	182.8
Subtotal Area	0.00		0.00		0.00		3.66		0.00			

Pervious Area Calculations	Total Pervious Area	3.66
	Composite Pervious Curve Number	50
Impervious Area Calculations	Total Directly Connected Area	1.08
	Total Indirectly Connected Area	0.49
	Total Impervious Area	1.57
	% X imp	20.7
	% T imp	30.0
	Total Area Check	5.22

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	3.66	18.28
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	10.00%	30	0.25
Impervious	1.5	10.00%	187	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **EX2 (Pre-Dev)**
D.A. AREA (ha) **1.41**

Hydrologic Parameters: CALIB STANDHYD Command
External Drainage Area: Catchment EX2 (Pre-Dev)

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	1.41
				0
				0
				0
Total Area Check				1.41

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*External soils assumed to be silty sand with poor hydraulic conductivity.
**Roadway includes driveways.

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.41	98	0.00	91	0.00	98	0.11	98	0.00	98	0.52	51.0
Subtotal Area	0.41		0.00		0.00		0.11		0.00		0.52	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		0.89	50	0.00		0.89	44.5
Subtotal Area	0.00		0.00		0.00		0.89		0.00			

	Pervious Area Calculations	Total Pervious Area	0.89
		Composite Pervious Curve Number	50
	Impervious Area Calculations	Total Directly Connected Area	0.41
		Total Indirectly Connected Area	0.11
		Total Impervious Area	0.52
		% X imp	29.1
		% T imp	36.9
		Total Area Check	1.41

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.89	4.45
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	6.00%	20	0.25
Impervious	1.5	6.00%	42	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2023-11-28
By: DK

D.A. NAME **201**
D.A. AREA (ha) **3.50**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 201

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	3.50
				0
				0
				0
Total Area Check				3.50

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*On-site soils silty sand with poor hydraulic conductivity per Terraprobe Hydrogeological Assessment (February 2023)

Impervious Landuses Present:												
	Roadway		Driveway		Sidewalk		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.48	98	0.25	98	0.07	98	0.83	98	0.15	50	1.78	167.2
Subtotal Area	0.48		0.25		0.07		0.83		0.15			

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		1.72	50	0.00		1.72	86.1
Subtotal Area	0.00		0.00		0.00		1.72		0.00			

Pervious Area Calculations	Total Pervious Area		1.72
	Composite Pervious Curve Number		50
Impervious Area Calculations	Total Directly Connected Area		0.70
	Total Indirectly Connected Area		1.08
	Total Impervious Area		1.78
	% X imp		19.9
	% T imp		50.8
	Total Area Check		3.50

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	1.72	8.61
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	4.00%	20	0.25
Impervious	1.5	4.00%	153	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2024.05.07
By: DK

D.A. NAME **202**
D.A. AREA (ha) **2.48**

Hydrologic Parameters: CALIB STANDHYD Command
Post Development Drainage Area: Catchment 202

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic Group	% Area	Area
Dumfries Sandy Loam*	DUF	A	86%	2.12
Parkhill Loam	PLL	C	14%	0.36
				0
				0
Total Area Check				2.48

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*On-site soils silty sand with poor hydraulic conductivity per Terraprobe Hydrogeological Assessment (February 2023)

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00	98	0.00	98	0.00	98	0.83	98		39	0.83	81.2
PLL							0.08	98			0.08	7.9
Subtotal Area	0.00		0.00		0.00		0.91		0.00		0.91	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		1.29	50	0.00		1.29	64.6
PLL	0.00		0.00		0.00		0.28	74	0.00		0.28	20.5
Subtotal Area	0.00		0.00		0.00		1.57		0.00			

Pervious Area Calculations	Total Pervious Area	1.57
	Composite Pervious Curve Number	54.2
Impervious Area Calculations	Total Directly Connected Area	0.00
	Total Indirectly Connected Area	0.91
	Total Impervious Area	0.91
	% X imp	0.0
	% T imp	36.7
	Total Area Check	2.48

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	1.57	7.85
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	4.00%	30	0.25
Impervious	1.0	2.00%	129	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **EX2**
D.A. AREA (ha) **0.26**

Hydrologic Parameters: CALIB STANDHYD Command
External Drainage Area: Catchment EX2

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	0.26
				0
				0
				0
Total Area Check				0.26

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*External soils assumed to be silty sand with poor hydraulic conductivity.
**Roadway includes driveways.

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.08	98	0.00	91	0.00	98	0.03	98	0.00	98	0.11	10.7
Subtotal Area	0.08		0.00		0.00		0.03		0.00		0.11	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		0.15	50	0.00		0.15	7.5
Subtotal Area	0.00		0.00		0.00		0.15		0.00			

	Pervious Area Calculations	Total Pervious Area	0.15
		Composite Pervious Curve Number	50
	Impervious Area Calculations	Total Directly Connected Area	0.08
		Total Indirectly Connected Area	0.03
		Total Impervious Area	0.11
		% X imp	30.5
		% T imp	42.0
		Total Area Check	0.26

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.15	0.75
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	6.00%	20	0.25
Impervious	1.5	6.00%	42	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **EX3**
D.A. AREA (ha) **0.26**

Hydrologic Parameters: CALIB STANDHYD Command
External Drainage Area: Catchment EX3

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	0.26
				0
				0
				0
Total Area Check				0.26

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*External soils assumed to be silty sand with poor hydraulic conductivity.
**Roadway includes driveways.

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.04	98	0.00	91	0.00	98	0.04	98	0.00	98	0.08	7.8
Subtotal Area	0.04		0.00		0.00		0.04		0.00		0.08	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		0.18	50	0.00		0.18	9.0
Subtotal Area	0.00		0.00		0.00		0.18		0.00			

	Pervious Area Calculations	Total Pervious Area	0.18
		Composite Pervious Curve Number	50
	Impervious Area Calculations	Total Directly Connected Area	0.04
		Total Indirectly Connected Area	0.04
		Total Impervious Area	0.08
		% X imp	15.4
		% T imp	30.8
		Total Area Check	0.26

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.18	0.90
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	10.00%	30	0.25
Impervious	1.5	4.00%	42	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

Project Name: 11 Main Street
Project Number: 2366-6537
Date: 2022-10-12
By: BP/PR

D.A. NAME **EX4**
D.A. AREA (ha) **0.46**

Hydrologic Parameters: CALIB STANDHYD Command
External Drainage Area: Catchment EX4

Curve Number Calculation

Soil Types Present per Wellington County Soils Map (1962):				
Type	ID	Hydrologic	% Area	Area
Dumfries Sandy Loam*	DUF	A	100	0.46
				0
				0
				0
Total Area Check				0.46

Note: RC and CN values obtained from the MTO Drainage Management Manual Part 4 (1995)
*External soils assumed to be silty sand with poor hydraulic conductivity.
**Roadway includes driveways.

Impervious Landuses Present:												
	Roadway		Gravel		Driveway		Building		SWM Pond		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.10	98	0.00	91	0.00	98	0.04	98	0.00	98	0.14	13.7
Subtotal Area	0.10		0.00		0.00		0.04		0.00		0.14	

Pervious Landuses Present:												
	Woodland		Meadow		Wetland		Lawn		Cultivated		Subtotals	
Soils	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area (ha)	CN	Area	A*CN
DUF	0.00		0.00		0.00		0.32	50	0.00		0.32	16.0
Subtotal Area	0.00		0.00		0.00		0.32		0.00			

Pervious Area Calculations	Total Pervious Area	0.32	
	Composite Pervious Curve Number	50	
Impervious Area Calculations	Total Directly Connected Area	0.10	
	Total Indirectly Connected Area	0.04	
	Total Impervious Area	0.14	
	% X imp	21.7	
	% T imp	30.4	
	Total Area Check	0.46	

Initial Abstraction and Tp Calculations

Landuse	IA (mm)	Area (ha)	A * IA
Woodland	10	0	0
Meadow	8	0	0
Wetland	16	0	0
Lawn	5	0.32	1.60
Cultivated	7	0	0

Land Use	IA (mm)	Slope (%)	Travel Length (m)	Manning's n
Pervious	5.0	4.00%	20	0.25
Impervious	1.5	2.00%	55	0.013

$$A = 1.5LGI^2$$

Note: LGI formula retrieved from Visual OTTHYMO Reference Manual (pg. 7)

where LGI represents impervious length (m)

CROZIER CONSULTING ENGINEERS

Project No:	11 Main Street
Project:	2366-6537
File:	Stage-Storage-Discharge
Design by:	CM
Checked by:	TF
Date:	2024-12-19

Storage - Outflow Calculations

Outlet Structure			**Main Cell Spillway**		
E.D. Orifice Diameter:	0.075	m	Emergency Spill Elev.	314.25	m
E.D. Orifice Invert Elevation:	312.35	m	Emerg Spill Bot. Width	5	m
V-notch angle	N/A	degrees	Trap. Side Slopes	10	:1
V-notch constant	N/A	const			
V-notch invert	N/A	m			
Rect weir length	0.900	m			
Rect weir invert	313.50	m			
Extended Detention Depth:	1.17	m			

Pond Dimensions				Total	Outlet Structure			Cell Spillway			
Elev.	Depth Above PP	Area	Storage Volume	Storage Volume	ED Orifice Discharge	V-notch Discharge	Rect. Weir Discharge	Emerg. Weir Ave. Width	Emerg. Weir Discharge	Total Discharge	Storage
(m)	(m)	(sqm)	(cu.m)	(cu.m)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(m)	(cu.m/s)	(cu.m/s)	(ha-m)
312.35	0.00	243	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
312.45	0.10	256	16	16	0.003	0.000	0.000	0.000	0.000	0.003	0.002
312.55	0.20	306	44	44	0.005	0.000	0.000	0.000	0.000	0.005	0.004
312.65	0.30	357	77	77	0.006	0.000	0.000	0.000	0.000	0.006	0.008
312.75	0.40	410	116	116	0.008	0.000	0.000	0.000	0.000	0.008	0.012
312.85	0.50	463	159	159	0.009	0.000	0.000	0.000	0.000	0.009	0.016
312.95	0.60	518	208	208	0.009	0.000	0.000	0.000	0.000	0.009	0.021
313.05	0.70	575	263	263	0.010	0.000	0.000	0.000	0.000	0.010	0.026
313.15	0.80	633	323	323	0.011	0.000	0.000	0.000	0.000	0.011	0.032
313.25	0.90	692	390	390	0.012	0.000	0.000	0.000	0.000	0.012	0.039
313.35	1.00	752	462	462	0.012	0.000	0.000	0.000	0.000	0.012	0.046
313.45	1.10	814	540	540	0.013	0.000	0.000	0.000	0.000	0.013	0.054
313.52	1.17	857	603	603	0.013	0.000	0.006	1.000	0.000	0.020	0.060
313.55	1.20	876	625	625	0.014	0.000	0.019	0.000	0.000	0.032	0.062
313.65	1.30	939	715	715	0.014	0.000	0.096	0.000	0.000	0.110	0.072
313.75	1.40	1002	812	812	0.015	0.000	0.207	0.000	0.000	0.222	0.081
313.85	1.50	1067	916	916	0.015	0.000	0.343	0.000	0.000	0.358	0.092
313.90	1.55	1100	973	973	0.015	0.000	0.419	5.000	0.000	0.434	0.097
313.95	1.60	1134	1026	1026	0.016	0.000	0.500	0.000	0.190	0.706	0.103
314.05	1.70	1202	1143	1143	0.016	0.000	0.675	0.000	1.300	1.992	0.114
314.15	1.80	1271	1266	1266	0.017	0.000	0.868	0.000	0.000	0.884	0.127
314.25	1.90	1341	1397	1397	0.017	0.000	1.076	0.000	0.000	1.093	0.140
314.35	2.00	1478	1536	1536	0.018	0.000	1.298	1.000	0.058	1.373	0.154

11 Main Street

2366-6537

STORM SEWER DESIGN SHEET

CROZIER CONSULTING ENGINEERS

FREQUENCY - 5 YEAR - CITY OF GUELPH DEVELOPMENT ENGINEERING MANUAL (OCTOBER 2023)			
Coef. A=	632.75	Coef. B=	-0.741
FREQUENCY - 100 YEAR - CITY OF GUELPH DEVELOPMENT ENGINEERING MANUAL (OCTOBER 2023)			
Coef. A=	953.29	Coef. B=	-0.711

MATERIAL	MANNINGS "n"
PVC	0.009
CONCRETE	0.013

DESIGNED BY:	H.W
CHECKED BY:	T.F
DATE:	2024.11.15
REVISION NO.:	1
REVISED BY:	T.F
DATE:	2024.11.15

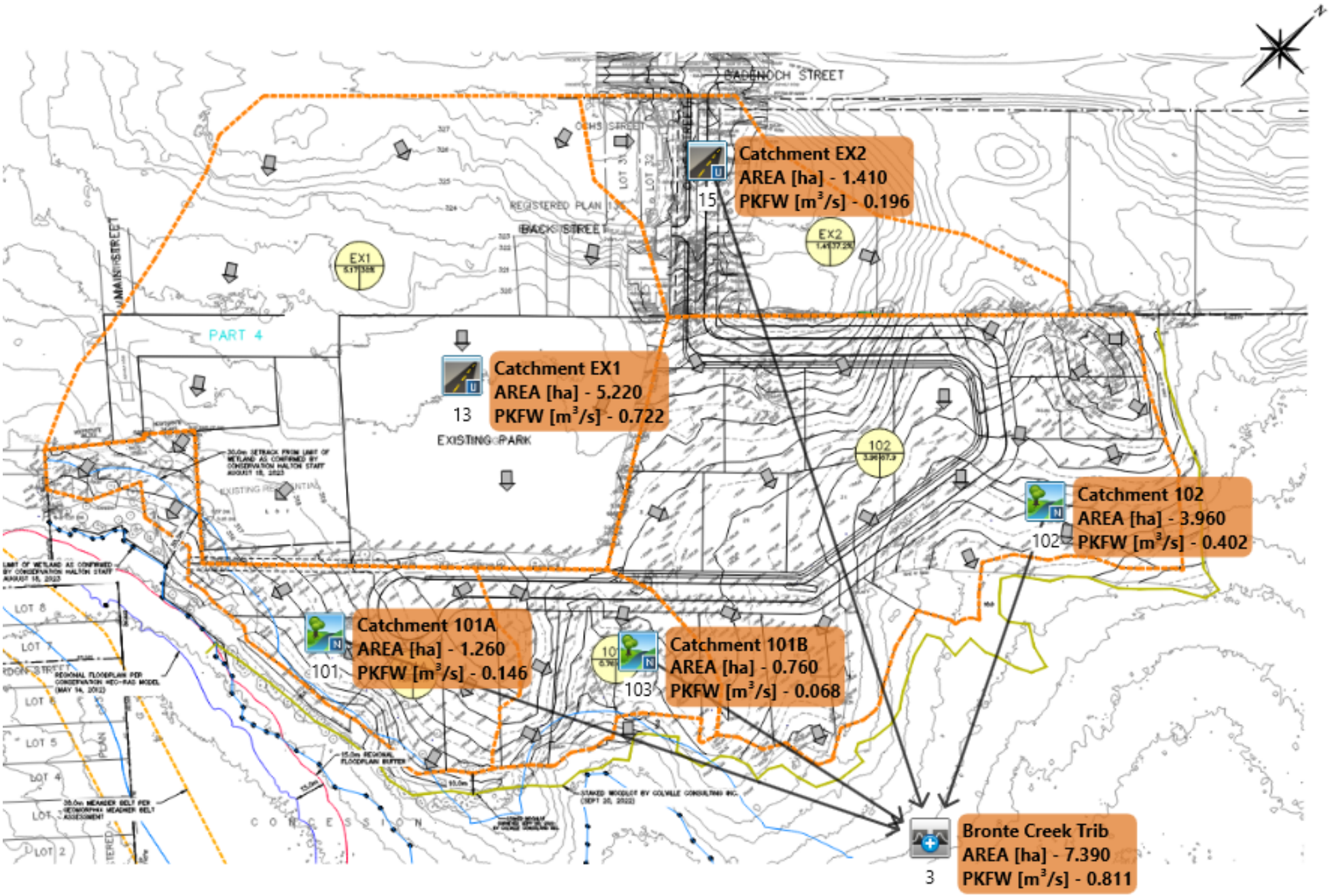
INITIAL TIME OF CONCENTRATION (minutes) = 10.00

CATCHMENT I.D.	STREET	TO MH	FROM MH	AREA (A) (Ha)	5 YEAR RUN-OFF COEFF (C_5)	100 YEAR RUN-OFF COEFF (C_{100})	DESIGN STORM	A x C	5 YEAR CUMUL. A x C	100 YEAR CUMUL. A x C	TIME OF CONC. (min.)	5 YEAR I (mm/hr)	100 YEAR I (mm/hr)	Q (RUNOFF) (l/sec)	DESIGN FLOW (l/sec)	SLOPE (%)	PIPE DIA. (mm)	MANNING'S "n"	VEL. (m/sec)	LENGTH	TIME OF FLOW (min)	PIPE CAPACITY (l/sec)	CAPACITY (%)
1	STREET A	STM DCB 15	STM MH 14	0.28	0.72	0.90	5 year	0.20	0.20	0.00	10.00	114.88	185.45	**63.26**	**63.26**	1.00%	300	0.009	2.0	37.3	0.31	**139.68**	**45%**
2	STREET A	STM MH 14	STM CBMH 13	0.04	0.67	0.83	5 year	0.03	0.22	0.00	10.31	112.27	181.41	**69.67**	**69.67**	1.00%	300	0.009	2.0	73.9	0.62	**139.68**	**50%**
3		STM CB 20	STM CBMH 19	0.07	0.74	0.93	5 year	0.05	0.05	0.00	10.00	114.88	185.45	**16.13**	**16.13**	1.00%	300	0.009	2.0	4.2	0.04	**139.68**	**12%**
4		STM CBMH 19	STM CBMH 13	0.04	0.90	1.00	5 year	0.04	0.09	0.00	10.04	114.58	184.98	**28.44**	**28.44**	2.00%	300	0.009	2.8	7.4	0.04	**197.54**	**14%**
5	STREET A	STM CBMH 13	STM CBMH 12	0.18	0.68	0.84	5 year	0.12	0.43	0.00	10.94	107.49	174.00	**128.76**	**128.76**	1.80%	450	0.009	3.5	90.7	0.44	**552.51**	**23%**
6		STM CB 18	STM CBMH 12	0.77	0.59	0.74	5 year	0.46	0.46	0.00	10.00	114.88	185.45	**145.34**	**145.34**	3.00%	300	0.009	3.4	9.2	0.04	**241.93**	**60%**
7	STREET A	STM CBMH 12	STM CBMH 11	0.25	0.68	0.85	5 year	0.17	1.05	0.00	11.37	104.43	169.24	**305.52**	**305.52**	1.70%	525	0.013	2.6	42.0	0.27	**560.73**	**54%**
8	STREET A	STM CBMH 11	STM DCBMH 2	0.43	0.62	0.78	5 year	0.27	1.32	0.00	11.64	102.63	166.44	**376.47**	**376.47**	0.40%	675	0.013	1.5	39.6	0.44	**531.63**	**71%**
9		STM DCB 17	STM DCBMH 2	0.22	0.61	0.77	5 year	0.13	0.13	0.00	10.00	114.88	185.45	**42.90**	**42.90**	0.50%	300	0.009	1.4	7.3	0.09	**98.77**	**43%**
10		STM CB 26	STM DCBMH 10	0.03	0.55	0.69	5 year	0.02	0.02	0.00	10.00	114.88	185.45	**5.88**	**5.88**	3.40%	300	0.009	3.6	3.7	0.02	**257.56**	**2%**
11		STM DCB 25	STM DCBMH 10	0.10	0.63	0.79	5 year	0.06	0.06	0.00	10.00	114.88	185.45	**20.16**	**20.16**	2.00%	300	0.009	2.8	7.4	0.04	**197.54**	**10%**
12		STM DCBMH 10	STM MH 9	0.05	0.67	0.84	5 year	0.03	0.11	0.00	10.04	114.50	184.87	**36.04**	**36.04**	2.10%	300	0.009	2.9	17.4	0.10	**202.41**	**18%**
13		STM MH 9	STM CBMH 8	0.02	0.83	1.00	5 year	0.01	0.13	0.00	10.15	113.65	183.56	**40.40**	**40.40**	2.80%	300	0.009	3.3	11.1	0.06	**233.73**	**17%**
14		STM CB 24	STM CBMH 8	0.01	0.90	1.00	5 year	0.01	0.01	0.00	10.00	114.88	185.45	**3.33**	**3.33**	2.00%	300	0.009	2.8	7.4	0.04	**197.54**	**2%**
15		STM CBMH 8	STM CBMH 7	0.02	0.79	0.99	5 year	0.01	0.15	0.00	10.04	114.50	184.87	**48.47**	**48.47**	3.00%	300	0.009	3.4	56.0	0.27	**241.93**	**20%**
16		STM CB 23	STM CBMH 7	0.05	0.84	1.00	5 year	0.05	0.05	0.00	10.00	114.88	185.45	**14.65**	**14.65**	2.00%	300	0.009	2.8	7.4	0.04	**197.54**	**7%**
17		STM CBMH 7	STM CBMH 6	0.09	0.78	0.97	5 year	0.07	0.26	0.00	10.32	112.25	181.38	**82.47**	**82.47**	2.00%	300	0.009	2.8	55.9	0.33	**197.54**	**42%**
18		STM CBMH 27	STM CBMH 22	0.06	0.71	0.89	5 year	0.05	0.05	0.00	10.00	114.88	185.45	**14.69**	**14.69**	0.50%	300	0.009	1.4	14.6	0.17	**98.77**	**15%**
19		STM CBMH 22	STM CBMH 6	0.03	0.90	1.00	5 year	0.02	0.07	0.00	10.17	113.42	183.19	**21.89**	**21.89**	2.00%	375	0.009	3.2	7.4	0.04	**358.16**	**6%**
20		STM CBMH 6	STM MH 5	0.10	0.75	0.94	5 year	0.08	0.41	0.00	10.65	109.64	177.33	**124.83**	**124.83**	3.00%	450	0.009	4.5	9.9	0.04	**713.29**	**18%**
21		STM MH 5	STM MH 4	0.04	0.70	0.88	5 year	0.03	0.44	0.00	10.69	109.36	176.89	**134.13**	**134.13**	3.00%	450	0.009	4.5	39.3	0.15	**713.29**	**19%**
22		STM CB 21	STM MH 4	0.16	0.61	0.76	5 year	0.10	0.10	0.00	10.00	114.88	185.45	**31.85**	**31.85**	2.00%	300	0.009	2.8	7.5	0.04	**197.54**	**16%**
23		STM CB 4	STM MH 3	0.05	0.90	1.00	5 year	0.05	0.59	0.00	10.83	108.26	175.19	**177.06**	**177.06**	3.00%	525	0.013	3.4	14.2	0.07	**744.89**	**24%**
24		STM MH 3	STM DCBMH 2	0.09	0.61	0.77	5 year	0.05	0.05	0.00	10.90	107.76	174.41	**15.75**	**15.75**	0.60%	600	0.013	1.7	34.6	0.34	**475.61**	**3%**
25		STM DCBMH 2	STM OGS	0.09	0.84	1.00	5 year	0.08	1.58	0.00	12.09	99.82	162.06	**439.70**	**439.70**	0.50%	750	0.013	1.8	5.6	0.05	**787.21**	**56%**
26		STM OGS	STM HW 1	0.00	0.00	0.00	5 year	0.00	1.58	0.00	12.14	99.50	161.57	**438.29**	**438.29**	0.60%	750	0.013	2.0	4.7	0.04	**862.34**	**51%**

APPENDIX E

VO Modelling

Pre-Development Visual-Otthymo Schematic



```
V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
V    V   I    SS     U   U   A A   L
 V  V    I      SS   U   U  AAAAA  L
  V V    I       SS  U   U  A   A  L
   VV    I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Smart City Water Inc

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\4b7dcaeb-9c
Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\4b7dcaeb-9c

DATE: 11-08-2024 TIME: 08:45:48

USER:

COMMENTS: _____

** SIMULATION : 2yr 4hr 10min Chicago **

| CHICAGO STORM | Ptotal= 33.31 mm |

IDF curve parameters: A= 475.610
B= 0.000
C= 0.738
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.45	1.00	12.69	2.00	5.04	3.00	2.85
0.17	2.76	1.17	86.95	2.17	4.42	3.17	2.67
0.33	3.17	1.33	15.73	2.33	3.95	3.33	2.52
0.50	3.77	1.50	9.66	2.50	3.59	3.50	2.39
0.67	4.72	1.67	7.25	2.67	3.30	3.67	2.27
0.83	6.58	1.83	5.91	2.83	3.05	3.83	2.17

| CALIB | NASHYD (0101) | ID= 1 DT= 5.0 min | Area (ha)= 1.26 | Ia (mm)= 7.21 | U.H. Tp(hrs)= 0.14 | Curve Number (CN)= 67.6 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Unit Hyd Qpeak (cms)= 0.344

PEAK FLOW (cms)= 0.019 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 4.573
TOTAL RAINFALL (mm)= 33.310
RUNOFF COEFFICIENT = 0.137

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

| CALIB | NASHYD (0102) | ID= 1 DT= 5.0 min | Area (ha)= 3.96 | Ia (mm)= 7.19 | U.H. Tp(hrs)= 0.06 | Curve Number (CN)= 67.9 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Unit Hyd Qpeak (cms)= 2.521

PEAK FLOW (cms)= 0.098 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 4.004
TOTAL RAINFALL (mm)= 33.310
RUNOFF COEFFICIENT = 0.120

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

| CALIB | NASHYD (0103) | ID= 1 DT= 5.0 min | Area (ha)= 0.76 | Ia (mm)= 7.28 | U.H. Tp(hrs)= 0.05 | Curve Number (CN)= 66.9 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Unit Hyd Qpeak (cms)= 0.581

PEAK FLOW (cms)= 0.017 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 3.408
TOTAL RAINFALL (mm)= 33.310
RUNOFF COEFFICIENT = 0.102

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

| CALIB | STANDHYD (0015) | ID= 1 DT= 5.0 min | Area (ha)= 1.41 | Total Imp(%)= 36.90 | Dir. Conn.(%)= 29.10 |

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.52	0.89
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	6.00	6.00
Length (m)=	42.00	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Max.Eff.Inten.(mm/hr)=	86.95	23.68	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.94 (ii)	5.76 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.15	
			TOTALS
PEAK FLOW (cms)=	0.10	0.05	0.134 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	31.81	9.76	16.17
TOTAL RAINFALL (mm)=	33.31	33.31	33.31
RUNOFF COEFFICIENT =	0.95	0.29	0.49

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0101):	1.26	0.019	1.42	4.57
		+ ID2= 2 (0102):	3.96	0.098	1.33	4.00
		ID = 3 (0003):	5.22	0.112	1.33	4.14

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 3 (0003):	5.22	0.112	1.33	4.14
		+ ID2= 2 (0103):	0.76	0.017	1.33	3.41
		ID = 1 (0003):	5.98	0.130	1.33	4.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0003):	5.98	0.130	1.33	4.05
		+ ID2= 2 (0015):	1.41	0.134	1.33	16.17

ID = 3 (0003): 7.39 0.264 1.33 6.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB | STANDHYD (0013) | ID= 1 DT= 5.0 min | Area (ha)= 5.22 | Total Imp(%)= 30.00 | Dir. Conn.(%)= 20.70 |

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.57	3.65
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	10.00	10.00
Length (m)=	186.55	30.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Max.Eff.Inten.(mm/hr)=	86.95	24.11	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.97 (ii)	8.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.31	0.12	
			TOTALS
PEAK FLOW (cms)=	0.26	0.17	0.380 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	31.81	9.83	14.38
TOTAL RAINFALL (mm)=	33.31	33.31	33.31
RUNOFF COEFFICIENT =	0.95	0.30	0.43

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
 V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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DATE: 11-08-2024                          TIME: 08:45:48

USER:


COMMENTS: _____________________________________________________________
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  ************************************************
  ** SIMULATION : 5yr 4hr 10min Chicago         **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 632.750
| Ptotal= 43.59 mm |                          B=   0.000
--------------------                          C=   0.741
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
      0.00    3.17 |   1.00   16.54 |'  2.00    6.54 |   3.00    3.69
      0.17    3.57 |   1.17  114.88 |'  2.17    5.73 |   3.17    3.46
      0.33    4.11 |   1.33   20.52 |'  2.33    5.13 |   3.33    3.26
      0.50    4.88 |   1.50   12.57 |'  2.50    4.65 |   3.50    3.09
      0.67    6.13 |   1.67    9.43 |'  2.67    4.27 |   3.67    2.94
      0.83    8.55 |   1.83    7.68 |'  2.83    3.95 |   3.83    2.80

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   1.26   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.21   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.14

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

                          ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
     0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
     0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
     0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
     0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
     0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
     0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
     0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
     0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
     0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
     0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
     0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
     1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.52         0.89
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      6.00         6.00
     Length            (m)=     42.00        20.00
     Mannings n            =     0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
     0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
     0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
     0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
     0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
     0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
     0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
     0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
     0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
     0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
     0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
     0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
     1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        41.98
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       0.84 (ii)    5.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.08          0.199 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      42.09        16.02         23.60
     TOTAL RAINFALL   (mm)=      43.59        43.59         43.59
     RUNOFF COEFFICIENT   =       0.97         0.37          0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0101):     1.26   0.038     1.42     8.31
      + ID2= 2 (  0102):     3.96   0.193     1.33     7.27
        ==========================================================
        ID = 3 (  0003):     5.22   0.225     1.33     7.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0003):     5.22   0.225     1.33     7.52
      + ID2= 2 (  0103):     0.76   0.034     1.33     6.21
        ==========================================================
        ID = 1 (  0003):     5.98   0.259     1.33     7.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     5.98   0.259     1.33     7.35
      + ID2= 2 (  0015):     1.41   0.199     1.33    23.60
        ==========================================================
```

```
     Unit Hyd Qpeak  (cms)=   0.344

     PEAK FLOW       (cms)=   0.038 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   8.308
     TOTAL RAINFALL   (mm)=  43.592
     RUNOFF COEFFICIENT   =   0.191

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   3.96   Curve Number   (CN)= 67.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.19   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.06

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

                          ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
     0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
     0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
     0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
     0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
     0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
     0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
     0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
     0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
     0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
     0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
     0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
     1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

     Unit Hyd Qpeak  (cms)=   2.521

     PEAK FLOW       (cms)=   0.193 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   7.266
     TOTAL RAINFALL   (mm)=  43.592
     RUNOFF COEFFICIENT   =   0.167

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0103)|   Area    (ha)=   0.76   Curve Number   (CN)= 66.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.28   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

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

                          ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
     0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
     0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
     0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
     0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
     0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
     0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
     0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
     0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
     0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
     0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
     0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
     1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

     Unit Hyd Qpeak  (cms)=   0.581

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   6.211
     TOTAL RAINFALL   (mm)=  43.592
     RUNOFF COEFFICIENT   =   0.142

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

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        ID = 3 (  0003):     7.39   0.457     1.33    10.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0013)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.57         3.65
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=     10.00        10.00
     Length            (m)=    186.55        30.00
     Mannings n            =     0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
      TIME    RAIN |   TIME    RAIN |'  TIME    RAIN |   TIME    RAIN
       hrs   mm/hr |    hrs   mm/hr |'   hrs   mm/hr |    hrs   mm/hr
     0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
     0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
     0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
     0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
     0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
     0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
     0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
     0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
     0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
     0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
     0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
     1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        42.67
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.76 (ii)    6.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.32          0.589 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      42.09        16.12         21.49
     TOTAL RAINFALL   (mm)=      43.59        43.59         43.59
     RUNOFF COEFFICIENT   =       0.97         0.37          0.49

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
 V  V    I    SS     U   U   A A   L
  V V    I     SS    U   U  AAAAA  L
   V V   I      SS   U   U  A   A  L
    VV   I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

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DATE: 11-08-2024 TIME: 08:45:48

USER:

COMMENTS: _____

****
** SIMULATION : 10yr 4hr 10min Chicago **
****

| CHICAGO STORM | Ptotal= 51.12 mm |

IDF curve parameters: A= 721.920
B= 0.000
C= 0.736
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.79	1.00	19.52	2.00	7.77	3.00	4.40
0.17	4.26	1.17	132.58	2.17	6.82	3.17	4.13
0.33	4.90	1.33	24.19	2.33	6.10	3.33	3.90
0.50	5.82	1.50	14.88	2.50	5.54	3.50	3.69
0.67	7.29	1.67	11.18	2.67	5.09	3.67	3.51
0.83	10.14	1.83	9.12	2.83	4.72	3.83	3.35

CALIB	NASHYD (0101)	ID= 1 DT= 5.0 min	Area (ha)= 1.26	Ia (mm)= 7.21	U.H. Tp(hrs)= 0.14	Curve Number (CN)= 67.6	# of Linear Res.(N)= 3.00

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

Unit Hyd Qpeak (cms)= 0.344

PEAK FLOW (cms)= 0.054 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 11.551
TOTAL RAINFALL (mm)= 51.117
RUNOFF COEFFICIENT = 0.226

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

CALIB	NASHYD (0102)	ID= 1 DT= 5.0 min	Area (ha)= 3.96	Ia (mm)= 7.19	U.H. Tp(hrs)= 0.06	Curve Number (CN)= 67.9	# of Linear Res.(N)= 3.00

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

Unit Hyd Qpeak (cms)= 2.521

PEAK FLOW (cms)= 0.270 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 10.095
TOTAL RAINFALL (mm)= 51.117
RUNOFF COEFFICIENT = 0.197

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

CALIB	NASHYD (0103)	ID= 1 DT= 5.0 min	Area (ha)= 0.76	Ia (mm)= 7.28	U.H. Tp(hrs)= 0.05	Curve Number (CN)= 66.9	# of Linear Res.(N)= 3.00

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

Unit Hyd Qpeak (cms)= 0.581

PEAK FLOW (cms)= 0.047 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 8.650
TOTAL RAINFALL (mm)= 51.117
RUNOFF COEFFICIENT = 0.169

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

CALIB	STANDHYD (0015)	ID= 1 DT= 5.0 min	Area (ha)= 1.41	Total Imp(%)= 36.90	Dir. Conn.(%)= 29.10

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.52	0.89
Dep. Storage	(mm)=	1.50	5.00
Average Slope	(%)=	6.00	6.00
Length	(m)=	42.00	20.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

			TOTALS
Max.Eff.Inten.(mm/hr)=		132.58	56.04
over (min)		5.00	5.00
Storage Coeff. (min)=		0.79 (ii)	4.87 (ii)
Unit Hyd. Tpeak (min)=		5.00	5.00
Unit Hyd. peak (cms)=		0.34	0.22
PEAK FLOW	(cms)=	0.15	0.14 0.287 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33 1.33
RUNOFF VOLUME	(mm)=	49.62	21.11 29.40
TOTAL RAINFALL	(mm)=	51.12	51.12 51.12
RUNOFF COEFFICIENT	=	0.97	0.41 0.58

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0101):	1.26	0.054	1.42	11.55
		+ ID2= 2 (0102):	3.96	0.270	1.33	10.10
		ID = 3 (0003):	5.22	0.316	1.33	10.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 3 (0003):	5.22	0.316	1.33	10.45
		+ ID2= 2 (0103):	0.76	0.047	1.33	8.65
		ID = 1 (0003):	5.98	0.364	1.33	10.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0003):	5.98	0.364	1.33	10.22
		+ ID2= 2 (0015):	1.41	0.287	1.33	29.40
		ID = 3 (0003):	7.39	0.651	1.33	13.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	STANDHYD (0013)	ID= 1 DT= 5.0 min	Area (ha)= 5.22	Total Imp(%)= 30.00	Dir. Conn.(%)= 20.70

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.57	3.65
Dep. Storage	(mm)=	1.50	5.00
Average Slope	(%)=	10.00	10.00
Length	(m)=	186.55	30.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

			TOTALS
Max.Eff.Inten.(mm/hr)=		132.58	56.90
over (min)		5.00	10.00
Storage Coeff. (min)=		1.66 (ii)	6.25 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.32	0.15
PEAK FLOW	(cms)=	0.40	0.43 0.747 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42 1.33
RUNOFF VOLUME	(mm)=	49.62	21.23 27.10
TOTAL RAINFALL	(mm)=	51.12	51.12 51.12
RUNOFF COEFFICIENT	=	0.97	0.42 0.53

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
 V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\90815c46-48
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\90815c46-48


DATE: 11-08-2024                          TIME: 08:45:48

USER:


COMMENTS: _____________________________________________________


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  ************************************************
  ** SIMULATION : 25yr 4hr 10min Chicago        **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 822.740
| Ptotal= 61.88 mm |                          B=   0.000
--------------------                          C=   0.725
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    4.77 |  1.00   23.97 |'  2.00    9.68 |  3.00    5.53
                0.17    5.36 |  1.17  154.98 |'  2.17    8.51 |  3.17    5.19
                0.33    6.14 |  1.33   29.61 |'  2.33    7.63 |  3.33    4.90
                0.50    7.28 |  1.50   18.34 |'  2.50    6.94 |  3.50    4.65
                0.67    9.09 |  1.67   13.85 |'  2.67    6.38 |  3.67    4.43
                0.83   12.58 |  1.83   11.32 |'  2.83    5.92 |  3.83    4.23


--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   1.26   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.21   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.14

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.89
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       6.00         6.00
     Length            (m)=      42.00        20.00
     Mannings n             =     0.013        0.250

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        76.33
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.74 (ii)    4.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.19          0.363 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      60.38        28.94         38.09
     TOTAL RAINFALL   (mm)=      61.88        61.88         61.88
     RUNOFF COEFFICIENT   =       0.98         0.47          0.62

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):     1.26   0.079     1.42     16.81
     + ID2= 2 (  0102):     3.96   0.387     1.33     14.68
       ==========================================================
       ID = 3 (  0003):     5.22   0.455     1.33     15.20

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     5.22   0.455     1.33     15.20
     + ID2= 2 (  0103):     0.76   0.067     1.33     12.62
       ==========================================================
       ID = 1 (  0003):     5.98   0.523     1.33     14.87

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     5.98   0.523     1.33     14.87
     + ID2= 2 (  0015):     1.41   0.363     1.33     38.09
       ==========================================================
```

```
     Unit Hyd Qpeak  (cms)=   0.344

     PEAK FLOW       (cms)=   0.079 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=  16.813
     TOTAL RAINFALL   (mm)=  61.875
     RUNOFF COEFFICIENT   =   0.272

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

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   3.96   Curve Number   (CN)= 67.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.19   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.06

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Unit Hyd Qpeak  (cms)=   2.521

     PEAK FLOW       (cms)=   0.387 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  14.683
     TOTAL RAINFALL   (mm)=  61.875
     RUNOFF COEFFICIENT   =   0.237

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

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--------------------
| CALIB            |
| NASHYD   (  0103)|   Area    (ha)=   0.76   Curve Number   (CN)= 66.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.28   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Unit Hyd Qpeak  (cms)=   0.581

     PEAK FLOW       (cms)=   0.067 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  12.615
     TOTAL RAINFALL   (mm)=  61.875
     RUNOFF COEFFICIENT   =   0.204

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

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--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.89
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       6.00         6.00
     Length            (m)=      42.00        20.00
     Mannings n             =     0.013        0.250

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        77.44
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       1.56 (ii)    5.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.33         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.46         0.60          0.976 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      60.38        29.09         35.56
     TOTAL RAINFALL   (mm)=      61.88        61.88         61.88
     RUNOFF COEFFICIENT   =       0.98         0.47          0.57

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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        ID = 3 (  0003):     7.39   0.886     1.33     19.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  0013)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57         3.65
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=      10.00        10.00
     Length            (m)=     186.55        30.00
     Mannings n             =     0.013        0.250

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

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
               0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
               0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
               0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
               0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
               0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
               0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
               0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
               0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
               0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
               0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
               1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        76.33
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       0.74 (ii)    4.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.19          0.363 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      60.38        28.94         38.09
     TOTAL RAINFALL   (mm)=      61.88        61.88         61.88
     RUNOFF COEFFICIENT   =       0.98         0.47          0.62

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\1720d434-be
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\1720d434-be


DATE: 11-08-2024                          TIME: 08:45:48

USER:


COMMENTS: _____________________________________________________________


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  **************************************************
  ** SIMULATION : 50yr 4hr 10min Chicago          **
  **************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 893.800
| Ptotal= 69.47 mm |                          B=   0.000
--------------------                          C=   0.719
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    5.47 |  1.00   27.09 |'  2.00   11.03 |  3.00    6.33
          0.17    6.13 |  1.17  170.70 |'  2.17    9.71 |  3.17    5.95
          0.33    7.02 |  1.33   33.42 |'  2.33    8.71 |  3.33    5.62
          0.50    8.31 |  1.50   20.79 |'  2.50    7.93 |  3.50    5.33
          0.67   10.36 |  1.67   15.73 |'  2.67    7.29 |  3.67    5.08
          0.83   14.30 |  1.83   12.89 |'  2.83    6.77 |  3.83    4.85


--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   1.26   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.21   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.14

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

                              ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.52         0.89
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      6.00         6.00
     Length            (m)=     42.00        20.00
     Mannings n             =    0.013        0.250

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

                              ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70        91.42
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.72 (ii)    4.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.22          0.419 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      67.97        34.78          44.44
     TOTAL RAINFALL   (mm)=      69.47        69.47          69.47
     RUNOFF COEFFICIENT   =       0.98         0.50           0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0101):     1.26   0.098     1.42    20.91
      + ID2= 2 (  0102):     3.96   0.476     1.33    18.25
        ========================================================
        ID = 3 (  0003):     5.22   0.563     1.33    18.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0003):     5.22   0.563     1.33    18.89
      + ID2= 2 (  0103):     0.76   0.083     1.33    15.71
        ========================================================
        ID = 1 (  0003):     5.98   0.645     1.33    18.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     5.98   0.645     1.33    18.49
      + ID2= 2 (  0015):     1.41   0.419     1.33    44.44
        ========================================================
```

```
     Unit Hyd Qpeak  (cms)=   0.344

     PEAK FLOW       (cms)=   0.098 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=  20.907
     TOTAL RAINFALL   (mm)=  69.467
     RUNOFF COEFFICIENT   =   0.301

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

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   3.96   Curve Number   (CN)= 67.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.19   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.06

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

                              ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

     Unit Hyd Qpeak  (cms)=   2.521

     PEAK FLOW       (cms)=   0.476 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  18.249
     TOTAL RAINFALL   (mm)=  69.467
     RUNOFF COEFFICIENT   =   0.263

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

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0103)|   Area    (ha)=   0.76   Curve Number   (CN)= 66.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.28   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

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

                              ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

     Unit Hyd Qpeak  (cms)=   0.581

     PEAK FLOW       (cms)=   0.083 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  15.706
     TOTAL RAINFALL   (mm)=  69.467
     RUNOFF COEFFICIENT   =   0.226

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

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        ID = 3 (  0003):     7.39   1.064     1.33    23.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0013)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.57         3.65
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=     10.00        10.00
     Length            (m)=    186.55        30.00
     Mannings n             =    0.013        0.250

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

                              ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70        92.71
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.50 (ii)    6.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.69          1.097 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      67.97        34.94          41.78
     TOTAL RAINFALL   (mm)=      69.47        69.47          69.47
     RUNOFF COEFFICIENT   =       0.98         0.50           0.60

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
V    V   I    SS     U   U   A A   L
 V  V    I      SS   U   U  AAAAA  L
  V V    I       SS  U   U  A   A  L
   VV    I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

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Output filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\9453acac-6d
Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\9453acac-6d

DATE: 11-08-2024 TIME: 08:45:48

USER:

COMMENTS: _____

** SIMULATION : 100yr 4hr 10min Chicago **

| CHICAGO STORM | Ptotal= 77.41 mm |

IDF curve parameters: A= 953.290
B= 0.000
C= 0.711
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.26	1.00	30.45	2.00	12.53	3.00	7.23
0.17	7.01	1.17	185.45	2.17	11.04	3.17	6.80
0.33	8.02	1.33	37.49	2.33	9.92	3.33	6.43
0.50	9.47	1.50	23.45	2.50	9.04	3.50	6.10
0.67	11.77	1.67	17.80	2.67	8.32	3.67	5.82
0.83	16.19	1.83	14.61	2.83	7.73	3.83	5.56

| CALIB | NASHYD (0101) | ID= 1 DT= 5.0 min | Area (ha)= 1.26 | Ia (mm)= 7.21 | U.H. Tp(hrs)= 0.14 | Curve Number (CN)= 67.6 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

| CALIB | STANDHYD (0015) | ID= 1 DT= 5.0 min | Area (ha)= 1.41 | Total Imp(%)= 36.90 | Dir. Conn.(%)= 29.10 |

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.52	0.89
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	6.00	6.00
Length (m)=	42.00	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

			TOTALS
Max.Eff.Inten.(mm/hr)=	185.45	106.73	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.69 (ii)	4.26 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.23	
PEAK FLOW (cms)=	0.21	0.26	0.474 (iii)
TIME TO PEAK (hrs)=	1.33	1.33	1.33
RUNOFF VOLUME (mm)=	75.91	41.11	51.24
TOTAL RAINFALL (mm)=	77.41	77.41	77.41
RUNOFF COEFFICIENT =	0.98	0.53	0.66

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0101):	1.26	0.118	1.42	25.48
		+ ID2= 2 (0102):	3.96	0.569	1.33	22.23
		ID = 3 (0003):	5.22	0.675	1.33	23.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 3 (0003):	5.22	0.675	1.33	23.02
		+ ID2= 2 (0103):	0.76	0.099	1.33	19.16
		ID = 1 (0003):	5.98	0.774	1.33	22.53

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)	1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
		ID1= 1 (0003):	5.98	0.774	1.33	22.53
		+ ID2= 2 (0015):	1.41	0.474	1.33	51.24

Unit Hyd Qpeak (cms)= 0.344

PEAK FLOW (cms)= 0.118 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 25.483
TOTAL RAINFALL (mm)= 77.410
RUNOFF COEFFICIENT = 0.329

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

| CALIB | NASHYD (0102) | ID= 1 DT= 5.0 min | Area (ha)= 3.96 | Ia (mm)= 7.19 | U.H. Tp(hrs)= 0.06 | Curve Number (CN)= 67.9 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

Unit Hyd Qpeak (cms)= 2.521

PEAK FLOW (cms)= 0.569 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 22.234
TOTAL RAINFALL (mm)= 77.410
RUNOFF COEFFICIENT = 0.287

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

| CALIB | NASHYD (0103) | ID= 1 DT= 5.0 min | Area (ha)= 0.76 | Ia (mm)= 7.28 | U.H. Tp(hrs)= 0.05 | Curve Number (CN)= 66.9 | # of Linear Res.(N)= 3.00 |

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

Unit Hyd Qpeak (cms)= 0.581

PEAK FLOW (cms)= 0.099 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 19.165
TOTAL RAINFALL (mm)= 77.410
RUNOFF COEFFICIENT = 0.248

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

ID = 3 (0003): 7.39 1.248 1.33 28.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB | STANDHYD (0013) | ID= 1 DT= 5.0 min | Area (ha)= 5.22 | Total Imp(%)= 30.00 | Dir. Conn.(%)= 20.70 |

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.57	3.65
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	10.00	10.00
Length (m)=	186.55	30.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

			TOTALS
Max.Eff.Inten.(mm/hr)=	185.45	108.19	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.45 (ii)	6.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
PEAK FLOW (cms)=	0.56	0.81	1.258 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	75.91	41.29	48.46
TOTAL RAINFALL (mm)=	77.41	77.41	77.41
RUNOFF COEFFICIENT =	0.98	0.53	0.63

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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=============================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\42274741-47
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DATE: 11-08-2024                          TIME: 08:45:48

USER:


COMMENTS: _____________________________________________________


-------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : Hurricane Hazel (Regional)    **
  ************************************************


-------------------
|    READ STORM    |    Filename: C:\Users\cmartin\AppD
|                  |              ata\Local\Temp\
|                  |              475b8c60-e583-467e-9c13-707b8b3dd18d\eeae85f6
| Ptotal=212.00 mm |    Comments: Hazel
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    6.00 |  3.00   13.00 |   6.00   23.00 |  9.00   53.00
               1.00    4.00 |  4.00   17.00 |   7.00   13.00 | 10.00   38.00
               2.00    6.00 |  5.00   13.00 |   8.00   13.00 | 11.00   13.00

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

-------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   1.26   Curve Number    (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.21   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.14

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 |  3.083   13.00 |  6.083   23.00 |  9.08   53.00
               0.167    6.00 |  3.167   13.00 |  6.167   23.00 |  9.17   53.00
               0.250    6.00 |  3.250   13.00 |  6.250   23.00 |  9.25   53.00
               0.333    6.00 |  3.333   13.00 |  6.333   23.00 |  9.33   53.00
               0.417    6.00 |  3.417   13.00 |  6.417   23.00 |  9.42   53.00
               0.500    6.00 |  3.500   13.00 |  6.500   23.00 |  9.50   53.00
               0.583    6.00 |  3.583   13.00 |  6.583   23.00 |  9.58   53.00
               0.667    6.00 |  3.667   13.00 |  6.667   23.00 |  9.67   53.00
               0.750    6.00 |  3.750   13.00 |  6.750   23.00 |  9.75   53.00
               0.833    6.00 |  3.833   13.00 |  6.833   23.00 |  9.83   53.00
               0.917    6.00 |  3.917   13.00 |  6.917   23.00 |  9.92   53.00
               1.000    6.00 |  4.000   13.00 |  7.000   23.00 | 10.00   53.00
               1.083    4.00 |  4.083   17.00 |  7.083   13.00 | 10.08   38.00
               1.167    4.00 |  4.167   17.00 |  7.167   13.00 | 10.17   38.00
               1.250    4.00 |  4.250   17.00 |  7.250   13.00 | 10.25   38.00
               1.333    4.00 |  4.333   17.00 |  7.333   13.00 | 10.33   38.00
               1.417    4.00 |  4.417   17.00 |  7.417   13.00 | 10.42   38.00
               1.500    4.00 |  4.500   17.00 |  7.500   13.00 | 10.50   38.00
               1.583    4.00 |  4.583   17.00 |  7.583   13.00 | 10.58   38.00
               1.667    4.00 |  4.667   17.00 |  7.667   13.00 | 10.67   38.00
               1.750    4.00 |  4.750   17.00 |  7.750   13.00 | 10.75   38.00
               1.833    4.00 |  4.833   17.00 |  7.833   13.00 | 10.83   38.00
               1.917    4.00 |  4.917   17.00 |  7.917   13.00 | 10.92   38.00
               2.000    4.00 |  5.000   17.00 |  8.000   13.00 | 11.00   38.00
               2.083    6.00 |  5.083   13.00 |  8.083   13.00 | 11.08   13.00
               2.167    6.00 |  5.167   13.00 |  8.167   13.00 | 11.17   13.00
               2.250    6.00 |  5.250   13.00 |  8.250   13.00 | 11.25   13.00
               2.333    6.00 |  5.333   13.00 |  8.333   13.00 | 11.33   13.00
               2.417    6.00 |  5.417   13.00 |  8.417   13.00 | 11.42   13.00
               2.500    6.00 |  5.500   13.00 |  8.500   13.00 | 11.50   13.00
               2.583    6.00 |  5.583   13.00 |  8.583   13.00 | 11.58   13.00
               2.667    6.00 |  5.667   13.00 |  8.667   13.00 | 11.67   13.00
               2.750    6.00 |  5.750   13.00 |  8.750   13.00 | 11.75   13.00
               2.833    6.00 |  5.833   13.00 |  8.833   13.00 | 11.83   13.00
               2.917    6.00 |  5.917   13.00 |  8.917   13.00 | 11.92   13.00
               3.000    6.00 |  6.000   13.00 |  9.000   13.00 | 12.00   13.00

    Unit Hyd Qpeak  (cms)=   0.344

    PEAK FLOW       (cms)=   0.146 (i)
    TIME TO PEAK    (hrs)=  10.000
    RUNOFF VOLUME    (mm)= 127.476
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.601

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

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-------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   3.96   Curve Number    (CN)= 67.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.19   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.06

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 |  3.083   13.00 |  6.083   23.00 |  9.08   53.00
               0.167    6.00 |  3.167   13.00 |  6.167   23.00 |  9.17   53.00
               0.250    6.00 |  3.250   13.00 |  6.250   23.00 |  9.25   53.00
               0.333    6.00 |  3.333   13.00 |  6.333   23.00 |  9.33   53.00
               0.417    6.00 |  3.417   13.00 |  6.417   23.00 |  9.42   53.00
               0.500    6.00 |  3.500   13.00 |  6.500   23.00 |  9.50   53.00
               0.583    6.00 |  3.583   13.00 |  6.583   23.00 |  9.58   53.00
               0.667    6.00 |  3.667   13.00 |  6.667   23.00 |  9.67   53.00
               0.750    6.00 |  3.750   13.00 |  6.750   23.00 |  9.75   53.00
               0.833    6.00 |  3.833   13.00 |  6.833   23.00 |  9.83   53.00
               0.917    6.00 |  3.917   13.00 |  6.917   23.00 |  9.92   53.00
               1.000    6.00 |  4.000   13.00 |  7.000   23.00 | 10.00   53.00
               1.083    4.00 |  4.083   17.00 |  7.083   13.00 | 10.08   38.00
               1.167    4.00 |  4.167   17.00 |  7.167   13.00 | 10.17   38.00
               1.250    4.00 |  4.250   17.00 |  7.250   13.00 | 10.25   38.00
               1.333    4.00 |  4.333   17.00 |  7.333   13.00 | 10.33   38.00
               1.417    4.00 |  4.417   17.00 |  7.417   13.00 | 10.42   38.00
               1.500    4.00 |  4.500   17.00 |  7.500   13.00 | 10.50   38.00
               1.583    4.00 |  4.583   17.00 |  7.583   13.00 | 10.58   38.00
               1.667    4.00 |  4.667   17.00 |  7.667   13.00 | 10.67   38.00
               1.750    4.00 |  4.750   17.00 |  7.750   13.00 | 10.75   38.00
               1.833    4.00 |  4.833   17.00 |  7.833   13.00 | 10.83   38.00
               1.917    4.00 |  4.917   17.00 |  7.917   13.00 | 10.92   38.00
               2.000    4.00 |  5.000   17.00 |  8.000   13.00 | 11.00   38.00
               2.083    6.00 |  5.083   13.00 |  8.083   13.00 | 11.08   13.00
               2.167    6.00 |  5.167   13.00 |  8.167   13.00 | 11.17   13.00
               2.250    6.00 |  5.250   13.00 |  8.250   13.00 | 11.25   13.00
               2.333    6.00 |  5.333   13.00 |  8.333   13.00 | 11.33   13.00
               2.417    6.00 |  5.417   13.00 |  8.417   13.00 | 11.42   13.00
               2.500    6.00 |  5.500   13.00 |  8.500   13.00 | 11.50   13.00
               2.583    6.00 |  5.583   13.00 |  8.583   13.00 | 11.58   13.00
               2.667    6.00 |  5.667   13.00 |  8.667   13.00 | 11.67   13.00
               2.750    6.00 |  5.750   13.00 |  8.750   13.00 | 11.75   13.00
               2.833    6.00 |  5.833   13.00 |  8.833   13.00 | 11.83   13.00
               2.917    6.00 |  5.917   13.00 |  8.917   13.00 | 11.92   13.00
               3.000    6.00 |  6.000   13.00 |  9.000   13.00 | 12.00   13.00

    Unit Hyd Qpeak  (cms)=   2.521

    PEAK FLOW       (cms)=   0.402 (i)
    TIME TO PEAK    (hrs)=  10.000
    RUNOFF VOLUME    (mm)= 110.787

    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.523

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

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-------------------
| CALIB            |
| NASHYD   (  0103)|   Area    (ha)=   0.76   Curve Number    (CN)= 66.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.28   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.05

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 |  3.083   13.00 |  6.083   23.00 |  9.08   53.00
               0.167    6.00 |  3.167   13.00 |  6.167   23.00 |  9.17   53.00
               0.250    6.00 |  3.250   13.00 |  6.250   23.00 |  9.25   53.00
               0.333    6.00 |  3.333   13.00 |  6.333   23.00 |  9.33   53.00
               0.417    6.00 |  3.417   13.00 |  6.417   23.00 |  9.42   53.00
               0.500    6.00 |  3.500   13.00 |  6.500   23.00 |  9.50   53.00
               0.583    6.00 |  3.583   13.00 |  6.583   23.00 |  9.58   53.00
               0.667    6.00 |  3.667   13.00 |  6.667   23.00 |  9.67   53.00
               0.750    6.00 |  3.750   13.00 |  6.750   23.00 |  9.75   53.00
               0.833    6.00 |  3.833   13.00 |  6.833   23.00 |  9.83   53.00
               0.917    6.00 |  3.917   13.00 |  6.917   23.00 |  9.92   53.00
               1.000    6.00 |  4.000   13.00 |  7.000   23.00 | 10.00   53.00
               1.083    4.00 |  4.083   17.00 |  7.083   13.00 | 10.08   38.00
               1.167    4.00 |  4.167   17.00 |  7.167   13.00 | 10.17   38.00
               1.250    4.00 |  4.250   17.00 |  7.250   13.00 | 10.25   38.00
               1.333    4.00 |  4.333   17.00 |  7.333   13.00 | 10.33   38.00
               1.417    4.00 |  4.417   17.00 |  7.417   13.00 | 10.42   38.00
               1.500    4.00 |  4.500   17.00 |  7.500   13.00 | 10.50   38.00
               1.583    4.00 |  4.583   17.00 |  7.583   13.00 | 10.58   38.00
               1.667    4.00 |  4.667   17.00 |  7.667   13.00 | 10.67   38.00
               1.750    4.00 |  4.750   17.00 |  7.750   13.00 | 10.75   38.00
               1.833    4.00 |  4.833   17.00 |  7.833   13.00 | 10.83   38.00
               1.917    4.00 |  4.917   17.00 |  7.917   13.00 | 10.92   38.00
               2.000    4.00 |  5.000   17.00 |  8.000   13.00 | 11.00   38.00
               2.083    6.00 |  5.083   13.00 |  8.083   13.00 | 11.08   13.00
               2.167    6.00 |  5.167   13.00 |  8.167   13.00 | 11.17   13.00
               2.250    6.00 |  5.250   13.00 |  8.250   13.00 | 11.25   13.00
               2.333    6.00 |  5.333   13.00 |  8.333   13.00 | 11.33   13.00
               2.417    6.00 |  5.417   13.00 |  8.417   13.00 | 11.42   13.00
               2.500    6.00 |  5.500   13.00 |  8.500   13.00 | 11.50   13.00
               2.583    6.00 |  5.583   13.00 |  8.583   13.00 | 11.58   13.00
               2.667    6.00 |  5.667   13.00 |  8.667   13.00 | 11.67   13.00
               2.750    6.00 |  5.750   13.00 |  8.750   13.00 | 11.75   13.00
               2.833    6.00 |  5.833   13.00 |  8.833   13.00 | 11.83   13.00
               2.917    6.00 |  5.917   13.00 |  8.917   13.00 | 11.92   13.00
               3.000    6.00 |  6.000   13.00 |  9.000   13.00 | 12.00   13.00

    Unit Hyd Qpeak  (cms)=   0.581

    PEAK FLOW       (cms)=   0.068 (i)
    TIME TO PEAK    (hrs)=  10.000
    RUNOFF VOLUME    (mm)=  96.784
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.457

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

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-------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
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                     IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.52          0.89
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=       6.00          6.00
    Length            (m)=      42.00         20.00
    Mannings n           =      0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 |  3.083   13.00 |  6.083   23.00 |  9.08   53.00
               0.167    6.00 |  3.167   13.00 |  6.167   23.00 |  9.17   53.00
               0.250    6.00 |  3.250   13.00 |  6.250   23.00 |  9.25   53.00
               0.333    6.00 |  3.333   13.00 |  6.333   23.00 |  9.33   53.00
               0.417    6.00 |  3.417   13.00 |  6.417   23.00 |  9.42   53.00
               0.500    6.00 |  3.500   13.00 |  6.500   23.00 |  9.50   53.00
               0.583    6.00 |  3.583   13.00 |  6.583   23.00 |  9.58   53.00
               0.667    6.00 |  3.667   13.00 |  6.667   23.00 |  9.67   53.00
               0.750    6.00 |  3.750   13.00 |  6.750   23.00 |  9.75   53.00
               0.833    6.00 |  3.833   13.00 |  6.833   23.00 |  9.83   53.00
               0.917    6.00 |  3.917   13.00 |  6.917   23.00 |  9.92   53.00
               1.000    6.00 |  4.000   13.00 |  7.000   23.00 | 10.00   53.00
               1.083    4.00 |  4.083   17.00 |  7.083   13.00 | 10.08   38.00
               1.167    4.00 |  4.167   17.00 |  7.167   13.00 | 10.17   38.00
               1.250    4.00 |  4.250   17.00 |  7.250   13.00 | 10.25   38.00
               1.333    4.00 |  4.333   17.00 |  7.333   13.00 | 10.33   38.00
               1.417    4.00 |  4.417   17.00 |  7.417   13.00 | 10.42   38.00
               1.500    4.00 |  4.500   17.00 |  7.500   13.00 | 10.50   38.00
               1.583    4.00 |  4.583   17.00 |  7.583   13.00 | 10.58   38.00
               1.667    4.00 |  4.667   17.00 |  7.667   13.00 | 10.67   38.00
               1.750    4.00 |  4.750   17.00 |  7.750   13.00 | 10.75   38.00
               1.833    4.00 |  4.833   17.00 |  7.833   13.00 | 10.83   38.00
               1.917    4.00 |  4.917   17.00 |  7.917   13.00 | 10.92   38.00
               2.000    4.00 |  5.000   17.00 |  8.000   13.00 | 11.00   38.00
               2.083    6.00 |  5.083   13.00 |  8.083   13.00 | 11.08   13.00
               2.167    6.00 |  5.167   13.00 |  8.167   13.00 | 11.17   13.00
               2.250    6.00 |  5.250   13.00 |  8.250   13.00 | 11.25   13.00
               2.333    6.00 |  5.333   13.00 |  8.333   13.00 | 11.33   13.00
               2.417    6.00 |  5.417   13.00 |  8.417   13.00 | 11.42   13.00
               2.500    6.00 |  5.500   13.00 |  8.500   13.00 | 11.50   13.00
               2.583    6.00 |  5.583   13.00 |  8.583   13.00 | 11.58   13.00
               2.667    6.00 |  5.667   13.00 |  8.667   13.00 | 11.67   13.00
               2.750    6.00 |  5.750   13.00 |  8.750   13.00 | 11.75   13.00
               2.833    6.00 |  5.833   13.00 |  8.833   13.00 | 11.83   13.00
               2.917    6.00 |  5.917   13.00 |  8.917   13.00 | 11.92   13.00
               3.000    6.00 |  6.000   13.00 |  9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00         55.18
              over (min)        5.00         10.00
    Storage Coeff.  (min)=      1.14 (ii)     5.39 (ii)
    Unit Hyd. Tpeak (min)=      5.00         10.00
    Unit Hyd. peak  (cms)=      0.34          0.16
                                                    *TOTALS*
    PEAK FLOW       (cms)=      0.06          0.14      0.196 (iii)
    TIME TO PEAK    (hrs)=      9.33         10.00       10.00
    RUNOFF VOLUME    (mm)=    210.50        163.13      176.91
    TOTAL RAINFALL   (mm)=    212.00        212.00      212.00
    RUNOFF COEFFICIENT   =      0.99          0.77        0.83

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):     1.26   0.146    10.00   127.48
     + ID2= 2 (  0102):     3.96   0.402    10.00   110.79
       ==========================================================
       ID = 3 (  0003):     5.22   0.547    10.00   114.82

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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-------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     5.22   0.547    10.00   114.82
     + ID2= 2 (  0103):     0.76   0.068    10.00    96.78
       ==========================================================
       ID = 1 (  0003):     5.98   0.615    10.00   112.52

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)     (cms)    (hrs)      (mm)
       ID1= 1 (  0003):     5.98   0.615    10.00   112.52
     + ID2= 2 (  0015):     1.41   0.196    10.00   176.91
       ================================================
       ID = 3 (  0003):     7.39   0.811    10.00   124.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB
| STANDHYD (  0013)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57         3.65
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=      10.00        10.00
     Length            (m)=     186.55        30.00
     Mannings n            =      0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
              0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
              0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
              0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
              0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
              0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
              0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
              0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
              0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
              0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
              0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
              1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
              1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
              1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
              1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
              1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
              1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
              1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
              1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
              1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
              1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
              1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
              1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
              2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
              2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
              2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
              2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
              2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
              2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
              2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
              2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
              2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
              2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
              2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
              2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
              3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

     Max.Eff.Inten.(mm/hr)=      53.00        55.69
           over (min)             5.00        10.00
     Storage Coeff.  (min)=       2.40 (ii)    7.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.56         0.722 (iii)
     TIME TO PEAK    (hrs)=       9.67        10.00        10.00
     RUNOFF VOLUME    (mm)=     210.50       163.45       173.19
     TOTAL RAINFALL   (mm)=     212.00       212.00       212.00
     RUNOFF COEFFICIENT   =       0.99         0.77         0.82

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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FINISH

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================================================================================================

       V     V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V     V   I    SS     U   U   A A   L
        V   V    I      SS   U   U  AAAAA  L
         V V     I       SS  U   U  A   A  L
          V      I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\4dd2c1fa-f8
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\4dd2c1fa-f8


DATE: 11-08-2024                          TIME: 08:57:04

USER:


COMMENTS: _____________________________________________________


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  ************************************************
  ** SIMULATION : 25mm 4hr 10min Chicago        **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 475.610
| Ptotal= 33.31 mm |                          B=   0.000
--------------------                          C=   0.738
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    2.45 |  1.00   12.69 |  2.00    5.04 |  3.00    2.85
                0.17    2.76 |  1.17   86.95 |  2.17    4.42 |  3.17    2.67
                0.33    3.17 |  1.33   15.73 |  2.33    3.95 |  3.33    2.52
                0.50    3.77 |  1.50    9.66 |  2.50    3.59 |  3.50    2.39
                0.67    4.72 |  1.67    7.25 |  2.67    3.30 |  3.67    2.27
                0.83    6.58 |  1.83    5.91 |  2.83    3.05 |  3.83    2.17


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--------------------
| MODIFY STORM     |    MODIFYING PARAMETERS
--------------------    Time shift  (min)    =  0.00

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   1.26   Curve Number   (CN)= 67.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.21   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.14

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

                          ---- TRANSFORMED HYETOGRAPH ----
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```
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Unit Hyd Qpeak  (cms)=   0.581

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   1.670
     TOTAL RAINFALL   (mm)=  24.999
     RUNOFF COEFFICIENT   =   0.067

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

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--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   1.41
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.90   Dir. Conn.(%)=  29.10
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.52          0.89
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope    (%)=       6.00          6.00
     Length           (m)=      42.00         20.00
     Mannings n            =    0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25        11.97
           over (min)            5.00        10.00
     Storage Coeff.  (min)=      1.05 (ii)    8.88 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.34         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.07         0.02          0.088 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=     23.50         5.48         10.72
     TOTAL RAINFALL   (mm)=     25.00        25.00         25.00
     RUNOFF COEFFICIENT   =      0.94         0.22          0.43

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0101):     1.26   0.008     1.42     2.25
     + ID2= 2 (  0102):     3.96   0.042     1.33     1.97
       ================================================
       ID = 3 (  0003):     5.22   0.048     1.33     2.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     5.22   0.048     1.33     2.04
```

```
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Unit Hyd Qpeak  (cms)=   0.344

     PEAK FLOW       (cms)=   0.008 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   2.251
     TOTAL RAINFALL   (mm)=  24.999
     RUNOFF COEFFICIENT   =   0.090

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

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--------------------
| CALIB            |
| NASHYD   (  0102)|   Area    (ha)=   3.96   Curve Number   (CN)= 67.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.19   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.06

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Unit Hyd Qpeak  (cms)=   2.521

     PEAK FLOW       (cms)=   0.042 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   1.974
     TOTAL RAINFALL   (mm)=  24.999
     RUNOFF COEFFICIENT   =   0.079

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

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--------------------
| CALIB            |
| NASHYD   (  0103)|   Area    (ha)=   0.76   Curve Number   (CN)= 66.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.28   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
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     + ID2= 2 (  0103):     0.76   0.007     1.33     1.67
       ================================================
       ID = 1 (  0003):     5.98   0.055     1.33     1.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     5.98   0.055     1.33     1.99
     + ID2= 2 (  0015):     1.41   0.088     1.33    10.72
       ================================================
       ID = 3 (  0003):     7.39   0.143     1.33     3.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0013)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.57          3.65
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope    (%)=      10.00         10.00
     Length           (m)=     186.55         30.00
     Mannings n            =    0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25        12.23
           over (min)            5.00        15.00
     Storage Coeff.  (min)=      2.21 (ii)   10.70 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.30         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.19         0.07          0.223 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=     23.50         5.53          9.25
     TOTAL RAINFALL   (mm)=     25.00        25.00         25.00
     RUNOFF COEFFICIENT   =      0.94         0.22          0.37

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
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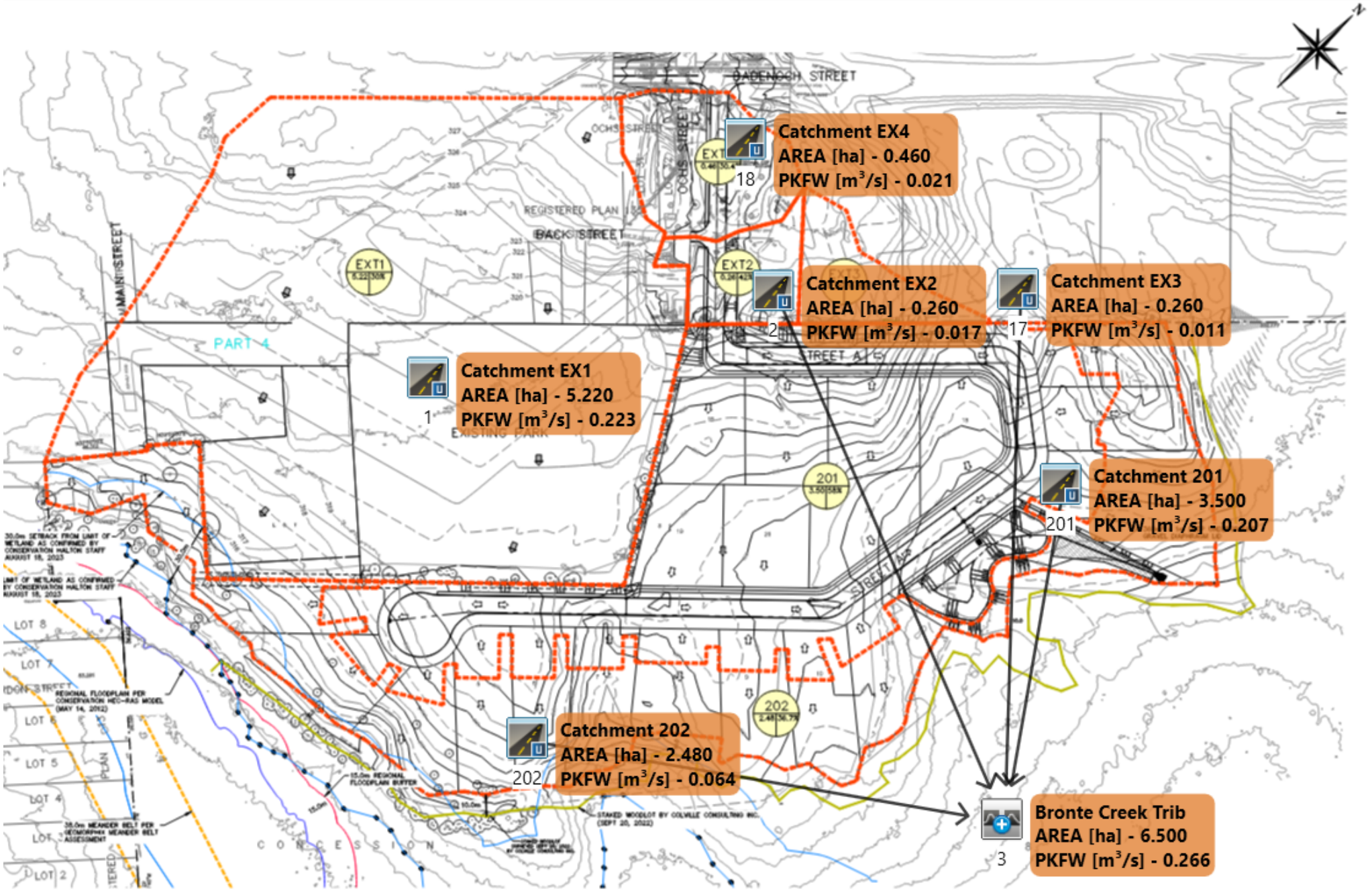
Post-Development Uncontrolled Visual-Otthymo Schematic



```
 V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\fbc119fe-34
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\fbc119fe-34

DATE: 11-08-2024                          TIME: 09:01:02

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 2yr 4hr 10Min Chicago         **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 475.610
| Ptotal= 33.31 mm |                           B=   0.000
--------------------                           C=   0.738
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    2.45 |  1.00   12.69 |'  2.00    5.04 |  3.00    2.85
          0.17    2.76 |  1.17   86.95 |'  2.17    4.42 |  3.17    2.67
          0.33    3.17 |  1.33   15.73 |'  2.33    3.95 |  3.33    2.52
          0.50    3.77 |  1.50    9.66 |'  2.50    3.59 |  3.50    2.39
          0.67    4.72 |  1.67    7.25 |'  2.67    3.30 |  3.67    2.27
          0.83    6.58 |  1.83    5.91 |'  2.83    3.05 |  3.83    2.17


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--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
         0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
         0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
         0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
         0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
         0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
         0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
         0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
         0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
         1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=     86.95        47.32
           over (min)           5.00        10.00
     Storage Coeff.  (min)=     2.55 (ii)    9.06 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.29         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.00         0.13        0.134 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42        1.42
     RUNOFF VOLUME    (mm)=    32.31        12.87       12.97
     TOTAL RAINFALL   (mm)=    33.31        33.31       33.31
     RUNOFF COEFFICIENT   =     0.97         0.39        0.39

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0017)| Area    (ha)=   0.26
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08          0.18
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00         10.00
     Length            (m)=    41.63         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
         0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
         0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
         0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
         0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
         0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
         0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
         0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
         0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
         1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=     86.95        28.43
```

```
         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
         0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
         0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
         0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
         1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=     86.95        67.96
           over (min)           5.00        10.00
     Storage Coeff.  (min)=     2.30 (ii)    6.71 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.30         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.17         0.20        0.330 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=    31.81        14.72       18.12
     TOTAL RAINFALL   (mm)=    33.31        33.31       33.31
     RUNOFF COEFFICIENT   =     0.95         0.44        0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0002)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  31.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.11          0.15
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     6.00          6.00
     Length            (m)=    41.63         20.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
         0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
         0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
         0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
         0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
         0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
         0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
         0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
         0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
         1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=     86.95        26.82
           over (min)           5.00        10.00
     Storage Coeff.  (min)=     0.93 (ii)    5.48 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.02         0.01        0.026 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=    31.81        10.27       16.93
     TOTAL RAINFALL   (mm)=    33.31        33.31       33.31
     RUNOFF COEFFICIENT   =     0.95         0.31        0.51

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
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           over (min)           5.00        10.00
     Storage Coeff.  (min)=     1.05 (ii)    7.11 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.01         0.01        0.017 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=    31.81        10.52       13.78
     TOTAL RAINFALL   (mm)=    33.31        33.31       33.31
     RUNOFF COEFFICIENT   =     0.95         0.32        0.41

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.017     1.33     13.78
     + ID2= 2 (  0002):     0.26   0.026     1.33     16.93
       ==========================================================
       ID = 3 (  0003):     0.52   0.044     1.33     15.36

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

--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52   0.044     1.33     15.36
     + ID2= 2 (  0201):     3.50   0.330     1.33     18.12
       ==========================================================
       ID = 1 (  0003):     4.02   0.374     1.33     17.76

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

--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02   0.374     1.33     17.76
     + ID2= 2 (  0202):     2.48   0.134     1.42     12.97
       ==========================================================
       ID = 3 (  0003):     6.50   0.478     1.33     15.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57          3.65
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=    10.00         10.00
     Length            (m)=   186.55         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
         0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
         0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
         0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
         0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
         0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
```

0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Max.Eff.Inten.(mm/hr)=	86.95	24.11	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.97 (ii)	8.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.31	0.12	
			TOTALS
PEAK FLOW (cms)=	0.26	0.17	0.380 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	31.81	9.83	14.38
TOTAL RAINFALL (mm)=	33.31	33.31	33.31
RUNOFF COEFFICIENT =	0.95	0.30	0.43

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0018)	Area (ha)=	0.46
ID= 1 DT= 5.0 min	Total Imp(%)=	30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	1.083	12.69	2.083	5.04	3.08	2.85
0.167	2.45	1.167	12.69	2.167	5.04	3.17	2.85
0.250	2.76	1.250	86.95	2.250	4.42	3.25	2.67
0.333	2.76	1.333	86.95	2.333	4.42	3.33	2.67
0.417	3.17	1.417	15.73	2.417	3.95	3.42	2.52
0.500	3.17	1.500	15.73	2.500	3.95	3.50	2.52
0.583	3.77	1.583	9.66	2.583	3.59	3.58	2.39
0.667	3.77	1.667	9.66	2.667	3.59	3.67	2.39
0.750	4.72	1.750	7.25	2.750	3.30	3.75	2.27
0.833	4.72	1.833	7.25	2.833	3.30	3.83	2.27
0.917	6.58	1.917	5.91	2.917	3.05	3.92	2.17
1.000	6.58	2.000	5.91	3.000	3.05	4.00	2.17

Max.Eff.Inten.(mm/hr)=	86.95	23.75	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.54 (ii)	8.26 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.13	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.035 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	31.81	9.77	14.54
TOTAL RAINFALL (mm)=	33.31	33.31	33.31
RUNOFF COEFFICIENT =	0.95	0.29	0.44

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\17438399-58
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\17438399-58

DATE: 11-08-2024                          TIME: 09:01:02

USER:


COMMENTS: _____________________________________________________

----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 5yr 4hr 10min Chicago         **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 632.750
| Ptotal= 43.59 mm |                           B=   0.000
--------------------                           C=   0.741
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    3.17 |  1.00   16.54 |  2.00    6.54 |  3.00    3.69
          0.17    3.57 |  1.17  114.88 |  2.17    5.73 |  3.17    3.46
          0.33    4.11 |  1.33   20.52 |  2.33    5.13 |  3.33    3.26
          0.50    4.88 |  1.50   12.57 |  2.50    4.65 |  3.50    3.09
          0.67    6.13 |  1.67    9.43 |  2.67    4.27 |  3.67    2.94
          0.83    8.55 |  1.83    7.68 |  2.83    3.95 |  3.83    2.80


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--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
          0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
          0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
          0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
          0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
          0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
          0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
          0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
          0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
          0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
          0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
          1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=    114.88        78.65
          over (min)           5.00         10.00
     Storage Coeff.  (min)=    2.28 (ii)     7.59 (ii)
     Unit Hyd. Tpeak (min)=    5.00         10.00
     Unit Hyd. peak  (cms)=    0.30          0.13
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.00          0.24      0.238 (iii)
     TIME TO PEAK    (hrs)=    1.33          1.42      1.42
     RUNOFF VOLUME    (mm)=   42.59         20.21     20.32
     TOTAL RAINFALL   (mm)=   43.59         43.59     43.59
     RUNOFF COEFFICIENT   =    0.98          0.46      0.47

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0017)| Area    (ha)=   0.26
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08          0.18
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00         10.00
     Length            (m)=    41.63         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
          0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
          0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
          0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
          0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
          0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
          0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
          0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
          0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
          0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
          0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
          1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=    114.88        49.49
          over (min)           5.00         10.00
     Storage Coeff.  (min)=    0.94 (ii)     5.80 (ii)
     Unit Hyd. Tpeak (min)=    5.00         10.00
     Unit Hyd. peak  (cms)=    0.34          0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.01          0.02      0.028 (iii)
     TIME TO PEAK    (hrs)=    1.33          1.42      1.33
     RUNOFF VOLUME    (mm)=   42.09         17.06     20.91
     TOTAL RAINFALL   (mm)=   43.59         43.59     43.59
     RUNOFF COEFFICIENT   =    0.97          0.39      0.48

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26    0.028     1.33    20.91
     + ID2= 2 (  0002):     0.26    0.045     1.33    24.58
       ================================================
       ID = 3 (  0003):     0.52    0.073     1.33    22.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
----------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52    0.073     1.33    22.74
     + ID2= 2 (  0201):     3.50    0.486     1.33    26.48
       ================================================
       ID = 1 (  0003):     4.02    0.560     1.33    26.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
----------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02    0.560     1.33    26.00
     + ID2= 2 (  0202):     2.48    0.238     1.42    20.32
       ================================================
       ID = 3 (  0003):     6.50    0.754     1.33    23.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
----------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)| Area    (ha)=   5.22
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57          3.65
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=    10.00         10.00
     Length            (m)=   186.55         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
          0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
          0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
          0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
          0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
          0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
          0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
          0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
```

0.750	6.13	1.750	9.43	2.750	4.27	3.75	2.94
0.833	6.13	1.833	9.43	2.833	4.27	3.83	2.94
0.917	8.55	1.917	7.68	2.917	3.95	3.92	2.80
1.000	8.55	2.000	7.68	3.000	3.95	4.00	2.80

Max.Eff.Inten.(mm/hr)=	114.88	42.67	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.76 (ii)	6.91 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.14	
			TOTALS
PEAK FLOW (cms)=	0.34	0.32	0.589 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	42.09	16.12	21.49
TOTAL RAINFALL (mm)=	43.59	43.59	43.59
RUNOFF COEFFICIENT =	0.97	0.37	0.49

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0018)	Area (ha)=	0.46	
ID= 1 DT= 5.0 min	Total Imp(%)=	30.40	Dir. Conn.(%)= 21.70

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.14	0.32
Dep. Storage	(mm)=	1.50	5.00
Average Slope	(%)=	2.00	4.00
Length	(m)=	55.38	20.00
Mannings n	=	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.17	1.083	16.54	2.083	6.54	3.08	3.69
0.167	3.17	1.167	16.54	2.167	6.54	3.17	3.69
0.250	3.57	1.250	114.88	2.250	5.73	3.25	3.46
0.333	3.57	1.333	114.88	2.333	5.73	3.33	3.46
0.417	4.11	1.417	20.52	2.417	5.13	3.42	3.26
0.500	4.11	1.500	20.52	2.500	5.13	3.50	3.26
0.583	4.88	1.583	12.57	2.583	4.65	3.58	3.09
0.667	4.88	1.667	12.57	2.667	4.65	3.67	3.09
0.750	6.13	1.750	9.43	2.750	4.27	3.75	2.94
0.833	6.13	1.833	9.43	2.833	4.27	3.83	2.94
0.917	8.55	1.917	7.68	2.917	3.95	3.92	2.80
1.000	8.55	2.000	7.68	3.000	3.95	4.00	2.80

Max.Eff.Inten.(mm/hr)=	114.88	42.09	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.38 (ii)	6.72 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.14	
			TOTALS
PEAK FLOW (cms)=	0.03	0.03	0.053 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	42.09	16.03	21.68
TOTAL RAINFALL (mm)=	43.59	43.59	43.59
RUNOFF COEFFICIENT =	0.97	0.37	0.50

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\b9d5599c-13
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\b9d5599c-13

DATE: 11-08-2024                          TIME: 09:01:02

USER:


COMMENTS: _____________________________________________________


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  ************************************************
  ** SIMULATION : 10yr 4hr 10min Chicago        **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 721.920
| Ptotal= 51.12 mm |                           B=   0.000
--------------------                           C=   0.736
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    3.79 |  1.00   19.52 |'  2.00    7.77 |  3.00    4.40
          0.17    4.26 |  1.17  132.58 |'  2.17    6.82 |  3.17    4.13
          0.33    4.90 |  1.33   24.19 |'  2.33    6.10 |  3.33    3.90
          0.50    5.82 |  1.50   14.88 |'  2.50    5.54 |  3.50    3.69
          0.67    7.29 |  1.67   11.18 |'  2.67    5.09 |  3.67    3.51
          0.83   10.14 |  1.83    9.12 |'  2.83    4.72 |  3.83    3.35


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--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
          0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
          0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
          0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
          0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
          0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
          0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
          0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
          0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
          1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58       139.82
          over (min)            5.00        10.00
     Storage Coeff.  (min)=     1.94 (ii)    6.50 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.31         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.26         0.41          0.608 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=    49.62        28.75         32.90
     TOTAL RAINFALL   (mm)=    51.12        51.12         51.12
     RUNOFF COEFFICIENT   =     0.97         0.56          0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0202)| Area    (ha)=   2.48
|ID= 1 DT= 5.0 min | Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.91          1.57
     Dep. Storage     (mm)=     1.00          5.00
     Average Slope     (%)=     2.00          4.00
     Length            (m)=   128.58         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
          0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
          0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
          0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
          0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
          0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
          0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
          0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
          0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
          1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58       101.79
          over (min)            5.00        10.00
     Storage Coeff.  (min)=     2.16 (ii)    6.95 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.31         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.00         0.31          0.316 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42          1.42
     RUNOFF VOLUME    (mm)=    50.12        26.01         26.13
     TOTAL RAINFALL   (mm)=    51.12        51.12         51.12
     RUNOFF COEFFICIENT   =     0.98         0.51          0.51

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0017)| Area    (ha)=   0.26
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08          0.18
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00         10.00
     Length            (m)=    41.63         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
          0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
          0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
          0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
          0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
          0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
          0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
          0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
          0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
          1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58        65.50
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          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
          0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
          0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
          0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
          1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58       139.82
          over (min)            5.00        10.00
     Storage Coeff.  (min)=     1.94 (ii)    6.50 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.31         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.26         0.41          0.608 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=    49.62        28.75         32.90
     TOTAL RAINFALL   (mm)=    51.12        51.12         51.12
     RUNOFF COEFFICIENT   =     0.97         0.56          0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
          0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
          0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
          0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
          0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
          0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
          0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
          0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
          0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
          1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58        62.31
          over (min)            5.00         5.00
     Storage Coeff.  (min)=     0.79 (ii)    4.63 (ii)
     Unit Hyd. Tpeak (min)=     5.00         5.00
     Unit Hyd. peak  (cms)=     0.34         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.03         0.03          0.056 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=    49.62        21.95         30.52
     TOTAL RAINFALL   (mm)=    51.12        51.12         51.12
     RUNOFF COEFFICIENT   =     0.97         0.43          0.60

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
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```
                 over (min)            5.00        10.00
     Storage Coeff.  (min)=     0.89 (ii)    5.23 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.01         0.03          0.036 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=    49.62        22.35         26.53
     TOTAL RAINFALL   (mm)=    51.12        51.12         51.12
     RUNOFF COEFFICIENT   =     0.97         0.44          0.52

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.036     1.33     26.53
     + ID2= 2 (  0002):     0.26   0.056     1.33     30.52
       ==========================================================
       ID = 3 (  0003):     0.52   0.092     1.33     28.52

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

--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52   0.092     1.33     28.52
     + ID2= 2 (  0201):     3.50   0.608     1.33     32.90
       ==========================================================
       ID = 1 (  0003):     4.02   0.701     1.33     32.34

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

--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02   0.701     1.33     32.34
     + ID2= 2 (  0202):     2.48   0.316     1.42     26.13
       ==========================================================
       ID = 3 (  0003):     6.50   0.967     1.33     29.97

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
----------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)| Area    (ha)=   5.22
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57          3.65
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=    10.00         10.00
     Length            (m)=   186.55         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
          0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
          0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
          0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
          0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
          0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
          0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
          0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
```

0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

Max.Eff.Inten.(mm/hr)=	132.58	56.90	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.66 (ii)	6.25 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.15	
			TOTALS
PEAK FLOW (cms)=	0.40	0.43	0.747 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	49.62	21.23	27.10
TOTAL RAINFALL (mm)=	51.12	51.12	51.12
RUNOFF COEFFICIENT =	0.97	0.42	0.53

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0018)	Area (ha)=	0.46
ID= 1 DT= 5.0 min	Total Imp(%)=	30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	3.79	1.083	19.52	2.083	7.77	3.08	4.40
0.167	3.79	1.167	19.52	2.167	7.77	3.17	4.40
0.250	4.26	1.250	132.58	2.250	6.82	3.25	4.13
0.333	4.26	1.333	132.58	2.333	6.82	3.33	4.13
0.417	4.90	1.417	24.19	2.417	6.10	3.42	3.90
0.500	4.90	1.500	24.19	2.500	6.10	3.50	3.90
0.583	5.82	1.583	14.88	2.583	5.54	3.58	3.69
0.667	5.82	1.667	14.88	2.667	5.54	3.67	3.69
0.750	7.29	1.750	11.18	2.750	5.09	3.75	3.51
0.833	7.29	1.833	11.18	2.833	5.09	3.83	3.51
0.917	10.14	1.917	9.12	2.917	4.72	3.92	3.35
1.000	10.14	2.000	9.12	3.000	4.72	4.00	3.35

Max.Eff.Inten.(mm/hr)=	132.58	56.17	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.30 (ii)	6.06 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.04	0.04	0.067 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	49.62	21.12	27.30
TOTAL RAINFALL (mm)=	51.12	51.12	51.12
RUNOFF COEFFICIENT =	0.97	0.41	0.53

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
 V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\5664af61-8b
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\5664af61-8b

DATE: 11-08-2024                          TIME: 09:01:02

USER:


COMMENTS: _____________________________________________________________
```

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  ************************************************
  ** SIMULATION : 25yr 4hr 10min Chicago        **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 822.740
| Ptotal= 61.88 mm |                           B=   0.000
--------------------                           C=   0.725
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    4.77 |  1.00   23.97 |'  2.00    9.68 |  3.00    5.53
          0.17    5.36 |  1.17  154.98 |'  2.17    8.51 |  3.17    5.19
          0.33    6.14 |  1.33   29.61 |'  2.33    7.63 |  3.33    4.90
          0.50    7.28 |  1.50   18.34 |'  2.50    6.94 |  3.50    4.65
          0.67    9.09 |  1.67   13.85 |'  2.67    6.38 |  3.67    4.43
          0.83   12.58 |  1.83   11.32 |'  2.83    5.92 |  3.83    4.23


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--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
         0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
         0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
         0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
         0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
         0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
```

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         0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
         0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
         0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
         0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
         0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
         1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        181.44
           over (min)        5.00          10.00
     Storage Coeff.  (min)=    1.82 (ii)     6.10 (ii)
     Unit Hyd. Tpeak (min)=    5.00          10.00
     Unit Hyd. peak  (cms)=    0.32          0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.30          0.54      0.779 (iii)
     TIME TO PEAK    (hrs)=    1.33          1.42      1.33
     RUNOFF VOLUME    (mm)=   60.38         37.94     42.40
     TOTAL RAINFALL   (mm)=   61.88         61.88     61.88
     RUNOFF COEFFICIENT   =    0.98          0.61      0.69

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0002)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  31.00
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.11          0.15
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     6.00          6.00
     Length            (m)=    41.63         20.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
         0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
         0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
         0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
         0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
         0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
         0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
         0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
         0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
         0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
         0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
         1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98         84.37
           over (min)        5.00           5.00
     Storage Coeff.  (min)=    0.74 (ii)     4.35 (ii)
     Unit Hyd. Tpeak (min)=    5.00           5.00
     Unit Hyd. peak  (cms)=    0.34           0.23
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.03           0.04      0.070 (iii)
     TIME TO PEAK    (hrs)=    1.33           1.33      1.33
     RUNOFF VOLUME    (mm)=   60.38          29.95     39.37
     TOTAL RAINFALL   (mm)=   61.88          61.88     61.88
     RUNOFF COEFFICIENT   =    0.98           0.48      0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
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| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.91          1.57
     Dep. Storage     (mm)=     1.00          5.00
     Average Slope     (%)=     2.00          4.00
     Length            (m)=   128.58         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
         0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
         0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
         0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
         0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
         0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
         0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
         0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
         0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
         0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
         0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
         1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        134.24
           over (min)        5.00          10.00
     Storage Coeff.  (min)=    2.03 (ii)     6.31 (ii)
     Unit Hyd. Tpeak (min)=    5.00          10.00
     Unit Hyd. peak  (cms)=    0.31          0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.01          0.43      0.427 (iii)
     TIME TO PEAK    (hrs)=    1.33          1.42      1.42
     RUNOFF VOLUME    (mm)=   60.88         34.77     34.90
     TOTAL RAINFALL   (mm)=   61.88         61.88     61.88
     RUNOFF COEFFICIENT   =    0.98          0.56      0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08          0.18
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00         10.00
     Length            (m)=    41.63         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
         0.167    4.77 |  1.168   23.97 |'  2.167    9.68 |  3.17    5.53
         0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
         0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
         0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
         0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
         0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
         0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
         0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
         0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
         0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
         1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98         88.44
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           over (min)        5.00          5.00
     Storage Coeff.  (min)=    0.84 (ii)     4.69 (ii)
     Unit Hyd. Tpeak (min)=    5.00          5.00
     Unit Hyd. peak  (cms)=    0.34          0.22
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.02          0.04      0.060 (iii)
     TIME TO PEAK    (hrs)=    1.33          1.33      1.33
     RUNOFF VOLUME    (mm)=   60.38         30.43     35.03
     TOTAL RAINFALL   (mm)=   61.88         61.88     61.88
     RUNOFF COEFFICIENT   =    0.98          0.49      0.57

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.060     1.33     35.03
     + ID2= 2 (  0002):     0.26   0.070     1.33     39.37
       ==========================================================
       ID = 3 (  0003):     0.52   0.131     1.33     37.20

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52   0.131     1.33     37.20
     + ID2= 2 (  0201):     3.50   0.779     1.33     42.40
       ==========================================================
       ID = 1 (  0003):     4.02   0.909     1.33     41.73

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02   0.909     1.33     41.73
     + ID2= 2 (  0202):     2.48   0.427     1.42     34.90
       ==========================================================
       ID = 3 (  0003):     6.50   1.283     1.33     39.12

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57          3.65
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=    10.00         10.00
     Length            (m)=   186.55         30.00
     Mannings n            =    0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
         0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
         0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
         0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
         0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
         0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
         0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
         0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
```

0.750	9.09	1.750	13.85	2.750	6.38	3.75	4.43
0.833	9.09	1.833	13.85	2.833	6.38	3.83	4.43
0.917	12.58	1.917	11.32	2.917	5.92	3.92	4.23
1.000	12.58	2.000	11.32	3.000	5.92	4.00	4.23

Max.Eff.Inten.(mm/hr)=	154.98	77.44	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.56 (ii)	5.62 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.46	0.60	0.976 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	60.38	29.09	35.56
TOTAL RAINFALL (mm)=	61.88	61.88	61.88
RUNOFF COEFFICIENT =	0.98	0.47	0.57

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0018)	Area (ha)=	0.46
ID= 1 DT= 5.0 min	Total Imp(%)=	30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	4.77	1.083	23.97	2.083	9.68	3.08	5.53
0.167	4.77	1.167	23.97	2.167	9.68	3.17	5.53
0.250	5.36	1.250	154.98	2.250	8.51	3.25	5.19
0.333	5.36	1.333	154.98	2.333	8.51	3.33	5.19
0.417	6.14	1.417	29.61	2.417	7.63	3.42	4.90
0.500	6.14	1.500	29.61	2.500	7.63	3.50	4.90
0.583	7.28	1.583	18.34	2.583	6.94	3.58	4.65
0.667	7.28	1.667	18.34	2.667	6.94	3.67	4.65
0.750	9.09	1.750	13.85	2.750	6.38	3.75	4.43
0.833	9.09	1.833	13.85	2.833	6.38	3.83	4.43
0.917	12.58	1.917	11.32	2.917	5.92	3.92	4.23
1.000	12.58	2.000	11.32	3.000	5.92	4.00	4.23

Max.Eff.Inten.(mm/hr)=	154.98	76.50	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.22 (ii)	5.43 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.16	
			TOTALS
PEAK FLOW (cms)=	0.04	0.05	0.088 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	60.38	28.96	35.77
TOTAL RAINFALL (mm)=	61.88	61.88	61.88
RUNOFF COEFFICIENT =	0.98	0.47	0.58

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\cd322883-d1
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\cd322883-d1

DATE: 11-08-2024                          TIME: 09:01:02

USER:


COMMENTS: _____________________________________________________

--------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 50yr 4hr 10min Chicago        **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 893.800
| Ptotal= 69.47 mm |                           B=   0.000
--------------------                           C=   0.719
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    5.47 |  1.00   27.09 |'  2.00   11.03 |  3.00    6.33
          0.17    6.13 |  1.17  170.70 |'  2.17    9.71 |  3.17    5.95
          0.33    7.02 |  1.33   33.42 |'  2.33    8.71 |  3.33    5.62
          0.50    8.31 |  1.50   20.79 |'  2.50    7.93 |  3.50    5.33
          0.67   10.36 |  1.67   15.73 |'  2.67    7.29 |  3.67    5.08
          0.83   14.30 |  1.83   12.89 |'  2.83    6.77 |  3.83    4.85


--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03         1.47
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     4.00         4.00
     Length            (m)=   152.75        20.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       157.89
           over (min)        5.00        10.00
     Storage Coeff.  (min)=    1.95 (ii)    5.97 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.31         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.01         0.51      0.509 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.42      1.42
     RUNOFF VOLUME    (mm)=   68.47        41.19     41.32
     TOTAL RAINFALL   (mm)=   69.47        69.47     69.47
     RUNOFF COEFFICIENT   =    0.99         0.59      0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0202)| Area    (ha)=   2.48
|ID= 1 DT= 5.0 min | Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.91         1.57
     Dep. Storage     (mm)=     1.00         5.00
     Average Slope     (%)=     2.00         4.00
     Length            (m)=   128.58        30.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       211.45
           over (min)        5.00        10.00
     Storage Coeff.  (min)=    1.75 (ii)    5.87 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.32         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.33         0.63      0.904 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.42      1.33
     RUNOFF VOLUME    (mm)=   67.97        44.62     49.26
     TOTAL RAINFALL   (mm)=   69.47        69.47     69.47
     RUNOFF COEFFICIENT   =    0.98         0.64      0.71

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0017)| Area    (ha)=   0.26
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08         0.18
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     4.00        10.00
     Length            (m)=    41.63        30.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
         0.750   10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
         0.833   10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
         0.917   14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
         1.000   14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       105.41
           over (min)        5.00         5.00
     Storage Coeff.  (min)=    0.80 (ii)    4.39 (ii)
     Unit Hyd. Tpeak (min)=    5.00         5.00
     Unit Hyd. peak  (cms)=    0.34         0.23
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.02         0.05      0.071 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.33      1.33
     RUNOFF VOLUME    (mm)=   67.97        36.43     41.27
     TOTAL RAINFALL   (mm)=   69.47        69.47     69.47
     RUNOFF COEFFICIENT   =    0.98         0.52      0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.071     1.33     41.27
     + ID2= 2 (  0002):     0.26   0.081     1.33     45.83
       ================================================
       ID = 3 (  0003):     0.52   0.152     1.33     43.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52   0.152     1.33     43.55
     + ID2= 2 (  0201):     3.50   0.904     1.33     49.26
       ================================================
       ID = 1 (  0003):     4.02   1.055     1.33     48.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02   1.055     1.33     48.53
     + ID2= 2 (  0202):     2.48   0.509     1.42     41.32
       ================================================
       ID = 3 (  0003):     6.50   1.511     1.33     45.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)| Area    (ha)=   5.22
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57         3.65
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=    10.00        10.00
     Length            (m)=   186.55        30.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
         0.167    5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
         0.250    6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
         0.333    6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
         0.417    7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
         0.500    7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
         0.583    8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
         0.667    8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
```

0.750	10.36	1.750	15.73	2.750	7.29	3.75	5.08
0.833	10.36	1.833	15.73	2.833	7.29	3.83	5.08
0.917	14.30	1.917	12.89	2.917	6.77	3.92	4.85
1.000	14.30	2.000	12.89	3.000	6.77	4.00	4.85

Max.Eff.Inten.(mm/hr)=	170.70	92.71	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.50 (ii)	6.32 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.51	0.69	1.097 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	67.97	34.94	41.78
TOTAL RAINFALL (mm)=	69.47	69.47	69.47
RUNOFF COEFFICIENT =	0.98	0.50	0.60

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0018) | Area (ha)= 0.46
ID= 1 DT= 5.0 min | Total Imp(%)= 30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	5.47	1.083	27.09	2.083	11.03	3.08	6.33
0.167	5.47	1.167	27.09	2.167	11.03	3.17	6.33
0.250	6.13	1.250	170.70	2.250	9.71	3.25	5.95
0.333	6.13	1.333	170.70	2.333	9.71	3.33	5.95
0.417	7.02	1.417	33.42	2.417	8.71	3.42	5.62
0.500	7.02	1.500	33.42	2.500	8.71	3.50	5.62
0.583	8.31	1.583	20.79	2.583	7.93	3.58	5.33
0.667	8.31	1.667	20.79	2.667	7.93	3.67	5.33
0.750	10.36	1.750	15.73	2.750	7.29	3.75	5.08
0.833	10.36	1.833	15.73	2.833	7.29	3.83	5.08
0.917	14.30	1.917	12.89	2.917	6.77	3.92	4.85
1.000	14.30	2.000	12.89	3.000	6.77	4.00	4.85

Max.Eff.Inten.(mm/hr)=	170.70	91.61	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.18 (ii)	6.04 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.05	0.06	0.099 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	67.97	34.81	42.00
TOTAL RAINFALL (mm)=	69.47	69.47	69.47
RUNOFF COEFFICIENT =	0.98	0.50	0.60

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
 V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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DATE: 11-08-2024                          TIME: 09:01:03

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 100yr 4hr 10min Chicago       **
  ************************************************


--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 953.290
| Ptotal= 77.41 mm |                           B=   0.000
--------------------                           C=   0.711
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    6.26 |  1.00   30.45 |'  2.00   12.53 |  3.00    7.23
          0.17    7.01 |  1.17  185.45 |'  2.17   11.04 |  3.17    6.80
          0.33    8.02 |  1.33   37.49 |'  2.33    9.92 |  3.33    6.43
          0.50    9.47 |  1.50   23.45 |'  2.50    9.04 |  3.50    6.10
          0.67   11.77 |  1.67   17.80 |'  2.67    8.32 |  3.67    5.82
          0.83   16.19 |  1.83   14.61 |'  2.83    7.73 |  3.83    5.56


--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0201)| Area    (ha)=   3.50
|ID= 1 DT= 5.0 min | Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03          1.47
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00          4.00
     Length            (m)=   152.75         20.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
          0.167   6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
          0.250   7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
          0.333   7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
          0.417   8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
          0.500   8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
```

```
          0.583   9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
          0.667   9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
          0.750  11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
          0.833  11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
          0.917  16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
          1.000  16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

     Max.Eff.Inten.(mm/hr)=    185.45       241.04
           over (min)          5.00        10.00
     Storage Coeff.  (min)=    1.70 (ii)    5.68 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.32         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.36         0.73      1.028 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.42      1.33
     RUNOFF VOLUME    (mm)=   75.91        51.75     56.56
     TOTAL RAINFALL   (mm)=   77.41        77.41     77.41
     RUNOFF COEFFICIENT   =    0.98         0.67      0.73

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0202)| Area    (ha)=   2.48
|ID= 1 DT= 5.0 min | Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.91          1.57
     Dep. Storage     (mm)=     1.00          5.00
     Average Slope     (%)=     2.00          4.00
     Length            (m)=   128.58         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
          0.167   6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
          0.250   7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
          0.333   7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
          0.417   8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
          0.500   8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
          0.583   9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
          0.667   9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
          0.750  11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
          0.833  11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
          0.917  16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
          1.000  16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

     Max.Eff.Inten.(mm/hr)=    185.45       181.43
           over (min)          5.00        10.00
     Storage Coeff.  (min)=    1.88 (ii)    5.69 (ii)
     Unit Hyd. Tpeak (min)=    5.00        10.00
     Unit Hyd. peak  (cms)=    0.32         0.15
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.01         0.59      0.591 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.42      1.42
     RUNOFF VOLUME    (mm)=   76.41        48.07     48.21
     TOTAL RAINFALL   (mm)=   77.41        77.41     77.41
     RUNOFF COEFFICIENT   =    0.99         0.62      0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0017)| Area    (ha)=   0.26
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08          0.18
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=     4.00         10.00
     Length            (m)=    41.63         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
          0.167   6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
          0.250   7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
          0.333   7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
          0.417   8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
          0.500   8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
          0.583   9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
          0.667   9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
          0.750  11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
          0.833  11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
          0.917  16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
          1.000  16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

     Max.Eff.Inten.(mm/hr)=    185.45       122.54
```

```
           over (min)          5.00         5.00
     Storage Coeff.  (min)=    0.78 (ii)    4.16 (ii)
     Unit Hyd. Tpeak (min)=    5.00         5.00
     Unit Hyd. peak  (cms)=    0.34         0.24
                                                    *TOTALS*
     PEAK FLOW       (cms)=    0.02         0.06      0.082 (iii)
     TIME TO PEAK    (hrs)=    1.33         1.33      1.33
     RUNOFF VOLUME    (mm)=   75.91        42.92     47.99
     TOTAL RAINFALL   (mm)=   77.41        77.41     77.41
     RUNOFF COEFFICIENT   =    0.98         0.55      0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* = 80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26    0.082     1.33    47.99
     + ID2= 2 (  0002):     0.26    0.091     1.33    52.74
       ==========================================================
       ID = 3 (  0003):     0.52    0.173     1.33    50.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52    0.173     1.33    50.36
     + ID2= 2 (  0201):     3.50    1.028     1.33    56.56
       ==========================================================
       ID = 1 (  0003):     4.02    1.201     1.33    55.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02    1.201     1.33    55.76
     + ID2= 2 (  0202):     2.48    0.591     1.42    48.21
       ==========================================================
       ID = 3 (  0003):     6.50    1.740     1.33    52.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0001)| Area    (ha)=   5.22
|ID= 1 DT= 5.0 min | Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     1.57          3.65
     Dep. Storage     (mm)=     1.50          5.00
     Average Slope     (%)=    10.00         10.00
     Length            (m)=   186.55         30.00
     Mannings n            =    0.013         0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
          0.167   6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
          0.250   7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
          0.333   7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
          0.417   8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
          0.500   8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
          0.583   9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
          0.667   9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
```

0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

Max.Eff.Inten.(mm/hr)=	185.45	108.19	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.45 (ii)	6.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.56	0.81	1.258 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	75.91	41.29	48.46
TOTAL RAINFALL (mm)=	77.41	77.41	77.41
RUNOFF COEFFICIENT =	0.98	0.53	0.63

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0018)| Area (ha)= 0.46
ID= 1 DT= 5.0 min | Total Imp(%)= 30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.26	1.083	30.45	2.083	12.53	3.08	7.23
0.167	6.26	1.167	30.45	2.167	12.53	3.17	7.23
0.250	7.01	1.250	185.45	2.250	11.04	3.25	6.80
0.333	7.01	1.333	185.45	2.333	11.04	3.33	6.80
0.417	8.02	1.417	37.49	2.417	9.92	3.42	6.43
0.500	8.02	1.500	37.49	2.500	9.92	3.50	6.43
0.583	9.47	1.583	23.45	2.583	9.04	3.58	6.10
0.667	9.47	1.667	23.45	2.667	9.04	3.67	6.10
0.750	11.77	1.750	17.80	2.750	8.32	3.75	5.82
0.833	11.77	1.833	17.80	2.833	8.32	3.83	5.82
0.917	16.19	1.917	14.61	2.917	7.73	3.92	5.56
1.000	16.19	2.000	14.61	3.000	7.73	4.00	5.56

Max.Eff.Inten.(mm/hr)=	185.45	106.95	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.14 (ii)	5.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.15	
			TOTALS
PEAK FLOW (cms)=	0.05	0.07	0.113 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	75.91	41.14	48.68
TOTAL RAINFALL (mm)=	77.41	77.41	77.41
RUNOFF COEFFICIENT =	0.98	0.53	0.63

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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=============================================================================================================

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       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
         V V    I       SS  U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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DATE: 11-08-2024                          TIME: 09:01:03

USER:


COMMENTS: _____________________________________________________


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  ************************************************
  ** SIMULATION : Hurricane Hazel (Regional)    **
  ************************************************


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|    READ STORM    |     Filename: C:\Users\cmartin\AppD
|                  |               ata\Local\Temp\
|                  |               07e8a009-fbe7-4e9c-84bb-a205d8c3d4b9\eeae85f6
| Ptotal=212.00 mm |     Comments: Hazel
-------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    6.00 |  3.00   13.00 |'  6.00   23.00 |  9.00   53.00
               1.00    4.00 |  4.00   17.00 |'  7.00   13.00 | 10.00   38.00
               2.00    6.00 |  5.00   13.00 |'  8.00   13.00 | 11.00   13.00

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| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
-------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03         1.47
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     4.00         4.00
     Length            (m)=   152.75        20.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00        97.88
          over (min)            5.00        10.00
    Storage Coeff.  (min)=      2.80 (ii)    6.62 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.28         0.14
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.10         0.40       0.501 (iii)
    TIME TO PEAK    (hrs)=      9.75        10.00         10.00
    RUNOFF VOLUME    (mm)=    210.50       180.65        186.59
    TOTAL RAINFALL   (mm)=    212.00       212.00        212.00
    RUNOFF COEFFICIENT   =      0.99         0.85          0.88

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
-------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.91         1.57
     Dep. Storage     (mm)=     1.00         5.00
     Average Slope     (%)=     2.00         4.00
     Length            (m)=   128.58        30.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00        79.69
          over (min)            5.00        10.00
    Storage Coeff.  (min)=      3.11 (ii)    8.39 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.27         0.12
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.00         0.35       0.348 (iii)
    TIME TO PEAK    (hrs)=      9.58        10.00         10.00
    RUNOFF VOLUME    (mm)=    211.00       174.97        175.15
    TOTAL RAINFALL   (mm)=    212.00       212.00        212.00
    RUNOFF COEFFICIENT   =      1.00         0.83          0.83

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
-------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08         0.18
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     4.00        10.00
     Length            (m)=    41.63        30.00
     Mannings n            =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
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2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	60.61	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.28 (ii)	5.76 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.15	
			TOTALS
PEAK FLOW (cms)=	0.01	0.03	0.036 (iii)
TIME TO PEAK (hrs)=	9.33	10.00	10.00
RUNOFF VOLUME (mm)=	210.50	166.35	173.14
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.78	0.82

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0017):	0.26	0.036	10.00	173.14	
+ ID2= 2 (0002):	0.26	0.036	10.00	179.32	
ID = 3 (0003):	0.52	0.073	10.00	176.23	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)					
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 3 (0003):	0.52	0.073	10.00	176.23	
+ ID2= 2 (0201):	3.50	0.501	10.00	186.59	
ID = 1 (0003):	4.02	0.574	10.00	185.25	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0003)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0003):	4.02	0.574	10.00	185.25	
+ ID2= 2 (0202):	2.48	0.348	10.00	175.15	
ID = 3 (0003):	6.50	0.922	10.00	181.40	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0001)	Area (ha)= 5.22		
ID= 1 DT= 5.0 min	Total Imp(%)= 30.00	Dir. Conn.(%)= 20.70	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.57	3.65	
Dep. Storage (mm)=	1.50	5.00	
Average Slope (%)=	10.00	10.00	
Length (m)=	186.55	30.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	55.69	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.40 (ii)	7.03 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.30	0.14	
			TOTALS
PEAK FLOW (cms)=	0.16	0.56	0.722 (iii)
TIME TO PEAK (hrs)=	9.67	10.00	10.00
RUNOFF VOLUME (mm)=	210.50	163.45	173.19
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.77	0.82

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0018)	Area (ha)= 0.46		
ID= 1 DT= 5.0 min	Total Imp(%)= 30.40	Dir. Conn.(%)= 21.70	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.14	0.32	
Dep. Storage (mm)=	1.50	5.00	
Average Slope (%)=	2.00	4.00	
Length (m)=	55.38	20.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	55.26	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.88 (ii)	6.67 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.14	
			TOTALS
PEAK FLOW (cms)=	0.01	0.05	0.064 (iii)
TIME TO PEAK (hrs)=	9.50	10.00	10.00
RUNOFF VOLUME (mm)=	210.50	163.18	173.44
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.77	0.82

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
         V V    I       SS  U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\90e02d60-89
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\90e02d60-89


DATE: 11-08-2024                          TIME: 09:01:03

USER:


COMMENTS: _____________________________________________________


----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 25mm 4hr 10min Chicago        **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 475.610
| Ptotal= 33.31 mm |                          B=   0.000
--------------------                          C=   0.738
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    2.45 |  1.00   12.69 |  2.00    5.04 |  3.00    2.85
                0.17    2.76 |  1.17   86.95 |  2.17    4.42 |  3.17    2.67
                0.33    3.17 |  1.33   15.73 |  2.33    3.95 |  3.33    2.52
                0.50    3.77 |  1.50    9.66 |  2.50    3.59 |  3.50    2.39
                0.67    4.72 |  1.67    7.25 |  2.67    3.30 |  3.67    2.27
                0.83    6.58 |  1.83    5.91 |  2.83    3.05 |  3.83    2.17


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--------------------
| MODIFY STORM     |    MODIFYING PARAMETERS
--------------------    Time shift  (min)    =  0.00

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03          1.47
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope     (%)=      4.00          4.00
     Length            (m)=    152.75         20.00
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     Mannings n        =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         39.36
               over (min)        5.00         10.00
     Storage Coeff.  (min)=      2.58 (ii)     8.07 (ii)
     Unit Hyd. Tpeak (min)=      5.00         10.00
     Unit Hyd. peak  (cms)=      0.29          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.12          0.11      0.207 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.42      1.33
     RUNOFF VOLUME    (mm)=     23.50          8.99     11.88
     TOTAL RAINFALL   (mm)=     25.00         25.00     25.00
     RUNOFF COEFFICIENT   =      0.94          0.36      0.48

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  31.00
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.11          0.15
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope     (%)=      6.00          6.00
     Length            (m)=     41.63         20.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         13.84
               over (min)        5.00         10.00
     Storage Coeff.  (min)=      1.05 (ii)     8.43 (ii)
     Unit Hyd. Tpeak (min)=      5.00         10.00
     Unit Hyd. peak  (cms)=      0.34          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.01          0.00      0.017 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.42      1.33
     RUNOFF VOLUME    (mm)=     23.50          5.83     11.28
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     TOTAL RAINFALL   (mm)=     25.00         25.00         25.00
     RUNOFF COEFFICIENT   =      0.94          0.23          0.45

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91          1.57
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      2.00          4.00
     Length            (m)=    128.58         30.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         26.34
               over (min)        5.00         15.00
     Storage Coeff.  (min)=      2.86 (ii)    11.09 (ii)
     Unit Hyd. Tpeak (min)=      5.00         15.00
     Unit Hyd. peak  (cms)=      0.28          0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.00          0.06      0.064 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.50      1.50
     RUNOFF VOLUME    (mm)=     24.00          7.65      7.73
     TOTAL RAINFALL   (mm)=     25.00         25.00     25.00
     RUNOFF COEFFICIENT   =      0.96          0.31      0.31

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08          0.18
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope     (%)=      4.00         10.00
     Length            (m)=     41.63         30.00
     Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

```
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         14.80
               over (min)        5.00         10.00
     Storage Coeff.  (min)=      1.18 (ii)     9.05 (ii)
     Unit Hyd. Tpeak (min)=      5.00         10.00
     Unit Hyd. peak  (cms)=      0.33          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.01          0.00      0.011 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.42      1.33
     RUNOFF VOLUME    (mm)=     23.50          6.00      8.67
     TOTAL RAINFALL   (mm)=     25.00         25.00     25.00
     RUNOFF COEFFICIENT   =      0.94          0.24      0.35

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.011     1.33      8.67
     + ID2= 2 (  0002):     0.26   0.017     1.33     11.28
       ==========================================================
       ID = 3 (  0003):     0.52   0.028     1.33      9.98

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0003):     0.52   0.028     1.33      9.98
     + ID2= 2 (  0201):     3.50   0.207     1.33     11.88
       ==========================================================
       ID = 1 (  0003):     4.02   0.235     1.33     11.63

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

--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0003):     4.02   0.235     1.33     11.63
     + ID2= 2 (  0202):     2.48   0.064     1.50      7.73
       ==========================================================
       ID = 3 (  0003):     6.50   0.266     1.33     10.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.57          3.65
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope     (%)=     10.00         10.00
     Length            (m)=    186.55         30.00
     Mannings n           =      0.013         0.250
```

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.84	1.083	9.52	2.083	3.78	3.08	2.14
0.167	1.84	1.167	9.52	2.167	3.78	3.17	2.14
0.250	2.07	1.250	65.25	2.250	3.32	3.25	2.01
0.333	2.07	1.333	65.25	2.333	3.32	3.33	2.01
0.417	2.38	1.417	11.81	2.417	2.97	3.42	1.89
0.500	2.38	1.500	11.81	2.500	2.97	3.50	1.89
0.583	2.83	1.583	7.25	2.583	2.69	3.58	1.79
0.667	2.83	1.667	7.25	2.667	2.69	3.67	1.79
0.750	3.55	1.750	5.44	2.750	2.47	3.75	1.70
0.833	3.55	1.833	5.44	2.833	2.47	3.83	1.70
0.917	4.94	1.917	4.44	2.917	2.29	3.92	1.63
1.000	4.94	2.000	4.44	3.000	2.29	4.00	1.63

Max.Eff.Inten.(mm/hr)=	65.25	12.23	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.21 (ii)	10.70 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.30	0.09	
			TOTALS
PEAK FLOW (cms)=	0.19	0.07	0.223 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.50	5.53	9.25
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.94	0.22	0.37

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0018) | Area (ha)= 0.46
ID= 1 DT= 5.0 min | Total Imp(%)= 30.40 Dir. Conn.(%)= 21.70

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.14	0.32
Dep. Storage (mm)=	1.50	5.00
Average Slope (%)=	2.00	4.00
Length (m)=	55.38	20.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.84	1.083	9.52	2.083	3.78	3.08	2.14
0.167	1.84	1.167	9.52	2.167	3.78	3.17	2.14
0.250	2.07	1.250	65.25	2.250	3.32	3.25	2.01
0.333	2.07	1.333	65.25	2.333	3.32	3.33	2.01
0.417	2.38	1.417	11.81	2.417	2.97	3.42	1.89
0.500	2.38	1.500	11.81	2.500	2.97	3.50	1.89
0.583	2.83	1.583	7.25	2.583	2.69	3.58	1.79
0.667	2.83	1.667	7.25	2.667	2.69	3.67	1.79
0.750	3.55	1.750	5.44	2.750	2.47	3.75	1.70
0.833	3.55	1.833	5.44	2.833	2.47	3.83	1.70
0.917	4.94	1.917	4.44	2.917	2.29	3.92	1.63
1.000	4.94	2.000	4.44	3.000	2.29	4.00	1.63

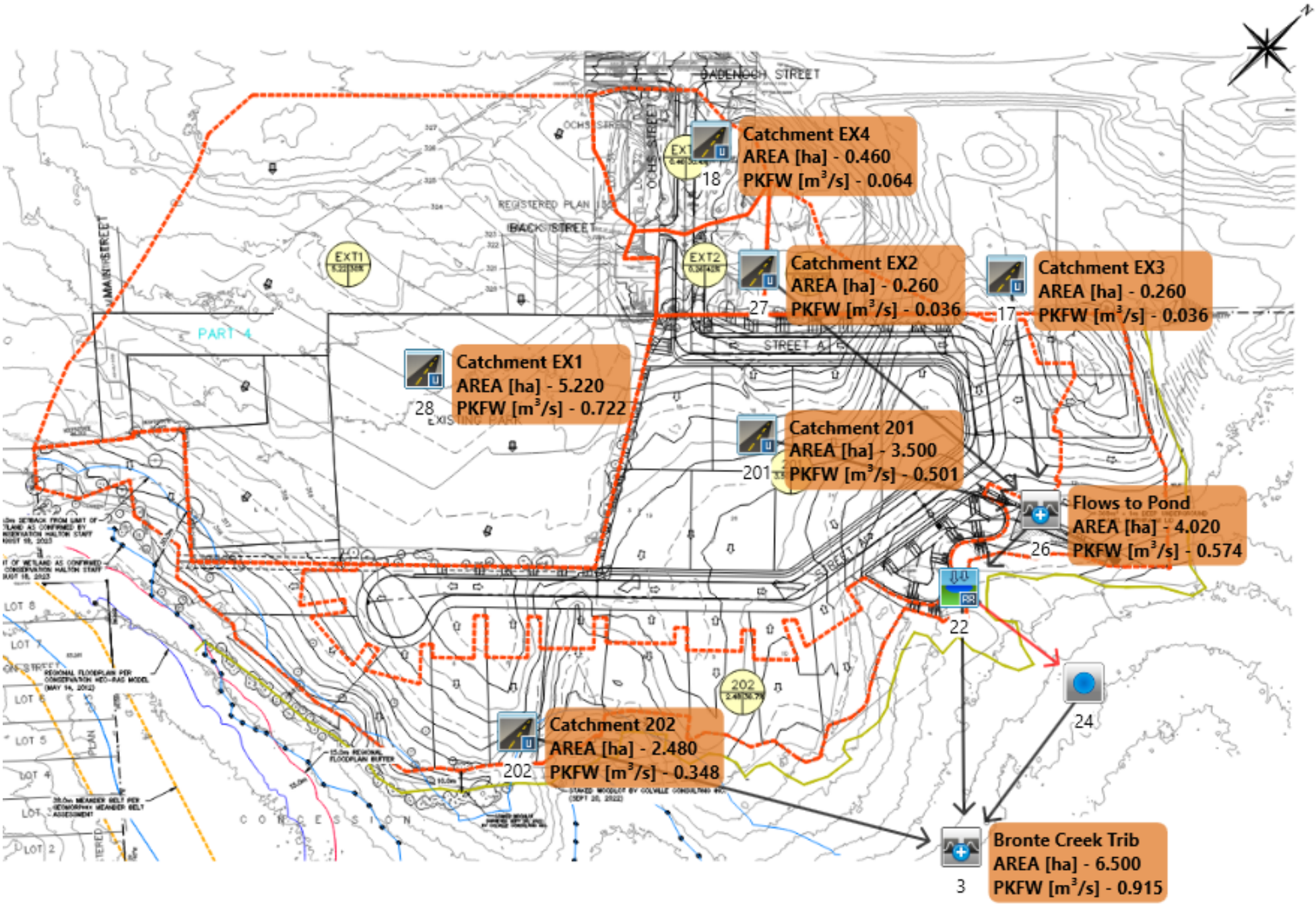
Max.Eff.Inten.(mm/hr)=	65.25	12.01	
over (min)	5.00	15.00	
Storage Coeff. (min)=	1.73 (ii)	10.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.32	0.09	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.021 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.50	5.49	9.38
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.94	0.22	0.38

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 80.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

FINISH

Post-Development Controlled Visual-Otthymo Schematic



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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\45c39cc8-23
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DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 2yr 4hr 10min Chicago         **
  ************************************************


--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 475.610
| Ptotal= 33.31 mm |                           B=   0.000
--------------------                           C=   0.738
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs  mm/hr |   hrs  mm/hr |'   hrs  mm/hr |   hrs  mm/hr
          0.00    2.45 |  1.00   12.69 |  2.00    5.04 |  3.00    2.85
          0.17    2.76 |  1.17   86.95 |  2.17    4.42 |  3.17    2.67
          0.33    3.17 |  1.33   15.73 |  2.33    3.95 |  3.33    2.52
          0.50    3.77 |  1.50    9.66 |  2.50    3.59 |  3.50    2.39
          0.67    4.72 |  1.67    7.25 |  2.67    3.30 |  3.67    2.27
          0.83    6.58 |  1.83    5.91 |  2.83    3.05 |  3.83    2.17


--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03         1.47
     Dep. Storage     (mm)=      1.70         5.00
     Average Slope     (%)=      4.00         4.00
     Length            (m)=    152.75        20.00
     Mannings n             =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs  mm/hr |   hrs  mm/hr |'   hrs  mm/hr |   hrs  mm/hr
          0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
          0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
          0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
          0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
          0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
          0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
          0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
          0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
          0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
          0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
          0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
          1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95        67.96
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     2.30 (ii)    6.71 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.30         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.17         0.20       0.330 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    31.61        14.72      18.08
     TOTAL RAINFALL   (mm)=    33.31        33.31      33.31
     RUNOFF COEFFICIENT   =     0.95         0.44       0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08         0.18
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00        10.00
     Length            (m)=     41.63        30.00
     Mannings n             =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs  mm/hr |   hrs  mm/hr |'   hrs  mm/hr |   hrs  mm/hr
          0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
          0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
          0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
          0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
          0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
          0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
          0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
          0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
          0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
          0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
          0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
          1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95        28.43
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     1.05 (ii)    7.11 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.01         0.01       0.017 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    31.81        10.52      13.78
     TOTAL RAINFALL   (mm)=    33.31        33.31      33.31
     RUNOFF COEFFICIENT   =     0.95         0.32       0.41

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.017     1.33    13.78
     + ID2= 2 (  0201):     3.50   0.330     1.33    18.08
       ================================================
       ID = 3 (  0026):     3.76   0.347     1.33    17.78

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.347     1.33    17.78
     + ID2= 2 (  0027):     0.26   0.026     1.33    16.87
       ================================================
       ID = 1 (  0026):     4.02   0.374     1.33    17.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
                         0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
                         0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
                         0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
                         0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
                         1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95        67.96
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     2.30 (ii)    6.71 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.30         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.17         0.20       0.330 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    31.61        14.72      18.08
     TOTAL RAINFALL   (mm)=    33.31        33.31      33.31
     RUNOFF COEFFICIENT   =     0.95         0.44       0.54

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.11         0.15
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      6.00         6.00
     Length            (m)=     41.63        20.00
     Mannings n             =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs  mm/hr |   hrs  mm/hr |'   hrs  mm/hr |   hrs  mm/hr
          0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
          0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
          0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
          0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
          0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
          0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
          0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
          0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
          0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
          0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
          0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
          1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95        27.24
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     0.93 (ii)    5.51 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.02         0.01       0.026 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    31.81        10.34      16.87
     TOTAL RAINFALL   (mm)=    33.31        33.31      33.31
     RUNOFF COEFFICIENT   =     0.95         0.31       0.51

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
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```
                         0.0090    0.0210  |   0.5160    0.1030
                         0.0100    0.0260  |   0.6920    0.1140
                         0.0120    0.0390  |   1.8600    0.1540

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (  0026)     4.020     0.374      1.33      17.72
     OUTFLOW: ID= 1 (  0022)     4.020     0.021      3.67      17.68
     OVERFLOW:ID= 3 (  0003)     0.000     0.000      0.00       0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.49
                    TIME SHIFT OF PEAK FLOW         (min)=140.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0554

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

  --------------------------
  | Junction Command(0024) |
  --------------------------

                              AREA     QPEAK    TPEAK     R.V.
                              (ha)     (cms)    (hrs)     (mm)
     INFLOW : ID= 3(  0022)    0.00      0.00     0.00      0.00
     OUTFLOW: ID= 2(  0024)    0.00      0.00     0.00      0.00

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------

                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91         1.57
     Dep. Storage     (mm)=      1.00         5.00
     Average Slope     (%)=      2.00         4.00
     Length            (m)=    128.58        30.00
     Mannings n             =    0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs  mm/hr |   hrs  mm/hr |'   hrs  mm/hr |   hrs  mm/hr
          0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
          0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
          0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
          0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
          0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
          0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
          0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
          0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
          0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
          0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
          0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
          1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95        47.32
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     2.55 (ii)    9.06 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.29         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.00         0.13       0.134 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.42
     RUNOFF VOLUME    (mm)=    32.31        12.87      12.97
     TOTAL RAINFALL   (mm)=    33.31        33.31      33.31
     RUNOFF COEFFICIENT   =     0.97         0.39       0.39

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0202):     2.48   0.134     1.42    12.97
    + ID2= 2 (  0022):     4.02   0.021     3.67    17.68
      ==========================================
      ID = 3 (  0003):     6.50   0.144     1.42    15.88

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

--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
      ID1= 3 (  0003):     6.50   0.144     1.42    15.88
    + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
      ==========================================
      ID = 1 (  0003):     6.50   0.144     1.42    15.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.14          0.32
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          4.00
     Length            (m)=      55.38         20.00
     Mannings n           =      0.013         0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
             0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
             0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
             0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
             0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
             0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
             0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
             0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
             0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
             0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
             0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
             1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95         23.75
               over (min)        5.00         10.00
     Storage Coeff.  (min)=      1.54 (ii)     8.26 (ii)
     Unit Hyd. Tpeak (min)=      5.00         10.00
     Unit Hyd. peak  (cms)=      0.33          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02          0.01          0.035 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=     31.81          9.77          14.54
     TOTAL RAINFALL   (mm)=     33.31         33.31          33.31
     RUNOFF COEFFICIENT   =      0.95          0.29           0.44

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57          3.65
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=      10.00         10.00
     Length            (m)=     186.55         30.00
     Mannings n           =      0.013         0.250

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


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.083    2.45 | 1.083   12.69 | 2.083    5.04 |  3.08    2.85
             0.167    2.45 | 1.167   12.69 | 2.167    5.04 |  3.17    2.85
             0.250    2.76 | 1.250   86.95 | 2.250    4.42 |  3.25    2.67
             0.333    2.76 | 1.333   86.95 | 2.333    4.42 |  3.33    2.67
             0.417    3.17 | 1.417   15.73 | 2.417    3.95 |  3.42    2.52
             0.500    3.17 | 1.500   15.73 | 2.500    3.95 |  3.50    2.52
             0.583    3.77 | 1.583    9.66 | 2.583    3.59 |  3.58    2.39
             0.667    3.77 | 1.667    9.66 | 2.667    3.59 |  3.67    2.39
             0.750    4.72 | 1.750    7.25 | 2.750    3.30 |  3.75    2.27
             0.833    4.72 | 1.833    7.25 | 2.833    3.30 |  3.83    2.27
             0.917    6.58 | 1.917    5.91 | 2.917    3.05 |  3.92    2.17
             1.000    6.58 | 2.000    5.91 | 3.000    3.05 |  4.00    2.17

     Max.Eff.Inten.(mm/hr)=      86.95         24.11
               over (min)        5.00         10.00
     Storage Coeff.  (min)=      1.97 (ii)     8.44 (ii)
     Unit Hyd. Tpeak (min)=      5.00         10.00
     Unit Hyd. peak  (cms)=      0.31          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.26          0.17          0.380 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=     31.81          9.83          14.38
     TOTAL RAINFALL   (mm)=     33.31         33.31          33.31
     RUNOFF COEFFICIENT   =      0.95          0.30           0.43

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\fb0d1eaa-b1
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\fb0d1eaa-b1

DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 5yr 4hr 10min Chicago         **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 632.750
| Ptotal= 43.59 mm |                           B=   0.000
--------------------                           C=   0.741
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    3.17 |  1.00   16.54 |  2.00    6.54 |  3.00    3.69
              0.17    3.57 |  1.17  114.88 |  2.17    5.73 |  3.17    3.46
              0.33    4.11 |  1.33   20.52 |  2.33    5.13 |  3.33    3.26
              0.50    4.88 |  1.50   12.57 |  2.50    4.65 |  3.50    3.09
              0.67    6.13 |  1.67    9.43 |  2.67    4.27 |  3.67    2.94
              0.83    8.55 |  1.83    7.68 |  2.83    3.95 |  3.83    2.80


--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.03         1.47
     Dep. Storage     (mm)=       1.70         5.00
     Average Slope     (%)=       4.00         4.00
     Length            (m)=     152.75        20.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
               0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
               0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
               0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
               0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
               0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
               0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
               0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
               0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
               0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
               0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
               1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        49.49
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      0.94 (ii)    5.80 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.34         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.01         0.02        0.028 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=     42.09        17.06        20.91
     TOTAL RAINFALL   (mm)=     43.59        43.59        43.59
     RUNOFF COEFFICIENT   =      0.97         0.39         0.48

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.028     1.33    20.91
     + ID2= 2 (  0201):     3.50   0.486     1.33    26.44
       ========================================================
       ID = 3 (  0026):     3.76   0.515     1.33    26.06

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.515     1.33    26.06
     + ID2= 2 (  0027):     0.26   0.045     1.33    24.52
       ========================================================
       ID = 1 (  0026):     4.02   0.560     1.33    25.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
                         0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
                         0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
                         0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
                         0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
                         1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88       109.65
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      2.06 (ii)    6.88 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.31         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.22         0.32        0.486 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=     41.89        22.60        26.44
     TOTAL RAINFALL   (mm)=     43.59        43.59        43.59
     RUNOFF COEFFICIENT   =      0.96         0.52         0.61

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.11         0.15
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       6.00         6.00
     Length            (m)=      41.63        20.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
               0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
               0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
               0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
               0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
               0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
               0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
               0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
               0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
               0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
               0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
               1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        47.61
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      0.83 (ii)    4.93 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=      0.34         0.22
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.02        0.045 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=     42.09        16.81        24.52
     TOTAL RAINFALL   (mm)=     43.59        43.59        43.59
     RUNOFF COEFFICIENT   =      0.97         0.39         0.56

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.18
     Dep. Storage     (mm)=       1.50         5.00
     Average Slope     (%)=       4.00        10.00
     Length            (m)=      41.63        30.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
               0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
               0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
               0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
               0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
               0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
               0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
               0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
               0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
               0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
               0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
               1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        49.49
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      0.94 (ii)    5.80 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.34         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.01         0.02        0.028 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=     42.09        17.06        20.91
     TOTAL RAINFALL   (mm)=     43.59        43.59        43.59
     RUNOFF COEFFICIENT   =      0.97         0.39         0.48

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.028     1.33    20.91
     + ID2= 2 (  0201):     3.50   0.486     1.33    26.44
       ========================================================
       ID = 3 (  0026):     3.76   0.515     1.33    26.06

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.515     1.33    26.06
     + ID2= 2 (  0027):     0.26   0.045     1.33    24.52
       ========================================================
       ID = 1 (  0026):     4.02   0.560     1.33    25.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.0090     0.0210    |   0.5160     0.1030
                         0.0100     0.0260    |   0.6920     0.1140
                         0.0120     0.0390    |   1.8600     0.1540

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (  0026)  4.020     0.560     1.33       25.96
     OUTFLOW: ID= 1 (  0022)  4.020     0.068     2.08       25.92
     OVERFLOW:ID= 3 (  0003)  0.000     0.000     0.00        0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.16
                    TIME SHIFT OF PEAK FLOW         (min)= 45.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0642

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

  -------------------------
  | Junction Command(0024) |
  -------------------------

                              AREA     QPEAK    TPEAK     R.V.
                              (ha)     (cms)    (hrs)     (mm)
     INFLOW : ID= 3(  0022)    0.00     0.00     0.00     0.00
     OUTFLOW: ID= 2(  0024)    0.00     0.00     0.00     0.00

--------------------------------------------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.91         1.57
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.00         4.00
     Length            (m)=     128.58        30.00
     Mannings n             =     0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    3.17 |  1.083   16.54 |  2.083    6.54 |  3.08    3.69
               0.167    3.17 |  1.167   16.54 |  2.167    6.54 |  3.17    3.69
               0.250    3.57 |  1.250  114.88 |  2.250    5.73 |  3.25    3.46
               0.333    3.57 |  1.333  114.88 |  2.333    5.73 |  3.33    3.46
               0.417    4.11 |  1.417   20.52 |  2.417    5.13 |  3.42    3.26
               0.500    4.11 |  1.500   20.52 |  2.500    5.13 |  3.50    3.26
               0.583    4.88 |  1.583   12.57 |  2.583    4.65 |  3.58    3.09
               0.667    4.88 |  1.667   12.57 |  2.667    4.65 |  3.67    3.09
               0.750    6.13 |  1.750    9.43 |  2.750    4.27 |  3.75    2.94
               0.833    6.13 |  1.833    9.43 |  2.833    4.27 |  3.83    2.94
               0.917    8.55 |  1.917    7.68 |  2.917    3.95 |  3.92    2.80
               1.000    8.55 |  2.000    7.68 |  3.000    3.95 |  4.00    2.80

     Max.Eff.Inten.(mm/hr)=     114.88        78.65
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      2.28 (ii)    7.59 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.30         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.00         0.24        0.238 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42         1.42
     RUNOFF VOLUME    (mm)=     42.59        20.21        20.32
     TOTAL RAINFALL   (mm)=     43.59        43.59        43.59
     RUNOFF COEFFICIENT   =      0.98         0.46         0.47

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0202):     2.48   0.238     1.42    20.32
     + ID2= 2 (  0022):     4.02   0.068     2.08    25.92
       ================================================
       ID = 3 (  0003):     6.50   0.249     1.42    23.78

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

--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
       ID1= 3 (  0003):     6.50   0.249     1.42    23.78
     + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
       ================================================
       ID = 1 (  0003):     6.50   0.249     1.42    23.78

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14          0.32
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=       2.00          4.00
    Length            (m)=      55.38         20.00
    Mannings n            =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
              hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
            0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
            0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
            0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
            0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
            0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
            0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
            0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
            0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
            0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
            0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
            0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
            1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

    Max.Eff.Inten.(mm/hr)=     114.88         42.09
              over (min)        5.00         10.00
    Storage Coeff.  (min)=      1.38 (ii)     6.72 (ii)
    Unit Hyd. Tpeak (min)=      5.00         10.00
    Unit Hyd. peak  (cms)=      0.33          0.14
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.03          0.03          0.053 (iii)
    TIME TO PEAK    (hrs)=      1.33          1.42          1.33
    RUNOFF VOLUME    (mm)=     42.09         16.03         21.68
    TOTAL RAINFALL   (mm)=     43.59         43.59         43.59
    RUNOFF COEFFICIENT   =      0.97          0.37          0.50

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* = 80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.57          3.65
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=      10.00         10.00
    Length            (m)=     186.55         30.00
    Mannings n            =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
              hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
            0.083    3.17 | 1.083   16.54 | 2.083    6.54 |  3.08    3.69
            0.167    3.17 | 1.167   16.54 | 2.167    6.54 |  3.17    3.69
            0.250    3.57 | 1.250  114.88 | 2.250    5.73 |  3.25    3.46
            0.333    3.57 | 1.333  114.88 | 2.333    5.73 |  3.33    3.46
            0.417    4.11 | 1.417   20.52 | 2.417    5.13 |  3.42    3.26
            0.500    4.11 | 1.500   20.52 | 2.500    5.13 |  3.50    3.26
            0.583    4.88 | 1.583   12.57 | 2.583    4.65 |  3.58    3.09
            0.667    4.88 | 1.667   12.57 | 2.667    4.65 |  3.67    3.09
            0.750    6.13 | 1.750    9.43 | 2.750    4.27 |  3.75    2.94
            0.833    6.13 | 1.833    9.43 | 2.833    4.27 |  3.83    2.94
            0.917    8.55 | 1.917    7.68 | 2.917    3.95 |  3.92    2.80
            1.000    8.55 | 2.000    7.68 | 3.000    3.95 |  4.00    2.80

    Max.Eff.Inten.(mm/hr)=     114.88         42.67
              over (min)        5.00         10.00
    Storage Coeff.  (min)=      1.76 (ii)     6.91 (ii)
    Unit Hyd. Tpeak (min)=      5.00         10.00
    Unit Hyd. peak  (cms)=      0.32          0.14
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.34          0.32          0.589 (iii)
    TIME TO PEAK    (hrs)=      1.33          1.42          1.33
    RUNOFF VOLUME    (mm)=     42.09         16.12         21.49
    TOTAL RAINFALL   (mm)=     43.59         43.59         43.59
    RUNOFF COEFFICIENT   =      0.97          0.37          0.49

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* = 80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
        V  V    I       SS  U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\e9272cd5-a2
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\e9272cd5-a2

DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 10yr 4hr 10min Chicago        **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 721.920
| Ptotal= 51.12 mm |                           B=   0.000
--------------------                           C=   0.736
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.00    3.79 |  1.00   19.52 |  2.00    7.77 |  3.00    4.40
             0.17    4.26 |  1.17  132.58 |  2.17    6.82 |  3.17    4.13
             0.33    4.90 |  1.33   24.19 |  2.33    6.10 |  3.33    3.90
             0.50    5.82 |  1.50   14.88 |  2.50    5.54 |  3.50    3.69
             0.67    7.29 |  1.67   11.18 |  2.67    5.09 |  3.67    3.51
             0.83   10.14 |  1.83    9.12 |  2.83    4.72 |  3.83    3.35


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--------------------
| CALIB              |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03         1.47
     Dep. Storage     (mm)=      1.70         5.00
     Average Slope     (%)=      4.00         4.00
     Length            (m)=    152.75        20.00
     Mannings n            =     0.013        0.250

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

                         ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
              0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
              0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
              0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
              0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
              0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
```

```
              0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
              0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
              0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
              0.833   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
              1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58       139.82
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     1.94 (ii)    6.50 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.31         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.26         0.41       0.608 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    49.42        28.75      32.86
     TOTAL RAINFALL   (mm)=    51.12        51.12      51.12
     RUNOFF COEFFICIENT   =     0.97         0.56       0.64

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.11         0.15
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      6.00         6.00
     Length            (m)=     41.63        20.00
     Mannings n            =     0.013        0.250

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

                         ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
              0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
              0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
              0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
              0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
              0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
              0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
              0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
              0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
              0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
              0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
              1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58        63.14
               over (min)        5.00         5.00
     Storage Coeff.  (min)=     0.79 (ii)    4.66 (ii)
     Unit Hyd. Tpeak (min)=     5.00         5.00
     Unit Hyd. peak  (cms)=     0.34         0.22
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.03         0.03       0.055 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.33       1.33
     RUNOFF VOLUME    (mm)=    49.62        22.05      30.45
     TOTAL RAINFALL   (mm)=    51.12        51.12      51.12
     RUNOFF COEFFICIENT   =     0.97         0.43       0.60

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
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| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08         0.18
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00        10.00
     Length            (m)=     41.63        30.00
     Mannings n            =     0.013        0.250

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

                         ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
              0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
              0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
              0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
              0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
              0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
              0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
              0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
              0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
              0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
              0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
              1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58        65.50
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     0.89 (ii)    5.23 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.34         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.01         0.03       0.036 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.33
     RUNOFF VOLUME    (mm)=    49.62        22.35      26.53
     TOTAL RAINFALL   (mm)=    51.12        51.12      51.12
     RUNOFF COEFFICIENT   =     0.97         0.44       0.52

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

----------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.036     1.33    26.53
     + ID2= 2 (  0201):     3.50   0.608     1.33    32.86
     ================================================================
       ID = 3 (  0026):     3.76   0.645     1.33    32.43

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.645     1.33    32.43
     + ID2= 2 (  0027):     0.26   0.055     1.33    30.45
     ================================================================
       ID = 1 (  0026):     4.02   0.700     1.33    32.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
----------------------------------------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.0090     0.0210    |   0.5160     0.1030
                         0.0100     0.0260    |   0.6920     0.1140
                         0.0120     0.0390    |   1.8600     0.1540

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (  0026)      4.020     0.700      1.33       32.30
     OUTFLOW: ID= 1 (  0022)      4.020     0.117      1.83       32.26
     OVERFLOW:ID= 3 (  0003)      0.000     0.000      0.00        0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 16.74
                    TIME SHIFT OF PEAK FLOW          (min)= 30.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0726

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

  -------------------------
  | Junction Command(0024) |
  -------------------------

                              AREA     QPEAK   TPEAK     R.V.
                              (ha)     (cms)   (hrs)     (mm)
     INFLOW : ID= 3(  0022)    0.00     0.00    0.00     0.00
     OUTFLOW: ID= 2(  0024)    0.00     0.00    0.00     0.00

----------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91         1.57
     Dep. Storage     (mm)=      1.00         5.00
     Average Slope     (%)=      2.00         4.00
     Length            (m)=    128.58        30.00
     Mannings n            =     0.013        0.250

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

                         ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
              0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
              0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
              0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
              0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
              0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
              0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
              0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
              0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
              0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
              0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
              1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

     Max.Eff.Inten.(mm/hr)=     132.58       101.79
               over (min)        5.00        10.00
     Storage Coeff.  (min)=     2.16 (ii)    6.95 (ii)
     Unit Hyd. Tpeak (min)=     5.00        10.00
     Unit Hyd. peak  (cms)=     0.31         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.00         0.31       0.316 (iii)
     TIME TO PEAK    (hrs)=     1.33         1.42       1.42
     RUNOFF VOLUME    (mm)=    50.12        26.01      26.13
     TOTAL RAINFALL   (mm)=    51.12        51.12      51.12
     RUNOFF COEFFICIENT   =     0.98         0.51       0.51

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0202):     2.48   0.316     1.42     26.13
    + ID2= 2 (  0022):     4.02   0.117     1.83     32.26
      ================================================
      ID = 3 (  0003):     6.50   0.329     1.42     29.92

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


--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
      ID1= 3 (  0003):     6.50   0.329     1.42     29.92
    + ID2= 2 (  0024):     0.00   0.000     0.00      0.00
      ================================================
      ID = 1 (  0003):     6.50   0.329     1.42     29.92

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14          0.32
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=       2.00          4.00
    Length            (m)=      55.38         20.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
   0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
   0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
   0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
   0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
   0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
   0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
   0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
   0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
   0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
   0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
   1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

    Max.Eff.Inten.(mm/hr)=     132.58         56.17
              over (min)         5.00         10.00
    Storage Coeff.  (min)=       1.30 (ii)    6.06 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.33          0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.04          0.04          0.067 (iii)
    TIME TO PEAK    (hrs)=       1.33          1.42           1.33
    RUNOFF VOLUME    (mm)=      49.62         21.12          27.30
    TOTAL RAINFALL   (mm)=      51.12         51.12          51.12
    RUNOFF COEFFICIENT   =       0.97          0.41           0.53

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.57          3.65
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=      10.00         10.00
    Length            (m)=     186.55         30.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    3.79 | 1.083   19.52 | 2.083    7.77 |  3.08    4.40
   0.167    3.79 | 1.167   19.52 | 2.167    7.77 |  3.17    4.40
   0.250    4.26 | 1.250  132.58 | 2.250    6.82 |  3.25    4.13
   0.333    4.26 | 1.333  132.58 | 2.333    6.82 |  3.33    4.13
   0.417    4.90 | 1.417   24.19 | 2.417    6.10 |  3.42    3.90
   0.500    4.90 | 1.500   24.19 | 2.500    6.10 |  3.50    3.90
   0.583    5.82 | 1.583   14.88 | 2.583    5.54 |  3.58    3.69
   0.667    5.82 | 1.667   14.88 | 2.667    5.54 |  3.67    3.69
   0.750    7.29 | 1.750   11.18 | 2.750    5.09 |  3.75    3.51
   0.833    7.29 | 1.833   11.18 | 2.833    5.09 |  3.83    3.51
   0.917   10.14 | 1.917    9.12 | 2.917    4.72 |  3.92    3.35
   1.000   10.14 | 2.000    9.12 | 3.000    4.72 |  4.00    3.35

    Max.Eff.Inten.(mm/hr)=     132.58         56.90
              over (min)         5.00         10.00
    Storage Coeff.  (min)=       1.66 (ii)    6.25 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.32          0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.40          0.43          0.747 (iii)
    TIME TO PEAK    (hrs)=       1.33          1.42           1.33
    RUNOFF VOLUME    (mm)=      49.62         21.23          27.10
    TOTAL RAINFALL   (mm)=      51.12         51.12          51.12
    RUNOFF COEFFICIENT   =       0.97          0.42           0.53

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
 V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\0e26e68f-37
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\0e26e68f-37


DATE: 11-08-2024                          TIME: 09:08:42

USER:


COMMENTS: _____________________________________________________________


-------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 25yr 4hr 10min Chicago        **
  ************************************************


--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 822.740
| Ptotal= 61.88 mm |                           B=   0.000
--------------------                           C=   0.725
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.00    4.77 |  1.00   23.97 |'  2.00    9.68 |  3.00    5.53
             0.17    5.36 |  1.17  154.98 |'  2.17    8.51 |  3.17    5.19
             0.33    6.14 |  1.33   29.61 |'  2.33    7.63 |  3.33    4.90
             0.50    7.28 |  1.50   18.34 |'  2.50    6.94 |  3.50    4.65
             0.67    9.09 |  1.67   13.85 |'  2.67    6.38 |  3.67    4.43
             0.83   12.58 |  1.83   11.32 |'  2.83    5.92 |  3.83    4.23


-------------------------------------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03         1.47
     Dep. Storage     (mm)=      1.70         5.00
     Average Slope     (%)=      4.00         4.00
     Length            (m)=    152.75        20.00
     Mannings n             =    0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
              0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
              0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
              0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
              0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
              0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
```

```
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08         0.18
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00        10.00
     Length            (m)=     41.63        30.00
     Mannings n             =    0.013        0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
              0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
              0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
              0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
              0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
              0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
              0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
              0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
              0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
              0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
              0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
              1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98        88.44
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.84 (ii)    4.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.04        0.060 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=      60.38        30.43        35.03
     TOTAL RAINFALL   (mm)=      61.88        61.88        61.88
     RUNOFF COEFFICIENT   =       0.98         0.49         0.57

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.060     1.33    35.03
     + ID2= 2 (  0201):     3.50   0.779     1.33    42.36
       ========================================================
       ID = 3 (  0026):     3.76   0.839     1.33    41.85

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.839     1.33    41.85
     + ID2= 2 (  0027):     0.26   0.070     1.33    39.31
       ========================================================
       ID = 1 (  0026):     4.02   0.909     1.33    41.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.583    7.28 |  1.583   18.34 |  2.583    6.94 |  3.58    4.65
                         0.667    7.28 |  1.667   18.34 |  2.667    6.94 |  3.67    4.65
                         0.750    9.09 |  1.750   13.85 |  2.750    6.38 |  3.75    4.43
                         0.833    9.09 |  1.833   13.85 |  2.833    6.38 |  3.83    4.43
                         0.917   12.58 |  1.917   11.32 |  2.917    5.92 |  3.92    4.23
                         1.000   12.58 |  2.000   11.32 |  3.000    5.92 |  4.00    4.23

              Max.Eff.Inten.(mm/hr)=     154.98       181.44
                        over (min)          5.00        10.00
              Storage Coeff.  (min)=       1.82 (ii)    6.10 (ii)
              Unit Hyd. Tpeak (min)=       5.00        10.00
              Unit Hyd. peak  (cms)=       0.32         0.15
                                                        *TOTALS*
              PEAK FLOW       (cms)=       0.30         0.54        0.779 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.42         1.33
              RUNOFF VOLUME    (mm)=      60.18        37.94        42.36
              TOTAL RAINFALL   (mm)=      61.88        61.88        61.88
              RUNOFF COEFFICIENT   =       0.97         0.61         0.68

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                     THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

         -------------------------------------------------------------------------------------------------
         --------------------
         | CALIB              |
         | STANDHYD (  0027)|   Area    (ha)=   0.26
         |ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
         --------------------
                                 IMPERVIOUS    PERVIOUS (i)
              Surface Area     (ha)=      0.11         0.15
              Dep. Storage     (mm)=      1.50         5.00
              Average Slope     (%)=      6.00         6.00
              Length            (m)=     41.63        20.00
              Mannings n             =    0.013        0.250

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


                                   ---- TRANSFORMED HYETOGRAPH ----
                        TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                         hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                       0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
                       0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
                       0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
                       0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
                       0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
                       0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
                       0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
                       0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
                       0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
                       0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
                       0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
                       1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

              Max.Eff.Inten.(mm/hr)=     154.98        85.43
                        over (min)          5.00         5.00
              Storage Coeff.  (min)=       0.74 (ii)    4.37 (ii)
              Unit Hyd. Tpeak (min)=       5.00         5.00
              Unit Hyd. peak  (cms)=       0.34         0.23
                                                        *TOTALS*
              PEAK FLOW       (cms)=       0.03         0.04        0.070 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.33         1.33
              RUNOFF VOLUME    (mm)=      60.38        30.08        39.31
              TOTAL RAINFALL   (mm)=      61.88        61.88        61.88
              RUNOFF COEFFICIENT   =       0.98         0.49         0.64

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                     THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

         -------------------------------------------------------------------------------------------------
         --------------------
         | CALIB              |
```

```
                         0.0090    0.0210  |   0.5160    0.1030
                         0.0100    0.0260  |   0.6920    0.1140
                         0.0120    0.0390  |   1.8600    0.1540

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
              INFLOW : ID= 2 (  0026)     4.020     0.909      1.33      41.69
              OUTFLOW: ID= 1 (  0022)     4.020     0.236      1.67      41.65
              OVERFLOW:ID= 3 (  0003)     0.000     0.000      0.00       0.00

                           TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                           CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                           PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                           PEAK   FLOW   REDUCTION [Qout/Qin](%)= 25.94
                           TIME SHIFT OF PEAK FLOW          (min)= 20.00
                           MAXIMUM  STORAGE   USED       (ha.m.)=  0.0823

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

           -------------------------
           | Junction Command(0024) |
           -------------------------

                                   AREA     QPEAK    TPEAK     R.V.
                                   (ha)     (cms)    (hrs)     (mm)
           INFLOW : ID= 3(  0022)    0.00     0.00     0.00     0.00
           OUTFLOW: ID= 2(  0024)    0.00     0.00     0.00     0.00

         -------------------------------------------------------------------------------------------------
         --------------------
         | CALIB              |
         | STANDHYD (  0202)|   Area    (ha)=   2.48
         |ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
         --------------------
                                 IMPERVIOUS    PERVIOUS (i)
              Surface Area     (ha)=      0.91         1.57
              Dep. Storage     (mm)=      1.00         5.00
              Average Slope     (%)=      2.00         4.00
              Length            (m)=    128.58        30.00
              Mannings n             =    0.013        0.250

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


                                   ---- TRANSFORMED HYETOGRAPH ----
                        TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                         hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                       0.083    4.77 |  1.083   23.97 |'  2.083    9.68 |  3.08    5.53
                       0.167    4.77 |  1.167   23.97 |'  2.167    9.68 |  3.17    5.53
                       0.250    5.36 |  1.250  154.98 |'  2.250    8.51 |  3.25    5.19
                       0.333    5.36 |  1.333  154.98 |'  2.333    8.51 |  3.33    5.19
                       0.417    6.14 |  1.417   29.61 |'  2.417    7.63 |  3.42    4.90
                       0.500    6.14 |  1.500   29.61 |'  2.500    7.63 |  3.50    4.90
                       0.583    7.28 |  1.583   18.34 |'  2.583    6.94 |  3.58    4.65
                       0.667    7.28 |  1.667   18.34 |'  2.667    6.94 |  3.67    4.65
                       0.750    9.09 |  1.750   13.85 |'  2.750    6.38 |  3.75    4.43
                       0.833    9.09 |  1.833   13.85 |'  2.833    6.38 |  3.83    4.43
                       0.917   12.58 |  1.917   11.32 |'  2.917    5.92 |  3.92    4.23
                       1.000   12.58 |  2.000   11.32 |'  3.000    5.92 |  4.00    4.23

              Max.Eff.Inten.(mm/hr)=     154.98       134.24
                        over (min)          5.00        10.00
              Storage Coeff.  (min)=       2.03 (ii)    6.31 (ii)
              Unit Hyd. Tpeak (min)=       5.00        10.00
              Unit Hyd. peak  (cms)=       0.31         0.15
                                                        *TOTALS*
              PEAK FLOW       (cms)=       0.01         0.43        0.427 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.42         1.42
              RUNOFF VOLUME    (mm)=      60.88        34.77        34.90
              TOTAL RAINFALL   (mm)=      61.88        61.88        61.88
              RUNOFF COEFFICIENT   =       0.98         0.56         0.56

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                     THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0202):     2.48   0.427     1.42    34.90
     + ID2= 2 (  0022):     4.02   0.236     1.67    41.65
       ================================================
       ID = 3 (  0003):     6.50   0.488     1.42    39.07

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

--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
       ID1= 3 (  0003):     6.50   0.488     1.42    39.07
     + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
       ================================================
       ID = 1 (  0003):     6.50   0.488     1.42    39.07

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.14          0.32
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          4.00
     Length            (m)=      55.38         20.00
     Mannings n             =    0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
              0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
              0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
              0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
              0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
              0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
              0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
              0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
              0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
              0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
              0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  4.00    4.23
              1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98         76.50
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       1.22 (ii)     5.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.33          0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04          0.05          0.088 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      60.38         28.96          35.77
     TOTAL RAINFALL   (mm)=      61.88         61.88          61.88
     RUNOFF COEFFICIENT   =       0.98          0.47           0.58

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57          3.65
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=      10.00         10.00
     Length            (m)=     186.55         30.00
     Mannings n             =    0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    4.77 | 1.083   23.97 | 2.083    9.68 |  3.08    5.53
              0.167    4.77 | 1.167   23.97 | 2.167    9.68 |  3.17    5.53
              0.250    5.36 | 1.250  154.98 | 2.250    8.51 |  3.25    5.19
              0.333    5.36 | 1.333  154.98 | 2.333    8.51 |  3.33    5.19
              0.417    6.14 | 1.417   29.61 | 2.417    7.63 |  3.42    4.90
              0.500    6.14 | 1.500   29.61 | 2.500    7.63 |  3.50    4.90
              0.583    7.28 | 1.583   18.34 | 2.583    6.94 |  3.58    4.65
              0.667    7.28 | 1.667   18.34 | 2.667    6.94 |  3.67    4.65
              0.750    9.09 | 1.750   13.85 | 2.750    6.38 |  3.75    4.43
              0.833    9.09 | 1.833   13.85 | 2.833    6.38 |  3.83    4.43
              0.917   12.58 | 1.917   11.32 | 2.917    5.92 |  3.92    4.23
              1.000   12.58 | 2.000   11.32 | 3.000    5.92 |  4.00    4.23

     Max.Eff.Inten.(mm/hr)=     154.98         77.44
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       1.56 (ii)     5.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.33          0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.46          0.60          0.976 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      60.38         29.09          35.56
     TOTAL RAINFALL   (mm)=      61.88         61.88          61.88
     RUNOFF COEFFICIENT   =       0.98          0.47           0.57

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\7b63774b-63
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\7b63774b-63

DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________________

--------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 50yr 4hr 10min Chicago        **
  ************************************************

--------------------
| CHICAGO STORM    |     IDF curve parameters: A= 893.800
| Ptotal= 69.47 mm |                           B=   0.000
--------------------                           C=   0.719
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.00    5.47 |  1.00   27.09 |'  2.00   11.03 |  3.00    6.33
          0.17    6.13 |  1.17  170.70 |'  2.17    9.71 |  3.17    5.95
          0.33    7.02 |  1.33   33.42 |'  2.33    8.71 |  3.33    5.62
          0.50    8.31 |  1.50   20.79 |'  2.50    7.93 |  3.50    5.33
          0.67   10.36 |  1.67   15.73 |'  2.67    7.29 |  3.67    5.08
          0.83   14.30 |  1.83   12.89 |'  2.83    6.77 |  3.83    4.85

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03         1.47
     Dep. Storage     (mm)=      1.70         5.00
     Average Slope     (%)=      4.00         4.00
     Length            (m)=    152.75        20.00
     Mannings n             =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
          0.167   5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
          0.250   6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
          0.333   6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
          0.417   7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
          0.500   7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
          0.583   8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
          0.667   8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
          0.750  10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
          0.833  10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
          0.917  14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
          1.000  14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       105.41
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.80 (ii)    4.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.05      0.071 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33      1.33
     RUNOFF VOLUME    (mm)=      67.97        36.43     41.27
     TOTAL RAINFALL   (mm)=      69.47        69.47     69.47
     RUNOFF COEFFICIENT   =       0.98         0.52      0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.071     1.33    41.27
     + ID2= 2 (  0201):     3.50   0.904     1.33    49.22
       ================================================
       ID = 3 (  0026):     3.76   0.975     1.33    48.68

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.975     1.33    48.68
     + ID2= 2 (  0027):     0.26   0.080     1.33    45.77
       ================================================
       ID = 1 (  0026):     4.02   1.055     1.33    48.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

```
                         0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
                         0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
                         0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
                         0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
                         0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
                         1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       211.45
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.75 (ii)    5.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.33         0.63      0.904 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42      1.33
     RUNOFF VOLUME    (mm)=      67.77        44.62     49.22
     TOTAL RAINFALL   (mm)=      69.47        69.47     69.47
     RUNOFF COEFFICIENT   =       0.98         0.64      0.71

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.11         0.15
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00         6.00
     Length            (m)=     41.63        20.00
     Mannings n             =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
          0.167   5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
          0.250   6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
          0.333   6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
          0.417   7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
          0.500   7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
          0.583   8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
          0.667   8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
          0.750  10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
          0.833  10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
          0.917  14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
          1.000  14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       101.93
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.71 (ii)    4.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04      0.080 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33      1.33
     RUNOFF VOLUME    (mm)=      67.97        36.04     45.77
     TOTAL RAINFALL   (mm)=      69.47        69.47     69.47
     RUNOFF COEFFICIENT   =       0.98         0.52      0.66

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
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| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08         0.18
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00        10.00
     Length            (m)=     41.63        30.00
     Mannings n             =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
          0.167   5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
          0.250   6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
          0.333   6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
          0.417   7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
          0.500   7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
          0.583   8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
          0.667   8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
          0.750  10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
          0.833  10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
          0.917  14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
          1.000  14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       105.41
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.80 (ii)    4.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.05      0.071 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33      1.33
     RUNOFF VOLUME    (mm)=      67.97        36.43     41.27
     TOTAL RAINFALL   (mm)=      69.47        69.47     69.47
     RUNOFF COEFFICIENT   =       0.98         0.52      0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.071     1.33    41.27
     + ID2= 2 (  0201):     3.50   0.904     1.33    49.22
       ================================================
       ID = 3 (  0026):     3.76   0.975     1.33    48.68

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.975     1.33    48.68
     + ID2= 2 (  0027):     0.26   0.080     1.33    45.77
       ================================================
       ID = 1 (  0026):     4.02   1.055     1.33    48.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

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                         0.0090     0.0210    |   0.5160     0.1030
                         0.0100     0.0260    |   0.6920     0.1140
                         0.0120     0.0390    |   1.8600     0.1540

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (  0026)  4.020     1.055     1.33       48.49
     OUTFLOW: ID= 1 (  0022)  4.020     0.327     1.58       48.45
     OVERFLOW:ID= 3 (  0003)  0.000     0.000     0.00        0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.97
                    TIME SHIFT OF PEAK FLOW          (min)= 15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0896

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  --------------------------
  | Junction Command(0024) |
  --------------------------

                              AREA     QPEAK    TPEAK     R.V.
                              (ha)     (cms)    (hrs)     (mm)
     INFLOW : ID= 3(  0022)    0.00     0.00     0.00      0.00
     OUTFLOW: ID= 2(  0024)    0.00     0.00     0.00      0.00

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91         1.57
     Dep. Storage     (mm)=      1.00         5.00
     Average Slope     (%)=      2.00         4.00
     Length            (m)=    128.58        30.00
     Mannings n             =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
          0.083   5.47 | 1.083   27.09 |' 2.083   11.03 |  3.08    6.33
          0.167   5.47 | 1.167   27.09 |' 2.167   11.03 |  3.17    6.33
          0.250   6.13 | 1.250  170.70 |' 2.250    9.71 |  3.25    5.95
          0.333   6.13 | 1.333  170.70 |' 2.333    9.71 |  3.33    5.95
          0.417   7.02 | 1.417   33.42 |' 2.417    8.71 |  3.42    5.62
          0.500   7.02 | 1.500   33.42 |' 2.500    8.71 |  3.50    5.62
          0.583   8.31 | 1.583   20.79 |' 2.583    7.93 |  3.58    5.33
          0.667   8.31 | 1.667   20.79 |' 2.667    7.93 |  3.67    5.33
          0.750  10.36 | 1.750   15.73 |' 2.750    7.29 |  3.75    5.08
          0.833  10.36 | 1.833   15.73 |' 2.833    7.29 |  3.83    5.08
          0.917  14.30 | 1.917   12.89 |' 2.917    6.77 |  3.92    4.85
          1.000  14.30 | 2.000   12.89 |' 3.000    6.77 |  4.00    4.85

     Max.Eff.Inten.(mm/hr)=     170.70       157.89
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.95 (ii)    5.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.51      0.509 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42      1.42
     RUNOFF VOLUME    (mm)=      68.47        41.19     41.32
     TOTAL RAINFALL   (mm)=      69.47        69.47     69.47
     RUNOFF COEFFICIENT   =       0.99         0.59      0.59

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0202):     2.48   0.509     1.42    41.32
     + ID2= 2 (  0022):     4.02   0.327     1.58    48.45
       ================================================
       ID = 3 (  0003):     6.50   0.632     1.42    45.73

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

--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
       ID1= 3 (  0003):     6.50   0.632     1.42    45.73
     + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
       ================================================
       ID = 1 (  0003):     6.50   0.632     1.42    45.73

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14          0.32
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=       2.00          4.00
    Length            (m)=      55.38         20.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
    0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
    0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
    0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
    0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
    0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
    0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
    0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
    0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
    0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
    0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
    1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

    Max.Eff.Inten.(mm/hr)=     170.70         91.61
              over (min)          5.00         10.00
    Storage Coeff.  (min)=       1.18 (ii)     6.04 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.33          0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.05          0.06          0.099 (iii)
    TIME TO PEAK    (hrs)=       1.33          1.42           1.33
    RUNOFF VOLUME    (mm)=      67.97         34.81          42.00
    TOTAL RAINFALL   (mm)=      69.47         69.47          69.47
    RUNOFF COEFFICIENT   =       0.98          0.50           0.60

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.57          3.65
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=      10.00         10.00
    Length            (m)=     186.55         30.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.083    5.47 | 1.083   27.09 | 2.083   11.03 |  3.08    6.33
    0.167    5.47 | 1.167   27.09 | 2.167   11.03 |  3.17    6.33
    0.250    6.13 | 1.250  170.70 | 2.250    9.71 |  3.25    5.95
    0.333    6.13 | 1.333  170.70 | 2.333    9.71 |  3.33    5.95
    0.417    7.02 | 1.417   33.42 | 2.417    8.71 |  3.42    5.62
    0.500    7.02 | 1.500   33.42 | 2.500    8.71 |  3.50    5.62
    0.583    8.31 | 1.583   20.79 | 2.583    7.93 |  3.58    5.33
    0.667    8.31 | 1.667   20.79 | 2.667    7.93 |  3.67    5.33
    0.750   10.36 | 1.750   15.73 | 2.750    7.29 |  3.75    5.08
    0.833   10.36 | 1.833   15.73 | 2.833    7.29 |  3.83    5.08
    0.917   14.30 | 1.917   12.89 | 2.917    6.77 |  3.92    4.85
    1.000   14.30 | 2.000   12.89 | 3.000    6.77 |  4.00    4.85

    Max.Eff.Inten.(mm/hr)=     170.70         92.71
              over (min)          5.00         10.00
    Storage Coeff.  (min)=       1.50 (ii)     6.32 (ii)
    Unit Hyd. Tpeak (min)=       5.00         10.00
    Unit Hyd. peak  (cms)=       0.33          0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.51          0.69          1.097 (iii)
    TIME TO PEAK    (hrs)=       1.33          1.42           1.33
    RUNOFF VOLUME    (mm)=      67.97         34.94          41.78
    TOTAL RAINFALL   (mm)=      69.47         69.47          69.47
    RUNOFF COEFFICIENT   =       0.98          0.50           0.60

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

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  80.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
         V V    I       SS  U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\19d0a497-3c
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\19d0a497-3c

DATE: 11-08-2024                          TIME: 09:08:42

USER:


COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 100yr 4hr 10min Chicago       **
  ************************************************

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| CHICAGO STORM    |     IDF curve parameters: A= 953.290
| Ptotal= 77.41 mm |                           B=   0.000
--------------------                           C=   0.711
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    6.26 |  1.00   30.45 |  2.00   12.53 |  3.00    7.23
              0.17    7.01 |  1.17  185.45 |  2.17   11.04 |  3.17    6.80
              0.33    8.02 |  1.33   37.49 |  2.33    9.92 |  3.33    6.43
              0.50    9.47 |  1.50   23.45 |  2.50    9.04 |  3.50    6.10
              0.67   11.77 |  1.67   17.80 |  2.67    8.32 |  3.67    5.82
              0.83   16.19 |  1.83   14.61 |  2.83    7.73 |  3.83    5.56


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--------------------
| CALIB              |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03         1.47
     Dep. Storage     (mm)=      1.70         5.00
     Average Slope     (%)=      4.00         4.00
     Length            (m)=    152.75        20.00
     Mannings n           =     0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
              0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
              0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
              0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
              0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
              0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
              0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
              0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
              0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
              0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
              0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
              1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

     Max.Eff.Inten.(mm/hr)=     185.45       122.54
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       0.78 (ii)    4.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.06          0.082 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      75.91        42.92         47.99
     TOTAL RAINFALL   (mm)=      77.41        77.41         77.41
     RUNOFF COEFFICIENT   =       0.98         0.55          0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.082     1.33    47.99
     + ID2= 2 (  0201):     3.50   1.028     1.33    56.52
       ========================================================
       ID = 3 (  0026):     3.76   1.110     1.33    55.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   1.110     1.33    55.93
     + ID2= 2 (  0027):     0.26   0.091     1.33    52.67
       ========================================================
       ID = 1 (  0026):     4.02   1.201     1.33    55.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
```

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                         0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
                         0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
                         0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
                         0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
                         0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
                         1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

              Max.Eff.Inten.(mm/hr)=     185.45       241.04
                        over (min)          5.00        10.00
              Storage Coeff.  (min)=       1.70 (ii)    5.68 (ii)
              Unit Hyd. Tpeak (min)=       5.00        10.00
              Unit Hyd. peak  (cms)=       0.32         0.15
                                                          *TOTALS*
              PEAK FLOW       (cms)=       0.36         0.73          1.028 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.42          1.33
              RUNOFF VOLUME    (mm)=      75.71        51.75         56.52
              TOTAL RAINFALL   (mm)=      77.41        77.41         77.41
              RUNOFF COEFFICIENT   =       0.98         0.67          0.73

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                   THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.11         0.15
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      6.00         6.00
     Length            (m)=     41.63        20.00
     Mannings n           =     0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
              0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
              0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
              0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
              0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
              0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
              0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
              0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
              0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
              0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
              0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
              1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

              Max.Eff.Inten.(mm/hr)=     185.45       118.62
                        over (min)          5.00         5.00
              Storage Coeff.  (min)=       0.69 (ii)    4.07 (ii)
              Unit Hyd. Tpeak (min)=       5.00         5.00
              Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
              PEAK FLOW       (cms)=       0.04         0.05          0.091 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.33          1.33
              RUNOFF VOLUME    (mm)=      75.91        42.49         52.67
              TOTAL RAINFALL   (mm)=      77.41        77.41         77.41
              RUNOFF COEFFICIENT   =       0.98         0.55          0.68

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                   THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
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| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08         0.18
     Dep. Storage     (mm)=      1.50         5.00
     Average Slope     (%)=      4.00        10.00
     Length            (m)=     41.63        30.00
     Mannings n           =     0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
              0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
              0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
              0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
              0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
              0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
              0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
              0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
              0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
              0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
              0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
              1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

              Max.Eff.Inten.(mm/hr)=     185.45       122.54
                        over (min)          5.00         5.00
              Storage Coeff.  (min)=       0.78 (ii)    4.16 (ii)
              Unit Hyd. Tpeak (min)=       5.00         5.00
              Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
              PEAK FLOW       (cms)=       0.02         0.06          0.082 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.33          1.33
              RUNOFF VOLUME    (mm)=      75.91        42.92         47.99
              TOTAL RAINFALL   (mm)=      77.41        77.41         77.41
              RUNOFF COEFFICIENT   =       0.98         0.55          0.62

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                   THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.082     1.33    47.99
     + ID2= 2 (  0201):     3.50   1.028     1.33    56.52
       ========================================================
       ID = 3 (  0026):     3.76   1.110     1.33    55.93

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

--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   1.110     1.33    55.93
     + ID2= 2 (  0027):     0.26   0.091     1.33    52.67
       ========================================================
       ID = 1 (  0026):     4.02   1.201     1.33    55.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)  |    (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0130     0.0540
                         0.0030     0.0020    |   0.1100     0.0720
                         0.0090     0.0160    |   0.4340     0.0980
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                         0.0090     0.0210    |   0.5160     0.1030
                         0.0100     0.0260    |   0.6920     0.1140
                         0.0120     0.0390    |   1.8600     0.1540

                                   AREA     QPEAK     TPEAK       R.V.
                                   (ha)     (cms)     (hrs)       (mm)
              INFLOW : ID= 2 (  0026)     4.020     1.201      1.33      55.72
              OUTFLOW: ID= 1 (  0022)     4.020     0.419      1.58      55.68
              OVERFLOW:ID= 3 (  0003)     0.000     0.000      0.00       0.00

                         TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                         CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                         PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                         PEAK   FLOW   REDUCTION [Qout/Qin](%)= 34.90
                         TIME SHIFT OF PEAK FLOW          (min)= 15.00
                         MAXIMUM  STORAGE   USED       (ha.m.)=  0.0973

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          --------------------------
          | Junction Command(0024) |
          --------------------------

                                   AREA     QPEAK    TPEAK     R.V.
                                   (ha)     (cms)    (hrs)     (mm)
            INFLOW : ID= 3(  0022)    0.00     0.00     0.00     0.00
            OUTFLOW: ID= 2(  0024)    0.00     0.00     0.00     0.00

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--------------------
| CALIB              |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91         1.57
     Dep. Storage     (mm)=      1.00         5.00
     Average Slope     (%)=      2.00         4.00
     Length            (m)=    128.58        30.00
     Mannings n           =     0.013        0.250

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


                        ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
              0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
              0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
              0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
              0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
              0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
              0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
              0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
              0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
              0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
              0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
              1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

              Max.Eff.Inten.(mm/hr)=     185.45       181.43
                        over (min)          5.00        10.00
              Storage Coeff.  (min)=       1.88 (ii)    5.69 (ii)
              Unit Hyd. Tpeak (min)=       5.00        10.00
              Unit Hyd. peak  (cms)=       0.32         0.15
                                                          *TOTALS*
              PEAK FLOW       (cms)=       0.01         0.59          0.591 (iii)
              TIME TO PEAK    (hrs)=       1.33         1.42          1.42
              RUNOFF VOLUME    (mm)=      76.41        48.07         48.21
              TOTAL RAINFALL   (mm)=      77.41        77.41         77.41
              RUNOFF COEFFICIENT   =       0.99         0.62          0.62

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

               (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                     CN*  =  80.0    Ia = Dep. Storage  (Above)
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
                   THAN THE STORAGE COEFFICIENT.
             (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +   2 =   3  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
      ID1= 1 (  0202):     2.48   0.591     1.42    48.21
    + ID2= 2 (  0022):     4.02   0.419     1.58    55.68
      ==========================================
      ID = 3 (  0003):     6.50   0.833     1.42    52.83

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0003)|
|   3 +   2 =   1  |        AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
      ID1= 3 (  0003):     6.50   0.833     1.42    52.83
    + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
      ==========================================
      ID = 1 (  0003):     6.50   0.833     1.42    52.83

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.14          0.32
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=       2.00          4.00
    Length            (m)=      55.38         20.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
    0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
    0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
    0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
    0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
    0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
    0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
    0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
    0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
    0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
    0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
    1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

    Max.Eff.Inten.(mm/hr)=     185.45       106.95
              over (min)          5.00        10.00
    Storage Coeff.  (min)=       1.14 (ii)    5.85 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.34         0.15
                                                    *TOTALS*
    PEAK FLOW       (cms)=       0.05         0.07          0.113 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.42           1.33
    RUNOFF VOLUME    (mm)=      75.91        41.14          48.68
    TOTAL RAINFALL   (mm)=      77.41        77.41          77.41
    RUNOFF COEFFICIENT   =       0.98         0.53           0.63

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.57          3.65
    Dep. Storage     (mm)=       1.50          5.00
    Average Slope     (%)=      10.00         10.00
    Length            (m)=     186.55         30.00
    Mannings n           =      0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.083    6.26 | 1.083   30.45 | 2.083   12.53 |  3.08    7.23
    0.167    6.26 | 1.167   30.45 | 2.167   12.53 |  3.17    7.23
    0.250    7.01 | 1.250  185.45 | 2.250   11.04 |  3.25    6.80
    0.333    7.01 | 1.333  185.45 | 2.333   11.04 |  3.33    6.80
    0.417    8.02 | 1.417   37.49 | 2.417    9.92 |  3.42    6.43
    0.500    8.02 | 1.500   37.49 | 2.500    9.92 |  3.50    6.43
    0.583    9.47 | 1.583   23.45 | 2.583    9.04 |  3.58    6.10
    0.667    9.47 | 1.667   23.45 | 2.667    9.04 |  3.67    6.10
    0.750   11.77 | 1.750   17.80 | 2.750    8.32 |  3.75    5.82
    0.833   11.77 | 1.833   17.80 | 2.833    8.32 |  3.83    5.82
    0.917   16.19 | 1.917   14.61 | 2.917    7.73 |  3.92    5.56
    1.000   16.19 | 2.000   14.61 | 3.000    7.73 |  4.00    5.56

    Max.Eff.Inten.(mm/hr)=     185.45       108.19
              over (min)          5.00        10.00
    Storage Coeff.  (min)=       1.45 (ii)    6.11 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.33         0.15
                                                    *TOTALS*
    PEAK FLOW       (cms)=       0.56         0.81          1.258 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.42           1.33
    RUNOFF VOLUME    (mm)=      75.91        41.29          48.46
    TOTAL RAINFALL   (mm)=      77.41        77.41          77.41
    RUNOFF COEFFICIENT   =       0.98         0.53           0.63

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I      SS   U   U  AAAAA  L
         V V    I       SS  U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\10e3ea0a-16
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\10e3ea0a-16

DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________

----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : Hurricane Hazel (Regional)    **
  ************************************************

--------------------
|    READ STORM    |    Filename: C:\Users\cmartin\AppD
|                  |              ata\Local\Temp\
|                  |              8c6e7f0c-3162-4f43-9add-4f8818604794\eeae85f6
| Ptotal=212.00 mm |    Comments: Hazel
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.00    6.00 |  3.00   13.00 |'  6.00   23.00 |  9.00   53.00
               1.00    4.00 |  4.00   17.00 |'  7.00   13.00 | 10.00   38.00
               2.00    6.00 |  5.00   13.00 |'  8.00   13.00 | 11.00   13.00

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     2.03         1.47
     Dep. Storage     (mm)=     1.70         5.00
     Average Slope     (%)=     4.00         4.00
     Length            (m)=   152.75        20.00
     Mannings n            =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00        97.88
          over (min)            5.00        10.00
    Storage Coeff.  (min)=      2.80 (ii)    6.62 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.28         0.14
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.10         0.40       0.501 (iii)
    TIME TO PEAK    (hrs)=      9.75        10.00       10.00
    RUNOFF VOLUME    (mm)=    210.30       180.65      186.55
    TOTAL RAINFALL   (mm)=    212.00       212.00      212.00
    RUNOFF COEFFICIENT   =      0.99         0.85        0.88

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0027)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  42.00   Dir. Conn.(%)=  30.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.11         0.15
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     6.00         6.00
     Length            (m)=    41.63        20.00
     Mannings n            =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00        59.28
          over (min)            5.00        10.00
    Storage Coeff.  (min)=      1.14 (ii)    5.27 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.34         0.16
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.01         0.02       0.036 (iii)
    TIME TO PEAK    (hrs)=      9.33        10.00       10.00
    RUNOFF VOLUME    (mm)=    210.50       165.60      179.29
    TOTAL RAINFALL   (mm)=    212.00       212.00      212.00
    RUNOFF COEFFICIENT   =      0.99         0.78        0.85

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=     0.08         0.18
     Dep. Storage     (mm)=     1.50         5.00
     Average Slope     (%)=     4.00        10.00
     Length            (m)=    41.63        30.00
     Mannings n            =    0.013        0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
               0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
               0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
               0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
               0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
               0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
               0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
               0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
               1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
               1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
               1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
               1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
               1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
               1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
               1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
               1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
               1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
               1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
               1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
               1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

    Max.Eff.Inten.(mm/hr)=      53.00        60.61
          over (min)            5.00        10.00
    Storage Coeff.  (min)=      1.28 (ii)    5.76 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.33         0.15
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.01         0.03       0.036 (iii)
    TIME TO PEAK    (hrs)=      9.33        10.00       10.00
    RUNOFF VOLUME    (mm)=    210.50       166.35      173.14
    TOTAL RAINFALL   (mm)=    212.00       212.00      212.00
    RUNOFF COEFFICIENT   =      0.99         0.78        0.82

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0017):      0.26    0.036    10.00   173.14
     + ID2= 2 (  0201):      3.50    0.501    10.00   186.55
       ==========================================================
       ID = 3 (  0026):      3.76    0.538    10.00   185.62

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0026)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0026):      3.76    0.538    10.00   185.62
     + ID2= 2 (  0027):      0.26    0.036    10.00   179.29
       ==========================================================
       ID = 1 (  0026):      4.02    0.574    10.00   185.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW     STORAGE     |  OUTFLOW     STORAGE
--------------------      (cms)     (ha.m.)     |   (cms)     (ha.m.)
                          0.0000     0.0000     |   0.0130     0.0540
                          0.0030     0.0020     |   0.1100     0.0720
                          0.0090     0.0160     |   0.4340     0.0980
                          0.0090     0.0210     |   0.5160     0.1030
                          0.0100     0.0260     |   0.6920     0.1140
                          0.0120     0.0390     |   1.8600     0.1540

                        AREA     QPEAK     TPEAK      R.V.
                        (ha)     (cms)     (hrs)      (mm)
  INFLOW : ID= 2 (  0026)      4.020     0.574      10.00     185.21
  OUTFLOW: ID= 1 (  0022)      4.020     0.567      10.00     185.17
  OVERFLOW:ID= 3 (  0003)      0.000     0.000       0.00       0.00

          TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
          CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
          PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

          PEAK   FLOW   REDUCTION [Qout/Qin](%)= 98.77
          TIME SHIFT OF PEAK FLOW          (min)=  0.00
          MAXIMUM  STORAGE   USED       (ha.m.)=  0.1149
```

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  ------------------------
  | Junction Command(0024) |
  ------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0022)    0.00      0.00    0.00     0.00
  OUTFLOW: ID= 2(  0024)    0.00      0.00    0.00     0.00

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.91          1.57
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       2.00          4.00
     Length            (m)=     128.58         30.00
     Mannings n             =     0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
              0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
              0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
              0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
              0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
              0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
              0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
              0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
              0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
              0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
              0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
              1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
              1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
              1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
              1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
              1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
              1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
              1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
              1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
              1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
              1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
              1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
              1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
              2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
              2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
              2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
              2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
              2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
              2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
              2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
              2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
              2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
              2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
              2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
              2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
              3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

     Max.Eff.Inten.(mm/hr)=      53.00         79.69
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       3.11 (ii)    8.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.27          0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.35          0.348 (iii)
     TIME TO PEAK    (hrs)=       9.58         10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00        174.97        175.15
     TOTAL RAINFALL   (mm)=     212.00        212.00        212.00
     RUNOFF COEFFICIENT   =       1.00          0.83          0.83

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57          3.65
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=      10.00         10.00
     Length            (m)=     186.55         30.00
     Mannings n             =     0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
              0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
              0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
              0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
              0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
              0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
              0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
              0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
              0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
              0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
              0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
              1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
              1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
              1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
              1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
              1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
              1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
              1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
              1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
              1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
              1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
              1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
              1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
              2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
              2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
              2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
              2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
              2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
              2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
              2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
              2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
              2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
              2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
              2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
              2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
              3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

     Max.Eff.Inten.(mm/hr)=      53.00         55.69
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.40 (ii)    7.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.30          0.14
```

```
             CN*  =  80.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

------------------
| ADD HYD  (  0003)|
|  1 +  2 =  3     |          AREA    QPEAK    TPEAK     R.V.
------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0202):     2.48    0.348    10.00   175.15
      + ID2= 2 (  0022):     4.02    0.567    10.00   185.17
        ==========================================
        ID = 3 (  0003):     6.50    0.915    10.00   181.35

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

------------------
| ADD HYD  (  0003)|
|  3 +  2 =  1     |          AREA    QPEAK    TPEAK     R.V.
------------------           (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
        ID1= 3 (  0003):     6.50    0.915    10.00   181.35
      + ID2= 2 (  0024):     0.00    0.000     0.00     0.00
        ==========================================
        ID = 1 (  0003):     6.50    0.915    10.00   181.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.14          0.32
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          4.00
     Length            (m)=      55.38         20.00
     Mannings n             =     0.013         0.250

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


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
              0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
              0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
              0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
              0.417    6.00 | 3.417   13.00 | 6.417   23.00 |  9.42   53.00
              0.500    6.00 | 3.500   13.00 | 6.500   23.00 |  9.50   53.00
              0.583    6.00 | 3.583   13.00 | 6.583   23.00 |  9.58   53.00
              0.667    6.00 | 3.667   13.00 | 6.667   23.00 |  9.67   53.00
              0.750    6.00 | 3.750   13.00 | 6.750   23.00 |  9.75   53.00
              0.833    6.00 | 3.833   13.00 | 6.833   23.00 |  9.83   53.00
              0.917    6.00 | 3.917   13.00 | 6.917   23.00 |  9.92   53.00
              1.000    6.00 | 4.000   13.00 | 7.000   23.00 | 10.00   53.00
              1.083    4.00 | 4.083   17.00 | 7.083   13.00 | 10.08   38.00
              1.167    4.00 | 4.167   17.00 | 7.167   13.00 | 10.17   38.00
              1.250    4.00 | 4.250   17.00 | 7.250   13.00 | 10.25   38.00
              1.333    4.00 | 4.333   17.00 | 7.333   13.00 | 10.33   38.00
              1.417    4.00 | 4.417   17.00 | 7.417   13.00 | 10.42   38.00
              1.500    4.00 | 4.500   17.00 | 7.500   13.00 | 10.50   38.00
              1.583    4.00 | 4.583   17.00 | 7.583   13.00 | 10.58   38.00
              1.667    4.00 | 4.667   17.00 | 7.667   13.00 | 10.67   38.00
              1.750    4.00 | 4.750   17.00 | 7.750   13.00 | 10.75   38.00
              1.833    4.00 | 4.833   17.00 | 7.833   13.00 | 10.83   38.00
              1.917    4.00 | 4.917   17.00 | 7.917   13.00 | 10.92   38.00
              2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
              2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
              2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
              2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
              2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
              2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
              2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
              2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
              2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
              2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
              2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
```

```
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.16          0.56          0.722 (iii)
     TIME TO PEAK    (hrs)=       9.67         10.00         10.00
     RUNOFF VOLUME    (mm)=     210.50        163.45        173.19
     TOTAL RAINFALL   (mm)=     212.00        212.00        212.00
     RUNOFF COEFFICIENT   =       0.99          0.77          0.82

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
================================================================================
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```
 V    V   I    SSSSS  U   U    A    L                (v 6.2.2015)
 V    V   I    SS     U   U   A A   L
  V  V    I      SS   U   U  AAAAA  L
  V  V    I       SS  U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\99c626c3-7e
  Summary filename: C:\Users\cmartin\AppData\Local\Civica\VH5\db2b9d01-d7f6-4e0b-8e9d-a57b449df036\99c626c3-7e


DATE: 11-08-2024                          TIME: 09:08:43

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 25mm 4hr 10min Chicago        **
  ************************************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 475.610
| Ptotal= 33.31 mm |                          B=   0.000
--------------------                          C=   0.738
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    2.45 |  1.00   12.69 |  2.00    5.04 |  3.00    2.85
                0.17    2.76 |  1.17   86.95 |  2.17    4.42 |  3.17    2.67
                0.33    3.17 |  1.33   15.73 |  2.33    3.95 |  3.33    2.52
                0.50    3.77 |  1.50    9.66 |  2.50    3.59 |  3.50    2.39
                0.67    4.72 |  1.67    7.25 |  2.67    3.30 |  3.67    2.27
                0.83    6.58 |  1.83    5.91 |  2.83    3.05 |  3.83    2.17


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--------------------
| MODIFY STORM     |    MODIFYING PARAMETERS
--------------------    Time shift  (min)    =  0.00

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   3.50
|ID= 1 DT= 5.0 min |   Total Imp(%)=  58.00   Dir. Conn.(%)=  19.90
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      2.03          1.47
     Dep. Storage     (mm)=      1.70          5.00
     Average Slope     (%)=      4.00          4.00
     Length            (m)=    152.75         20.00
     Mannings n            =     0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         14.80
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.18 (ii)    9.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.33          0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.01          0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42          1.33
     RUNOFF VOLUME    (mm)=      23.50          6.00          8.67
     TOTAL RAINFALL   (mm)=      25.00         25.00         25.00
     RUNOFF COEFFICIENT   =       0.94          0.24          0.35

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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

--------------------
| ADD HYD  (  0026)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.011     1.33      8.67
     + ID2= 2 (  0201):     3.50   0.207     1.33     11.84
       ==========================================================
       ID = 3 (  0026):     3.76   0.218     1.33     11.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0026)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.218     1.33     11.62
     + ID2= 2 (  0027):     0.26   0.017     1.33     11.23
       ==========================================================
       ID = 1 (  0026):     4.02   0.235     1.33     11.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |  0.0130     0.0540
                         0.0030     0.0020    |  0.1100     0.0720
                         0.0090     0.0160    |  0.4340     0.0980
                         0.0090     0.0210    |  0.5160     0.1030
                         0.0100     0.0260    |  0.6920     0.1140
                         0.0120     0.0390    |  1.8600     0.1540

                              AREA     QPEAK     TPEAK      R.V.
                               (ha)     (cms)     (hrs)      (mm)
     INFLOW : ID= 2 (  0026)     4.020     0.235      1.33      11.59
     OUTFLOW: ID= 1 (  0022)     4.020     0.011      4.00      11.56
     OVERFLOW:ID= 3 (  0003)     0.000     0.000      0.00       0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.86
                    TIME SHIFT OF PEAK FLOW          (min)=160.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0352

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  | Junction Command(0024) |
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                              AREA     QPEAK    TPEAK     R.V.
                               (ha)     (cms)    (hrs)     (mm)
     INFLOW : ID= 3(  0022)     0.00     0.00     0.00      0.00
     OUTFLOW: ID= 2(  0024)     0.00     0.00     0.00      0.00

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91          1.57
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      2.00          4.00
     Length            (m)=    128.58         30.00
     Mannings n            =     0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         26.34
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.86 (ii)   11.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.28          0.09
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.06          0.064 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.50          1.50
     RUNOFF VOLUME    (mm)=      24.00          7.65          7.73

     Mannings n            =     0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         14.09
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.05 (ii)    8.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.01          0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42          1.33
     RUNOFF VOLUME    (mm)=      23.50          5.88         11.23

     TOTAL RAINFALL   (mm)=      25.00         25.00         25.00
     RUNOFF COEFFICIENT   =       0.94          0.24          0.45

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0017)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.80   Dir. Conn.(%)=  15.40
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.08          0.18
     Dep. Storage     (mm)=      1.50          5.00
     Average Slope     (%)=      4.00         10.00
     Length            (m)=     41.63         30.00
     Mannings n            =     0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         14.80
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.18 (ii)    9.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.33          0.12
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.01          0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42          1.33
     RUNOFF VOLUME    (mm)=      23.50          6.00          8.67
     TOTAL RAINFALL   (mm)=      25.00         25.00         25.00
     RUNOFF COEFFICIENT   =       0.94          0.24          0.35

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0026)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 1 (  0017):     0.26   0.011     1.33      8.67
     + ID2= 2 (  0201):     3.50   0.207     1.33     11.84
       ==========================================================
       ID = 3 (  0026):     3.76   0.218     1.33     11.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0026)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)     (cms)    (hrs)     (mm)
       ID1= 3 (  0026):     3.76   0.218     1.33     11.62
     + ID2= 2 (  0027):     0.26   0.017     1.33     11.23
       ==========================================================
       ID = 1 (  0026):     4.02   0.235     1.33     11.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0022)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |  0.0130     0.0540
                         0.0030     0.0020    |  0.1100     0.0720
                         0.0090     0.0160    |  0.4340     0.0980
                         0.0090     0.0210    |  0.5160     0.1030
                         0.0100     0.0260    |  0.6920     0.1140
                         0.0120     0.0390    |  1.8600     0.1540

                              AREA     QPEAK     TPEAK      R.V.
                               (ha)     (cms)     (hrs)      (mm)
     INFLOW : ID= 2 (  0026)     4.020     0.235      1.33      11.59
     OUTFLOW: ID= 1 (  0022)     4.020     0.011      4.00      11.56
     OVERFLOW:ID= 3 (  0003)     0.000     0.000      0.00       0.00

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.86
                    TIME SHIFT OF PEAK FLOW          (min)=160.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0352

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  --------------------------
  | Junction Command(0024) |
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                              AREA     QPEAK    TPEAK     R.V.
                               (ha)     (cms)    (hrs)     (mm)
     INFLOW : ID= 3(  0022)     0.00     0.00     0.00      0.00
     OUTFLOW: ID= 2(  0024)     0.00     0.00     0.00      0.00

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   2.48
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.70   Dir. Conn.(%)=   0.50
--------------------
                        IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.91          1.57
     Dep. Storage     (mm)=      1.00          5.00
     Average Slope     (%)=      2.00          4.00
     Length            (m)=    128.58         30.00
     Mannings n            =     0.013         0.250

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

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
               0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
               0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
               0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
               0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
               0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
               0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
               0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
               0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
               0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
               0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
               1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         26.34
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.86 (ii)   11.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.28          0.09
                                                    *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.06          0.064 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.50          1.50
     RUNOFF VOLUME    (mm)=      24.00          7.65          7.73
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     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.31           0.31

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0003)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0202):     2.48   0.064     1.50     7.73
     + ID2= 2 (  0022):     4.02   0.011     4.00    11.56
       ==================================================
       ID = 3 (  0003):     6.50   0.073     1.50    10.10

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

--------------------
| ADD HYD  (  0003)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0024 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
       ID1= 3 (  0003):     6.50   0.073     1.50    10.10
     + ID2= 2 (  0024):     0.00   0.000     0.00     0.00
       ==================================================
       ID = 1 (  0003):     6.50   0.073     1.50    10.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.40   Dir. Conn.(%)=  21.70
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.14          0.32
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=       2.00          4.00
     Length            (m)=      55.38         20.00
     Mannings n            =      0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
         0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
         0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
         0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
         0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
         0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
         0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
         0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
         0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
         0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
         0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
         1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         12.01
               over (min)        5.00         15.00
     Storage Coeff.  (min)=      1.73 (ii)    10.56 (ii)
     Unit Hyd. Tpeak (min)=      5.00         15.00
     Unit Hyd. peak  (cms)=      0.32          0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02          0.01          0.021 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.50          1.33
     RUNOFF VOLUME    (mm)=     23.50          5.49          9.38
     TOTAL RAINFALL   (mm)=     25.00         25.00         25.00
     RUNOFF COEFFICIENT   =      0.94          0.22          0.38

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0028)|   Area    (ha)=   5.22
|ID= 1 DT= 5.0 min |   Total Imp(%)=  30.00   Dir. Conn.(%)=  20.70
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.57          3.65
     Dep. Storage     (mm)=       1.50          5.00
     Average Slope     (%)=      10.00         10.00
     Length            (m)=     186.55         30.00
     Mannings n            =      0.013         0.250

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

                        ---- TRANSFORMED HYETOGRAPH ----
          TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
           hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
         0.083    1.84 | 1.083    9.52 | 2.083    3.78 |  3.08    2.14
         0.167    1.84 | 1.167    9.52 | 2.167    3.78 |  3.17    2.14
         0.250    2.07 | 1.250   65.25 | 2.250    3.32 |  3.25    2.01
         0.333    2.07 | 1.333   65.25 | 2.333    3.32 |  3.33    2.01
         0.417    2.38 | 1.417   11.81 | 2.417    2.97 |  3.42    1.89
         0.500    2.38 | 1.500   11.81 | 2.500    2.97 |  3.50    1.89
         0.583    2.83 | 1.583    7.25 | 2.583    2.69 |  3.58    1.79
         0.667    2.83 | 1.667    7.25 | 2.667    2.69 |  3.67    1.79
         0.750    3.55 | 1.750    5.44 | 2.750    2.47 |  3.75    1.70
         0.833    3.55 | 1.833    5.44 | 2.833    2.47 |  3.83    1.70
         0.917    4.94 | 1.917    4.44 | 2.917    2.29 |  3.92    1.63
         1.000    4.94 | 2.000    4.44 | 3.000    2.29 |  4.00    1.63

     Max.Eff.Inten.(mm/hr)=      65.25         12.23
               over (min)        5.00         15.00
     Storage Coeff.  (min)=      2.21 (ii)    10.70 (ii)
     Unit Hyd. Tpeak (min)=      5.00         15.00
     Unit Hyd. peak  (cms)=      0.30          0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.19          0.07          0.223 (iii)
     TIME TO PEAK    (hrs)=      1.33          1.50          1.33
     RUNOFF VOLUME    (mm)=     23.50          5.53          9.25
     TOTAL RAINFALL   (mm)=     25.00         25.00         25.00
     RUNOFF COEFFICIENT   =      0.94          0.22          0.37

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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APPENDIX F

Water Treatment Train Calculations

Project: 11 Main Street
Project No.: 2366-6537
Prepared By: BP
Date: 20234.03.08

WATER QUALITY CALCULATIONS (TREATMENT TRAIN)			
Catchment ID	LID	TSS removal	Combined TSS Removal
1	EF08 SYSTEM	50.0	80.0
	Dry Pond	60.0	

Note: The TSS removal values were calculated using the New Jersey Treatment train equation. Although the EF08 system is designed to provide higher treatment rates than those shown above the rates shown above are representative of the long term treatment provided by these systems.

Treatment Train Approach:

$$R = A + B - [(A \times B) / 100] \qquad \text{(Equation 4-1)}$$

Where:

R = Total TSS Removal Rate

A = TSS Removal Rate of the First or Upstream BMP

B = TSS Removal Rate of the Second or Downstream BMP

*Per 'New Jersey Stormwater Best Management Practices Manual' Equation 4-1 (February 2004)

TSS Removal:

EF08 (Rate 1) = 50 %

Dry Pond (Rate 2) = 60 %

Removal at end of treatment train:

R_3 = Rate 1 + Rate 2 - [(Rate 1 x Rate 2)/100]

R_{total} = 80.0 %

*It should be noted that following treatment from the OGS and Dry Pond the runoff will outlet through a level spreader and then travel 30 meters overland which will provide additional TSS removal.

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/15/2024

Province:	Ontario
City:	Puslinch
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	11 Main Street

Drainage Area (ha):	4.02
% Imperviousness:	55.20

Runoff Coefficient 'c': 0.63

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	50.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	96.14
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	439.70
Influent TSS Concentration (mg/L):	
Estimated Average Annual Sediment Volume (L/yr):	1262

Project Name:	11 Main Street
Project Number:	66114
Designer Name:	Cole Martin
Designer Company:	C.F. Crozier & Associates Inc.
Designer Email:	cmartin@cfcrozier.ca
Designer Phone:	289-204-8239
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	33
EFO6	43
EFO8	50
EFO10	55
EFO12	58

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 50

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

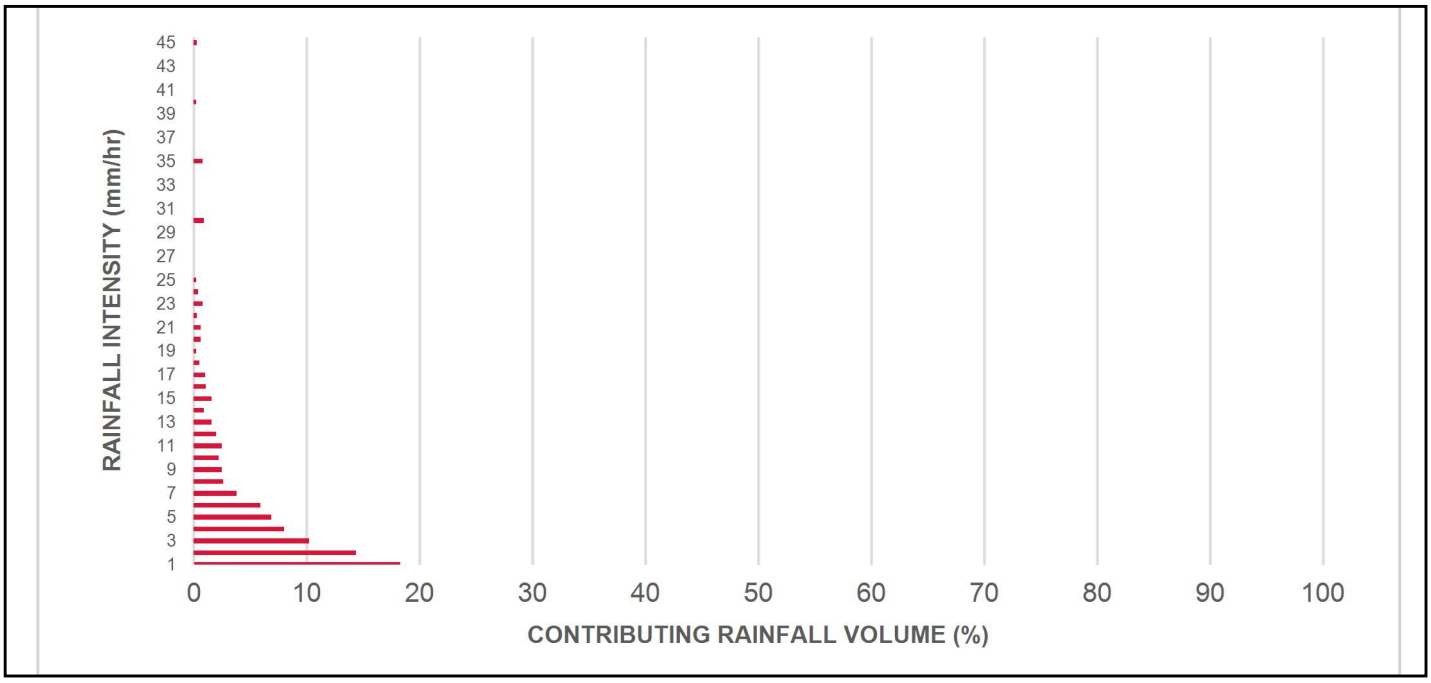
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

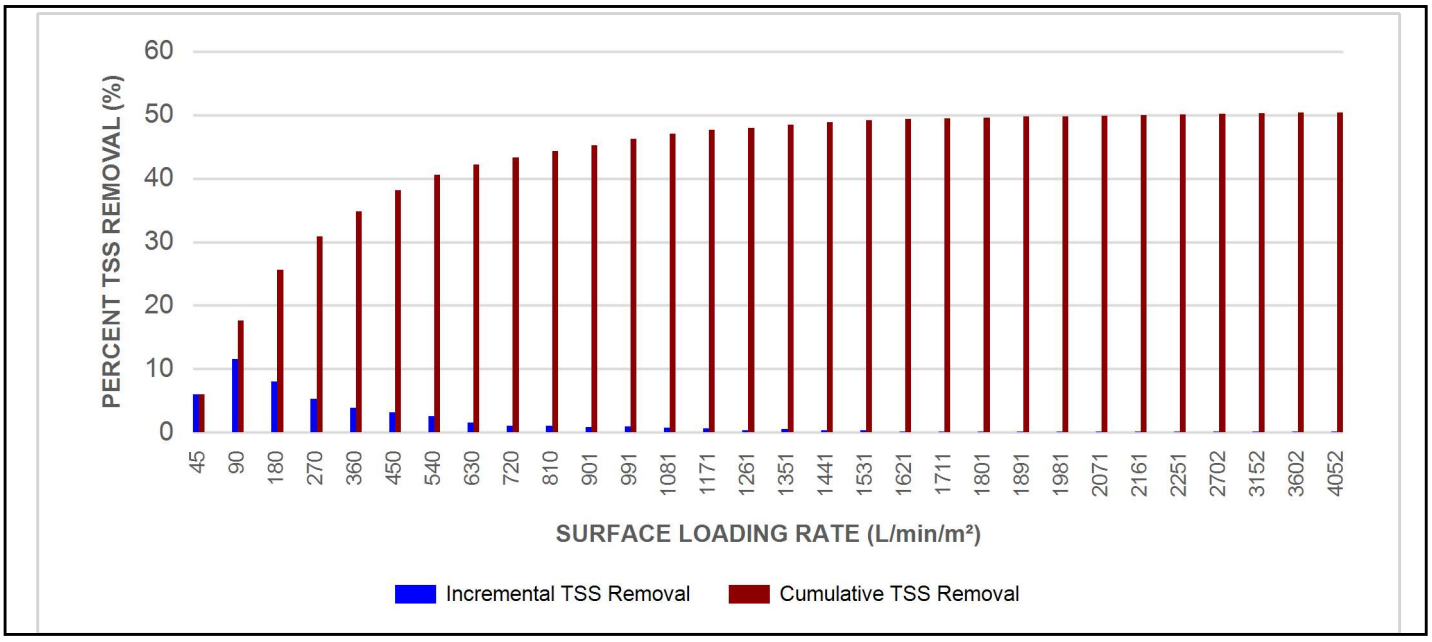
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	3.53	212.0	45.0	70	6.0	6.0
1.00	18.3	26.8	7.05	423.0	90.0	63	11.6	17.6
2.00	14.4	41.3	14.11	846.0	180.0	56	8.0	25.6
3.00	10.2	51.5	21.16	1270.0	270.0	52	5.3	30.9
4.00	8.0	59.5	28.22	1693.0	360.0	49	3.9	34.8
5.00	6.9	66.4	35.27	2116.0	450.0	47	3.2	38.1
6.00	5.9	72.3	42.32	2539.0	540.0	44	2.6	40.6
7.00	3.8	76.1	49.38	2963.0	630.0	42	1.6	42.2
8.00	2.6	78.7	56.43	3386.0	720.0	41	1.1	43.3
9.00	2.5	81.1	63.49	3809.0	810.0	41	1.0	44.3
10.00	2.2	83.3	70.54	4232.0	901.0	41	0.9	45.2
11.00	2.5	85.8	77.59	4656.0	991.0	40	1.0	46.2
12.00	2.0	87.8	84.65	5079.0	1081.0	39	0.8	47.0
13.00	1.6	89.4	91.70	5502.0	1171.0	37	0.6	47.6
14.00	0.9	90.4	98.76	5925.0	1261.0	36	0.3	47.9
15.00	1.6	91.9	105.81	6349.0	1351.0	35	0.5	48.4
16.00	1.1	93.0	112.86	6772.0	1441.0	33	0.4	48.8
17.00	1.0	94.0	119.92	7195.0	1531.0	31	0.3	49.1
18.00	0.5	94.6	126.97	7618.0	1621.0	29	0.2	49.3
19.00	0.2	94.8	134.03	8042.0	1711.0	28	0.1	49.4
20.00	0.6	95.4	141.08	8465.0	1801.0	26	0.2	49.5
21.00	0.6	96.1	148.13	8888.0	1891.0	25	0.2	49.7
22.00	0.3	96.4	155.19	9311.0	1981.0	24	0.1	49.7
23.00	0.8	97.2	162.24	9735.0	2071.0	23	0.2	49.9
24.00	0.4	97.6	169.30	10158.0	2161.0	22	0.1	50.0
25.00	0.2	97.8	176.35	10581.0	2251.0	21	0.0	50.1
30.00	0.9	98.7	211.62	12697.0	2702.0	18	0.2	50.2
35.00	0.8	99.5	246.89	14813.0	3152.0	15	0.1	50.3
40.00	0.2	99.7	282.16	16930.0	3602.0	13	0.0	50.4
45.00	0.3	100.0	317.43	19046.0	4052.0	12	0.0	50.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**50 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

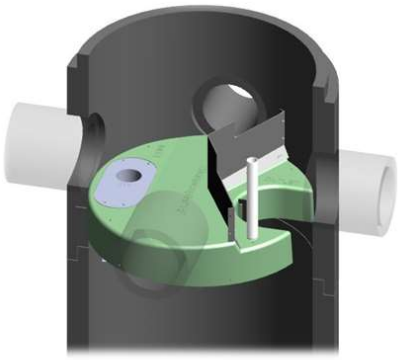
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

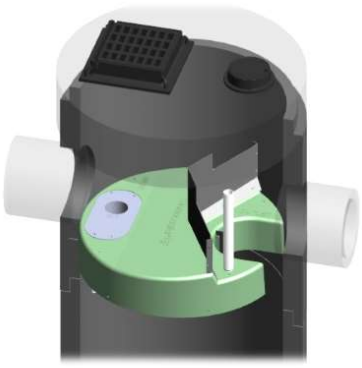
DESIGN FLEXIBILITY

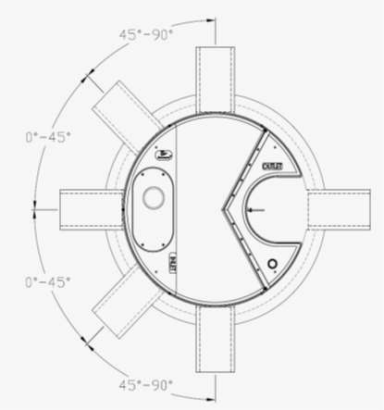
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

APPENDIX G

Conservation Halton Email Excerpts

Daniel Caberlin

From: Ola Panczyk <opanczyk@hrca.on.ca>
Sent: August 1, 2023 2:57 PM
To: Brendan Walton; Janet Engel
Cc: Kayly Robbins; Brett Pond
Subject: RE: [EXTERNAL]11 Main Street, Morriston | Floodplain Study Follow-up (CFCA 2366-6537)

Follow Up Flag: Follow up
Flag Status: Completed

Categories: Filed to Sharepoint

Hi Brendan,

Thank you for your patience while we reviewed the overlay in relation to CH's hydraulic model.

For this specific site, based on the quality of the existing model and the location of the proposed development, CH has no objection to the use of CH's HEC-RAS model for the purposes of delineating the flood hazard limit. Please ensure a topographic survey is included in the future submission, which delineates the flood hazard based on the elevations from the HEC-RAS model.

Please note that any changes to the location of the proposed development may require updated flood hazard modelling.

If you have any questions, please let me know.

Thank you,
Ola

Ola Panczyk
Environmental Planner

2596 Britannia Road West, Burlington, ON L7P 0G3
905.336.1158 ext.2279 | opanczyk@hrca.on.ca
conservationhalton.ca

From: Brendan Walton <bwalton@cfcrozier.ca>
Sent: Tuesday, July 18, 2023 1:31 PM
To: Ola Panczyk <opanczyk@hrca.on.ca>; Janet Engel <jengel@hrca.on.ca>
Cc: Kayly Robbins <krobbins@westonconsulting.com>; Brett Pond <bpond@cfcrozier.ca>
Subject: RE: [EXTERNAL]11 Main Street, Morriston | Floodplain Study Follow-up (CFCA 2366-6537)

Hi Ola,

Thank you for confirming. We look forward to CH's feedback next week.

Kind regards,

Brendan

Brendan Walton, P.Eng.
Project Manager, Land Development
Office: 548.708.0022
Collingwood | Milton | Toronto | Bradford | Guelph

From: Ola Panczyk <opanczyk@hrca.on.ca>
Sent: Monday, July 17, 2023 10:37 AM
To: Brendan Walton <bwalton@cfcrozier.ca>; Janet Engel <jengel@hrca.on.ca>
Cc: Kayly Robbins <krobbins@westonconsulting.com>; Brett Pond <bpond@cfcrozier.ca>
Subject: RE: [EXTERNAL]11 Main Street, Morriston | Floodplain Study Follow-up (CFCA 2366-6537)

Hi Brendan,

Confirming receipt of your email. Thanks for providing the overlay. We will take a look and discuss internally. We will aim to get back to you next week.

Kind regards,
Ola

Ola Panczyk
Environmental Planner

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905.336.1158 ext.2279 | opanczyk@hrca.on.ca
conservationhalton.ca

RECOGNIZED AS ONE OF HAMILTON-NIAGARA'S TOP EMPLOYERS 2023
Find out more about our recent award **here**!

From: Brendan Walton <bwalton@cfcrozier.ca>
Sent: Wednesday, July 12, 2023 1:13 PM
To: Ola Panczyk <opanczyk@hrca.on.ca>; Janet Engel <jengel@hrca.on.ca>
Cc: Kayly Robbins <krobbins@westonconsulting.com>; Brett Pond <bpond@cfcrozier.ca>
Subject: [EXTERNAL]11 Main Street, Morriston | Floodplain Study Follow-up (CFCA 2366-6537)

Good afternoon Ola, Janet,

Thank you again for meeting with us last week regarding this project. It was nice catching up with each of you!

As requested, please see attached overlay figure that outlines the Regional floodplain and 15.0 m set-back near Highway 6 on a satellite image. As discussed on the call, we believe a detailed hydrologic/hydraulic floodplain assessment for the proposed development is not required considering the floodplain (dark blue solid line) and associated set-back (red solid line) are sufficiently far enough away from the proposed dwellings and building envelopes (black dashed lines). There are also environmental features (i.e., wetland, woodlot) located outside of the floodplain that further increase the separation distance from the Regional floodplain.

Upon your review, please let us know if you have any questions or would like to discuss. We are happy to have a follow up discussion too if helpful.

Kind regards,

Brendan

Brendan Walton, P.Eng.
Project Manager, Land Development
Office: 548.708.0022
Collingwood | Milton | Toronto | Bradford | Guelph

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CROZIER CONSULTING ENGINEERS

APPENDIX H

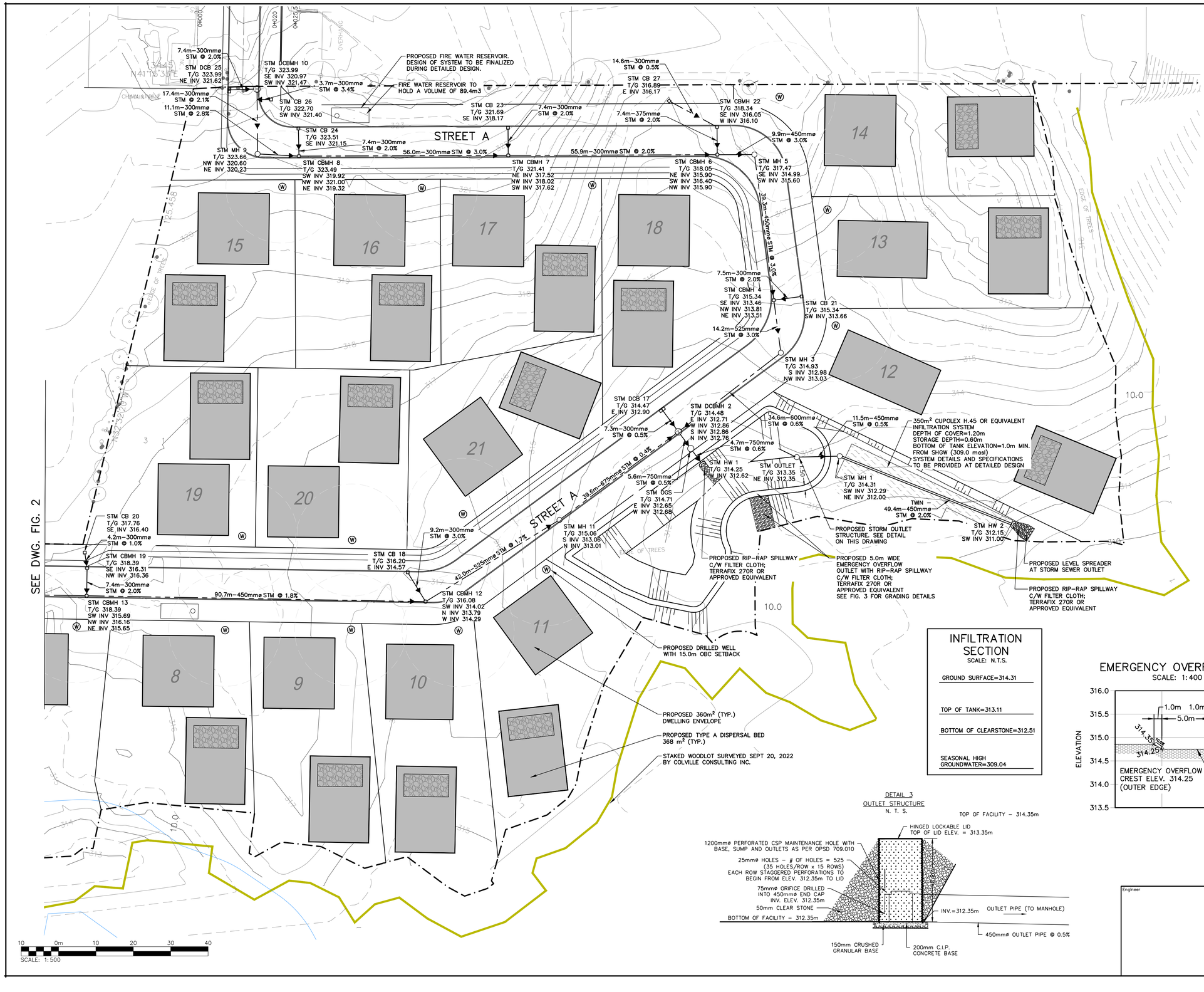
Site Photos

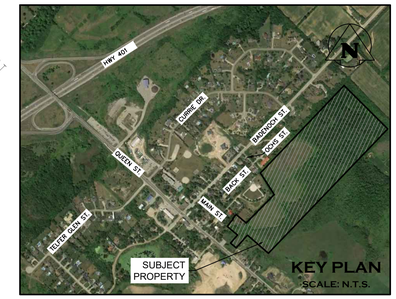

2024/11/01 - Site Photo of Earth Berm located at southern limits of Old Morriston Baseball Diamond (EX1)


2024/11/01 - Site Photo of general slope of Old Morriston Baseball Diamond (EX1) - Photo taken looking west

FIGURES

Figure 1: Preliminary Site Servicing Plan (East)
Figure 2: Preliminary Site Servicing Plan (West)
Figure 3: Preliminary Site Grading Plan (East)
Figure 4: Preliminary Site Grading Plan (West)
Figure 5: External Grading Plan (Ochs Street)
Figure 6: Pre-Development Drainage Plan
Figure 7: Post-Development Drainage Plan
Figure 8: Storm Design Sheet Drainage Plan





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- x215.00 EXISTING GRADE
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- CONCEPTUAL 360 m² BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 368 m²
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK
- PROPOSED STORM MANHOLE
- PROPOSED MANHOLE CATCHBASIN
- PROPOSED CATCHBASIN / DOUBLE CATCHBASIN

NOTES:

1. PROPOSED DRIVEWAY LOCATIONS AND APRONS TO BE CONFIRMED DURING DESIGN PROCESS.

INFILTRATION SECTION

SCALE: N.T.S.

GROUND SURFACE=314.31

TOP OF TANK=313.11

BOTTOM OF CLEARSTONE=312.51

SEASONAL HIGH GROUNDWATER=309.04

EMERGENCY OVERFLOW DETAIL

SCALE: 1:400

DETAIL 3 OUTLET STRUCTURE

N. T. S.

EMERGENCY OVERFLOW DETAIL

SCALE: 1:400

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ELEVATION NOTE:

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SURVEY NOTES:

SURVEY COMPLETED BY J.D. BARNES LTD. (2023/JAN/31)
DRAWING FILE No.: 22-14-718-00-TOPO

BEARINGS ARE UTM GRID, DERIVED FROM RTN OBSERVATIONS
UTM ZONE 17, NAD83 (GSRS) (2010.0)

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

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DRAWING No. 10779 CONCEPTS/C2_2022-03-16
DATE RECEIVED 2023/FEB/06

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

11 MAIN STREET TOWN OF PUSLINCH

Drawing

PRELIMINARY SITE SERVICING PLAN (EAST)

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366–6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 1

SEWAGE SYSTEM NOTES

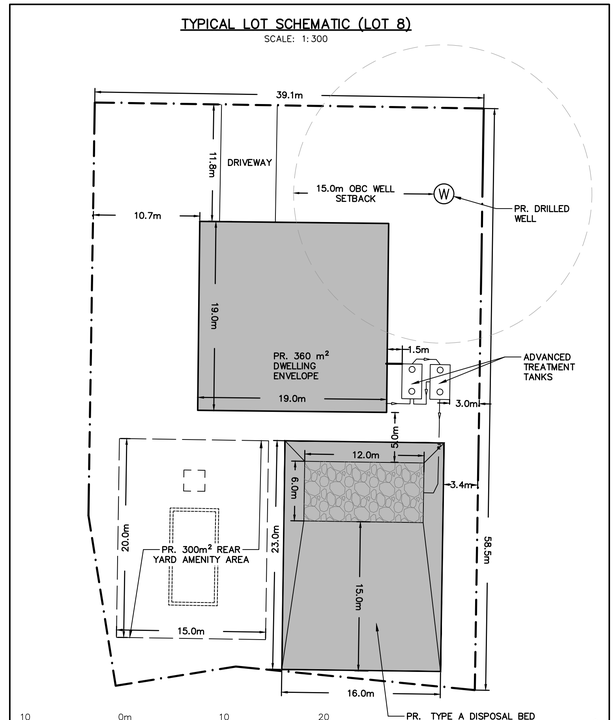
1. PROPOSED SEWAGE SYSTEM CONSTRUCTION TO BE UNDERTAKEN IN ACCORDANCE WITH THE ONTARIO BUILDING CODE, ONTARIO MINISTRY OF ENVIRONMENT, AND THE MANUFACTURER'S RECOMMENDATIONS.
2. INSTALLATION OF ALL COMPONENTS OF THE SEWAGE SYSTEM TO BE COMPLETED BY A LICENSED AND REGISTERED ONSITE SEWAGE SYSTEM INSTALLER IN THE PROVINCE OF ONTARIO.
3. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL NECESSARY INSPECTIONS WITH THE TOWN AND OTHER AUTHORITIES PERTAINING TO THE INSTALLATION OF THEIR WORK.
4. CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES AND EXISTING SEWAGE WORKS PRIOR TO CONSTRUCTION.
5. ALL COMPONENT LOCATIONS SHALL BE FIELD VERIFIED WITH THE ENGINEER PRIOR TO INSTALLATION.
6. ALL EARTHWORKS, INCLUDING PLACEMENT OF FILL ARE TO BE UNDERTAKEN WITH TRACK MOUNTED EQUIPMENT TO KEEP COMPACTION TO A MINIMUM. KEEP ALL TRAFFIC IN THE AREA OF THE PROPOSED LEACHING BED TO A MINIMUM.
7. ALL TOPSOIL AND ORGANICS TO BE REMOVED FROM LEACHING BED AREA.
8. IF HIGH GROUNDWATER CONDITIONS ARE EVIDENT AT THE TIME OF CONSTRUCTION, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY. ALL VERTICAL CLEARANCE DISTANCES AS REQUIRED BY THE ONTARIO BUILDING CODE MUST BE MAINTAINED.
9. GRAVITY SEWERS TO HAVE MINIMUM 0.6 M COVER AND SHALL BE INSULATED WHERE LESS THAN 1.0M COVER IS PROVIDED. FORCEMAIN SHALL BE INSULATED WHERE LESS THAN 1.5 M COVER IS PROVIDED. BEDDING, COVER AND BACKFILL TO BE IN ACCORDANCE WITH OPSS.
10. UNLESS OTHERWISE NOTED PE FORCEMAIN TO BE HDPE SERIES 100 OR DR 13.5 PE AND PVC FORCEMAIN TO BE SCHEDULE 40. GRAVITY SEWERS TO BE SDR-35. FORCE MAIN TO BE PROVIDED WITH TRACER WIRE, SECURED TO THE TOP OF THE PIPE WITH WATER PROOF TAPE OR ZIP TIES.
11. ALL PIPES SUBJECT TO VEHICULAR TRAFFIC SHALL BE ADEQUATELY PROTECTED.
12. ALL METAL IN TANKS OR PUMP CHAMBERS TO BE GLAVANIZED OR STAINLESS STEEL
13. ALL JOINTS BELOW THE HIGH WATER LEVEL IN PRECAST TANKS TO BE SEALED WITH MASTIC SEALANT IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS FOR WATERTIGHT SEAL. ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH CAST IN RUBBER BOOT FOR WATER TIGHT SEAL. UNLESS OTHERWISE NOTED ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH TEES.
14. ALL TANKS TO BE PROVIDED WITH PRECAST CONCRETE OR PVC ACCESS RISERS TO GRADE. HATCHES TO BE BOLTED AND GASKETED AND ACCESSIBLE AT GRADE. ALL CIRCULAR HATCHES TO BE 600 MM DIAMETER POLYLOK RISER WITH CAST IN ADAPTOR. ALL SQUARE ACCESS OPENINGS TO BE EQUIPPED WITH CONCRETE RISERS. VENTED HATCHES TO BE PROVIDED ON TANKS CONTAINING PUMPS.
15. EXISTING SOILS SHALL BE SCARIFIED AT A RIGHT ANGLE TO THE DIRECTION OF LATERAL SEWAGE FLOW IN THE LEACHING BED PRIOR TO IMPORTING FILL OR INSTALLING DISTRIBUTION PIPE STONE LAYER.
16. WHEN THE IMPORTATION OF FILL IS REQUIRED, FILL SHOULD BE END-DUMPED AND GRADED PROGRESSIVELY OVER THE PREPARED SITE AREA WITH TRACK MOUNTED EQUIPMENT.
17. ALL ELEVATIONS TO BE VERIFIED PRIOR TO BACKFILL
18. ALL FILL MATERIAL PLACED BENEATH TANKS TO BE COMPACTED TO 95%.
19. ALL DISTURBED AREAS TO BE TOPSOILED (100MM MINIMUM) AND SEEDED COMPLETE WITH FERTILIZER AND MULCH IN ACCORDANCE WITH OPSS
20. THE INSTALLING CONTRACTOR SHALL INSTALL THE SEWAGE SYSTEM USING A TRANSIT/LEVEL AND SHALL PROVIDE SAME FOR INSPECTION OF ANY COMPONENT.
21. MAXIMUM BURIAL DEPTH OF TANKS NOT TO EXCEED TO MANUFACTURERS RECOMMENDATIONS
22. CLEARANCE DISTANCES FROM PROPERTY LINES, STRUCTURES, WELLS, AND SURFACE WATER WILL ADHERE TO THE REQUIREMENTS OF OBC 8.2.1.6.A
23. A LEACHING BED SHALL NOT BE LOCATED ON AN AREA WITH A SLOPE OF GREATER THAN 4 UNITS HORIZONTALLY TO 1 UNIT VERTICALLY.
24. THE HEADER LINE, DISTRIBUTION PIPES AND LEACHING BED SHALL BE EQUIPPED WITH MEANS OF DETECTION AS REQUIRED BY OBC 8.7.2.2. (2). LIGHT COLOURED PLASTIC COATED 14 GAUGE TRACER WIRE OR EPOXY COATED, 10m REBAR LAID HORIZONTALLY AT EACH CORNER OF THE BED IS ACCEPTABLE.
25. STONE TRENCH OR LAYER TO BE COVERED WITH PERMEABLE GEOTEXTILE PRIOR TO BACKFILL.
26. STONE TO CONFORM WITH OBC 8.7.3.3.
27. ALL IMPORTED SAND FILL TO HAVE A T-TIME OF 6 TO 10 MIN/CM AND A SILT/CLAY CONTENT OF NO MORE THAN 5% AND SHALL BE VERIFIED IN WRITING BY A SOIL TESTING FIRM AND APPROVED BY THE ENGINEER PRIOR TO PLACEMENT.
28. ANAEROBIC DIGESTER AND BIOFILTER BASKET PUMPS AS DESIGNED AND SUPPLIED BY WATERLOO BIOFILTER.
29. PUMP CHAMBER TO BE VENTED AND EQUIPPED WITH AUDIBLE AND VISUAL HIGH LEVEL ALARM
30. ALL VALVES TO PROVIDE NO OBSTRUCTION TO FLOW WHEN FULLY OPENED. ALL VALVES AND COUPLINGS TO BE ACCESSIBLE AT GRADE.
31. ALL PUMP FLOATS TO BE SECURED TO A REMOVABLE PVC FLOAT TREE
32. ALL PUMP CONTROL PANELS TO BE EQUIPPED WITH SEPARATE CIRCUIT BREAKERS FOR PUMP CIRCUIT
33. NO JUNCTION BOXES IN RISERS
34. ALL BURIED ELECTRICAL WIRING TO BE IN PVC CONDUIT
35. PRIOR TO ACCEPTANCE CONTRACTOR TO PROVIDE DOCUMENTATION THAT ALL ELECTRICAL WORK HAS BEEN INPSECTED AND APPROVED BY THE ELECTRICAL AUTHORITY HAVING JURISDICTION

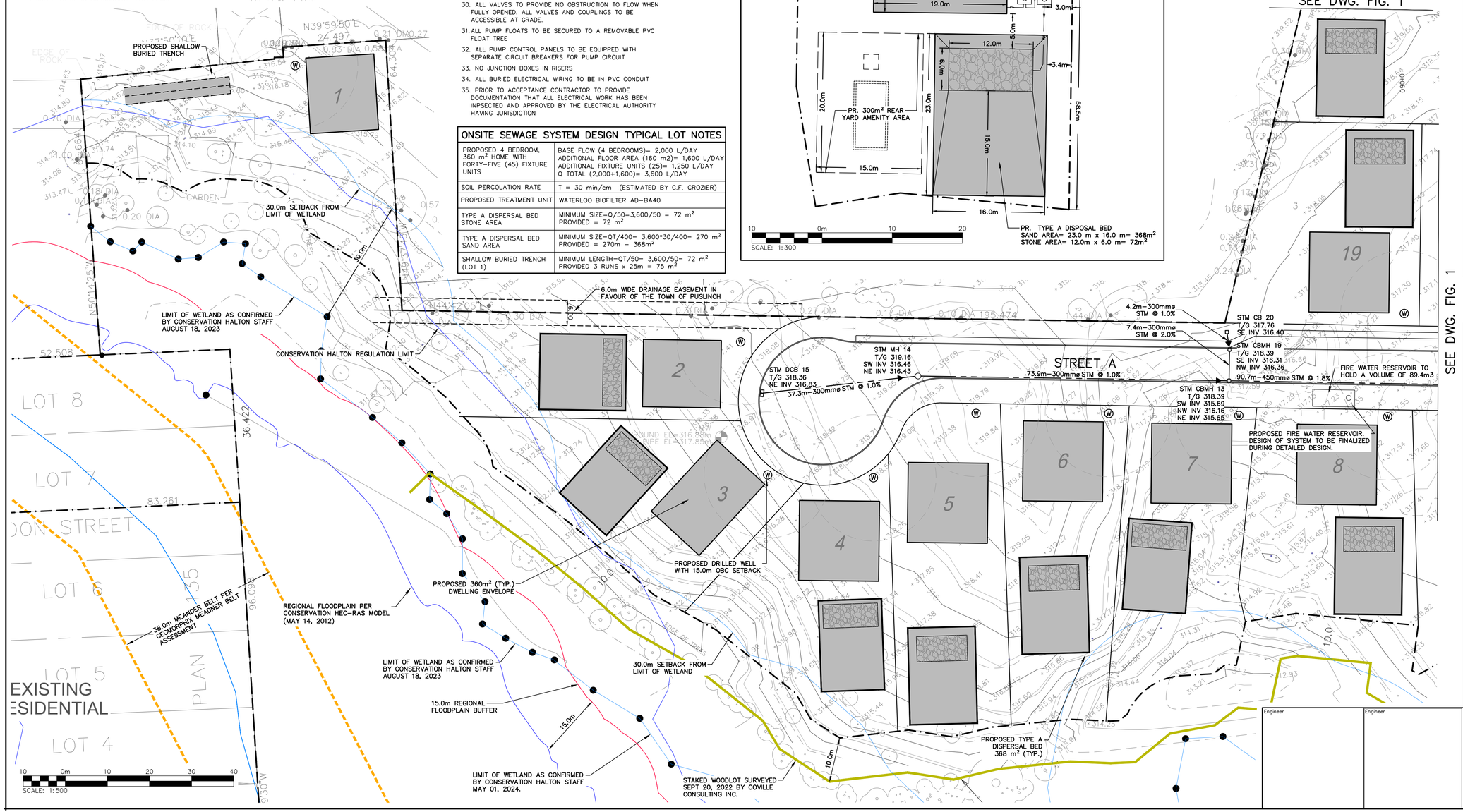
ONSITE SEWAGE SYSTEM DESIGN TYPICAL LOT NOTES

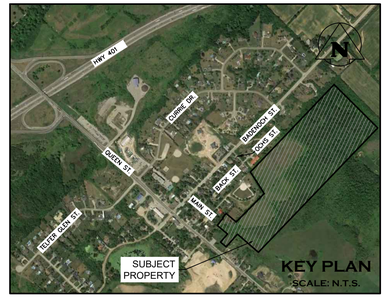
PROPOSED 4 BEDROOM, 360 m^2 HOME WITH FORTY-FIVE (45) FIXTURE UNITS	BASE FLOW (4 BEDROOMS)= 2,000 L/DAY ADDITIONAL FLOOR AREA (160 m2)= 1,600 L/DAY ADDITIONAL FIXTURE UNITS (25)= 1,250 L/DAY Q TOTAL (2,000+1,600)= 3,600 L/DAY
SOIL PERCOLATION RATE	T = 30 min/cm (ESTIMATED BY C.F. CROZIER)
PROPOSED TREATMENT UNIT	WATERLOO BIOFILTER AD-BA40
TYPE A DISPERSAL BED STONE AREA	MINIMUM SIZE=Q/50=3,600/50 = 72 m^2 PROVIDED = 72 m^2
TYPE A DISPERSAL BED SAND AREA	MINIMUM SIZE=QT/400= 3,600*30/400= 270 m^2 PROVIDED = 270m - 368m^2
SHALLOW BURIED TRENCH (LOT 1)	MINIMUM LENGTH=QT/50= 3,600/50= 72 m^2 PROVIDED 3 RUNS x 25m = 75 m^2

TYPICAL LOT SCHEMATIC (LOT 8)

SCALE: 1:300







SEE DWG. FIG. 1

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- x215.00 EXISTING GRADE
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- CONCEPTUAL 360 m^2 BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 368 m^2
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK
- PROPOSED STORM MANHOLE
- PROPOSED MANHOLE CATCHBASIN
- PROPOSED CATCHBASIN / DOUBLE CATCHBASIN

NOTES:

1. PROPOSED DRIVEWAY LOCATIONS AND APRONS TO BE CONFIRMED DURING DESIGN PROCESS.

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DRAWING FILE No.: 22-14-718-00-TOPO

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Project

11 MAIN STREET TOWN OF PUSLINCH

Drawing

PRELIMINARY SITE SERVICING PLAN (WEST)

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	M.I.M	Design	M.I.M.	Project No.	2366-6537
Check	B.W.	Check	B.W.	Scale	1:500
				Dwg.	FIG. 2

SEE DWG. FIG. 5

SEE DWG. FIG. 4

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

STM DCB 25 T/G 323.99

STM CB 26 T/G 322.70

STM CB 27 T/G 316.89

EX. LOCALIZED LOW AREA TO BE ADDRESSED DURING DETAILED DESIGN

STM DCBMH 10 T/G 323.99

STM CB 23 T/G 321.69

STM CBMH 22 T/G 318.34

STREET A

STM MH 9 T/G 323.66

STM CB 24 T/G 323.51

STM CBMH 8 T/G 323.49

STM CBMH 7 T/G 321.41

STM MH 5 T/G 317.47

STM CBMH 6 T/G 318.05

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

STM CBMH 4 T/G 315.34

STM CB 21 T/G 315.34

STM MH 3 T/G 314.93

STM DCB 17 T/G 314.47

STM DCBMH 2 T/G 314.48

350m² CUPOLEX H.45 OR EQUIVALENT INFILTRATION SYSTEM. SYSTEM DETAILS AND SPECIFICATIONS TO BE PROVIDED AT DETAILED DESIGN

STM OGS T/G 314.71

STM HW 1 T/G 314.25

STM OUTLET T/G 313.50

STM MH 1 T/G 314.31

PR. RIP-RAP SPILLWAY

STM MH 11 T/G 315.06

STM HW 2 T/G 312.15

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

PROPOSED 5.0m WIDE EMERGENCY OVERFLOW OUTLET WITH RIP-RAP SPILLWAY C/W FILTER CLOTH; TERRAFIX 270R OR APPROVED EQUIVALENT

PR. RIP-RAP SPILLWAY AND LEVEL SPREADER

EXTENDED DETENTION WATER LEVEL ELEVATION=313.35

REGIONAL WATER LEVEL ELEVATION=314.05

STM CB 20 T/G 317.76

STM CBMH 19 T/G 318.39

STM CB 18 T/G 316.20

STM CBMH 13 T/G 318.39

STM CBMH 12 T/G 316.08

30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023

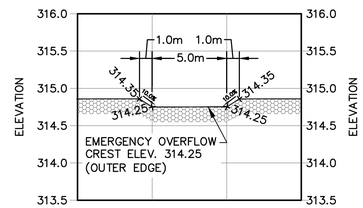
EDGE OF TREES

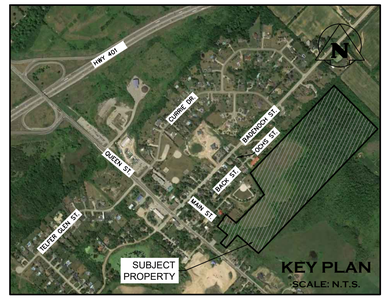
10 0m 10 20 30 40

SCALE: 1:500

EMERGENCY OVERFLOW DETAIL

SCALE: 1:400





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.50m)
- EXISTING CONTOUR (1.0m)
- ×215.00 EXISTING GRADE
- ×215.00 PROPOSED GRADE
- ×215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- STAKED WOODLOT BY COLVILLE CONSULTING INC.
- PROPOSED STORM MANHOLE
- PROPOSED MANHOLE CATCHBASIN
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TOWN OF PUSLINCH

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Engineer

Engineer

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SUITE 100
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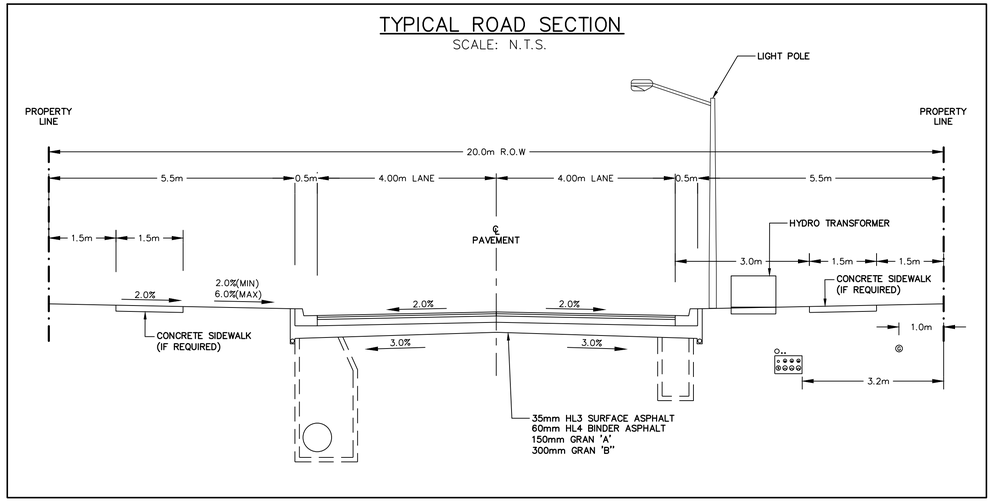
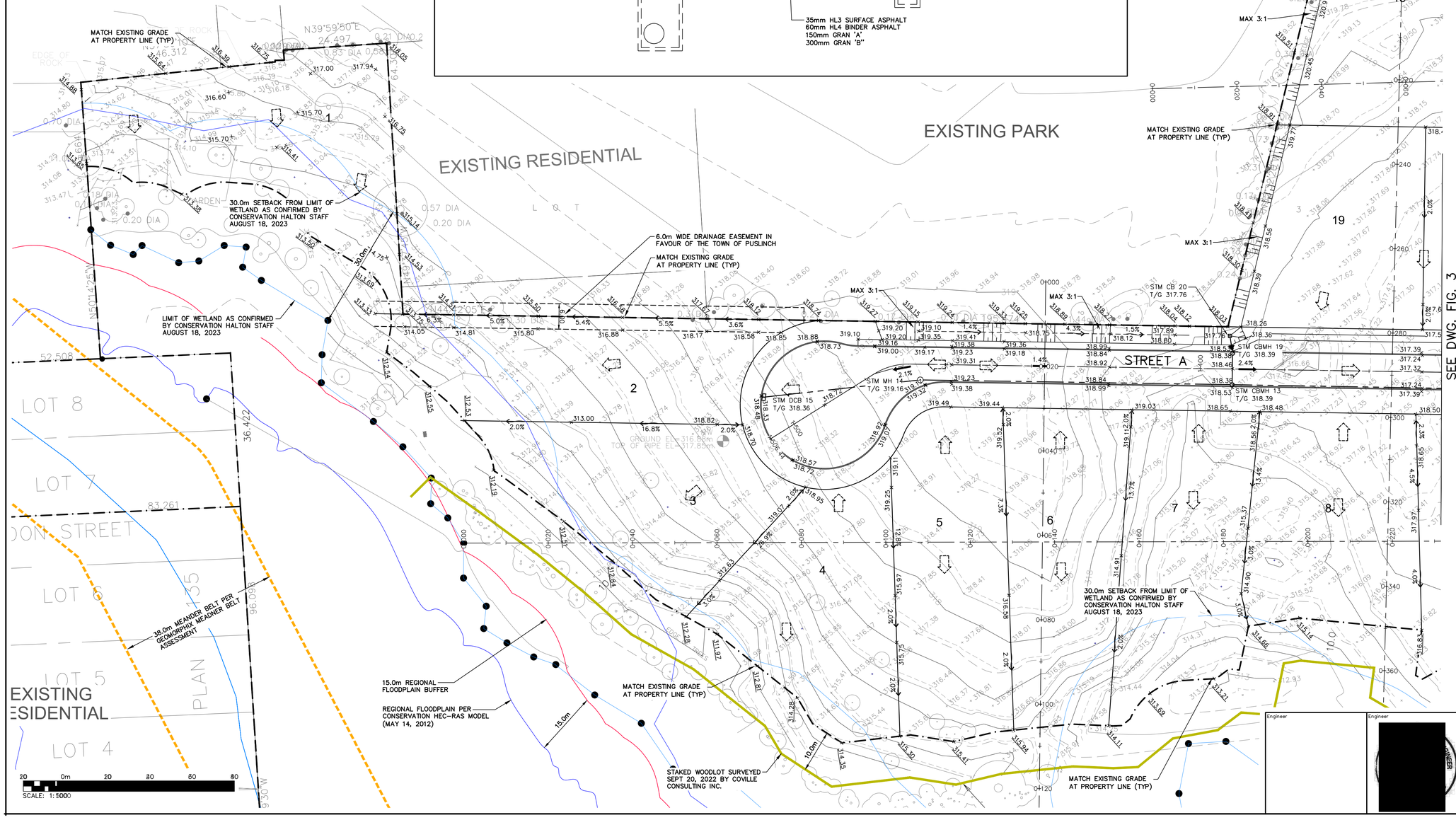
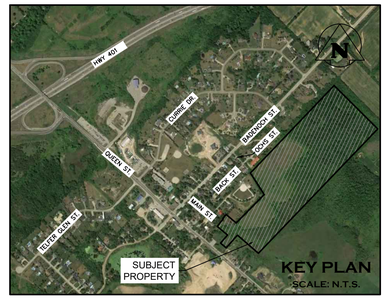
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 3

TYPICAL ROAD SECTION

SCALE: N.T.S.







LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.50m)
- EXISTING CONTOUR (1.0m)
- ×215.00 EXISTING GRADE
- ×215.00 PROPOSED GRADE
- ×215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- PROPOSED STORM MANHOLE / MANHOLE CATCHBASIN
- PROPOSED CATCHBASIN

No.	ISSUE / REVISION	YYYY/MMM/DD
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1	ISSUED FOR SECOND SUBMISSION (ZBA)	2023/DEC/20
0	ISSUED ZBA AND DPS APPLICATIONS	2023/FEB/17

ELEVATION NOTE:

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SURVEY NOTES:

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DRAWING FILE No.: 22-14-718-00-TOPO

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UTM ZONE 17, NAD83 (GSRS) (2010.0)

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY WESTON CONSULTING INC.
DRAWING No. 10779 CONCEPTS/C2_2022-03-16
DATE RECEIVED 2023/FEB/06

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

SITE GRADING PLAN (WEST)

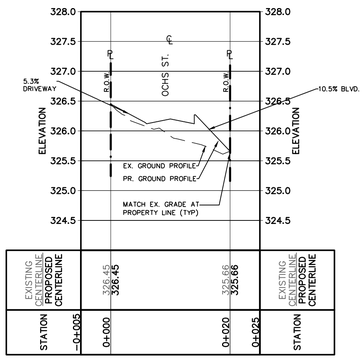
Engineer

Engineer

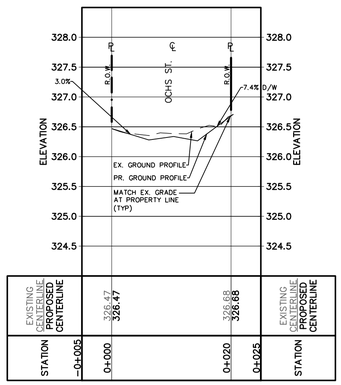
CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905875-0026 T
905875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.	2366-6537	
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 4

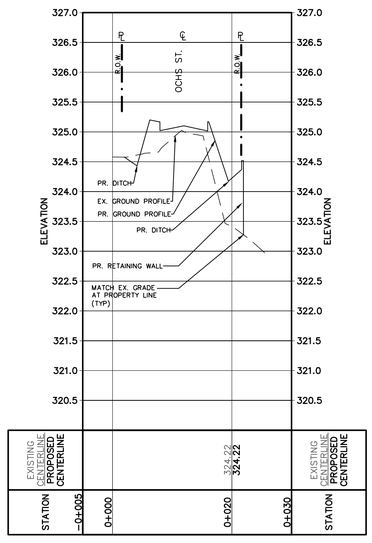
SECTION A

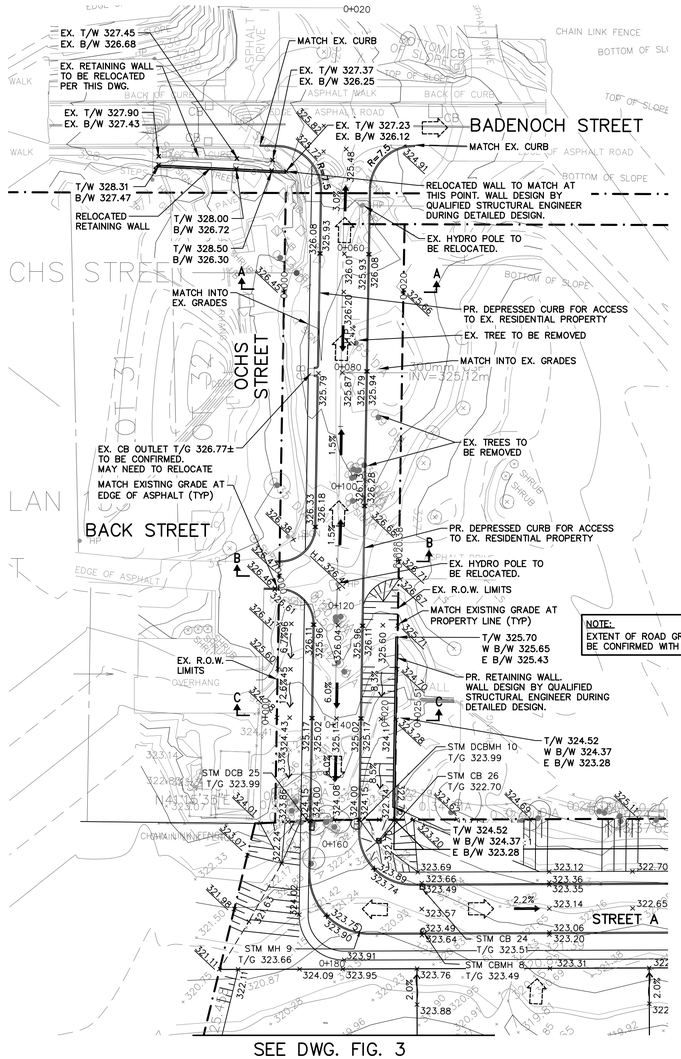


SECTION B

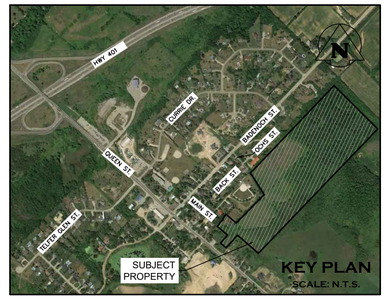


SECTION C





SEE DWG. FIG. 3



KEY PLAN
SCALE: N.T.S.

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.50m)
- EXISTING CONTOUR (1.0m)
- ×215.00 EXISTING GRADE
- ×215.00 PROPOSED GRADE
- ×215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED MAJOR OVERLAND FLOW DIRECTION

NOTE:

EXTERNAL OF OCHS STREET IS FOR SCHEMATIC PURPOSES ONLY. DETAILED DESIGN OF OCHS STREET TO BE COMPLETED THROUGH CONSULTATION WITH THE TOWNSHIP DURING SUBSEQUENT PLANNING APPLICATION.

EXTERNAL DRAINAGE FROM PRIVATE LOTS TO BE CONVEYED AS PART OF THESE ROAD IMPROVEMENTS.

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SURVEY NOTES:

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

EXTERNAL GRADING PLAN (OCHS STREET)

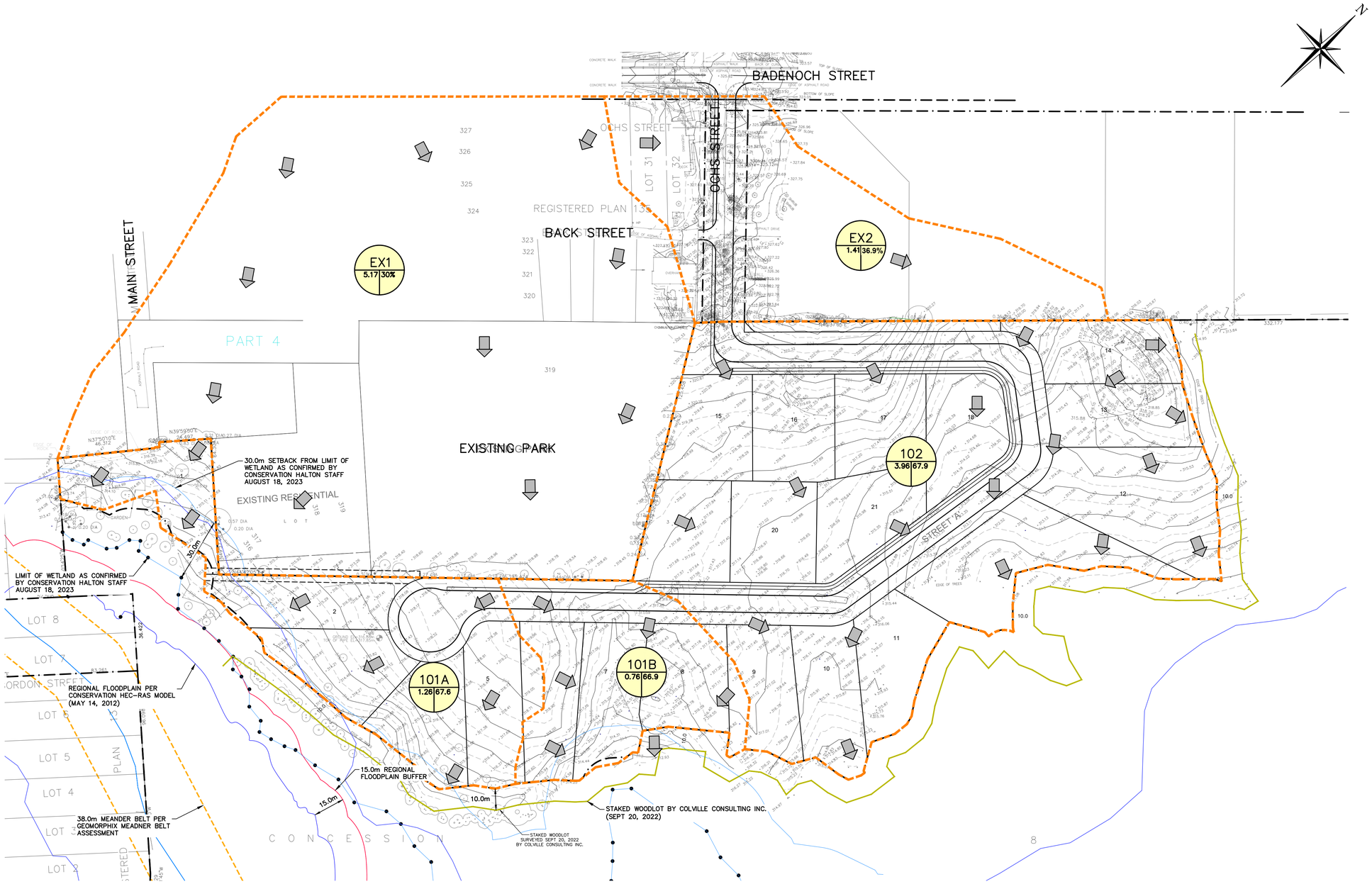
Engineer

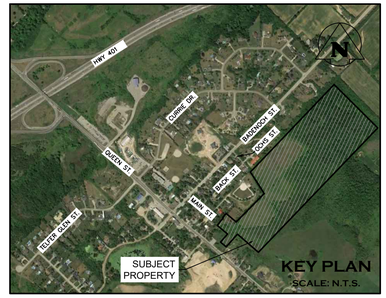
Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905875-0026 T
905875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 5

10 0m 10 20 30 40
SCALE: 1:500





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING OVERLAND FLOW DIRECTION
- PRE-DEVELOPMENT STORM DRAINAGE CATCHMENT
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- ID / AREA (ha) | PERCENT IMPERVIOUS — CATCHMENT I.D.
- ID / AIRC — CATCHMENT I.D. / AREA (ha) | RUNOFF CO-EFFICIENT

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

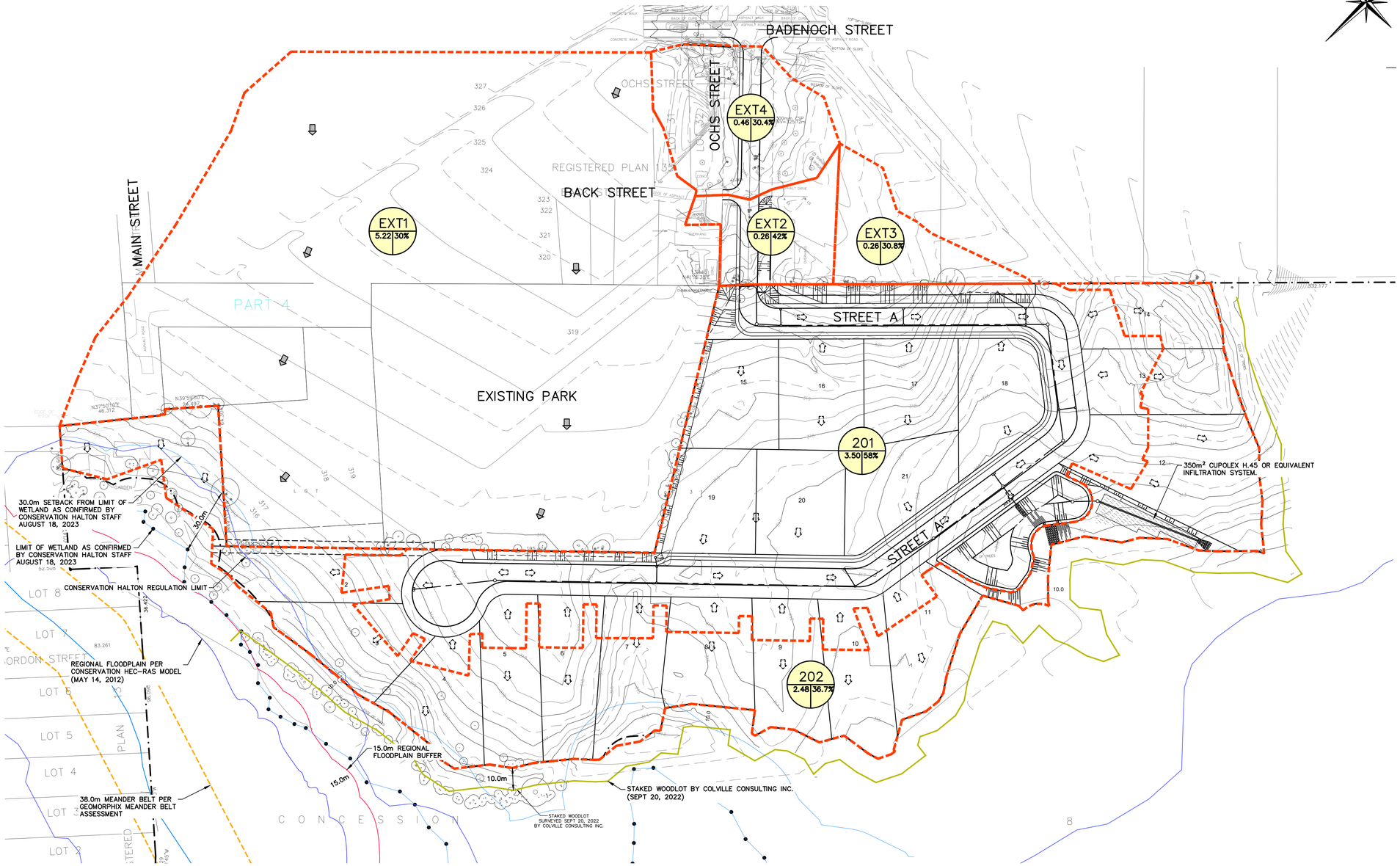
PRE-DEVELOPMENT DRAINAGE PLAN

Engineer

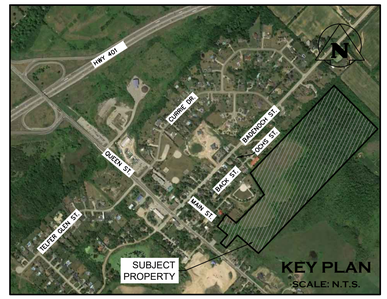
Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:1000	FIG. 6



20 0m 20 40 60 80
SCALE: 1:1000



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE (x 215.00)
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- POST-DEVELOPMENT STORM DRAINAGE CATCHMENT
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SINGLE CATCHBASIN MANHOLE
- ID — CATCHMENT I.D.
- A (ha) | %IMP — AREA (ha) | PERCENT IMPERVIOUS

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

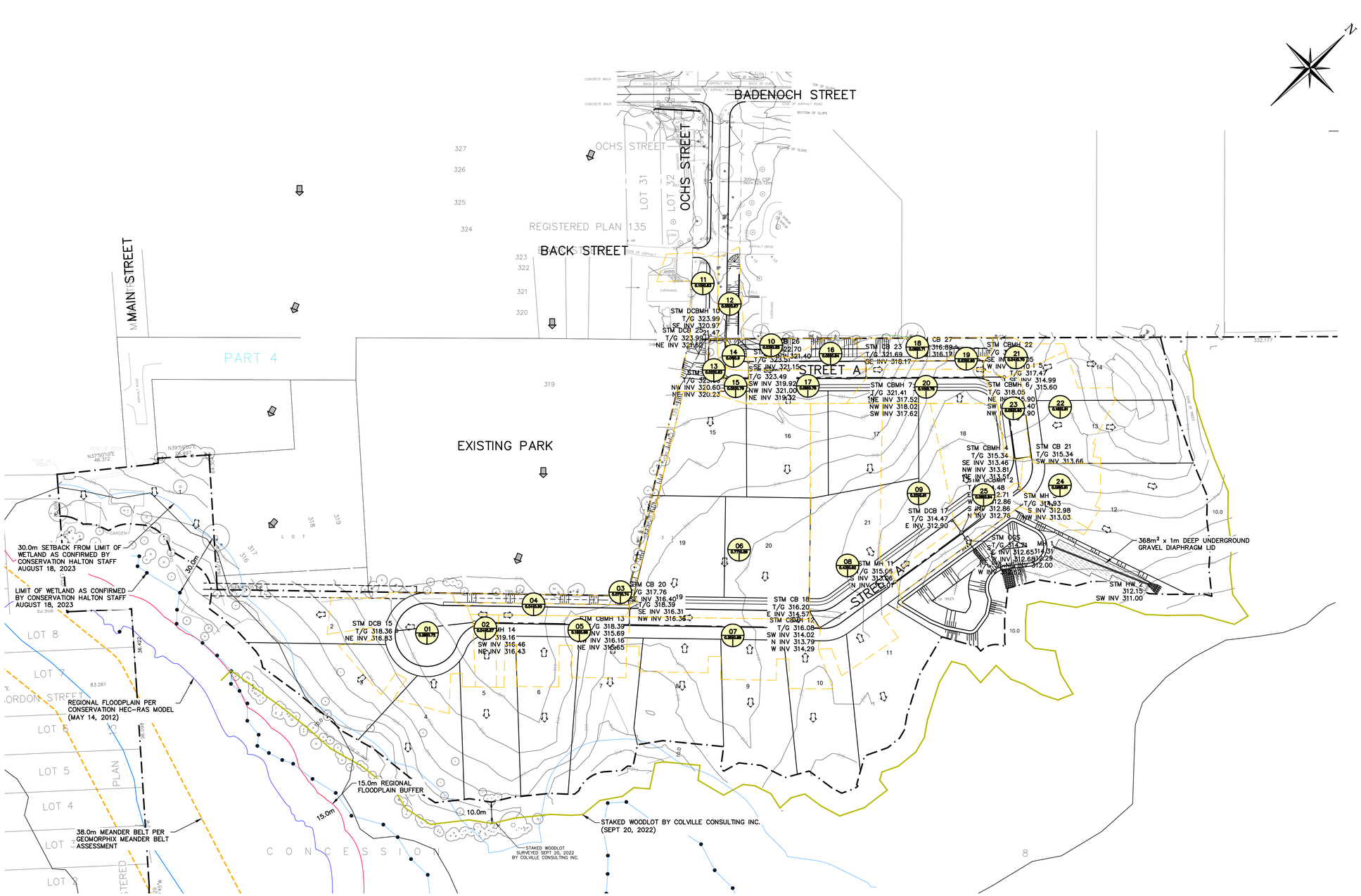
POST-DEVELOPMENT DRAINAGE PLAN

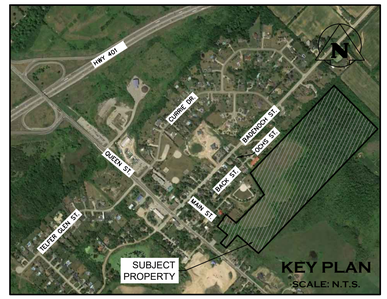
Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:1000	FIG. 7





LEGEND

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- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE (x 215.00)
- EXISTING OVERLAND FLOW DIRECTION
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- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
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- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SINGLE CATCHBASIN MANHOLE
- ID / A|RC — CATCHMENT I.D. | AREA (ha) | RUNOFF COEFFICIENT

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0	ISSUED ZBA AND DPS APPLICATIONS	2023/FEB/17

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

STORM DESIGN SHEET
DRAINAGE PLAN

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
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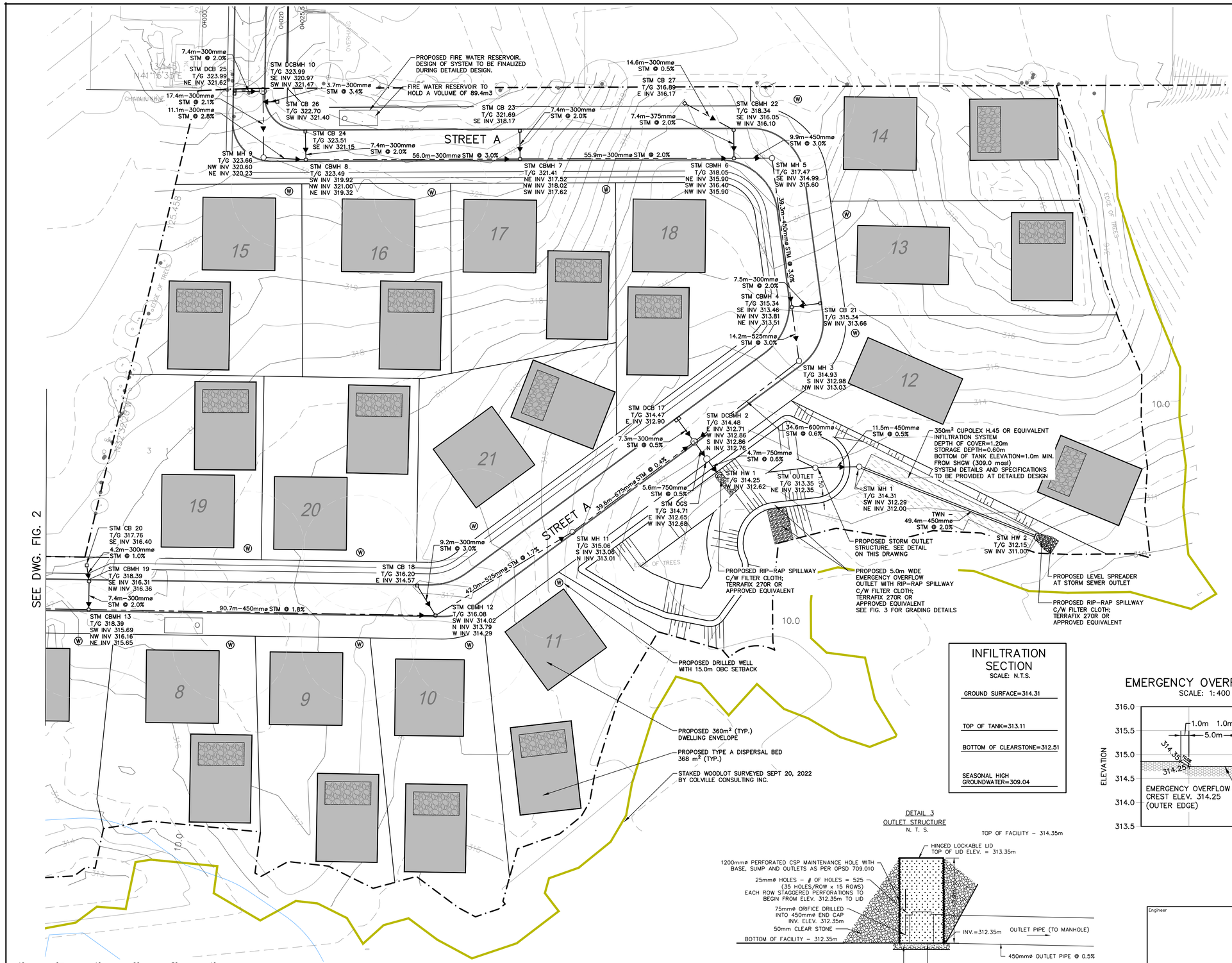
Check	Check	Scale	Dwg.
B.W.	B.W.	1:1000	FIG. 8



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- x215.00 EXISTING GRADE
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- CONCEPTUAL 360 m² BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 368 m²
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK
- PROPOSED STORM MANHOLE
- PROPOSED MANHOLE CATCHBASIN
- PROPOSED CATCHBASIN / DOUBLE CATCHBASIN

NOTES:

1. PROPOSED DRIVEWAY LOCATIONS AND APRONS TO BE CONFIRMED DURING DESIGN PROCESS.

INFILTRATION SECTION

SCALE: N.T.S.

GROUND SURFACE=314.31

TOP OF TANK=313.11

BOTTOM OF CLEARSTONE=312.51

SEASONAL HIGH GROUNDWATER=309.04

EMERGENCY OVERFLOW DETAIL

SCALE: 1:400

DETAIL 3 OUTLET STRUCTURE

N. T. S.

No.	ISSUE / REVISION	YYYY/MMM/DD
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Project

11 MAIN STREET TOWN OF PUSLINCH

Drawing

PRELIMINARY SITE SERVICING PLAN (EAST)

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366–6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 1

SEWAGE SYSTEM NOTES

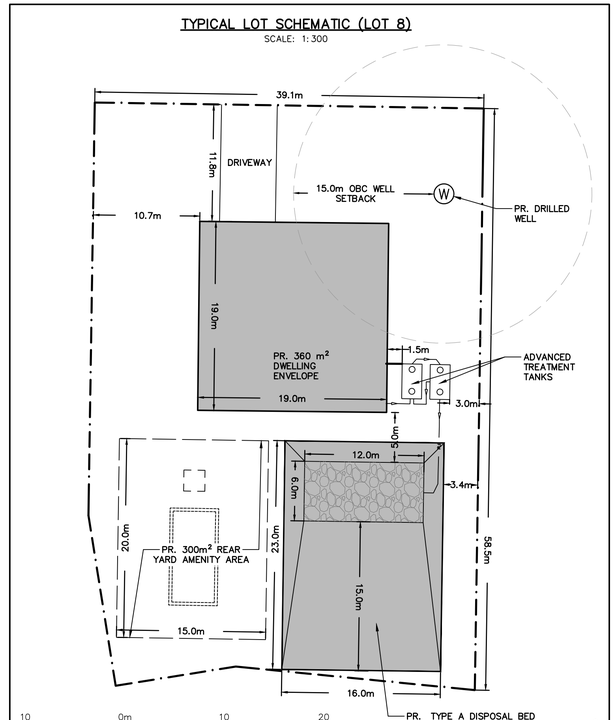
1. PROPOSED SEWAGE SYSTEM CONSTRUCTION TO BE UNDERTAKEN IN ACCORDANCE WITH THE ONTARIO BUILDING CODE, ONTARIO MINISTRY OF ENVIRONMENT, AND THE MANUFACTURER'S RECOMMENDATIONS.
2. INSTALLATION OF ALL COMPONENTS OF THE SEWAGE SYSTEM TO BE COMPLETED BY A LICENSED AND REGISTERED ONSITE SEWAGE SYSTEM INSTALLER IN THE PROVINCE OF ONTARIO.
3. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL NECESSARY INSPECTIONS WITH THE TOWN AND OTHER AUTHORITIES PERTAINING TO THE INSTALLATION OF THEIR WORK.
4. CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES AND EXISTING SEWAGE WORKS PRIOR TO CONSTRUCTION.
5. ALL COMPONENT LOCATIONS SHALL BE FIELD VERIFIED WITH THE ENGINEER PRIOR TO INSTALLATION.
6. ALL EARTHWORKS, INCLUDING PLACEMENT OF FILL ARE TO BE UNDERTAKEN WITH TRACK MOUNTED EQUIPMENT TO KEEP COMPACTION TO A MINIMUM. KEEP ALL TRAFFIC IN THE AREA OF THE PROPOSED LEACHING BED TO A MINIMUM.
7. ALL TOPSOIL AND ORGANICS TO BE REMOVED FROM LEACHING BED AREA.
8. IF HIGH GROUNDWATER CONDITIONS ARE EVIDENT AT THE TIME OF CONSTRUCTION, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY. ALL VERTICAL CLEARANCE DISTANCES AS REQUIRED BY THE ONTARIO BUILDING CODE MUST BE MAINTAINED.
9. GRAVITY SEWERS TO HAVE MINIMUM 0.6 M COVER AND SHALL BE INSULATED WHERE LESS THAN 1.0M COVER IS PROVIDED. FORCEMAIN SHALL BE INSULATED WHERE LESS THAN 1.5 M COVER IS PROVIDED. BEDDING, COVER AND BACKFILL TO BE IN ACCORDANCE WITH OPSS.
10. UNLESS OTHERWISE NOTED PE FORCEMAIN TO BE HDPE SERIES 100 OR DR 13.5 PE AND PVC FORCEMAIN TO BE SCHEDULE 40. GRAVITY SEWERS TO BE SDR-35. FORCE MAIN TO BE PROVIDED WITH TRACER WIRE, SECURED TO THE TOP OF THE PIPE WITH WATER PROOF TAPE OR ZIP TIES.
11. ALL PIPES SUBJECT TO VEHICULAR TRAFFIC SHALL BE ADEQUATELY PROTECTED.
12. ALL METAL IN TANKS OR PUMP CHAMBERS TO BE GLAVANIZED OR STAINLESS STEEL
13. ALL JOINTS BELOW THE HIGH WATER LEVEL IN PRECAST TANKS TO BE SEALED WITH MASTIC SEALANT IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS FOR WATERTIGHT SEAL. ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH CAST IN RUBBER BOOT FOR WATER TIGHT SEAL. UNLESS OTHERWISE NOTED ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH TEES.
14. ALL TANKS TO BE PROVIDED WITH PRECAST CONCRETE OR PVC ACCESS RISERS TO GRADE. HATCHES TO BE BOLTED AND GASKETED AND ACCESSIBLE AT GRADE. ALL CIRCULAR HATCHES TO BE 600 MM DIAMETER POLYLOK RISER WITH CAST IN ADAPTOR. ALL SQUARE ACCESS OPENINGS TO BE EQUIPPED WITH CONCRETE RISERS. VENTED HATCHES TO BE PROVIDED ON TANKS CONTAINING PUMPS.
15. EXISTING SOILS SHALL BE SCARIFIED AT A RIGHT ANGLE TO THE DIRECTION OF LATERAL SEWAGE FLOW IN THE LEACHING BED PRIOR TO IMPORTING FILL OR INSTALLING DISTRIBUTION PIPE STONE LAYER.
16. WHEN THE IMPORTATION OF FILL IS REQUIRED, FILL SHOULD BE END-DUMPED AND GRADED PROGRESSIVELY OVER THE PREPARED SITE AREA WITH TRACK MOUNTED EQUIPMENT.
17. ALL ELEVATIONS TO BE VERIFIED PRIOR TO BACKFILL
18. ALL FILL MATERIAL PLACED BENEATH TANKS TO BE COMPACTED TO 95%.
19. ALL DISTURBED AREAS TO BE TOPSOILED (100MM MINIMUM) AND SEEDED COMPLETE WITH FERTILIZER AND MULCH IN ACCORDANCE WITH OPSS
20. THE INSTALLING CONTRACTOR SHALL INSTALL THE SEWAGE SYSTEM USING A TRANSIT/LEVEL AND SHALL PROVIDE SAME FOR INSPECTION OF ANY COMPONENT.
21. MAXIMUM BURIAL DEPTH OF TANKS NOT TO EXCEED TO MANUFACTURERS RECOMMENDATIONS
22. CLEARANCE DISTANCES FROM PROPERTY LINES, STRUCTURES, WELLS, AND SURFACE WATER WILL ADHERE TO THE REQUIREMENTS OF OBC 8.2.1.6.A
23. A LEACHING BED SHALL NOT BE LOCATED ON AN AREA WITH A SLOPE OF GREATER THAN 4 UNITS HORIZONTALLY TO 1 UNIT VERTICALLY.
24. THE HEADER LINE, DISTRIBUTION PIPES AND LEACHING BED SHALL BE EQUIPPED WITH MEANS OF DETECTION AS REQUIRED BY OBC 8.7.2.2. (2). LIGHT COLOURED PLASTIC COATED 14 GAUGE TRACER WIRE OR EPOXY COATED, 10m REBAR LAID HORIZONTALLY AT EACH CORNER OF THE BED IS ACCEPTABLE.
25. STONE TRENCH OR LAYER TO BE COVERED WITH PERMEABLE GEOTEXTILE PRIOR TO BACKFILL.
26. STONE TO CONFORM WITH OBC 8.7.3.3.
27. ALL IMPORTED SAND FILL TO HAVE A T-TIME OF 6 TO 10 MIN/CM AND A SILT/CLAY CONTENT OF NO MORE THAN 5% AND SHALL BE VERIFIED IN WRITING BY A SOIL TESTING FIRM AND APPROVED BY THE ENGINEER PRIOR TO PLACEMENT.
28. ANAEROBIC DIGESTER AND BIOFILTER BASKET PUMPS AS DESIGNED AND SUPPLIED BY WATERLOO BIOFILTER.
29. PUMP CHAMBER TO BE VENTED AND EQUIPPED WITH AUDIBLE AND VISUAL HIGH LEVEL ALARM
30. ALL VALVES TO PROVIDE NO OBSTRUCTION TO FLOW WHEN FULLY OPENED. ALL VALVES AND COUPLINGS TO BE ACCESSIBLE AT GRADE.
31. ALL PUMP FLOATS TO BE SECURED TO A REMOVABLE PVC FLOAT TREE
32. ALL PUMP CONTROL PANELS TO BE EQUIPPED WITH SEPARATE CIRCUIT BREAKERS FOR PUMP CIRCUIT
33. NO JUNCTION BOXES IN RISERS
34. ALL BURIED ELECTRICAL WIRING TO BE IN PVC CONDUIT
35. PRIOR TO ACCEPTANCE CONTRACTOR TO PROVIDE DOCUMENTATION THAT ALL ELECTRICAL WORK HAS BEEN INPSECTED AND APPROVED BY THE ELECTRICAL AUTHORITY HAVING JURISDICTION

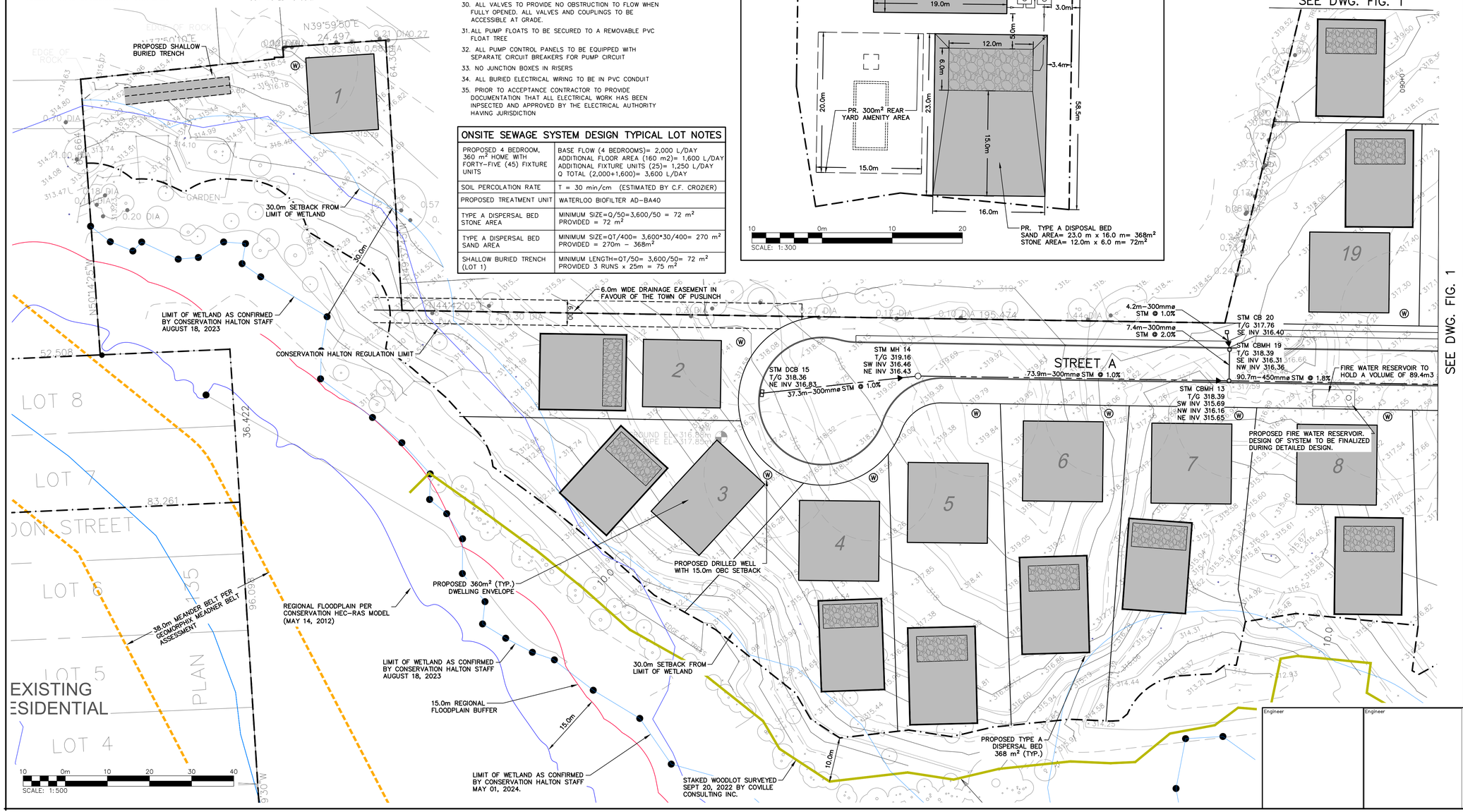
ONSITE SEWAGE SYSTEM DESIGN TYPICAL LOT NOTES

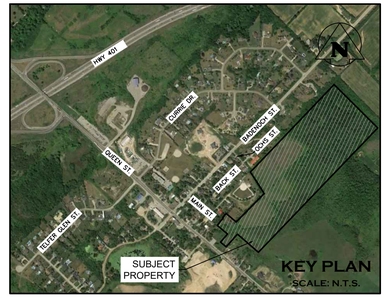
PROPOSED 4 BEDROOM, 360 m^2 HOME WITH FORTY-FIVE (45) FIXTURE UNITS	BASE FLOW (4 BEDROOMS)= 2,000 L/DAY ADDITIONAL FLOOR AREA (160 m2)= 1,600 L/DAY ADDITIONAL FIXTURE UNITS (25)= 1,250 L/DAY Q TOTAL (2,000+1,600)= 3,600 L/DAY
SOIL PERCOLATION RATE	T = 30 min/cm (ESTIMATED BY C.F. CROZIER)
PROPOSED TREATMENT UNIT	WATERLOO BIOFILTER AD-BA40
TYPE A DISPERSAL BED STONE AREA	MINIMUM SIZE=Q/50=3,600/50 = 72 m^2 PROVIDED = 72 m^2
TYPE A DISPERSAL BED SAND AREA	MINIMUM SIZE=QT/400= 3,600*30/400= 270 m^2 PROVIDED = 270m - 368m^2
SHALLOW BURIED TRENCH (LOT 1)	MINIMUM LENGTH=QT/50= 3,600/50= 72 m^2 PROVIDED 3 RUNS x 25m = 75 m^2

TYPICAL LOT SCHEMATIC (LOT 8)

SCALE: 1:300







SEE DWG. FIG. 1

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- x215.00 EXISTING GRADE
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- CONCEPTUAL 360 m^2 BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 368 m^2
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK
- PROPOSED STORM MANHOLE
- PROPOSED MANHOLE CATCHBASIN
- PROPOSED CATCHBASIN / DOUBLE CATCHBASIN

NOTES:

1. PROPOSED DRIVEWAY LOCATIONS AND APRONS TO BE CONFIRMED DURING DESIGN PROCESS.

No.	ISSUE / REVISION	YYYY/MMM/DD
3	ISSUED FOR FOURTH SUBMISSION (ZBA/OPA)	2024/NOV/15
2	ISSUED FOR THIRD SUBMISSION (ZBA/DPA)	2024/AUG/29
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SURVEY NOTES:

SURVEY COMPLETED BY J.D. BARNES LTD. (2023/JAN/31)
DRAWING FILE No.: 22-14-718-00-TOPO

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DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

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DRAWING No. 10779 CONCEPTS/C2_2022-03-16
DATE RECEIVED 2023/FEB/06

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11 MAIN STREET TOWN OF PUSLINCH

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PRELIMINARY SITE SERVICING PLAN (WEST)

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Engineer

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2800 HIGH POINT DRIVE
SUITE 100
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Drawn	M.I.M	Design	M.I.M.	Project No.	2366-6537
Check	B.W.	Check	B.W.	Scale	1:500
				Dwg.	FIG. 2

SEE DWG. FIG. 5

SEE DWG. FIG. 4

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

STM DCB 25 T/G 323.99

STM CB 26 T/G 322.70

STM CB 27 T/G 316.89

EX. LOCALIZED LOW AREA TO BE ADDRESSED DURING DETAILED DESIGN

STM DCBMH 10 T/G 323.99

STM CB 23 T/G 321.69

STM CBMH 22 T/G 318.34

STREET A

STM MH 9 T/G 323.66

STM CB 24 T/G 323.51

STM CBMH 8 T/G 323.49

STM CBMH 7 T/G 321.41

STM MH 5 T/G 317.47

STM CBMH 6 T/G 318.05

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

STM CBMH 4 T/G 315.34

STM CB 21 T/G 315.34

STM MH 3 T/G 314.93

STM DCB 17 T/G 314.47

STM DCBMH 2 T/G 314.48

350m² CUPOLEX H.45 OR EQUIVALENT INFILTRATION SYSTEM. SYSTEM DETAILS AND SPECIFICATIONS TO BE PROVIDED AT DETAILED DESIGN

STM OGS T/G 314.71

STM HW 1 T/G 314.25

STM OUTLET T/G 313.50

STM MH 1 T/G 314.31

PR. RIP-RAP SPILLWAY

STM MH 11 T/G 315.06

STM HW 2 T/G 312.15

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

PROPOSED 5.0m WIDE EMERGENCY OVERFLOW OUTLET WITH RIP-RAP SPILLWAY C/W FILTER CLOTH; TERRAFIX 270R OR APPROVED EQUIVALENT

PR. RIP-RAP SPILLWAY AND LEVEL SPREADER

EXTENDED DETENTION WATER LEVEL ELEVATION=313.35

REGIONAL WATER LEVEL ELEVATION=314.05

STM CB 20 T/G 317.76

STM CBMH 19 T/G 318.39

STM CB 18 T/G 316.20

STM CBMH 13 T/G 318.39

STM CBMH 12 T/G 316.08

30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023

MATCH EXISTING GRADE AT PROPERTY LINE (TYP)

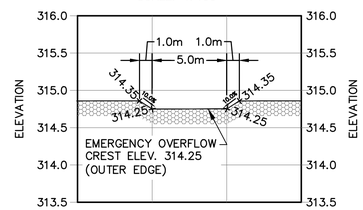
LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023

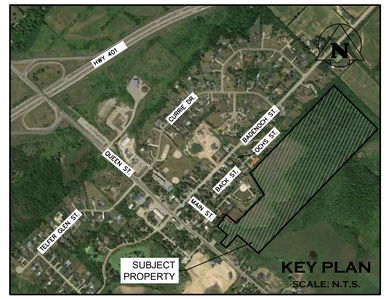
10 0m 10 20 30 40

SCALE: 1:500

EMERGENCY OVERFLOW DETAIL

SCALE: 1:400





LEGEND

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- ×215.00 EXISTING GRADE
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- PROPOSED SLOPE (3:1 MAX.)
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- STAKED WOODLOT BY COLVILLE CONSULTING INC.
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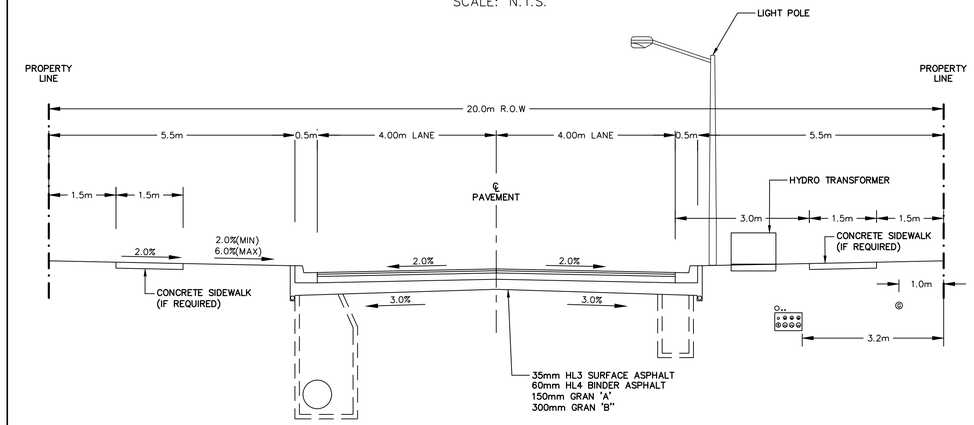
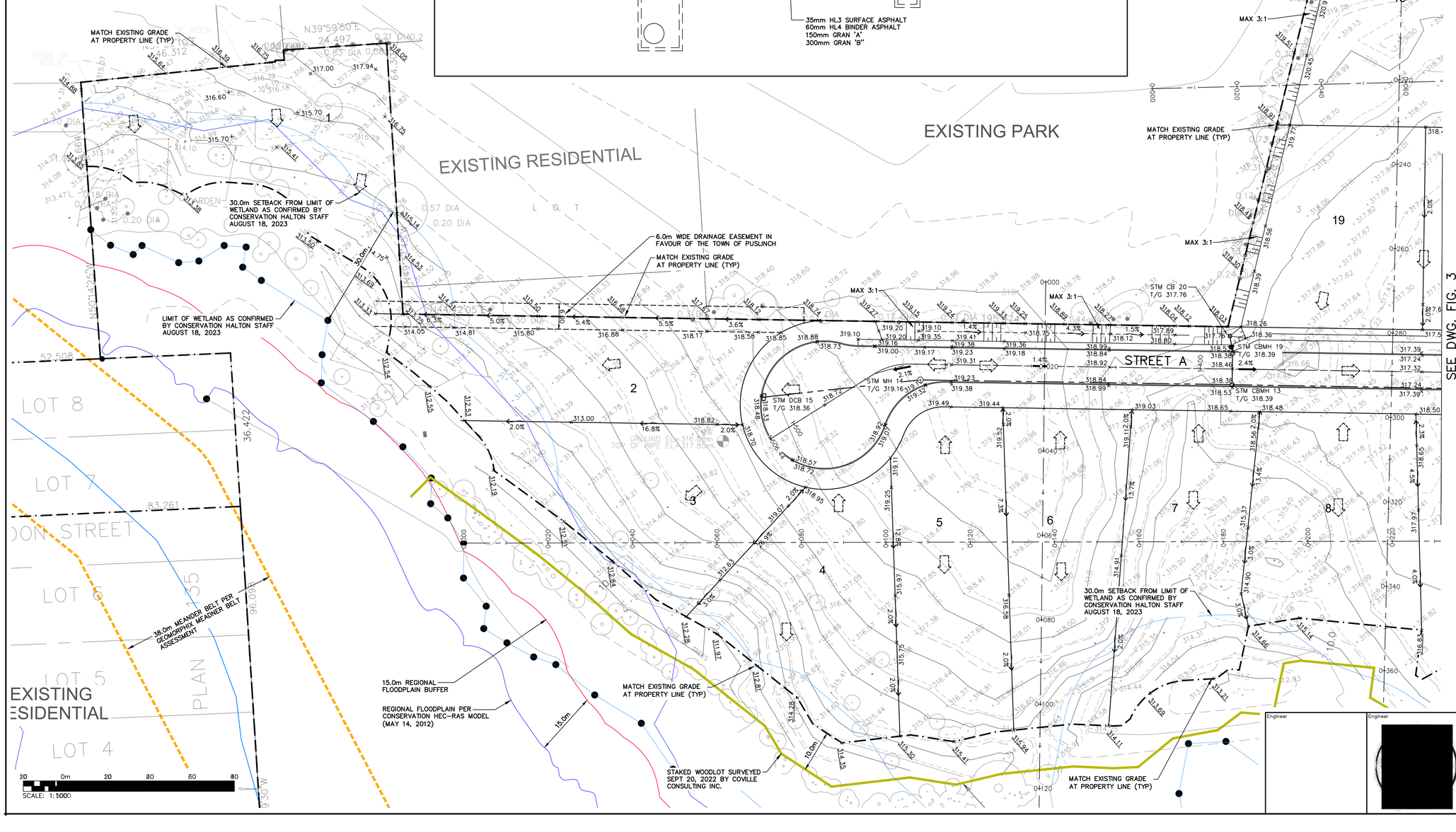
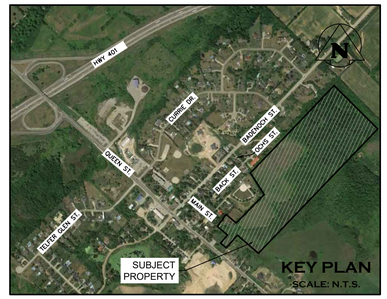
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 3

TYPICAL ROAD SECTION

SCALE: N.T.S.







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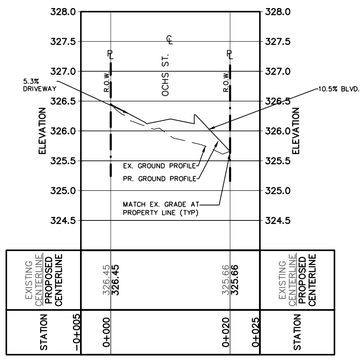
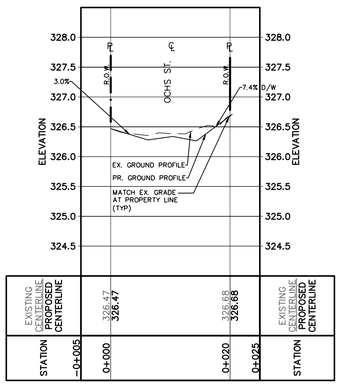
B.W.	B.W.	1:500	FIG. 4

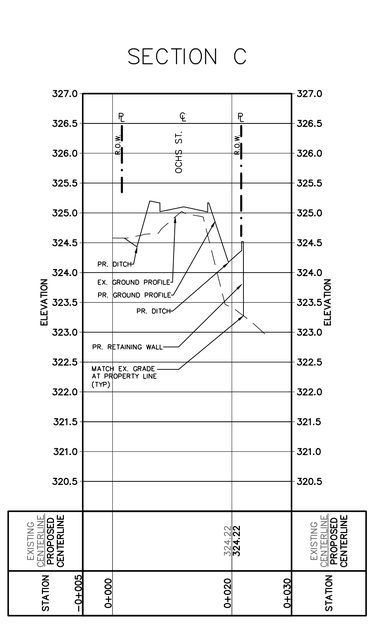
SECTION A

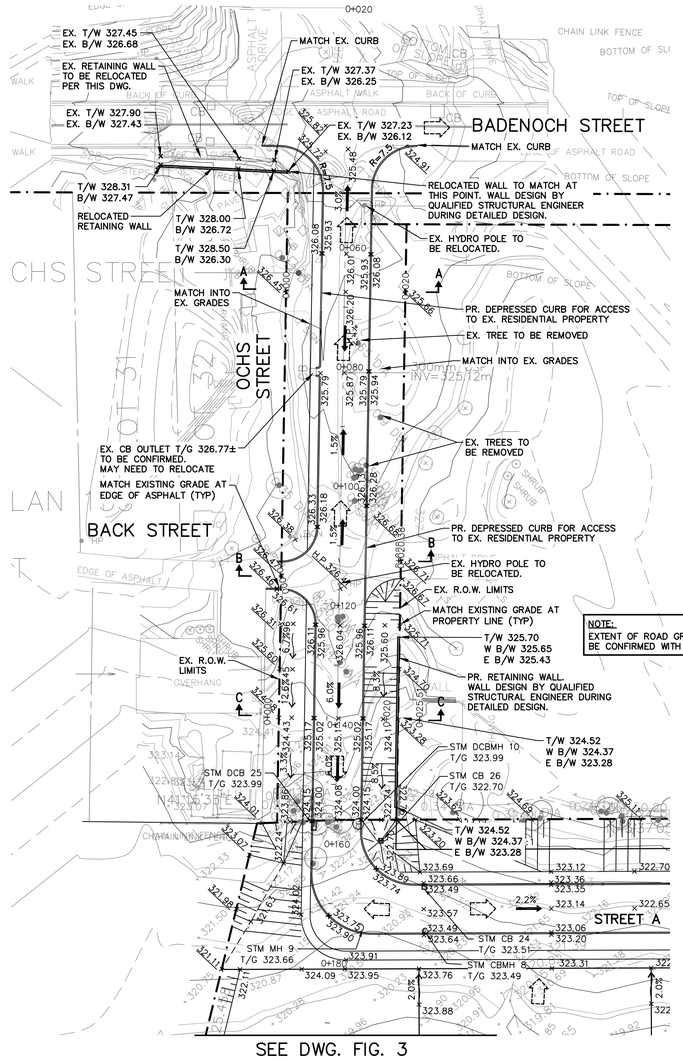


SECTION B

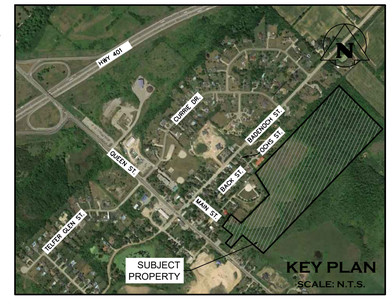


SECTION C





SEE DWG. FIG. 3



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- PROPOSED MAJOR OVERLAND FLOW DIRECTION

NOTE:

EXTERNAL OF OCHS STREET IS FOR SCHEMATIC PURPOSES ONLY. DETAILED DESIGN OF OCHS STREET TO BE COMPLETED THROUGH CONSULTATION WITH THE TOWNSHIP DURING SUBSEQUENT PLANNING APPLICATION.

EXTERNAL DRAINAGE FROM PRIVATE LOTS TO BE CONVEYED AS PART OF THESE ROAD IMPROVEMENTS.

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0	ISSUED ZBA AND DPS APPLICATIONS	2023/FEB/17

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SURVEY NOTES:

SURVEY COMPLETED BY J.D. BARNES LTD. (2023/JAN/31)
DRAWING FILE No.: 22-14-718-00-TOPO

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UTM ZONE 17, NAD83 (GSRS) (2010.0)

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY WESTON CONSULTING INC.
DRAWING No. 10779 CONCEPTS/C2_2022-03-16
DATE RECEIVED 2023/FEB/06

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

EXTERNAL GRADING PLAN
(OCHS STREET)

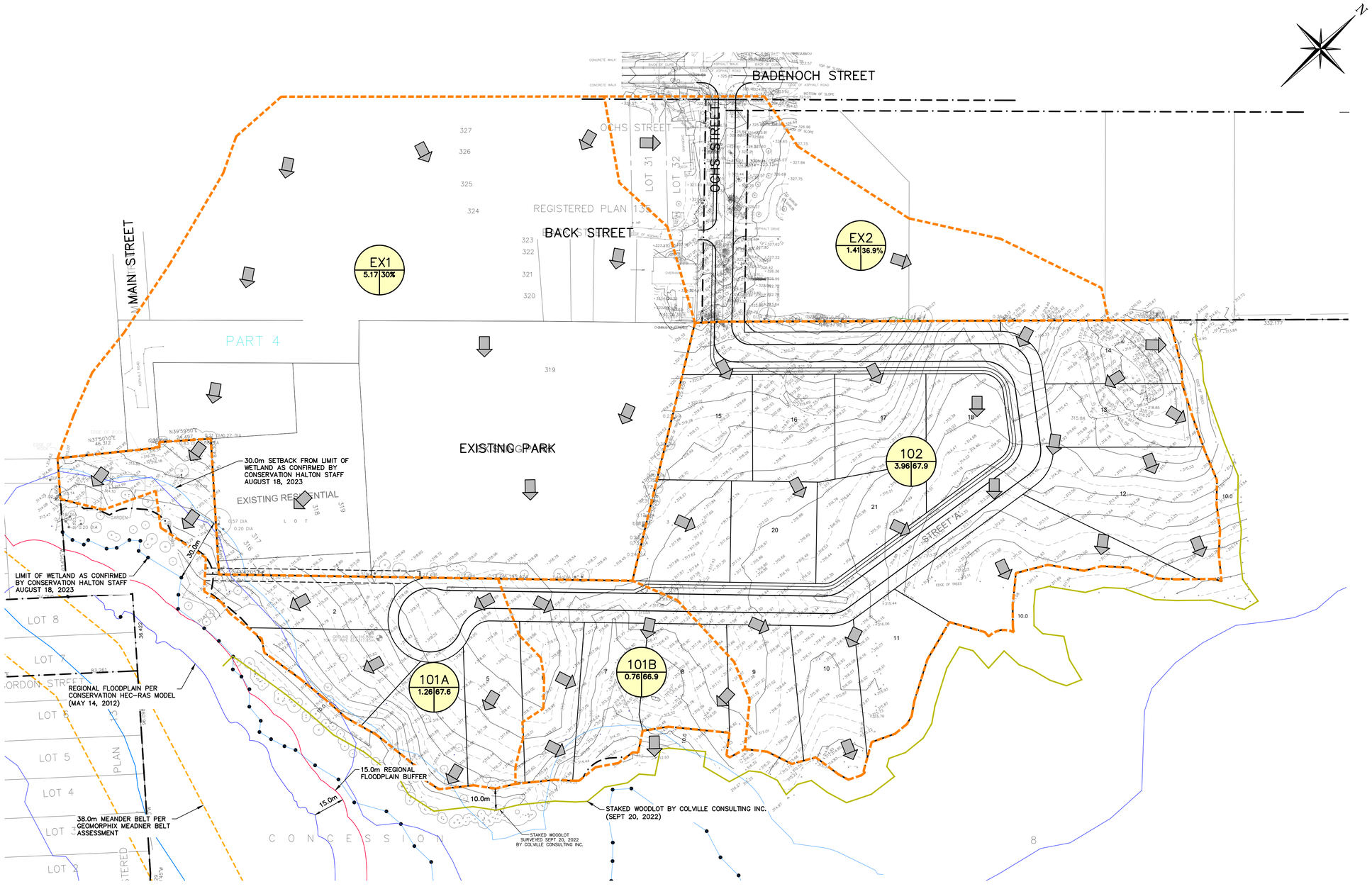
Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:500	FIG. 5

10 0m 10 20 30 40
SCALE: 1:500



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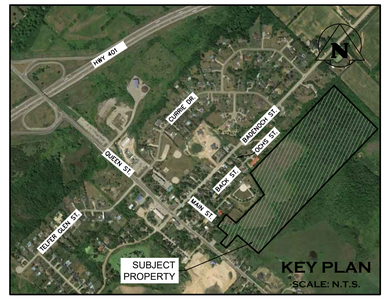
SCALE: 1:1000



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING OVERLAND FLOW DIRECTION
- PRE-DEVELOPMENT STORM DRAINAGE CATCHMENT
- REGIONAL FLOODPLAIN (CONSERVATION HALTON)
- REGIONAL FLOODPLAIN 15.0m BUFFER
- CONSERVATION HALTON REGULATION LIMIT
- STAKED WOODLOT BY COLVILLE CONSULTING INC. (SEPT 20, 2022)
- LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF (AUGUST 18, 2023)
- 30.0m SETBACK FROM LIMIT OF WETLAND AS CONFIRMED BY CONSERVATION HALTON STAFF AUGUST 18, 2023
- MEANDER BELT 38m BUFFER (19m EACH SIDE)
- ID / AREA (ha) | PERCENT IMPERVIOUS — CATCHMENT I.D.
- ID / A | RC — CATCHMENT I.D. / AREA (ha) | RUNOFF CO-EFFICIENT

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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

Engineer

Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON. L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
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Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
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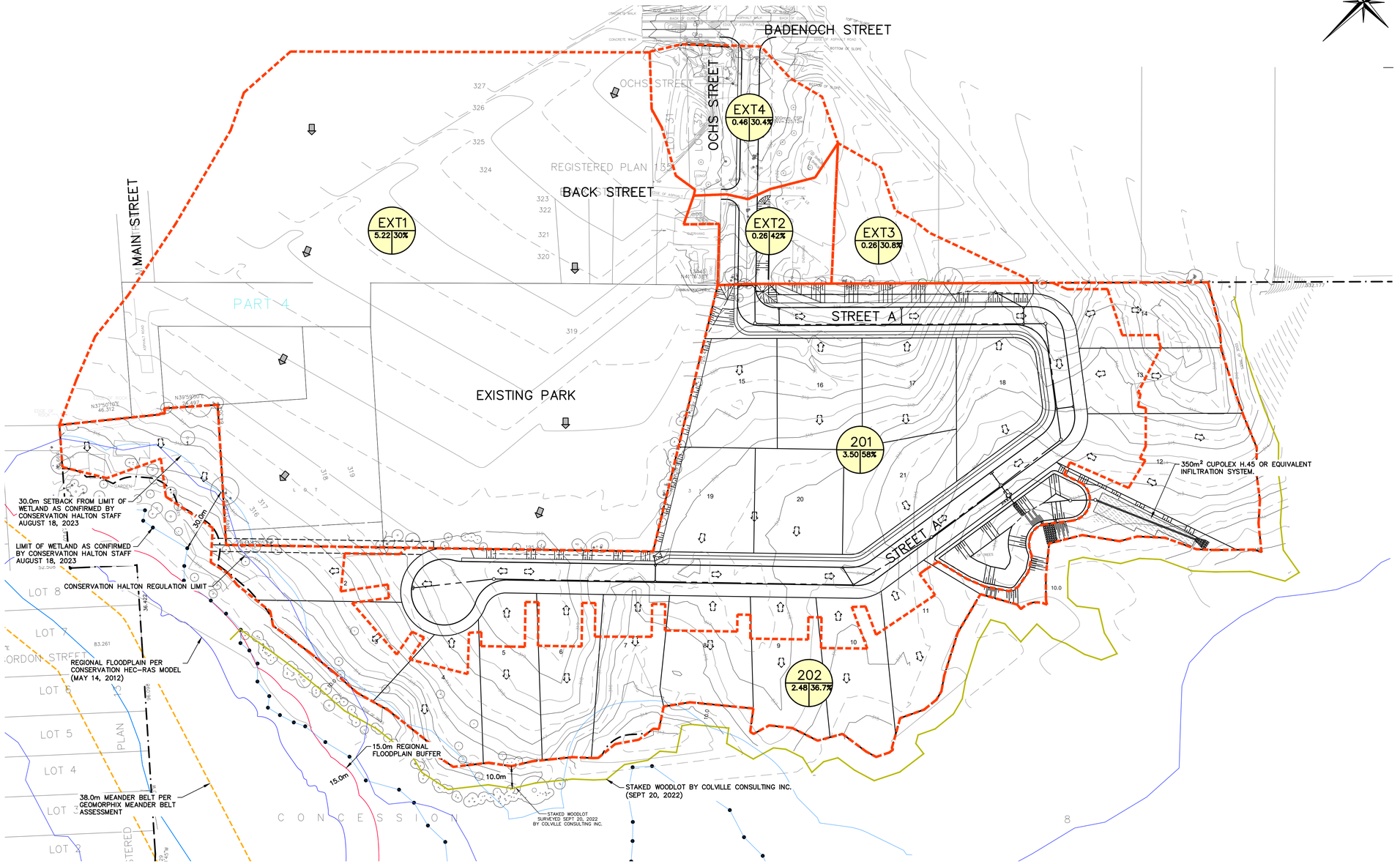

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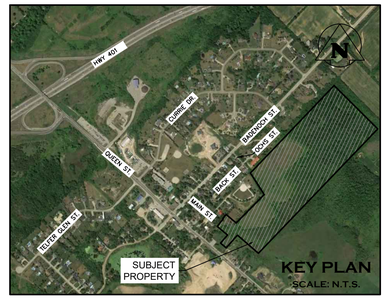
SCALE: 1:1000



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE (x 215.00)
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- POST-DEVELOPMENT STORM DRAINAGE CATCHMENT
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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

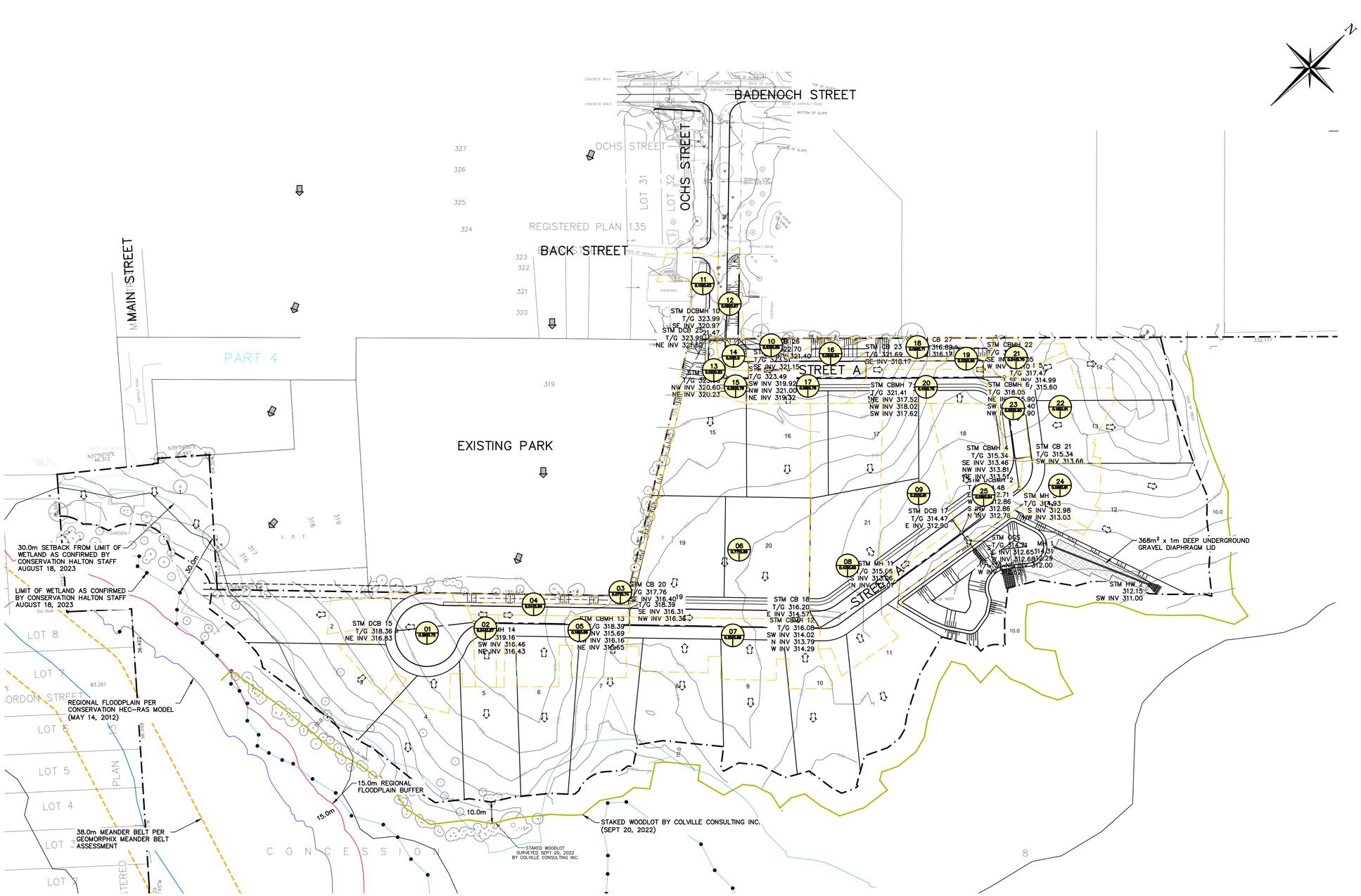
POST-DEVELOPMENT DRAINAGE PLAN

Engineer

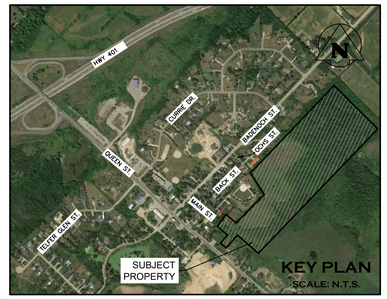
Engineer

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 0026 T
905 875 4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:1000	FIG. 7



20 0m 20 40 60 80
SCALE: 1:1000



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Project

11 MAIN STREET
TOWN OF PUSLINCH

Drawing

STORM DESIGN SHEET
DRAINAGE PLAN

Engineer

Engineer

[redacted]

CROZIER CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905 875 5026 T
905 875 4915 F
WWW.CFCROZIER.CA
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Drawn	Design	Project No.	
M.I.M	M.I.M.		2366-6537
Check	Check	Scale	Dwg.
B.W.	B.W.	1:1000	FIG. 8

WESTON CONSULTING

Township of Puslinch
Planning and Development
7404 Wellington Road 34,
Puslinch, ON
N0B 2J0

January 10, 2025
File: 10779

Attn: Lynne Banks, Development and Legislative Coordinator, Township of Puslinch

Re: Fifth Submission Zoning By-law Amendment
11 Main Street, Morriston
Township of Puslinch

Weston Consulting is the planning consultant for WDD Main Street Inc., the registered owner of the lands located at 11 Main Street (Lot 31, Concession 8) in the Township of Puslinch (the "Subject Lands"). We are pleased to submit the following materials in support of a Zoning By-law Amendment application for a proposed residential subdivision consisting of 21 detached dwelling lots, environmental protection lands, a stormwater management pond and municipal roads. The Draft Plan of Subdivision Application for the Subject Lands was submitted and has been deemed complete by the County of Wellington on December 13, 2024, File number 23T-23002.

Description of Subject Lands

The Subject Lands are currently vacant and located southeast of the Main Street and Badenoch Street intersection in Morriston. The Subject Lands are surrounded by open spaces to the east and south, and single-detached dwellings to the north and west. The Subject Lands have an approximate area of 23.48 hectares (58.03 acres) and an approximate frontage of 12 metres at the terminus of Main Street and 20 metres at the current terminus of Ochs Street.

The County of Wellington Official Plan designates the northwesterly portion of the Subject Lands as *Residential,* and the easterly and southerly portion of the subject lands as *Greenlands*, and a small portion is designated *Core Greenlands*. The Township of Puslinch Comprehensive Zoning By-law 023-18 zones the majority of the Subject Lands as *Future Development (FD2)* and a minor portion of the north-easterly corner as *Urban Residential (UR),* and a minor southeasterly and southerly portion of the subject lands as *Natural Environment (NE)*. The southwestern, southern and eastern part of the subject lands are overlayed by the Environmental Protection zone. A portion of the subject lands to the west and south are within the Halton Region Conservation Authority (HRCA) regulated area.

The purpose of this submission is to provide the Township and County with the updated technical materials to address the specific comments provided on December 19, 2024. As part of this submission, there were no changes to the Draft Plan of Subdivision. It is our intent to move through the statutory planning process to address any outstanding comments. We ask that a Public Meeting be scheduled at the earliest available date to engage with the Public, and provide them an opportunity to provide comments through the appropriate statutory process.

Submission Materials

The following materials are being provided electronically, and address the comments from the Township of Puslinch regarding the Zoning By-law Amendment Application.

No.	Document	Consultant	Date
1.	Draft Zoning By-law Amendment Text and Schedule	Weston Consulting	January 10, 2025
2.	Comment Response Matrix		January, 2025
3.	Letter Response to Wellington Hydrogeology Comments	Englobe	December 20, 2024
4.	Functional Servicing and Preliminary Stormwater Management Report	Crozier	December 2024
5.	Civil Engineering Drawing Package		December 20, 2024

We trust that the above documents are sufficient for your review and circulation of the Zoning By-law Amendment applications. Should you have any questions please contact the undersigned at ext. 315 or Michael Pizzimenti at ext. 365.

Yours truly,
Weston Consulting
Per:

Kayly Robbins, MPL, MCIP, RPP
Senior Planner

c. WDD Main Street Inc.