Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG

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DRAFT

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG. A total of 8 alternatives are available based on a total of three bridge structures, each with the option of being closed or replaced.

At the onset of the project, a review of the applicable Project Descriptions outlined in the Municipal Engineering Association (MEA) Guide for Municipal Class Environmental Assessments (EAs) (February 2024) was completed and identified that the appropriate Schedule of Municipal Class EA would be dependent on the findings of the cultural heritage and archaeological assessments. Following the completion of the Cultural Heritage Evaluation Report (CHER) and the Stage 1 Archaeological Assessment, it was determined that all project activities would be classified as Exempt under the MEA Guidelines through the Archaeological Screening Process.

The Alternative Solutions were evaluated against the transportation, natural, economic, social, and cultural environments of the Study Area.

A key component of the study included consultation with the public, Indigenous communities, and agencies that may have an interest in the project. Formal notices included mailed and / or emailed notices for project startup, Public Open House (POH) No. 1, POH No. 2, Project Screening and study completion. POH No. 1 provided an opportunity for interested parties to receive background information on the study and provide input on the problems and opportunities to be addressed. POH No. 2 presented the preliminary preferred alternative and opportunity for comments from interested parties on the solution. Additional consultation was also maintained throughout the study via email with interested parties.

The preferred solution consists of the replacement of Bridges 21-WG and 29-WG, and the removal of Bridge 30-WG. The preferred solution has many significant benefits and addresses several of the problems and opportunities, including:

- Replaces the top two (2) structures for transportation improvements.
  - 21-WG offers the most overall benefit, with significant improvements to emergency response times.
  - 29-WG offers slightly less benefit overall, but provides the most improvements to commute times, local community travel, and travel with farm equipment
  - Compounding effects of opening 21-WG & 29-WG is the highest overall transportation score, with a score slightly higher than opening 29-WG & 30-WG.
- Impacts to the sensitive wetlands, fish habitat, and Regionally Significant Area of Natural and Scientific Interest at the site of Bridge 30-WG are limited.
- Aligns with social and cultural considerations and community input on structures.

Throughout the study, a series of mitigation and monitoring requirements were identified based on background and field studies of the Study Area. These measures are to be employed during the implementation of the preferred alternative works. Additionally, several commitment requirements related to the design and construction phases of future implementation projects were developed throughout the study and summarized herein.

Comments or concerns regarding the Project are to be directed to the Township for consideration and response.

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1.0 Introduction and Background

1.1 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG. These three bridges are located within relatively close proximity to one another in a rural area northeast of Fergus. The structures were originally owned by West Garafraxa prior to the amalgamation of the Township, but are now owned by the Township of Centre Wellington and located within Ward 5.

These structures have been closed to vehicular traffic (Bridges 21-WG and 30-WG) or have had load limitations applied (Bridge 29-WG, 5 tonnes) based on recommendations of structural engineers due to their severely deteriorated condition. The Township has recognized the impact of having numerous closed structures on the overall connectivity of the local community. Accordingly, the Township initiated this study to evaluate the role of each structure on the overall transportation network and consider improvements to some or all of the subject bridges in order to improve connectivity within the Study Area. The results of this study will be used by the Township for future capital planning requirements for the subject bridges.

The existing conditions, proposed alternatives, and manner in which public consultation was conducted are presented in this Project Report.

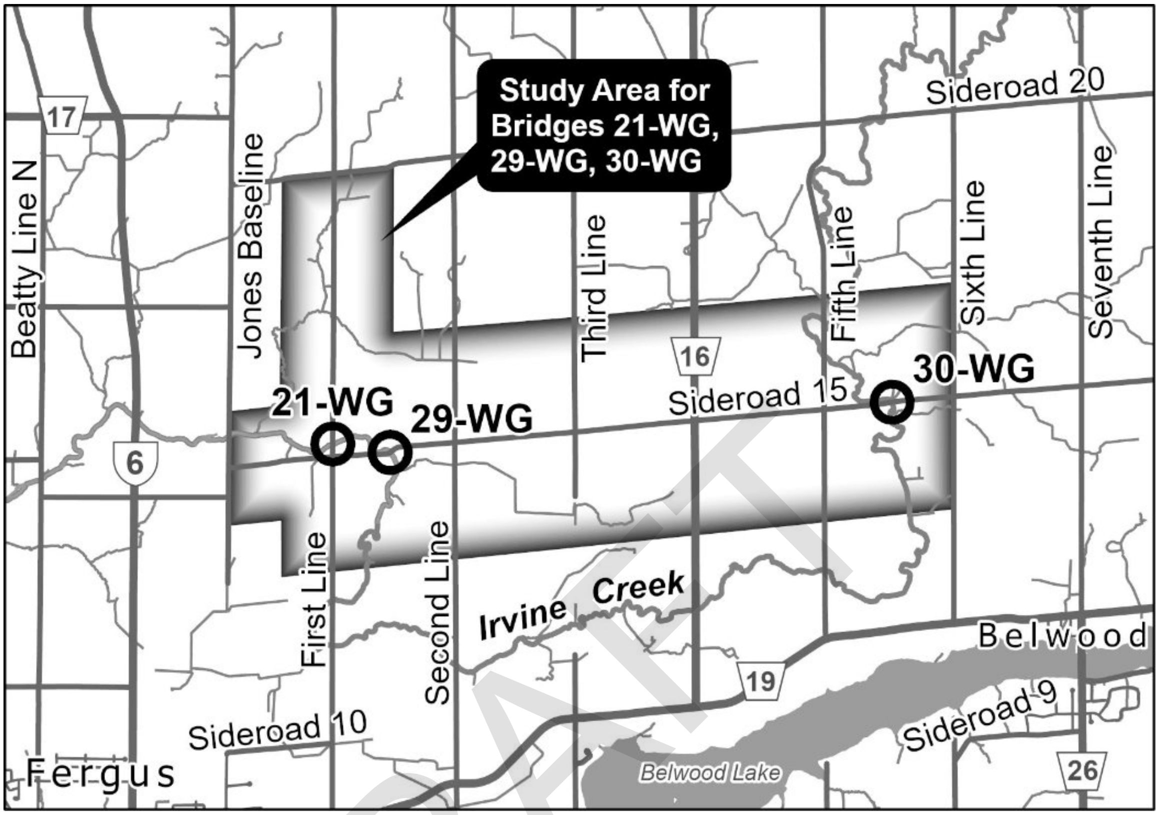
1.2 Study Area

The three bridges being reviewed are located in the northeast quadrant of the Township of Centre Wellington, northeast of the community of Fergus, Ontario. All three bridges are crossings of the Irvine Creek. These structures were built prior to the amalgamation of the Township of Centre Wellington, which occurred in 1999. The locations of the bridges are illustrated in Figure 1 and further described below.

- **Bridge 21-WG:** Located on First Line of former Township of West Garafraxa, immediately north of Sideroad 15.
- **Bridge 29-WG:** Located on Sideroad 15 of former Township of West Garafraxa, approximately 600 m northeast of First Line.
- **Bridge 30-WG:** Located on Sideroad 15 of former Township of West Garafraxa, approximately midway between 5th Line and 6th Line.

The letters in the bridge identification numbers indicate the former West Garafraxa Township prior to the amalgamation of Centre Wellington.

Figure 1: Study Area



The three bridges service a rural community which is home to agricultural, residential, and commercial properties. The network of roads within the Study Area carries vehicular traffic and agricultural equipment and connects the local community within the Study Area to the neighbouring areas of Fergus, Elora, Belwood, Rockwood, Erin, Guelph, and beyond. These local roads were also noted by local residents to be used for recreational walks, biking, and horseback riding.

1.3 Municipal Class Environmental Assessment

The planning of public sector projects or activities that have the potential for environmental effect are subject to a Municipal Class Environmental Assessment (MCEA) as required by Ontario's Environmental Assessment Act, R.S.O. 1990 (EAA).

The MCEA process was developed by the Municipal Engineers Association (MEA), in consultation with the Ministry of the Environment, Conservation and Parks (MECP), as an alternative method to Individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale, and with a predictable range of environmental impacts, which were responsive to mitigating measures.

The MCEA solicits input from regulatory agencies, the Municipality, Indigenous Communities, and the public at the local level. This process leads to an evaluation of the alternatives in view of the significance of the environmental effects, including the technical, natural, social / cultural, and economic impact of a project, and the choice of effective mitigation measures.

1.3.1 Exemption of Project from Ontario's Environmental Assessment Act

At the onset of the project, a review of the applicable Project Descriptions outlined in the MEA Guide for Municipal Class EAs (February 2024) was completed and identified that the appropriate Schedule of Municipal Class EA would be dependent on the findings of the cultural heritage and archaeological assessments.

Following the completion of the Cultural Heritage Evaluation Report (CHER) and the Stage 1 Archaeological Assessment, it was determined that all project activities would be eligible for screening for exemption from the EEA through the Archaeological Screen Process, as identified under Project Description 31b of the MEA Guidelines:

Project Description	Exempt	Eligible for Screening	Schedule B	Schedule C
31b Reconstruction of, or alteration to a structure or the grading adjacent to it when the structure is over 40 years old, the structure is found to have cultural heritage value or interest, and the heritage attributes will be conserved in accordance with the recommendations of a Heritage Impact Assessment • *To determine whether a bridge has "cultural heritage value", refer to the MEA's municipal heritage bridge checklist developed with the Ministry of Citizenship and Multiculturalism and posted on the MEA website*		ASP	X	

The Cultural Heritage Evaluation identified that the structures have cultural heritage value or interest; however, the Township, in consultation with Heritage Centre Wellington, have committed to commemorate the existing structures' heritage attributes in accordance with the recommendations of the Heritage Impact Assessment.

Projects classified as 'Exempt' through the MEA Guide to Municipal Class EAs, either directly or through screening processes, are exempt from the requirements of Ontario's EEA. An activity that is classified as Exempt may not be elevated to a Schedule B or C process; however, the Township has chosen to carry out a consultation and decision-making process similar to a Schedule B EA, but outside of the formal process of the MCEA.

1.3.2 Archaeological Screening Process

The Township completed the Archaeological Screening Process for the bridges in accordance with the Ontario Heritage Act, R.S.O. 1990, c O.18. A Stage 1 Archaeological Assessment was completed, determining that "the study areas were identified to exhibit low archaeological potential due to previous disturbance or poorly drained conditions". The Study Areas are considered free of archeological concerns, and no further archaeological assessment is recommended. As such, it has been determined that the project will have no negative impacts on archaeological resources, and the requirements of the Archaeological Screening Process have been met. In consideration of this, the project was completed without further application of the EEA.

Following the completion of the Archaeological Screening Process, which confirmed that all project activities related to this study would be exempt from the EEA, a Notice of Project Screening was provided to the Ministry’s Regional contact and Indigenous communities to provide the opportunity for comments on the screening process. A Streamline Project Initiation Form was also provided to the MECP to identify that the project has been screened for exemption.

The Stage 1 Archaeological Assessment was submitted to the Ministry of Citizenship and Multiculturalism (MCM) and has been entered into the Ontario Public Register of Archaeological Reports.

1.3.3 Continued Public Engagement

Although this study has been screened to be exempt from the EAA, the Township recognizes that engagement with Indigenous communities, agencies, the public, and other interested parties is an integral component of the decision-making process for the future of these bridge structures. Accordingly, the Township continued with a process similar to the Schedule B EA process, but outside of the formal regulations of the EAA.

2.0 Problem Statement

2.1 Study Purpose

As previously indicated, the Township has recognized the impact of having numerous closed structures on the overall connectivity of the local community. The purpose of this study is to evaluate the role of each structure on the overall transportation network and consider improvements or permanent closure for some or all of the subject bridges in order to address current concerns of the local community and provide direction to the Township's capital planning for their bridge infrastructure inventory.

The objective of this study is to provide a traceable decision-making process while offering effective consultation with the Community, Ministries, Indigenous communities, Conservation Authorities, and other interested parties in order to consider and review a number of potential alternatives, with due consideration of the effects they have on the physical, natural, social, cultural, economic, and technical environments.

2.2 Study Justification

The three bridges included in this study have significantly deteriorated to the point of load limitation (Bridge 29-WG, 5 tonnes) or closure to vehicular traffic (Bridges 21-WG and 30-WG). Given the close proximity of the bridges, these limitations impact the overall transportation network within the local Study Area, which has resulted in additional concerns to the local population and affected parties. The deteriorated state of the closed structures also poses a risk to the public and the environment, resulting in liability concerns to the Township.

2.3 Problems and Opportunities

At the onset of this study and during the first Public Open House, consultation with the public and other interested parties was undertaken to help identify the problems and opportunities that were present due to the current conditions, or that may occur with the opening or permanent closure of the bridges. A summary of the comments received during the first Public Open House, which formed the basis of the problems and opportunities explored during this study, are available in Appendix B. The problems and opportunities raised by interested parties during consultation can be summarized as follows:

- Closures result in increased commute times to surrounding communities.
- Delays to emergency response times as a result of bridge closures.
- Lengthy detours or disruptions for farm equipment travel between agricultural lands within the Study Area and surrounding community.
- Complicated routes for service vehicles such as waste collection, school buses, snow ploughs, delivery vehicles, etc., due to closures / load limitations.

- Increased risks associated with slow-moving agricultural equipment detouring around the bridges to busier arterial routes (County Roads).
- Proposed work should consider increased width requirements for farm equipment.
- Residents are interested in connections for different road user types (pedestrians, cyclists, horses).
- Sight Line and road alignment safety should be considered during improvements.
- Concerns related to traffic increases and speeds if bridges are reopened.
- Vandalism and after-hours loitering at closed structures (notably Bridge 30-P).
- Request to use cost-effective structure types to allow for more work to be done in the area.
- The failing state of the remaining infrastructure presents risks to the public and the surrounding environment should collapse occur.
- The Study Area Population feels ‘forgotten’ because improvements are occurring in other locations of the Township and not within the Study Area.
- Potential impacts to cultural heritage or archeological resources due to construction activities.
- Potential impacts to Built Heritage associated with the removal of the existing bridges.
- Opportunity for geometry and alignment improvements to reduce the potential for erosion and provide additional aquatic and wildlife habitat and / or passage.

The above-noted concerns and opportunities have shaped the investigations that were undertaken throughout this study, to allow alternatives to be evaluated against their ability to address the concerns raised.

3.0 Supporting Studies

To address the problems and opportunities noted above and evaluate the alternative solutions, a series of background studies related to the technical, natural, cultural heritage, social, and economic environments has been undertaken. These studies provide context for the existing conditions, as well as assess the extent to which improvements to each structure would aid in resolving the problems or capturing the opportunities previously outlined.

3.1 Policy and Planning

A review of existing planning and policy data was conducted to obtain secondary source information relating to the technical, natural, cultural, and social environments within the Study Area and to provide an overview of existing policy framework in the Study Area. Sources reviewed include, but are not limited to:

- Planning Act and Provincial Policy Statement;
- Township of Centre Wellington Official Plan;
- County of Wellington Official Plan;
- Township of Centre Wellington Transportation Master Plan; and
- Clean Water Act – Source Water Protection.

The information below is a summary of policy and planning commitments related to the general Study Area. Additional references to the plans and policies related to areas of specific interest (i.e., transportation or natural heritage) are provided in the appended supporting studies, where applicable.

3.1.1 Provincial Policy Statement and Official Plans

The Provincial Policy Statement (PPS) provides policy direction on matters of provincial interest related to land use planning and development (MMAH, 2024). County and Official Plans provide additional policy which is more specific to the Study Area. Policy of the Township's Official Plan only applies to the Elora and Fergus Urban Centres, including Salem and Belwood. Given that the Study Area is outside these Urban Centres, the Study Area is governed by the County of Wellington's Official Plan. In general, the County's Official Plan outlines that decisions for land use shall be made for development that provides an economically strong, healthy, and socially responsible community and which protects the natural and cultural heritage for this and future generations. The following are excerpts from the County's Official Plan future commitments, which may apply to this study:

- Ensure that County residents have convenient access to commercial uses and services.
- Ensure cost-effective development and land use patterns.

- Maintain the small town and rural character of the County.
- Protect the agricultural land base for farming.
- Ensure that farmers, following normal farming practices, are not hindered by conflicting development.
- Provide the infrastructure required to accommodate growth in an environmentally and fiscally responsible manner.
- Maintain clean water, clean air, and a healthy, diverse, and connected Greenlands system.
- Protect, restore, or, where feasible, improve the diversity, connectivity and ecological functions of natural heritage features and areas such as wetlands, environmentally sensitive areas, streams and valley lands, woodlands, areas of natural and scientific interest, discharge and recharge areas and other open space areas.
- Prevent, eliminate or minimize the risks to public health or safety and to property caused by natural hazards.
- Ensure that County residents continue to have convenient access to health care, education and cultural facilities.
- Develop a safe and efficient transportation system for people, goods and services.

These commitments from the Official Plan will be considered in the analysis of the alternatives considered in this Study.

3.1.2 Land Use and Zoning

The Study Area comprises Rural and Greenland systems. The Official Plan designates that rural areas will be the focus for resource activities and that the Greenland system will be the focus for protection of the natural heritage system.

The existing land use designation identified by the Wellington County Official Plan includes mainly prime agricultural, green lands, and core green lands.

3.1.3 Transportation Master Plan

The Township of Centre Wellington Transportation Master Plan (2019) classifies all non-Wellington County roads within the Study Area as Local Rural in existing conditions. The Master Plan does not provide any recommendations for the portion of Sideroad 15 or First Line where the bridges are located. It is noted that the Transportation Master Plan identifies improvements to Bridge 30-WG as a medium-term priority. However, it is recognized that the Transportation Master Plan was conducted prior to the closure of 21-WG and lowered load limitations at 29-WG, so may not reflect the current conditions in the analysis.

Figure 2: Study Area Land Use

Additional context to transportation related plans and policies are provided in Appendix A.1.

3.1.4 Clean Water Act -Source Water Protection

As a result of the *Clean Water Act* (Ontario Regulation 287/07), communities in Ontario are required to develop source protection plans in order to protect their municipal sources of drinking water. These plans identify risks to local drinking water sources and develop strategies to reduce or eliminate these risks.

The bridges are located in the Grand River Source Water Protection Plan and are within a Wellhead Protection Area. Bridge 30-WG is located in a Significant Groundwater Recharge Area.

The Clean Water Act defines a "prescribed threat" as "an activity or condition that adversely affects, or has the potential to adversely affect, the quality or quantity of any water that is or may be used as a source of drinking water and includes an activity or condition that is prescribed by source protection regulation as a drinking water threat."

The Province has identified 22 activities that could pose a threat if they are present in vulnerable areas (listed in Section 1.1 of the Clean Water Act). Project activities are not prescribed drinking water threats and are not anticipated to pose a risk to drinking water.

3.2 Technical Environment

3.2.1 Transportation Network

As part of the analysis of the technical environment, a study on the overall transportation network within the Study Area was conducted to review the current and future road use and evaluate the impacts associated with the opening or closure of the three subject bridges on the overall connectivity of the local community to emergency response, cross-community travel, and localized travel within the Study Area.

3.2.1.1 Transportation Network Overview

The Study Area encompasses an approximately 20 km^2 system of roads that are situated in a relatively grid-like manner, as illustrated previously in Figure 1 above. The road network provides connectivity within the Study Area and to the neighbouring Communities of Alma, Arthur, Belwood, Fergus, Grand Valley, Guelph, and beyond.

A summary of the road characteristics for the Study Area is provided below in Table 1. The roads within the Study Area generally run in a southwest to northeast or southeast, not northwest orientation. However, for the purpose of this study, the ‘Sideroads’ will be classified as ‘East-West’, and the ‘Lines’ will be classified as 'North-South’.

Table 1: Study Area Roadway Characteristics

Road	Classification	Travel Direction	Surface Type	Regulatory Speed Limit
Wellington Road 19	Two-Lane Arterial Rural	East-West	Asphalt	80 km/h (posted)
Side Road 15	Two-Lane Local Rural	East-West	Gravel	80 km/h (unposted)
Side Road 20	Two-Lane Local Rural	East-West	Asphalt & Gravel	60 km/h (posted)
Side Road 25	Two-Lane Local Rural	East-West	Gravel	80 km/h (unposted)
Wellington Road 109	Two-Lane Arterial	East-West	Asphalt	80 km/h (posted)
Jones Baseline	Two-Lane Local Rural	North-South	Gravel	60 km/h (posted)
First Line	Two-Lane Local Rural	North-South	Gravel	80 km/h (posted)
2nd Line	Two-Lane Local Rural	North-South	Gravel	80 km/h (unposted)
3rd Line	Two-Lane Local Rural	North-South	Gravel	80 km/h (unposted)
Wellington Road 16 (CR16)	Two-Lane Rural Arterial	North-South	Asphalt	80 km/h (posted)
5th Line	Two-Lane Local Rural	North-South	Gravel	80 km/h (unposted)
6th Line	Two-Lane Local Rural	North-South	Gravel	80 km/h (unposted)

Several of the roads in the Study Area do not have posted speed limits. These unposted roadways are considered to have regulatory speed limits of 80 km/h in accordance with the Highway Traffic Act (located outside of built-up area).

The road networks in the Study Area service a heavily agricultural and primarily rural community. Traffic on the local roadways consists mainly of passenger vehicles and agricultural equipment. Sideroads 15 and First Line, on which the subject bridges are located, are classified as Local roads within the Township's Transportation Master Plan, with the primary function intended to provide land access. Heavy trucks travelling on the subject roads of this study should be limited to those directly accessing properties within the Study Area.

Highway 6 (west of the Study Area) serves as the primary route facilitating the transportation of goods, both internally and externally, via trucking operations. Notably, Highway 6 plays a pivotal role in the efficient movement of commercial vehicles coming into Centre Wellington or bypassing it. The Study Area road network experiences trucking operations for moving products of various farmlands and some industrial businesses. The transportation of the farmland products rests on light-duty trucks, which are the only type of heavy vehicles allowed to use the local roads in the Study Area.

Although there is no formal active transportation network within the Study Area, it is understood that these low-volume roads are used by the public for recreational activities such as walking, horseback riding, or cycling.

Due to their severely deteriorated condition, these structures have had load limitations applied (21-WG) or have been closed (29-WG and 30-WG) to vehicular traffic. These closures result in local residents, businesses, and visitors of the Study Area being required to travel additional distances to reach destinations located between the closed bridges and the nearest intersection. The impacts of the closures and the three bridges are summarized in the subsections below and further detailed in the Transportation Network Study of Appendix A.1.

3.2.1.2 Cross-Community Connectivity

To address the concerns related to the additional time and distance required by local residents travelling to or from surrounding communities, a study was undertaken to quantify the magnitude of the changes with each individual bridge or combinations of bridges being opened or closed.

The local roads impacted by the bridge closures are not part of the main network for travel between neighbouring communities and therefore do not impact the travel network outside of the local community. However, for residents or businesses located directly within the Study Area, travel times to these neighbouring communities are impacted.

The Transportation Network Study included in Appendix A.1 contains a detailed review of the travel times and distances based on origins or destinations on each side of the bridge to six surrounding communities, including Alma, Arthur, Belwood, Fergus, Grand Valley, and Guelph.

The findings of the study are summarized in Table 2 for each combination of bridges being opened or closed. It should be noted that the total time and distance savings are based on the specific routes analyzed to allow for comparative scoring and that the time savings for other origins and destinations may vary slightly. All noted time savings are relative to the base scenario of all three bridges being closed.

To capture the volume of users that these benefits may impact, the results were weighted by the Average Annual Daily Traffic (AADT). The pre-closure AADT values were utilized and indexed to estimate current-year AADT values.

Table 2: Cross-Community Travel Results Summary (Relative to All Bridges Closed)

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Saved (mm:ss)	43:54	16:54	15:04	08:08	27:03	25:02	32:12
Maximum Time Saved (mm:ss)	6:00	4:00	4:19	02:33	6:00	4:00	4:19
Traffic Weighted Time Savings(1)	8,990	3,243	4,002	1,570	6,588	4,813	6,514
Total Distance Saved (km)	47.10	24.25	21.60	5.99	29.21	30.24	38.60
Maximum Distance Saved (km)	7.01	5.96	6.25	1.69	7.01	5.96	6.25
Traffic Weighted Distance Savings (1)	9,727	5,079	5,565	1,177	7,178	6,257	8,011
Traffic Weighted Savings are calculated by summing the product of the time (minutes) or distance (km) saved for each OD pair by the applicable AADT value along that route.							

Based on the above, opening all three bridges provides the most benefit to Cross-Community travel for local residents. The combination of opening 29-WG and 30-WG results in the most time savings for an individual trip, and the most benefit to traffic weighted time savings, given that it opens an east-west corridor. The combination of opening Bridges 21-WG and 29-WG provides the greatest total time savings for all routes and a comparable traffic weighted time savings to 29-WG and 30-WG. The benefits for reduced travel distance are similar to those of travel time; however, the combination of opening 21-WG and 29-WG provides a greater benefit for the traffic weighted distance savings than the combination of Bridges 29-WG and 30-WG.

3.2.1.3 Emergency Response

A robust analysis was completed to evaluate the impact of bridge closures on emergency response times, involving three essential entities: fire, ambulatory, and police response. The analysis reviewed response times from primary and additional response stations in the surrounding communities to the properties nearest each side of the bridges.

A weighted result was also calculated as part of the analysis to capture the number of properties that would benefit from the improvements and to consider whether the improvements were for a primary, secondary, tertiary, or quaternary response station.

The results of the study are shown in Table 3. Further details on the emergency response analysis are provided in the Transportation Network Study included in Appendix A.1.

Table 3: Summary of First Response Stations and Time Savings (Relative to All Bridges Closed)

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Savings (mm:ss)	50:45	26:06	14:59	07:27	25:53	33:33	38:19
Max Time Savings (mm:ss)	06:02	04:00	04:21	02:33	06:02	04:00	04:21
Total Properties Benefited	30	15	15	15	22	30	23
Weighted Time Savings(1) (h:mm:ss)	1:50:40	1:11:17	0:17:50	0:12:45	0:33:36	1:24:01	1:31:59
Total Distance Savings (km)	42.50	31.47	10.96	6.76	10.96	6.76	17.26
Max Distance Savings (km)	6.23	5.61	5.48	1.69	5.48	1.69	6.23
Weighted Distance Savings(1)	102.50	86.16	12.45	13.70	20.47	99.86	92.96
(1) Weighted Savings is the sum of the product of the individual time or distance savings along each OD pair route, multiplied by the number of benefitting properties and the response order factor.							

The primary consideration used in the analysis for selecting the preferred alternative is the time savings, given that the fastest response time is the primary concern, as opposed to shorter distances when it comes to emergency response.

As per the above, opening of 21-WG provides a substantially greater benefit than the other structures. This is mostly due to the primary response stations being located in Fergus, and access to each side of Bridges 29-WG and 30-WG being fairly accessible via County Road 19, with only minor backtracking required. In Contrast, access to properties north of 21-WG requires response vehicles to travel to up to Sideroad 20 and backtrack, which is a lengthier detour.

Replacing all structures would provide the most benefit to emergency response. The next most beneficial combinations include those which include the replacement of Bridge 21-WG and 29-WG or Bridges 21-WG and 30-WG.

3.2.1.4 Slow Moving Vehicles

In recognition that the Study Area is predominantly agricultural land use, an evaluation of travel times for slow-moving agricultural equipment was also completed to address comments received from the public. This analysis used a 25 km/h travel speed and prohibited the use of busier arterial roads where possible. Although it is recognized that the slow-moving vehicles may be permitted to travel on the busier collector or arterial roads, it is understood that the preference would be to have these vehicles use lower volume roads to not impact routes designed for continuous through traffic. It is also recognized that some operators of slow-moving vehicles would prefer to use local roads from a safety perspective.

The findings of the study are summarized in Table 4 for individual bridges being opened or closed. It should be noted that the total time and distance savings are based specifically on the distinct routes analyzed to allow for comparative scoring. Time savings for other origins and destinations may vary slightly. For further information on the analyzed routes and study findings, refer to Appendix A.1.

Table 4: Summary of Total Time & Distance Savings for Slow-Moving Vehicles along Analyzed Routes (Relative to All Bridges Closed)

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Saved (h:mm:ss)	1:49:56	0:27:05	0:30:10	0:23:38	1:08:44	0:50:43	1:00:28
Maximum Time Saved (mm:ss)	24:06	16:19	24:06	19:20	24:06	19:20	24:06
Total Distance Saved (km)	45.82	11.28	12.57	9.86	28.65	21.14	25.20
Maximum Distance Saved (km)	10.04	6.80	10.04	8.06	10.04	8.06	10.04

As summarized in the results above, opening Bridge 29-WG provides the most benefit for an individual bridge, with the highest benefit for a single route as well as the highest total savings for all routes in regard to both time and distance.

Opening all bridges would provide the most benefit for slow-moving vehicles; however, if considering only opening two bridges, the combination of 29-WG and 30-WG offers the most improvements overall, followed closely by the combination of opening 21-WG and 29-WG.

3.2.1.5 Local Community Travel

An additional traffic analysis was completed to determine the impacts associated with vehicles travelling within the Study Area. This study analyses routes that may be used by local residents travelling to neighbouring properties or by service and delivery vehicles, such as postal services, snow ploughs, waste collection vehicles, school buses, etc. Further details and all routes analyzed as part of this study are outlined in Appendix A.1.

No weighting for properties or vehicle traffic has been applied to these results, considering that the vehicles and routes being analyzed are typically required to travel to each side of the bridge regardless of these factors. The results for the combinations of opened bridges are summarized in Table 5. It should be noted that the total time and distance savings are based specifically on the distinct routes analyzed to allow for comparative scoring. Time savings for other origins and destinations may vary slightly. All time savings noted are relative to the scenario of all bridges being closed.

Table 5: Summary of Total Time & Distance Savings for Travel within Study Area (Relative to All Bridges Closed)

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Saved (mm:ss)	38:53	08:21	12:07	08:01	24:02	17:52	24:34
Maximum Time Saved (mm:ss)	08:55	05:54	08:55	05:17	08:55	05:54	08:55
Total Distance Saved (km)	45.48	12.30	14.94	8.45	28.31	20.80	27.24
Maximum Distance Saved (km)	10.96	6.80	10.96	6.70	10.96	6.80	10.96

The results above indicate that opening Bridge 29-WG provides the most benefit for an individual bridge, with the highest benefit for a single route as well as the highest total savings for all routes in regard to both time and distance.

Opening all bridges would provide the most benefit for travel within the local community; however, if considering only opening two bridges, the combinations of opening 29-WG and 30-WG or opening 21-WG and 29-WG offer comparable benefit, with the latter offering slightly better time improvements and the former providing slightly better improvements to travel distance.

3.2.1.6 Summary of Traffic Memo Findings

The analysis of the various alternatives highlights the significant impact that bridge closures and openings have on various aspects of transportation, including cross-community travel, emergency response times and local community and slow-moving vehicle trips within the Study Area. Each alternative demonstrates varying levels of improvement in travel time and distance, depending on the combination of bridges opened. Additionally, the analysis underscores the importance of considering not only the total reductions in travel time and distance but also the distribution of these impacts across different OD pairs. Some alternatives provide more localized improvements, benefiting select routes or properties, while others result in more widespread enhancements.

When looking at the effects of individual structures, opening Bridge 21-WG offers the most benefit to emergency response, whereas opening Bridge 29-WG offers the most improvement to cross-community travel, slow-moving equipment, and travel within the local community. Bridge 30-WG provides the least benefit overall on an individual bridge basis.

When considering combinations of multiple structures being opened, the most benefit would be realized by opening all bridges. When considering the options of opening two structures, the compounding effects of opening Bridges 21-WG and 29-WG, is the highest scoring alternative when considering the combined effects of all criteria and outweighs the combined effects of opening 29-WG and 30-WG (a through east-west corridor) due to the substantially larger benefit to emergency services related to opening Bridge 21-WG versus Bridge 30-WG.

3.2.2 Bridge Improvement Study

As part of the overall project study, an evaluation of the existing bridge conditions and a series of potential improvements to each structure were also completed to determine the preferred improvement at each specific bridge site. This study included:

- A review of the existing roadway and bridge geometry to allow comparison to current standards and identify areas of potential improvements to increase the safety and usability of the bridge and approach road.

- A review of the physical conditions of the existing bridges to identify the structural concerns and determine the feasibility and scope of work associated with potential rehabilitation.
- Analysis of various structure types to evaluate opportunities for using different types of crossing structures, such as multi-cell culverts, narrow-lane bridges, and various types of single-span bridges.
- Hydrology study and hydraulic analysis to determine the applicable flow rates of the watercourse at each site and determine the structure and road geometry required to ensure that the proposed improvement does not result in increased flooding or erosion potential.

Detailed technical memorandums related to the Existing Geometry and Physical Condition, the Evaluation of Structure Improvement Types, and the Hydrology and Hydraulic evaluation are available in Appendices A.2, A.3, and A.4, respectively. Summaries of the findings of these reports are provided below.

3.2.2.1 Existing Geometry and Physical Condition

The three structures were constructed between 1928 and 1942. At present, a 5-tonne gross vehicle weight load limit applies to Bridge 29-WG, while Bridges 21-WG and 30-WG have been closed to traffic. A summary of the three bridges being evaluated as part of this study is provided in Table 6.

Table 6: Existing Bridge Information

ID	Structure Type	Road Name	Span (m)	Year Built	Year Repaired	Year Closed
21-WG	Bowstring Arch	First Line	17.9	1929	2016	2024
29-WG	Bowstring Arch	Sideroad 15	21.3	1928	N/A	NA
30-WG	Steel Through Truss	Sideroad 15	26.3	1923	N/A	2010

Previous inspections completed by a structural engineer have determined that the structures are in a significantly deteriorated state, which has resulted in the closure or significant load reduction of the structures, as outlined in Table 7 below and further detailed within the Existing Geometry and Physical Condition memo of Appendix A.2.

Table 7: Current Load Limitations

Bridge No.	Current Load Limitations
21-WG	Closed to Vehicular Traffic
29-WG	5-Tonne Gross Vehicle Weight
30-WG	Closed to Vehicular Traffic

In addition to the limitations imposed by the structure condition, the geometry of the bridges also provides restrictions on vehicles or equipment that would otherwise be able to use the structure. The narrow platform widths on the bridges (see Table 8) do not meet the minimum 6.0 m requirements outlined in the MTO Structural Manual for a two-lane Low Volume Road bridge. Additionally, some larger articulated four wheel drive tractors and tillage implements may exceed the height or clear width between the bridge trusses.

A summary of the characteristics of the existing roadways on the approaches to the bridges are shown in Table 8 below.

Table 8: Existing Road Geometry & Details

ID	Road Name	Surface Type	Speed Limit	Driving Platform Width	
				Approach	Bridge
21-WG	First Line	Gravel	80 km/h (non-posted)	4.8 – 5 m	4.8 m +/-
29-WG	Sideroad 15	Gravel	80 km/h (non-posted)	6.0 – 8.0 m	5.5 m +/-
30-WG	Sideroad 15	Gravel	80 km/h (non-posted)	4.5 – 6 m	4.5 m +/-

A review of the topographic survey in the immediate vicinity of each bridge indicates that the existing vertical and horizontal profiles do not have adequate sight lines to safely accommodate 80 km/h. The design speeds at the bridges are less than the assumed regulatory speed limit. Regulatory speed limit signs or advisory speed signs, at minimum, should be considered by the Township to ensure drivers have adequate sight lines and stopping distances at the subject bridges during detailed design.

Further, the existing road and bridge platform width does not meet the Township's current standards for travel lane and shoulder widths, which requires a total 9.1 m wide driving platform for a two-lane road.

Further details regarding the existing geometry and physical condition of the bridge are available in Appendix A.2.

3.2.2.2 Evaluation of Structure Improvement Types

Several structure types were evaluated to determine the preferred structure improvement most suitable to address the problems and opportunities identified during this study. The following improvement options were considered:

1. Rehabilitation;
2. Replacement, Two-lane;

   - Single-Span, Slab on Prestressed Girder Bridge.
   - Two-Span, Slab on Prestressed Girder Bridge.
3. Replacement, Narrow Two-Lane Steel Through-Truss; and
4. Replacement, Single Lane, Prefabricated Modular Panel Bridge.

An evaluation was completed for the structure improvement types, which analyzed each structure type against the following criteria:

- The driving platform width available and the ability of this width to meet Township standards, provide the required width for crossing of large agricultural equipment and provide a safe transition from the approach roadway.
- Available load carrying capacity and the ability to carry current vehicular loads.
- The maintenance requirements associated with the bridge over its design life.
- The potential need for property easements or acquisition.
- The degree of environmental impacts associated with disturbance to the creek bed, excavation and grading limits.
- The relative hydraulic capacity and the hydraulic efficiency of the structure opening and associated depth required from the soffit to the centreline of road.
- The ability to maintain or conserve heritage attributes or provide sympathetic design features to the existing bridges.
- The accommodation for pedestrian use.
- Construction cost and duration.
- Service life.

The evaluation determined that the preferred solution for improvement should involve the replacement of the structure with a two-lane, prestressed concrete box girder bridge. Where the hydraulics allow, the use of a single-span configuration is desired; however, where the depth of a single span girder would result in increases to the road profile that would have adverse impacts on Regional flood elevations, the use of a two-span configuration would still be preferred over the other options considered.

Further details of the evaluation are provided in the Evaluation of Structure Improvement Types Technical Memo of Appendix A.3.

3.2.3 Hydrology and Hydraulics

A hydrology and hydraulic study was completed to assess the existing conditions of the current bridge structures and determine the required geometry for replacement options being considered in the evaluation of alternative solutions.

A detailed report outlining the hydrology and hydraulic study is provided in Appendix A.4. The results of the study are summarized below.

3.2.3.1 Hydrology

In accordance with MTO Highway Drainage Design Standards, the Unified Ontario Flood Method (UOFM) shall be used for the calculation of peak flows. In addition to the UOFM method, peak flows shall be calculated using an alternative hydrology model to determine which UOFM peak flow limits are to be used in design.

The alternative hydrology model used was developed in Visual OTTHYMO (VO), using IDF coefficients derived from MTO Lookup Tool, lane use data extracted from ArcHydro and contour data from LiDAR obtained from Ontario GeoHub. The entire catchment area for the three subject bridges, as illustrated in Figure 3 below, were divided into 45 subcatchments and routed to the applicable bridges. Using the SCS curve number method, peak flows were calculated for the 24hr SCS Type II design storms in VO. The Hurricane Hazel Regional Storm was also modelled in VO.

Comparison of the peak flows from the two hydrological methods identified that the values calculated in the VO model exceeded those of the UOFM method. Therefore, per the MTO Highway Drainage Design Standards, the value at the upper limit of the range calculated via the UOFM shall be applied in design. The UOFM method is not used for calculation of the Regional Storm peak flows, and therefore, the results of the VO model are used for such flows. Table 9 contains a summary of the peak flows used for design.

Figure 3: Catchment Area for Subject Bridges

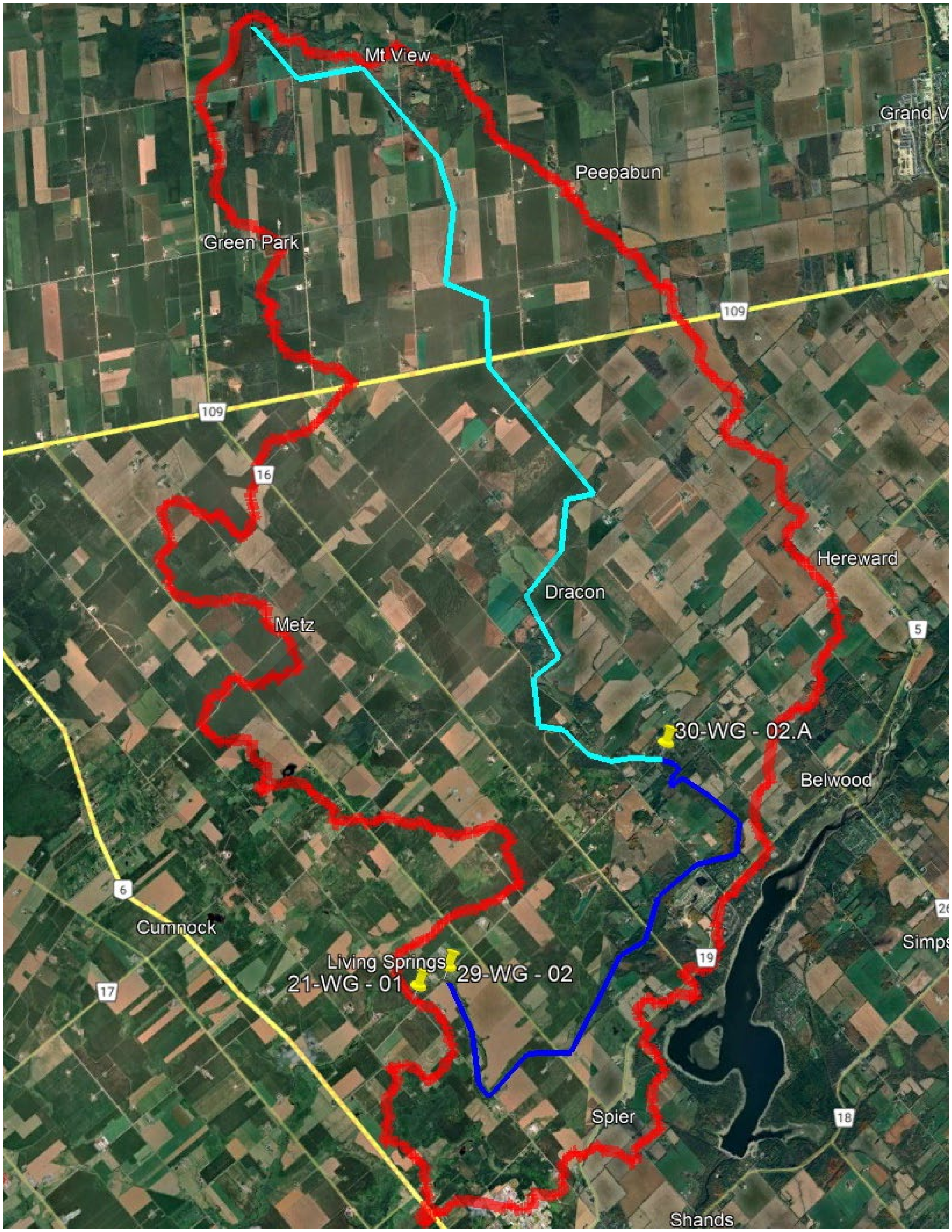


Table 9: Summarized Peak Flows

Bridge No.	50% AEP / 2-year (m^3/s)	10% AEP / 10-year (m^3/s)	4% AEP / 25-year (m^3/s)	2% AEP / 50-year (m^3/s)	1% AEP / 100-year (m^3/s)	Regional (m^3/s)
30-WG	40.20	75.93	95.71	110.87	127.76	519.81
29-WG	44.41	81.95	102.55	118.25	135.74	562.75
21-WG	44.72	82.54	103.28	119.1	136.73	563.403

A more detailed breakdown of the modelling methods used to determine the above peak flows is available in the Technical Memorandum - Hydrology and Hydraulics Report provided in Appendix A.4.

3.2.3.1 Hydraulic Design Criteria

The following criteria has been used in the hydraulic analysis of the existing and proposed structures:

- The existing bridges are located on Low-Volume Local Roads and in accordance with the MTO Highway Drainage Design Standards WC-1, 1.2.1, the Design flow for the bridge analysis is the 4% Annual Exceedance Probability (AEP) or 25-year peak flow, given that the total span exceeds 6.0 m.
- In accordance with the MTO Highway Drainage Design Standards WC-2, 3.3.1, there are no freeboard requirements for Low-Volume Local Roads.
- In accordance with the MTO Highway Drainage Design Standards WC-2, 3.3.2, the minimum Clearance to the soffit shall be ≥ 0.0 m.
- As per the policies of the GRCA, the pre- to post-development conditions shall not result in negative impacts to the flood levels or erosion potential.

The HEC-RAS version 6.6 computer model developed by the U.S. Army Corps of Engineers has been utilized to analyze the hydraulic performance of the existing and proposed structures. This model estimates the change in water surface elevation between selected valley cross-sections and routines to account for local increases in water levels due to bridges, culverts, or other flow obstructions. The model is intended for utilization in the analysis of water surface profiles of steady state, gradually varied, one-dimensional flow in natural, and man-made channels.

3.2.3.2 Hydraulic Analysis, Existing Conditions

Existing hydraulic models were developed using surveyed road profile and structure elevations and record documents or site measurements of the existing structures. All three structures consist of truss structures with partially open panels. Given that these partially open panels could become obstructed by debris or ice blockage during significant storm events, the geometry used for the existing truss used 50% of the truss width as a solid blockage.

HECRAS modelling for all three of the existing bridges and approach roads identified that the structures convey all storms up to and including the 1% Annual Exceedance Probability (100-year return period). All three existing structures were also found to overtop significantly during the Regional Storm flow events.

The existing conditions of all three bridges met the minimum criteria for freeboard and clearances for low-volume roads as outlined in Section 3.2.3.1 above.

Additional details regarding the hydraulic performance of the existing structures can be found in Appendix A.4.

3.2.3.3 Hydraulic Analysis, Proposed Conditions

In order to aid in the evaluation of alternatives relating to replacement structures, preliminary structure sizing and a hydraulic analysis of the proposed replacement structure was required in order to assure the recommended structure would satisfy the hydraulic criteria and not result in any negative impacts to flood elevations.

Several iterations of bridge sizes and configurations, and the associated road profiles, were generated and evaluated based on preliminary geometric design at each site. Given that the hydraulic analysis of the existing conditions identified that the structures overtop under the Regional Storm flows, increases to the road profile can result in significant impacts to Regional flood elevations that must be offset by increasing the hydraulic conveyance through the structure.

To minimize the hydraulic impacts associated with road profile changes, structure types with lower superstructure depth to span ratios were used. Accordingly, the use of side-by-side prestressed concrete box girders was considered, given that they are one of the most efficient structure types for superstructure depth to span ratio. The depth of superstructure used in the hydraulic model was based on the MTO Prestress Girder Design Guideline Span Applicability Charts.

The use of Through-Truss structures was also considered; however, consultation with fabricators indicated that for a full, two-lane bridge (9.1 m driving platform), the depth of superstructure from soffit to underside of deck would exceed that of the slab on prestressed girder.

The proposed bridge geometry was set to balance minimization of the road profile increases while maintaining a similar soffit elevation to the existing structure. In considering that larger spans require deeper superstructures, several iterations were undertaken until a solution was found that satisfied the hydraulic requirements while maintaining a structure span that was relatively suited for the natural landform of the sites.

In the instance of structure 29-WG, the depth of girder required for a single span resulted in the road profile increases that were too significant and resulted in increased flood elevations upstream. Accordingly, two-span options with shallower girders and a pier obstruction in the watercourse were modelled and found to be suitable hydraulically.

A summary of the selected preliminary structure geometry determined to meet the hydraulic requirements is provided in Table 10 below. The associated hydraulic performance of the noted bridge geometry is summarized in Table 11 and further outlined in Appendix A.4.

Table 10: Structure Geometry for Hydraulic Analysis of Proposed Replacement Bridges

Bridge ID	Required Clear Span(s) (m)	Preferred Structure Type (if replaced)	Road Profile Design Speed
21-WG	26.0	Single Span, Slab on Side-by-Side B800 Prestressed Concrete Girder	50 km/h
29-WG	18.5, 18.5	Two-Span, Slab on Side-by-Side B700 Prestressed Concrete Girder	50 km/h
30-WG	28.0	Single-Span Slab on Side-by-Side B900 Prestressed Concrete Girder	50 km/h

Table 11: Hydraulic Performance of Preliminary Designs at All Bridges

Bridge ID	Headwater Elevation (m) [Difference vs. Existing]						Soffit Elevation	Elev. Edge of Travelled Lane at Low Point	Clearance at 4% AEP
	50% AEP	10% AEP	4% AEP	2% AEP	1% AEP	Regional			
21-WG	416.85 [-0.02]	417.36 [-0.06]	417.55 [-0.09]	417.68 [-0.12]	417.81 [-0.16]	420.64 [+0.04]	418.00 m	418.75 m	0.45 m
29-WG	418.13 [-0.06]	418.59 [-0.14]	418.78 [-0.20]	418.91 [-0.25] (P)	419.05 [-0.30] (P)	421.34 [-0.02]	419.00 m	419.23 m	0.22 m
30-WG	439.48 [0.00] (P)	439.85 [-0.02]	440.02 [-0.03]	440.14 [-0.04]	440.27 [-0.06]	442.15 [0.05]	440.32 m	441.03 m	1.01 m

3.3 Natural Environment

A detailed Natural Heritage Study was conducted to determine the potential risks for impacts and available opportunities for improvements related to the natural environment, including both terrestrial and aquatic, at each bridge site. The study involved a review of a localized Study Area within 120 m radius around each bridge, which is anticipated to cover the area to be impacted by potential construction activities at the structure. Terrestrial and aquatic assessments were completed and included a review of various sources of background information as well as site visit components to confirm the background information as well as characterize the existing conditions at the site. Surveys for Ecological Land Classification (ELC), botanical inventory, wetland staking, and aquatic assessment were undertaken in 2025.

The subject lands are in the jurisdiction of the Grand River Conservation Authority (GRCA) and the Guelph MECP District. The subject bridges are crossings of the Irvine Creek. All subject lands immediately adjacent the watercourse are identified in Schedule B1 of the Wellington County Official Plan as surrounded by Core Greenlands. The Wellington County Official Plan identifies that the stream and valley lands at the sites are considered significant natural features, providing protection to the watercourses. Any wetland, where identified, is considered a significant natural feature in the Official Plan as well.

A summary of the findings related to the Natural Environment are below. A full report identifying all natural feature constraints that will need to be protected or mitigated from short-term or long-term impacts is provided in Appendix A.5.

3.3.1 Bridge 21-WG

In total, five ELC communities are present within the Study Area associated with Bridge 21-WG. The natural heritage system adjacent to this structure consists of narrow bands of forested lands. Two of the ELC communities, Fresh Moist Lowland Deciduous Forest and Fencerow are potential habitat for endangered and threatened species. Three of the communities are also candidate Significant Wildlife Habitat.

An active Cliff Swallow (*Petrochelidon pyrrhonota*) colony comprised of over 20 nests is present under the bridge deck. No other species of bird were observed nesting on the structure.

Burnside’s aquatic ecologist visited the structure on June 23, 2025, to characterize the existing aquatic features. Fish were observed. The upstream reach flowed along a naturalized corridor surrounded by an agriculturally dominated landscape. Downstream, the surrounding riparian habitat was similar to that observed upstream. However, the downstream reach was noticeably more exposed to sunlight (<10% cover), as there were fewer large trees and mostly overhanging grasses.

Additional information can be found in the Natural Heritage Report, which has been included in Appendix A.5.

3.3.2 Bridge 29-WG

The natural heritage system adjacent to this structure is narrow, with hedgerows of trees or shrubs and meadows separating the watercourse from the agricultural lands and rural residential areas.

In total, eight ELC communities occur in association with this structure. No birds were noted to be breeding on this structure. One of the ELC communities, Fencerow, is potential habitat for endangered and threatened species. Four of the communities are also candidate Significant Wildlife Habitat.

Burnside’s aquatic ecologist visited the structure on June 23, 2025, to characterize the existing aquatic features. Fish were observed. The upstream reach is surrounded by a narrow line of riparian trees on the south bank with a grass-dominated north bank. Despite the vegetation, the watercourse was largely exposed to sunlight, with ~30% covered by overhanging trees. The vegetation helped to protect the banks, as there was minimal erosion. Downstream was totally exposed, with no large trees within the 30 m observed. The banks were well-vegetated with grasses and riparian shrubs, and as a result, no major signs of erosion were observed.

Additional information can be found in the Natural Heritage Report in Appendix A.5.

3.3.3 Bridge 30-WG

This structure is located within the Living Springs Wetland Complex provincially significant wetland complies. Southeast of the structure, a mature coniferous swamp is present, while a deciduous swamp is located to the northwest, well beyond the existing structure. Deciduous woodlands and meadows are located immediately adjacent to the structure to the northeast, northwest, and southwest of the structure.

Wetland boundary delineation was completed at this structure with the GRCA. Due to issues with cell service, the wetland boundary west of Bridge 30-WG is not 100% accurate and should be considered approximate. It should also be noted that the mapped wetland boundary span >0.5 ha. The wetland boundary east of the structure is accurate.

In total, ten ELC communities occur in association with this structure. Six of the ELC communities are potential habitat for endangered and threatened species. Eight of the communities are also candidate Significant Wildlife Habitat.

Burnside’s aquatic ecologist visited the structure on June 23, 2025, to characterize the existing aquatic features. Fish were observed. The upstream reach is entirely exposed with no large riparian trees present or high grasses providing no observable cover. The banks were stable except for the minimal erosion observed at the structure's base in the form of undercutting. Downstream was exposed like the upstream section. The banks were well vegetated with high grasses and showed no signs of erosion.

In 2022, Burnside conducted physical fish community surveys approximately 3.3 km downstream of Bridge 30-WG (effectively at the same location as Bridge 16-WG) but did not capture Redside Dace.

However, in 2019, AECOM (2020) carried out a broader survey using environmental DNA (eDNA), a molecular detection method, conducted alongside physical sampling. Through eDNA analysis, Redside Dace were detected near 21-WG, 29-WG, and approximately 3.3 km downstream of 30-WG, the same site where Burnside’s physical survey at 16-WG found no detections. However, consistent with Burnside’s findings, AECOM also did not physically capture any Redside Dace during their field program.

Additional information can be found in the Natural Heritage Report in Appendix A.5.

3.4 Social and Cultural Environment

3.4.1 Built Heritage and Cultural Heritage Resources

A Cultural Heritage Evaluation Report (CHER) was completed by Peninsula Heritage Ltd. (PHL) for each of the three existing structures. The purpose of the study was to review relevant historical documents, evaluate any potential cultural heritage value or interest (CHVI), and provide recommendations for each bridge, as appropriate.

As part of the assessment, a site visit was conducted to document the bridges and surrounding landscape. All three bridges were found to exhibit cultural heritage value or interest, and as such, a Heritage Impact Assessment was required.

Each of the three bridges evaluated met at least two of the nine criteria as outlined by O. Reg. 9/06 (as amended by O. Reg 569/22) and therefore met the criteria for Listing under Section 27 of the Ontario Heritage Act (OHA), or Designation under Section 29 of the OHA.

A Heritage Impact Assessment (HIA) of the bridges was also conducted by Peninsula Heritage Ltd. to further review the CHVI, evaluate the potential direct or indirect impacts to the bridge based on the proposed alternatives of removal, rehabilitation, or replacement and provide recommendations for conservation options. The HIA identified options for conservation ranging from retention of the bridge with no major modifications, to full documentation of the existing structure prior to removal and, where possible, salvage or elements of the bridge for incorporation into new structure or for future conservation work or displays.

Upon review of the CHER and HIA documents by Heritage Centre Wellington, the Township requested that a Documentation and Salvage report be prepared in order to outline potential options for conserving and commemorating heritage attributes of the structure during removal and to document the existing structures for deposition in local repositories. Documentation and Salvage reports were prepared by PHL for each structure and provided to the Township for consideration in the implementation of future works and circulation to local heritage repositories.

Further details can be found in the Cultural Heritage Evaluation Report, Heritage Impact Assessment and the Documentation and Salvage Reports are included in Appendices A.6, A.7 and A.8, respectively.

3.4.2 Archaeology

Parslow Heritage Consultancy (PHC) conducted a Stage 1 Archaeology Assessment of all three sites. The assessment provides compiled information about the Study Area's geography, history, and current land conditions. The property inspection conducted as part of the study (on June 12, 2025) determined that negative indicators of archaeological potential related to soil manipulation and grading of soils associated with the construction of the bridges and roads. The earth movement activities associated with such disturbance would have either eradicated or relocated any cultural materials to such a degree that the information potential and cultural heritage value or interest would have been lost.

Based on the results of the Stage 1 Archaeological Assessment, which has been provided in Appendix A.9, the Study Areas are considered to have low archaeological potential and no further archaeological assessments are recommended.

3.4.3 Community, Residential and Recreational Property, and Access Impacts

Access to all residential properties would be optimized with all bridges open; however, closure of the bridges would not eliminate access to any properties. The routes required to access properties may be impacted by bridge closures, as previously outlined in Section 3.2.1.

3.4.4 Pedestrian Use

While there are no formal trails or recreational facilities located within the Study Area, consultation with the community identified that residents use these low-volume roads for recreational walks, horseback riding, and cycling. The current road network is not designed to support active transportation. The narrow bridge widths do not provide designated areas for pedestrian crossing, and therefore, users are forced to cross the bridge within the travelled portion of the roadway. If the bridges are closed to vehicular traffic, this alternative is acceptable; however, if the bridges are opened to traffic, it would be preferred, at minimum, to have a designated shoulder that would allow pedestrians to walk or ride along, outside of the travelled portion of the road.

For scenarios with bridges closed, it is anticipated that the road would be travelled by vehicles accessing the local properties only. These reduced traffic volumes may make it more desirable for users to use the roadway for recreational activities such as walking, horseback riding, or cycling.

Comments were received by the public stating that if the bridges are closed to vehicular traffic, it would be preferred to have a pedestrian crossing maintained. Given that the pedestrian loading is substantially less than vehicular loading, the current state of the bridges that are closed to traffic are likely capable of carrying the anticipated volumes of pedestrian loading. It is recommended that if the structures are kept open for pedestrian access, that a detailed visual inspection be completed to confirm their suitability for carrying pedestrian loading at a regular interval of at least once per year. If concerns related to accelerating deterioration are identified that may suggest the state of the infrastructure’s capacity would change between annual inspections, the Township should consider more frequent inspection.

3.4.5 Air and Noise Impacts

In general, the air pollution of the Study Area would be reduced with the bridges being opened, as the travel routes for accessing properties would be optimized by having through routes at all bridge locations.

Some local residents indicated a preference for the bridges to remain closed, as it results in reductions of the total traffic travelling the local roads and results in less noise created from passing vehicles.

3.4.6 Community Preference

Through consultations during the project, several local residents and business owners identified a preference for the opening or closure of the bridges. Following the first public open house, the public was provided the opportunity to rank the bridges based on the individual's level of desire to have the bridge opened. A ranking of 0 indicated that they had no desire for the bridge to be opened, whereas a ranking of 5 indicated that opening the bridge without any restrictions is of significant importance to them. Additional comments received throughout the study were also considered in addition to the direct rankings provided on the comment sheets. A summary of the preferences identified through the consultation process are summarized in Table 12.

Table 12: Community Preference

Bridge ID	Number of Responses per Rating					
	0	1	2	3	4	5
21-WG	3	2	2	1	3	10
29-WG	1	1	1	0	3	15
30-WG	7	4	2	4	2	4

3.5 Economic Environment

3.5.1 Construction Cost Estimates

An estimation of the construction costs for the options of removal or replacement of each bridge has been completed based on current industry pricing. For the replacement structure costing, the required spans and preferred structure types outlined in Section 3.2.3.3 were utilized. The replacement costs outlined include the cost of structure removal. A summary of the estimated construction costs are provided in Table 13. Additional information regarding the construction cost estimates for replacement can be found in the Preliminary Construction Cost Estimate in Appendix A.10.

Table 13: Capital Costs for Removals and Replacements

Bridge ID	Structure Removal [1, 2]	Structure Replacement [1, 3]
21-WG	$100,000.00	$2,800,000.00
29-WG	$100,000.00	$3,780,000.00
30-WG	$100,000.00	$2,850,000.00

1 Cost estimates are exclusive of engineering costs, property acquisition, utility relocations.
2 Removal cost estimates do not account for improvements to the approach roadway.
3 Replacement cost estimates include for structure removal and improvements to the roadway only within the necessary limits to tie into the proposed replacement structure. Costs associated with upgrading the roadway beyond the limits required for bridge work are excluded.

3.5.2 Operational and Maintenance Costs

Additional costs related to ongoing operational and maintenance activities have also been considered in this study.

Bridges that are closed to traffic and not yet removed require ongoing operational monitoring to ensure that the barricades which prevent vehicles from traversing the structures are maintained. Township Public Works staff provide visual inspections as part of regular road patrols, and annual technical inspections by a qualified Engineer are required to ensure that pedestrian passage over closed structures continues to be made safe. Annual costs related to these ongoing inspections are estimated at approximately $4,000.00 to $6,000.00 per year.

- These costs are based on the fact that 29-WG is currently on a monthly inspection cycle with K. Smart and Associates Engineering.

When bridges are open to traffic, ongoing maintenance is an important aspect of extending the service life of the bridge. For bridges that are recommended for replacement, the proposed structure types involve jointless concrete structures, which minimize the required annual maintenance to routine cleaning of sand, gravel, or debris from the structure. The annual maintenance cost for new structures is estimated at approximately $500.00 per year.

3.5.3 Business-Related Transportation Benefit

It was identified through the study that improvements to the transportation network may also provide benefits to local commercial or agricultural businesses within the Study Area. Accordingly, the results of the time and distance savings associated with the cross-community traffic impact assessment were also applied to the Economic Environment. This criterion recognizes the benefits of improvement movements of goods from within the local Study Area to the surrounding arterial routes, which allows for cost savings associated with delivery time and mileage.

4.0 Consultation

Comprehensive consultation was a key component of this study. An effective consultation process was followed. The process was highly visible and maximized opportunities for the public, government agencies, and Indigenous communities to participate in a constructive manner with a process that was open, traceable, rational, and highly defensible.

The key features of the consultation process included are:

- The identification of Indigenous communities, agencies, local residents, and other interested or potentially affected parties that would need to be consulted during the Study. These contacts comprised the Project Contact List, which was used to maintain contact information for interested parties throughout the process and summarize comments received about the project and responses.
- Indigenous communities, agencies, key landowners / developers, local residents, and other interested or potentially affected parties of the study were notified of results at key points of the study.
- Engaging Indigenous communities, agencies, key landowners, local residents, and other interested or potentially affected parties at key points of the study to gather input and help inform key decision-making.
- Responding to inquiries or comments in an efficient and timely manner.

Comments received throughout the study were incorporated into the study by determining appropriate background studies required to assess the comments and considering the comments during the evaluation of alternatives.

4.1 Notices

Notifications were mailed or emailed to all contacts on the Project Contact List created for this Study. Contacts were notified at the initiation of the project and were sent notices with invitations to attend the two (2) Public Open House presentations. All notices received information related to the purpose of the study, a link to the Township's project specific 'Connect CW' page, which contained all relevant documents, narrated versions of the Open Houses for the public's review and contact information for the Project Team to whom any questions or concerns could be directed.

All notices were also advertised in the Wellington Advertiser and made available to the public on the Township's 'Connect CW' webpage (https://www.connectcw.ca/CW-3Bridge-Study).

Indigenous communities and the MECP were also provided a Notice of Project Screening, which identified that the project was considered Exempt from the Environmental Assessment Act after the completion of the Archaeological Screening Process.

At the conclusion of the study, an additional notice will be provided to the public and interested parties to notify them of the conclusion of the study and the availability of this report for their review and comment.

The Project Contact List and all project notices are included in Appendix B.

4.2 Indigenous Communities

MECP has developed guidance on the steps to rights-based consultation with Indigenous communities and was contacted in May 2025 to determine the communities that may have an interest in the project. A copy of the correspondence is provided in Appendix B.5.

A letter was sent to Indigenous communities via registered mail on May 20, 2025, and via email on May 26, 2025, to inform them of the upcoming study and provide an invitation to the first Public Open House. Follow-up correspondence was also made to the Communities.

The Mississaugas of the Credit First Nation (MCFN)'s Department of Consultation and Accommodation (DOCA) identified that they only needed to be forwarded the completed report when available and be notified and kept informed on any archaeological work.

Six Nations of the Grand River (SNGR) confirmed they did not need to attend field studies but would like to be consulted with respect to environmental studies and recommended alternatives once reports and alternatives were determined.

The Haudenosaunee Development Institute (HDI) requested to be a part of any ecological or archaeological field studies and to be informed of what course of action is planned for the bridge once it is known. HDI also indicated that they would like to potentially monitor the bridge periodically depending on what course of action is taken.

The Notice of Project Screening was sent to Indigenous communities on September 25, 2025, via email. Representatives of each community were also sent the Notice of Project Screening by Registered Mail to confirm receipt.

All communities were provided the Notices for Public Open Houses No. 1 and 2, which were sent via certified mail and emailed on May 27, 2025, and October 10, 2025, respectively. No representatives of the communities attended the open house events.

All communities were invited to have a field representative present for the ecological field studies. Two members of the Haudenosaunee Development Institute (HDI) attended the ecological field work and wetland staking with Burnside and GRCA staff on June 11, 2025. Copies of the Natural Heritage Report were provided to all communities for their review and comment. No comments were received from any community on the Natural Heritage Report.

All communities were provided with a copy of the Stage 1 Archaeological Assessment Report for their review and comment. MCFN noted that they reviewed the report and had no comments. HDI provided comments that were addressed in the finalization of the report. No comments were received from SNGR.

A summary of communication with identified Indigenous communities was maintained by Burnside on the Project Contact List and summarized in Table 14. Copies of all correspondence with Indigenous communities are provided in Appendix B.5.

The draft Project File Report will be circulated to Indigenous communities for review and comment prior to its finalization. Any comments received from Indigenous communities will be considered and included as necessary when confirming the final preferred solution for this study and the three bridges

Table 14: Summary of Indigenous Community Consultation

Indigenous Community	Date	Summary of Correspondence
Mississaugas of the Credit First Nation (MCFN)	May 20, 2025	Township sent the Notice of Project Startup to MCFN staff via Registered mail, which was confirmed received on May 21, 2025. The letter included project background information, an invitation to Public Open House No. 1, and information on how to access additional project information (including a narrated version of Public Open House No. 1) online via Centre Wellington's ConnectCW webpage.
	May 26, 2025	Mishaal Rizwan (Burnside) sent MCFN staff an overview of the new project, asking for staff to confirm interest in reviewing archaeological and natural heritage studies, including field work participation and report review, also asking MCFN staff to identify information regarding knowledge about archaeological sites or past use as part of the ASP process.
	May 26, 2025	Mishaal (Burnside) followed up with Lindsay Wong asking to confirm interest in the natural heritage work, noting that a wetland staking with GRCA was scheduled for June 11, 2025, offering MCFN staff to join and offering alternative dates if staff were busy, noting the study team would like to provide MCFN with an opportunity to provide comments or identify any items of interest to MCFN.
	May 26, 2025	MCFN confirmed interest in archaeological review and field participation for the project, specifically for MCFN Field Liaison Representatives (FLRs) to be present on location during archaeological fieldwork. MCFN added their Manager of Environment to the email correspondence chain and noted she would confirm MCFN's desired involvement in the environmental aspects of the project. MCFN provided an agreement to be signed by the Township should their review be required based on the field work to be conducted. MCFN confirmed that they have no knowledge of archaeological sites within 500 m of the bridges but anticipates that the area may meet the requirements for Stage 2 Archaeological Assessment if the scope includes ground disturbance.
	May 27, 2025	Burnside emailed the Notice of Project Startup that was previously circulated via registered mail on May 20, 2025.
	June 5, 2025	Burnside followed up with MCFN to confirm whether they have interest in attending the site visit on June 11, 2025, or if they would prefer to just review the report.
	June 6, 2025	MCFN responded to Burnside email asking that the draft natural heritage reports be sent to Lindsay Wong and Simar Kaur once available.
	August 15, 2025	Burnside provided Natural Heritage Report to MCFN, as well as a summary of the proposed alternatives being considered for each site. Burnside requested MCFN confirm whether they will be reviewing and providing comments by September 5, 2025. No response was received.
	August 15, 2025	Burnside provided MCFN the draft Stage 1 Archaeological Assessment, noting that all structures were found to have low archaeological potential and that no further investigations are required. Burnside requested that MCFN confirm whether they will be reviewing the report and providing comments by September 5, 2025, if so. MCFN responded indicating that they would provide comments by September 5, 2025.
	September 11, 2025	Burnside followed up with MCFN to confirm whether they will be providing comments on the Archaeology Assessment report as indicated.
	September 12, 2025	MCFN confirmed that they have reviewed the Stage 1 Archaeological Assessment and have no comments to add regarding the archaeology portion of the project.
	September 25, 2025	Burnside provided a Notice of Completed Project Screening to MCFN, indicating that the results of the Cultural Heritage Assessments and Archaeological Screening resulted in the Project being considered Exempt from the Environmental Assessment Act. Background information was provided regarding the justification behind the exemption, and it was identified that the Township would still follow a process similar to the EA process, that typical mitigation measures previously adopted through consultation with Indigenous communities on similar projects would be included in this study and that Indigenous communities will still be consulted with and provided the opportunity for commenting throughout the study.
	October 23, 2025	Notice of Public Open House #2 was sent to MCFN staff via email.
Six Nations of Grand River (SNGR)	May 20, 2025	Township sent the Notice of Project Startup to SNGR staff via Registered mail, which was confirmed received on May 21, 2025. The letter included project background information, an invitation to Public Open House No. 1 and information on how to access additional project information (including a narrated version of Public Open House No. 1) online via Centre Wellington's ConnectCW webpage.
	May 26, 2025	Burnside sent SNGR staff an overview of the new project, asking for staff to confirm interest in reviewing archaeological and natural heritage studies, including field work participation and report review, also asking SNGR staff to identify information regarding knowledge about archaeological sites or past use as part of the ASP process.
	May 26, 2025	SNGR responded to indicate they are interested in being consulted as the project progresses, particularly when natural environmental studies and recommended alternatives are available.

Indigenous Community	Date	Summary of Correspondence
	May 27, 2025	Burnside emailed the Notice of Project Startup that was previously circulated via registered mail on May 20, 2025.
	August 15, 2025	Burnside provided Natural Heritage Report to SNGR, as well as a summary of the proposed alternatives being considered for each site. Burnside requested SNGR confirm whether they will be reviewing and providing comments by September 5. No response was received.
	August 15, 2025	Burnside provided SNGR the draft Stage 1 Archaeological Assessment, noting that all structures were found to have low archaeological potential and that no further investigations are required. Burnside requested that SNGR confirm whether they will be reviewing the report and provide comments by September 5, 2025, if so. No response was received.
	September 25, 2025	Burnside provided a Notice of Completed Project Screening to SNGR, indicating that the results of the Cultural Heritage Assessments and Archaeological Screening resulted in the Project being considered Exempt from the Environmental Assessment Act. Background information was provided regarding the justification behind the exemption, and it was identified that the Township would still follow a process similar to the EA process, that typical mitigation measures previously adopted through consultation with Indigenous communities on similar projects would be included in this study and that Indigenous communities will still be consulted with and provided the opportunity for commenting throughout the study.
	October 23, 2025	Notice of Public Open House No. 2 was sent to MCFN staff via email.
Haudenosaunee Development Institute (HDI)	May 20, 2025	Township sent the Notice of Project Startup to HDI staff via Registered mail, which was confirmed received on May 22, 2025. The letter included project background information, an invitation to Public Open House No. 1, and information on how to access additional project information (including a narrated version of Public Open House No. 1) online via Centre Wellington's ConnectCW webpage.
	May 26, 2025	Burnside sent HDI staff an overview of the new project, asking for staff to confirm interest in reviewing archaeological and natural heritage studies including field work participation and report review, also asking HDI staff to identify information regarding knowledge about archaeological sites or past use as part of the ASP process.
	May 27, 2025	Burnside emailed the Notice of Project Startup that was previously circulated via registered mail on May 20, 2025.
	May 29, 2025	HDI confirmed their preference to participate in all archaeological and ecological field studies, and to be informed of what course of action is planned for the bridge once it is known. HDI also indicated that they would like to potentially monitor the bridge periodically depending on what course of action is taken.
	June 5 – June 10, 2025	Correspondence between Burnside, the Township, and HDI regarding agreements for HDI review and field representative presence during Environmental Study field work.
	June 30 , 2025	Finalized agreement sent to HDI by Township.
	August 15, 2025	Burnside provided Natural Heritage Report to HDI, as well as a summary of the proposed alternatives being considered for each site. Burnside requested HDI confirm whether they will be reviewing and providing comments by September 5, 2025. No response was received.
	August 15, 2025	Burnside provided HDI the draft Stage 1 Archaeological Assessment, noting that all structures were found to have low archaeological potential and that no further investigations are required. Burnside requested that HDI confirm whether they will be reviewing the report and provide comments by September 5, 2025, if so.
	October 1, 2025	HDI provided feedback on the Stage 1 Archaeological Assessment with comments on the following topics: Treaty Geography & Modern Rights, Historical Narrative & Tone, Colonial Assumptions in Euro-Canadian Land History, and Internal Consistency & Editorial Corrections.
	December 22, 2025	Burnside provided HDI with the final Stage 1 Archaeological Assessment for review and summarized if / how their comments were addressed and limitations associated with the wording in the recommendations section of the report due to Standards and Guidelines for MCM permits. Burnside noted that the report had been sent to MCM for entering into the registry.
	January 21, 2026	HDI confirmed that their archaeological department reviewed the final copy of the Stage 1 Archaeological Assessment and had no further comments.

4.3 Municipal Heritage Committee

The project background information and findings of the Cultural Heritage Evaluation Report (CHER) and Heritage Impact Assessment (HIA) were presented to the Heritage Committee on July 8, 2025, by Mr. Adam Dickieson (Township of Centre Wellington Project Manager). A copy of the slides presented are included in Appendix B.3.

The Heritage Centre Wellington Committee was generally in acceptance of the Cultural Heritage Evaluation Report and Heritage Impact Assessment recommendations provided by Peninsula Heritage Ltd. The committee noted that removal and replacement of the structures would be considered acceptable given the constraints of the existing structures provided:

- An interpretive plaque be installed at the structures to identify the original bridges when replaced, removed or relocated;
- For replacement bridges, an imprint of the original bridge shape be included in the new structure;
- The Cultural Heritage Evaluation Report and Heritage Impact Assessments for each of the three bridges be provided to local historical societies, libraries, and municipal archives;
- A concrete section of Bridge 29-WG which includes the inscription of the workers names be incorporated into a commemoration of the bridge as outlined in report HCW2025-14; and
- A Documentation and Salvage report be completed and submitted to Heritage Centre Wellington.

4.4 Council

A Report to Council was provided to the Mayor and Members of Council on May 26, 2025, by Mr. Adam Dickieson, Project Manager, Township of Centre Wellington. The report provided an introduction of the project and the proposed process to be undertaken during the study.

Council was updated on the project status by Township staff as the project progressed. All members were included in notice distributions and invited to attend the Public Open House meetings.

Council will be provided this report for review and comment prior to the finalization of the project. Any comments received from Council will be incorporated when confirming the final preferred solution for this study and the three bridges.

4.5 Grand River Conservation Authority

Pre-consultation emails were exchanged with Grand River Conservation Authority (GRCA) throughout the study. GRCA staff provided comments on the Notice of Project Start and Public Open House No. 1 providing a map of natural hazard features in the Study Area.

GRCA staff provided comments on Public Open House No. 2 materials noting the presence of regulated features at each bridge location and the requirements for permits for proposed bridge replacement and removal.

Records of email correspondence are included in Appendix B.6.

4.6 Community Members

The opportunity for the public to provide comments to the Study Team was provided over the full duration of the study. Means of contacting the members of the Study Team were provided with each of the issued notices, starting with the Notice of Commencement. In addition to the option to correspond with the Township and / or Consultant Project Manager via email or phone call at any time, two in-person formal Public Open Houses were also provided, as well as the option to review the project information and open house content online and provide comment during an extended comment period via the Township's Connect CW website. A summary of the consultations with the public are provided below. All correspondence records are provided in Appendix B.7.

4.6.1 Open House No. 1

Public Open House (POH) No. 1 was held on June 10, 2025. POH No. 1 was arranged as a drop-in style session with the primary goal of obtaining feedback regarding priorities from residents and determining the problems and opportunities to be addressed as part of the study. Community members and other interested persons could review the display boards and discuss comments, questions, and concerns directly with the Study Team. A voice-over narration of the boards was posted to the project webpage following the POH.

A copy of the display boards is provided in Appendix B.2.

Correspondence was received from several individuals following the issuance of the Notice of Public Open House No. 1. Several requests to be included on the mailing list for all future project updates were received.

Comments received during Public Open House No. 1 are summarized as follows:

- Bridge closures impact emergency service access for residents;
- Bridges play a key role in connecting farms;

- Bridge work should consider sufficient width for farm equipment;
- Residents are interested in connections for different road user types (pedestrians, cyclists, horses);
- Visibility issues exist when attempting to determine if the single-lane bridges are clear on oncoming traffic; and
- Cost effectiveness of solutions is a priority for residents.

A copy of the display boards is provided in Appendix B.2.

A total of 33 people signed in at POH No. 1, excluding the Study Team. A total of 22 comments were received at the POH, and one additional set of comments was received in the comment period following POH No. 1. Comments at the POH were provided through paper comment sheets supplied; the one additional comment was received by email. Copies of comments are provided in Appendix B.2.

All feedback from the public on the existing conditions and potential alternative solutions was reviewed by the project team and considered in the selection of the preferred alternative.

Additional information about the public open house is summarized in the POH No. 1 Summary Slides in Appendix B.2.

4.6.2 Public Open House No. 2

POH No. 2 was held on November 3, 2025. POH No. 2 was arranged as a drop-in style session with a presentation at 6:15 p.m. After the presentation, residents and other interested persons could review the display boards and discuss comments, questions, and concerns with the Study Team. A voice-over narration of the boards was posted to the project webpage following the POH.

A copy of the display boards is provided in Appendix B.4.

A total of 29 people signed in at POH No. 2, excluding the Study Team. A total of six comments were submitted at the open house. Comments were provided through paper comment sheets supplied at the POH. Copies of the comment sheets are provided in Appendix B.4.

The comments received through the formal comment sheets, as well as through conversation during the open conversation forum during the POH No. 2, and email correspondence following the POH, included the following themes.

Key issues noted within the written responses relate to:

- Economic and business impacts from closures;
- Environmental and engineering considerations;

- Safety and traffic concerns of re-opening bridges;
- Community and recreational use;
- Bridge prioritization and recommendations; and
- Comments regarding opinions on preliminary preferred solution.

The majority of received comments were already considered in the selection of the preferred alternative. Although some revisions to the evaluation criteria and results were made in consideration of the comments received, no changes were significant enough to affect the selected preliminary preferred solution. Responses were provided indicating the justification to still support the preferred solution.

Additional information about the public open house is summarized in the POH No. 2 Summary Slides in Appendix B.4.

5.0 Evaluation of Alternative Solutions

5.1 Identification of Alternative Solutions

A total of eight (8) alternatives were available based on available combinations of the three subject bridges being closed or replaced.

The Alternative Solutions carried forward for detailed evaluation are the following:

Table 15: Alternative Solutions

Bridge ID	Alternatives							
	1	2	3	4	5	6	7	8
21-WG	✗	✓	✓	✗	✗	✗	✓	✓
29-WG	✗	✓	✗	✓	✗	✓	✗	✓
30-WG	✗	✓	✗	✗	✓	✓	✓	✗

✗ - Closed ✓ - Open

As outlined in Section 3.2.2.2, the preferred solution for the scenario noted as 'Replaced' involves replacement with a two-lane bridge.

5.2 Evaluation Criteria

The overall objective of this study was to identify a Preferred Solution among the eight alternatives using a systematic and transparent approach. The Preferred Solution is the Alternative that best addresses the Problem Statement with as few negative impacts as possible.

To this end, a set of Evaluation Criteria was identified to comparatively evaluate the Alternative solutions. The Evaluation Criteria is outlined in Table 16.

Table 16: Summary of Evaluation Criteria

Transportation	
Cross-Community Travel	Quantitative measure of improvements on cross-community travel time / distance, measured based on the total benefit, weighted by the average traffic volumes estimated based on pre-closure traffic counts.

Emergency Response	Quantitative measure of impacts on emergency response times. Measured using the total time improvements, weighted by the number of properties impacted, and factored to consider whether the affected response station is a primary, secondary, tertiary or quaternary response station.
Slow-Moving Vehicle Accommodation	Quantitative measure of impacts to required travel time / distances using a travel speed of 25 km/h and avoidance of arterial routes where possible.
Local Community Travel	Quantitative measure of impact to travelling within the local community, which represents the impacts to service and delivery vehicles, school buses, etc. Measured based on the total time savings.
Natural Environment	
Environmentally Sensitive Areas	Qualitative ranking of the potential impacts / benefits that the alternatives would have on Environmentally Sensitive Areas, such as wetlands, woodlands, watercourses, etc.
Terrestrial Habitat	Qualitative ranking of the potential impacts / benefits to terrestrial habitats such as nesting areas for breeding birds, wildlife habitat, as well as habitat connectivity (ex: wildlife passage through structure openings), etc.
Fisheries / Aquatic Habitat	Qualitative ranking of the potential impact / benefits to aquatic habitat features and passage. Examples include impacts related to construction activities, improvements by eliminating barriers to passage, re-naturalization of the watercourse and embankments, etc.
Species at Risk (SAR)	Qualitative ranking of potential impacts / benefits to identified SAR, such as Barn / Cliff swallows, bats, butternut trees, etc.
Economic Environment	
Estimated Construction Costs	Relative quantitative ranking of estimated construction cost.
Business-Related Transportation Benefit	Reflects the time / distance savings for haul routes of businesses within the Study Area to the surrounding cities and / or major arterial routes for transportation. Rating is based on the time and distance savings for each route, as evaluated in the Cross-Community transportation impact study.
Maintenance & Operational Costs	Relative ranking of long-term costs associated with typical maintenance repairs for the applicable structure type, maintenance of barricade systems for structure closures, and operational costs associated with access control for low-level crossings.

Social & Cultural Environments	
Social Environment	Qualitative ranking of the impacts / benefits to residential property and access, community facilities, recreational facilities, pedestrians, cyclists, noise impacts, and air quality.
Community Input	A qualitative ranking of the alignment of the proposed alternative in comparison to the community's input on preferred structures to be opened or closed based on consultation with, and comments from, the public.
Archaeological Resources	Qualitative ranking of the potential impacts to archaeological resources, including identified areas of archaeological potential, based on the anticipated limits of disturbance associated with the alternatives.
Cultural and Built Heritage	Qualitative ranking of the potential impacts / benefits to built heritage resources and cultural heritage resources, considering value or interest of the structure and the ability to conserve or document heritage features and / or provide sympathetic features in replacement structures.

5.3 Summary of the Evaluation of Alternatives

The evaluation of the alternative solutions was based on an assessment of potential impacts and a review of input received from the public and regulatory agencies during the study process. Table 17 provides a summary of the evaluation of alternative solutions. A detailed evaluation matrix is provided in Appendix C.1, which provides further explanation of the reasoning behind each of the ratings. The relative ratings of the criteria are represented by graphical 'pies', for which the order of preference is indicated below:

Least Preferred ☆☆☆☆ → ★★★★ Most Preferred

The stars are visual representations of the actual numerical rating associated with the criteria. Where alternatives may appear to have the same rating based on the visual representation, the ranking is based on the numerical values, which may differ despite showing the same symbol.

The overall ranking of alternative solutions is provided at the end of Table 17. The Equal Weighting ranking is based on the main criteria (Transportation, Natural, Social & Cultural, and Economic) all being equally weighted. A sensitivity analysis ranking is also provided, which is based on the combined scores of the nine weighting scenarios evaluated in the Sensitivity Analysis. Refer to Appendix C.2 for a breakdown of the weighting scenarios considered in the sensitivity analysis.

Table 17: Summary of the Evaluation of Alternatives

Criteria	All Removed	All Replaced	21-WG Replaced	29-WG Replaced	30-WG Replaced	29-WG & 30-WG Replaced	21-WG & 30-WG Replaced	21-WG & 29-WG Replaced
TRANSPORTATION								
Cross-Community Travel	☆☆☆☆	★★★★	★☆☆☆	★☆☆☆	⯪☆☆☆	★★★☆	★★☆☆	★★⯪☆
Emergency Response Times	☆☆☆☆	★★★★	★★☆☆	⯪☆☆☆	⯪☆☆☆	★⯪☆☆	★★⯪☆	★★★☆
Slow Moving Vehicles	☆☆☆☆	★★★★	★☆☆☆	★⯪☆☆	★☆☆☆	★★★☆	★★☆☆	★★⯪☆
Local Community Travel	☆☆☆☆	★★★★	★☆☆☆	★⯪☆☆	★☆☆☆	★★★☆	★★☆☆	★★★☆
Transportation Summary	☆☆☆☆	★★★★	★☆☆☆	★☆☆☆	⯪☆☆☆	★★⯪☆	★★☆☆	★★⯪☆
NATURAL ENVIRONMENT								
Environmentally Sensitive Areas	★★★★	★★☆☆	★★★⯪	★★★⯪	★★☆☆	★★☆☆	★★☆☆	★★★☆
Terrestrial Habitat	★★★⯪	★★☆☆	★★★☆	★★☆☆	★★⯪☆	★★☆☆	★★★☆	★★⯪☆
Fisheries / Aquatic Habitat	★★★⯪	★⯪☆☆	★★★☆	★★⯪☆	★★☆☆	★⯪☆☆	★★☆☆	★★⯪☆
Species at Risk	★★★★	⯪☆☆☆	★★★☆	★★★☆	★★★☆	★★☆☆	★⯪☆☆	★★☆☆
Natural Environment Summary	★★★⯪	★⯪☆☆	★★★☆	★★⯪☆	★★☆☆	★⯪☆☆	★★☆☆	★★⯪☆
ECONOMIC ENVIRONMENT								
Capital Costs	★★★★	☆☆☆☆	★★★☆	★★⯪☆	★★★☆	★☆☆☆	★⯪☆☆	★☆☆☆
Business-Related Transportation Benefit	☆☆☆☆	★★★★	★★☆☆	★★☆☆	⯪☆☆☆	★★★☆	★★⯪☆	★★★☆
Maintenance & Operational Costs	★★★⯪	★★☆☆	★★★☆	★★★☆	★★★☆	★★⯪☆	★★⯪☆	★★⯪☆
Economic Summary	★★⯪☆	★★☆☆	★★⯪☆	★★⯪☆	★★☆☆	★★☆☆	★★☆☆	★★☆☆
SOCIAL & CULTURAL ENVIRONMENTS								
Social Environment	★☆☆☆	★★★☆	★★☆☆	★★⯪☆	★★☆☆	★★★☆	★★★☆	★★★☆
Community Input	★★☆☆	★★★⯪	★★☆☆	★★★⯪	★⯪☆☆	★★★☆	★★⯪☆	★★★★
Archaeological	★★★★	★★⯪☆	★★★⯪	★★★⯪	★★★⯪	★★★☆	★★★☆	★★★☆
Cultural & Built Heritage	★☆☆☆	★★★⯪	★★⯪☆	★★⯪☆	★★⯪☆	★★★☆	★★★☆	★★★☆
Social & Cultural Summary	★★☆☆	★★★☆	★★⯪☆	★★★☆	★★☆☆	★★★☆	★★⯪☆	★★★☆
Addresses Problem Statement?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall Ranking (Equal Weighting)	**8**	**2**	**3**	**4**	**7**	**5**	**6**	**1**
Overall Ranking (Sensitivity Analysis)	**8**	**2**	**3**	**5**	**7**	**4**	**6**	**1**

6.0 Preferred Solution

As identified in Table 17 (and Appendix C), the preferred solution consists of the Replacement of Bridges 21-WG & 29-WG. The preferred solution ranked first or second in all weighting scenarios considered and was the most consistent highly rated alternative, providing the highest combined score on the sensitivity analysis, confirming its selection of the preferred solution.

The preferred solution has many significant benefits and addresses several of the problems and opportunities previously noted in Section 2.3, as summarized below:

- Replaces the top two bridges for transportation improvements;
- Opens Bridge 21-WG, which provides the most significant improvements to emergency response times;
- Opens Bridge 29-WG, which provides the most benefit to cross-community travel, slow-moving vehicles, and travel within the local Study Area;
- Limits impact to the environmentally sensitive wetlands, potential Redside Dace fish habitat, and the Regionally Significant Area of Natural and Scientific Interest at 30-WG; and
- Aligns best with the overall social and cultural considerations, including community input on structures.

6.1 Description of Proposed Undertaking

As indicated in Section 6.0, the preferred solution is to replace 21-WG and 29-WG. Table 18 summarizes the proposed undertaking at each location, based on the results of the background studies provided in Section 3.0. It is noted that the geometry referenced for the bridges is based on the preliminary conceptual design completed as part of this study and may be subject to revision upon more refined design and analysis as part of the detailed design stage.

Table 18: Summary of Proposed Undertaking

Structure	Proposed Undertaking
21-WG	Remove existing bridge and replace with a single 26 m span prestressed concrete box girder.
29-WG	Remove existing bridge and replace with a two-span (19 m, 19 m) prestressed concrete box girder.
30-WG	To remain closed until time of removal. Removal timing will be determined as part of the development of the future bridge plan. Consider formal vehicle turn-arounds at time of removal.

Conceptual Plan and Profile, and General Arrangement drawings have been provided for the two replacement bridges in Appendix D.

6.2 Prioritization for Implementation

The proposed preferred solution involves the replacement of two bridge structures and the eventual removal of a third, with total construction costs estimated at approximately $6,700,000. Given the large capital expenditure and the Township's typical annual budget for bridge works, the replacement of the two bridges will likely be required to be phased over several years. Recommendations regarding the prioritization for replacements are provided herein; however, the Township will ultimately be responsible for determining the relative needs of these bridges in comparison to other structures within the municipality during their capital planning and budgeting review to determine the ultimate timelines in which replacement is to occur.

When considering prioritization, scoring from the Transportation, Economic, and Social & Cultural criteria was considered. Natural Environment Criteria was not considered in the analysis of prioritization, as the environmental impacts are considered independent of time. A summary of the scoring for the individual structures is reiterated in Table 19 below.

Table 19: Analysis of Individual Structures for Replacement Prioritization

Criteria	21-WG	29-WG
Transportation	3.00	2.75
Economic	5.33	5.00
Social & Cultural	5.00	6.00
Total	13.33	13.75

In consideration of the current state of the bridges and the potential improvements to the transportation network that each bridge offers, as outlined in Section 3.2.1 and summarized above, the recommended prioritization is as follows:

1. Replacement of Bridge 29-WG;
2. Replacement of Bridge 21-WG; and then,
3. Removal of Bridge 30-WG.

It should be noted, however, that prioritization of removal of 30-WG may be adjusted if future inspections identify any concerns significant enough to warrant accelerated removal of the structure to reduce the potential risk of collapse.

7.0 Environmental Impacts, Mitigation Measures, and Monitoring

The potential environmental impacts associated with construction, operation, and maintenance of the proposed bridge replacements within the Study Area have been identified and are summarized in Table 20. Proposed measures to mitigate these impacts and monitoring activities to ensure that the mitigation measures are implemented effectively are also provided in the table. All mitigation measures and monitoring activities shall be reviewed during the detailed design phase of the project.

Table 20: Summary of Impacts, Mitigation, and Monitoring Activities

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Effects on Ecological Features and Functions			
Wildlife (General)	Temporary displacement and disturbance to wildlife and habitat during the construction phase. May include SAR and Species of Special Concern.	The footprint of the proposed disturbed area shall be minimized as much as possible. In the event an animal is encountered during construction and does not move from the construction zone, the Contract Administrator should be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location should temporarily stop and the MNRF or MECP can be contacted for direction. If temporary perimeter exclusion fencing is used at a location, it should be installed to allow wildlife to leave the fenced area during vegetation clearing. Once the work area has been cleared, it can be securely fenced to prevent wildlife from returning. The excluded area should be searched immediately following fencing installation for any wildlife (including SAR) that may have become trapped. Any wildlife should be safely relocated or permitted to escape, to a suitable habitat. All works should stop immediately and MECP should be contacted if SAR is encountered within the area to ensure compliance with the ESA. Avoid vegetation clearing during sensitive times of the year for local wildlife, such as spring and early summer (during breeding and migration seasons). The new structure will allow for wildlife passage below the structure if feasible. • Fencing to delineate the work zone will prevent encroachment into adjacent habitat supporting SAR and Species of Special Concern.	The Contractor will conduct regular monitoring of the erosion and sediment control measures to ensure they are acting as intended and are containing the work area.
Migratory Breeding Birds	Disturbance or destruction of migratory breeding bird nests / habitat may occur during construction phase (vegetation clearing)	To reduce the risk of contravening the federal Migratory Bird Convention Act, 1994 (MBCA), timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and / or structure works (construction) during the active window for breeding birds, broadly from April 1 to August 31 for most species. Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, cannot be destroyed at any time of the year. If a nesting migratory bird (or SAR protected under ESA) is identified within or adjacent to the construction site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities should stop and the Contract Administrator (with assistance from an Avian Biologist) should discuss mitigation measures with the Township. If SAR are identified, all activities should stop and MECP should be contacted to ensure compliance with the ESA. The Contract Administrator can instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the Township, the MECP and / or Environment Canada. • To avoid contravention of the MBCA and / or ESA, the bridge structure should be completely excluded with tarping or netting material prior to the next active window for breeding birds (i.e., by end of March) if construction works are to occur during the active window for breeding birds (as noted above). Tarping or netting of the bridge ensures that breeding birds are excluded from nesting on or under the structure while the bridge is being replaced.	If construction works occur during the active window for breeding birds, an Environmental Inspector should monitor the tarped or netted structure every two to three days to ensure that no bird nests are established on the bridge (some species such as Barn Swallow or Eastern Phoebe (Sayornis phoebe) have been reported to attempt nesting on the exterior of the tarp material used for exclusion).

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
SAR Bat Maternity-Roosting Habitat	Tree removals could impact wildlife.	Trees that are identified as candidate bat maternal roosting habitat must be taken down outside the active bat window (active window is March 31 to October 1).	Further studies are required to confirm the extent of impacts and whether surveys are required to determine absence or presence of SAR bats.
Trees	Loss of woody vegetation and creation of new forest edges causing new growing conditions, such as sun exposure and weed invasion.	A tree inventory will be completed during the detailed design to characterize and confirm required removals. Impacts will be minimized to remaining trees by implementing measures such as tree protection or ESC fencing to protect trees from grading impacts near adjacent construction. ESC measures and other specified protection measures must be installed prior to commencement of any construction or vegetation disturbance. No access, storage or stockpile of materials or equipment should occur within the area protected by the ESC and other protection measures. A replanting plan may be required to compensate for tree loss.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Vegetation	Temporary disturbance of meadow, swamp, hedgerow, marsh, forest, and plantation vegetation may be required for access and construction.	Tree protection fence and ESC measures will delineate the areas of access and construction to reduce impacts extending unnecessarily into adjacent lands. Seeding of native grasses and wildflowers may be required to revegetate the disturbed areas that will be illustrated in replanting plan.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Fish and Fish Habitat	In-water works may be required, and the proposed works could potentially result in HADD to fish habitat and the death of fish by means other than fishing.	A qualified professional aquatic ecologist will submit a Request for Review to DFO for any bridge replacements or removals requiring in-water works. It is anticipated that a Letter of Advice will be obtained for the project based on the footprints of the structures and fish community present. During Detailed Design, correspondence shall be maintained with a qualified professional aquatic ecologist to determine appropriate mitigation measures and whether the proposal has potential to pose HADD to fish habitat and / or if the proposal has the potential to kill fish. Preferred mitigation measures include work zone isolation while maintaining flow downstream and fish salvage from the isolated work area. Efforts will be made in consultation with the DFO to mitigate should HADD to fish habitat occur. A fish salvage must occur under a License to Collect Fish for a Scientific Purpose obtained from the MNRF. Near-water work and work below the annual high-water mark will adhere to the appropriate in-water work timing window to avoid potential impacts to resident and migratory fish species. As the watercourses share a spring-spawning fish community, this would exclude in-water works from March 15 to July 15 of any year.	ESC monitoring during construction. Fish salvage prior to the commencement of any in-water works. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.
Groundwater	Potential for localized groundwater quality impacts as a result of spills. Temporary dewatering in the work area.	Refueling of equipment and fuel storage shall be conducted in designated areas, at least 30 m away from the watercourses and any existing wells, with spill protection provided. The work area shall be dewatered as per recognized provincial standards and pumped into acceptable dewatering traps. These dewatering traps will be placed away from the watercourse to allow for infiltration prior to discharging to the watercourse.	ESC monitoring throughout construction. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Surface Water / Hydrology / Stormwater	Potential for sediments to enter the watercourse due to stockpiling, excavation, and construction. Potential for localized water quality impacts in the case of spills. Potential for invasive species to enter the environment.	The footprint of the disturbed area shall be minimized as much as possible, for example, vegetated buffers/setbacks will remain untouched adjacent to the watercourse, wherever possible. An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project, prior to construction. Implementation of the erosion and sediment control measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS), and the requirements of the GRCA. A permit from the GRCA under the Prohibited Activities, Exemptions and Permits Regulation (Ontario Regulation 41/24) will be required prior to conducting the proposed works as work is proposed within a flood Regulated Area. In-water operation of heavy equipment shall be prevented, as well as minimizing the operation of any equipment on the banks of the watercourse. Stockpiled material shall be stored and stabilized a minimum of 30 m from the watercourse. All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water. ESC measures (silt curtains, silt fence, rock check dams, etc.) shall be installed and maintained during the work phase, until the site has been stabilized. ESC measures will be inspected daily to ensure they are functioning and maintained as required. If ESC measures are not functioning properly, no further work will occur until the problem is resolved. Temporary mitigation measures shall be installed prior to the commencement of any clearing, grubbing, excavation, filling, or grading works and must be maintained on a regular basis, prior to, and after precipitation events. Water quality impacts related to surface water runoff shall be mitigated to avoid downstream impacts by controlling surface water run off within the boundaries of the site. All disturbed areas of the work site shall be stabilized immediately and revegetated as soon as conditions allow. All equipment fueling and maintenance shall be done at least 30 m from the watercourse to ensure that no deleterious substances enter the waterway. The Contractor shall be required to develop Spill Prevention and Contingency Plans for construction and operational phases of the project. Personnel will be trained in how to apply the Plans, and the Plans will be reviewed to strengthen their effectiveness and ensure continuous improvement. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Center at 1-800-268-6060. All equipment and personal protective equipment must arrive on-site clean to prevent the potential transfer of invasive species (i.e., phragmites) to the local environment.	Monitoring of surface water quality will be completed along with regular ESC monitoring as outlined above. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Effects on Cultural Heritage and Archaeological Resources			
Archaeological Resources	There is low potential for archaeological resources to be disturbed during construction based on the Archaeological Assessment report.	• Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the Ontario Heritage Act. • The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with O. Reg. 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (via email to archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations, which would be a contravention of the Ontario Heritage Act.	Any monitoring requirements identified through subsequent assessments required as a result of a discovery will be implemented.
Cultural Resources	There is a potential for cultural resources to be impacted during construction.	• Should the Township of Centre Wellington decide to exercise protection of any of the three bridges under the terms of the OHA, additional approvals will be required prior to the removal or replacement of the structure. • The recommendations outlined within the Heritage Impact Assessment, Documentation and Salvage report, and the requests identified by Heritage Centre Wellington should be implemented as part of the proposed design works.	No monitoring required.
Effects on Social Environment, Property, and Public Safety			
Private Property	Construction may cause damage to private property.	• Construction access routes will be clearly defined in consultation with private landowners prior to construction. • Construction areas will be clearly marked and fenced. • Any temporary access or staging areas will be restored to their pre-construction condition. • Timing of construction on private property will be agreed upon with the property owner.	A Construction Inspector will ensure that construction limits are well-marked and adhered to throughout construction.
Public Safety	Emergency Response could be impacted during construction.	• Bridge construction will be completed in either a phased manor, allowing one of traffic through at all times, or alternatively, bridge closure may be required. • Should bridge closure be required, EMS must be notified and detour plans will be completed as required.	No monitoring required.
Public Safety	The configuration of the bridges will impact access and routes for Emergency Response which could affect public safety.	• The Township will work with EMS to ensure that opening new routes are documented in EMS's database so access plans are updated in case of emergency.	No monitoring required.
Air Quality	Potential air quality impacts during construction.	• A complaint response protocol for nuisance impacts including dust emissions will be prepared during the detailed design phase of the project and implemented prior to construction. • During construction, the following mitigation measures shall be used: – The road shall be graded as required to remove potholes, ruts and ripples in the road surface. Efforts to prevent contamination of the road surface, such as spilling sands, silts and clays, will also help to minimize dust. – If appropriate equipment is available, the roadway should be sprayed with water as required to minimize dust generation prior to paving.	An environmental monitor shall regularly inspect construction work areas to ensure that dust suppression measures are being adequately applied and confirm the requirements outlined in the CMP are being followed. If dust suppression measures are not functioning properly, alternative measures shall be

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
		– The construction contractor will be required to develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs. – Vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. The contractor shall also be required to implement dust suppression measures to reduce the potential for airborne particulate matter resulting from construction activities. This should be in the form of water applications on exposed soils. – Considerations shall be given to using of chemical suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust and equipment washing. – The construction contractor shall develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs.	implemented immediately and prioritized above other construction activities.
Noise	Potential for noise through the use of large equipment for construction of the proposed road extension.	• A complaint response protocol for nuisance impacts including construction noise shall be prepared during the detailed design phase of the project and implemented prior to construction. • Noise control measures shall be implemented where required during the construction phase, such as restricted hours of operation and the use of appropriate machinery and mufflers. The noise produced by the equipment can be limited through proper equipment maintenance. • All construction activities shall conform to the criteria set out in NPC-115 of 83 dB. • The construction contractor will be required to develop a Construction Management Plan (CMP) that specifically addresses noise controls, mitigation to be implemented and frequency of equipment inspection.	An environmental monitor shall regularly monitor construction noise to ensure that noise control measures are being adequately applied and confirm the requirements outlined in the CMP are being followed. If noise control measures are not functioning properly, alternative measures shall be implemented immediately and prioritized above other construction activities.

8.0 Climate Change Considerations

8.1 Climate Change

Climate change is defined as any significant change in long-term weather patterns. The term can apply to any major variation in temperature, wind patterns, or precipitation that occurs over time. Global warming describes the recent rise in the average global temperature caused by increased concentrations of greenhouse gas emissions (GHG) trapped in the atmosphere. Scientists have concluded that human activity is largely responsible for recently observed changes to our climate since GHGs are mainly caused by burning fossil fuels to produce energy.

Two types of climate change effects can be considered. The first is the effect that a project can have on climate change. In this case, the degree to which the project can provide some climate change mitigation measures is to be assessed. The second is the effect climate change has on the project. Climate change was considered during this study and is discussed in this Section.

8.2 Effects of the Project on Climate Change

No new traffic is expected to be generated as a result of this project. However, patterns may change as a result of bridges being reopened. Some travel routes may be shortened and more straightforward, resulting in minor reductions in vehicular emissions. At a minimum, it is expected that there will be no net increase in greenhouse gas emissions.

Existing vegetation will be retained to the extent possible. Removals will be kept to a minimum to limit direct effects to vegetation communities and vascular flora, as well as indirect effects (e.g., soil compaction and changes to topography and drainage). Disturbed areas will be re-stabilized, incorporating revegetation using non-invasive, preferably native plantings and / or seed mix appropriate to the site conditions and adjacent vegetation communities. Seed mixes will be used in conjunction with an appropriate non-invasive cover crop as appropriate.

8.3 Effects on the Project from Climate Change

There is potential for the project to be affected by climate change. Climate change is usually associated with any significant change in long-term weather patterns. Changes in the composition of the atmosphere are resulting in processes that alter global temperature and precipitation, in turn affecting local weather patterns. These processes can ultimately lead to increased occurrences of extreme weather events such as floods, droughts, ice storms, and heat waves.

Precipitation, whether it is rainfall, snowfall, or other forms of frozen / liquid water, is the key climate and weather-related variable of concern with respect to drainage and bridge design. As a result of climate change, storm events are predicted to become more intense, which can result in larger volumes of precipitation at one time. Other climate variables, such as temperature, are major inputs to evaporation and snowmelt processes. Increases in temperature are likely to impact precipitation and snowmelt runoff volumes discharged to watercourses.

During the detailed design, all bridge and Stormwater Management-related components of the project shall be designed with consideration for increased precipitation.

9.0 Detailed Design and Construction Commitments

The following list provides a preliminary set of commitments to be undertaken during the detailed design phase or construction phase of the Project to ensure that work is being completed in accordance with the commitments used during the evaluation of alternatives. These commitments shall be revisited during the detailed design phase of the Project, at which time any additional commitments shall be identified.

9.1 Detailed Design Commitments

- A geotechnical subsurface investigation should be completed to provide recommendations on the appropriate foundation type and suitable bearing elevations. The required chemical testing and reporting required for compliance with O. Reg. 406/19 'On-site and Excess Soil Management' shall also be conducted during the geotechnical investigations at the detailed design stage to provide contractor's the applicable information required for selecting receiving sites.
- Additional topographic and / or bathymetric survey of the watercourse should be completed upstream and downstream of the bridge to confirm the elevations of the bottom of watercourse, if deemed necessary.
- A detailed Hydrologic and hydraulic modelling shall be completed to verify compliance of the proposed works with GRCA policies 8.1.15 and 8.1.16. The GRCA shall be consulted early in the detailed design stage to determine the scope of work for this exercise.
- Further investigations shall be undertaken to ensure the proposed alternatives will not impact potential erosion hazards that may be present due to riverine slopes and / or the meander belt of the creek. The requirement for engineering assessments, such as geotechnical or fluvial geomorphology, should be confirmed with the GRCA at the detailed design stage.
- A scoped environmental impact study, in accordance with GRCA Policy 8.4.7, shall be completed during Detailed Design. Wetland staking shall be undertaken during the growing season (May – September) and verified by GRCA staff. GRCA shall be circulated on a terms of reference for the Environmental Impact Study (EIS) at the onset of this work to ensure the scope of the EIS meets their requirements.
- A fluvial geomorphology assessment may be required to be completed to address GRCA Policy 8.9.2, which requires that "crossing structures avoid the Riverine Erosion Hazard in order to accommodate natural watercourse movement, wherever possible". The requirement for such assessment shall be confirmed in the early planning stages of the design phase.

- A Subsurface Utility Engineering (SUE) investigation should be undertaken at any locations where excavation works are anticipated to occur. Utility conflicts should be confirmed in the detailed design stage and relocated prior to construction, if necessary.
- A further analysis of the preferred structure type with the additional information gathered during detailed design should be conducted to confirm the recommendations outlined within this report. The geometry and alignment of structures should also be reviewed during the detailed design stage.
- A review of preliminary grading areas of each site for SAR wildlife habitats, such as bat roost trees, and snake hibernacula, should be completed.
- A tree inventory should be completed to determine and characterize required removals. The Six Nations of the Grand River Elected Council (SNGREC)'s list of plant species of interest and importance shall be reviewed to identify if vegetation proposed for removal is of interest to the SNGREC. Impacts to trees shall be minimized by implementing a tree protection plan in areas adjacent to construction or grading.
- If any Provincial SAR are identified during the tree inventory and / or associated detailed design studies, potential impacts will be mitigated to the extent possible and the MECP will be consulted with as needed to determine next steps and permitting requirements.
- Plant species loss should be minimized where possible, and a re-vegetation plan using native species and seed mix should be created. A re-planting ratio of ten replanted trees per one removed tree shall be used for quantifying replacements, as per the request of the Six Nations of the Grand River Elected Council (SNGREC). Re-planting should be completed on-site to the extent possible. Where the required re-planting quantities are unable to be achieved within the Township right-of-way (ROW), the preference is for the Township to strive to reach an agreement with the immediately adjacent landowners to allow for replanting on-site, beyond the Township ROW. If on-site planting is not achievable, off-site plantings to reach the desired ratios are acceptable to the SNGREC.
- Plant species identified for replanting shall be selected from the SNGREC's list of species of Interest / Importance which are suitable for the proposed planting locations. The Kayanase Greenhouse is available for consultation regarding replanting initiatives during detailed design.
- Near-bank cover plantings along the watercourse shall be included in the re-planting landscaping plan where possible, while considering the required offset of plantings from structures.

- An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project in consultation with the GRCA and will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specification (OPSS).
- All bridge and SWM-related components of the project shall be designed with consideration for increased precipitation due to Climate Change.
- Where erosion protection, channel regrading / stabilization, or earth retaining structures are determined to be required, the use of "softer" means of protection shall be preferred over the use of hard surfaces unless it is unfeasible to do so.
- Should future work require an expansion of the Study Area, then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.
- All Indigenous communities previously engaged shall be contacted, if there are any substantial changes to the project / process or if the Owner applies for subsequent permits from the Ministry (MECP) that may be of interest or concern to communities.
- The Township shall comply with the Ontario Water Resources Act, 1990, c. O.40 with respect to the quality of water discharging into natural receivers. The footprint of disturbed areas shall be minimized to the extent possible. For example, vegetated buffers shall be left in place adjacent to natural vegetation features (forested areas) to the maximum extent possible.
- Any features that are identified as candidate bat maternal roosting habitat shall be taken down outside the active bat window (i.e., active window is March 31 to October 1).
- A complaint response protocol for nuisance impacts, including dust emissions, shall be prepared during the detailed design phase of the project and implemented prior to construction.
- If revisions to the designs result in ground disturbances beyond the previously disturbed lands, or beyond the areas previously evaluated during the Stage 1 Archaeological Assessment, additional archaeological assessment of the areas should be undertaken. Any further recommended archaeological assessments shall be undertaken by a licensed archaeologist as early as possible during detailed design and prior to any ground disturbing activities.

  Should previously undocumented archaeological resources be discovered, there may be a new archaeological site and therefore be subject to Section 48(1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the Ontario Heritage Act.

The Funeral, Burial, and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with O. Reg. 30/11, the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations, which would be a contravention of the Ontario Heritage Act.

- Indigenous communities that were included in the EA contact list shall be consulted and given an opportunity to participate in any additional Archeological Assessment reporting and monitoring process, should it be determined that additional assessment is required.
- Documentation of each structure should be compiled and deposited in a local publicly accessible repository in accordance with the recommendations of the Cultural Heritage Evaluation Report, Heritage Impact Assessment, Documentation and Salvage Reports.
- Excess soils shall be managed in accordance with O. Reg. 406/19 and the MECP's "Management of Excess Soil – A Guide for Best Management Practices" (2014).
- If Bridge 30-WG is to be removed in the future, the recommendations for conservation outlined in the Heritage Impact Assessment (see Appendix A.7) shall be undertaken, which involves documentation of the existing bridge and filing of the documentation, including the Cultural Heritage Evaluation Report, Heritage Impact Assessment and Documentation and Salvage Reports to local historical societies, libraries and the municipal archives.

9.2 Construction Commitments

- The extent of vegetation removal shall be clearly delineated for the vegetation clearing and grubbing contractor. All tree work, including branch pruning, root pruning, and removal, shall be completed by an ISA Certified Arborist.
- An Environmental Inspector shall be engaged during the construction phase to review protection measures.
- A site inspector shall monitor the success of the seed mix application in re-vegetated areas. Seed mix should be re-applied by the contractor if bare patches are noticed or if it fails to germinate. Ecologists may be required to review site conditions if seed mix persists in not germinating.

- Trees to be retained beyond the limit of clearing should be protected using tree protection fence installed at the dripline or grading limit, whichever provides the greatest setback from the trees.
- Residential properties that are subject to tree removal on the adjacent ROWs may require reinstatement of native woody vegetation to compliment existing aesthetics and privacy screening where desired by the property Owner.
- To reduce the risk of contravening the *Migratory Bird Convention Act, 1994*, and Endangered Species Act, the structures shall be completely excluded with tarping / netting prior to the active breeding window for birds in the season leading up to the proposed construction works (i.e., by the end of March) and timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and / or structure works (construction, maintenance) during the period between April 1 to October 31 to avoid the active period for the following:
  - Breeding birds – Broadly from April 1 to August 31 for most species (regardless of the calendar year).
  - Bat species – Considered to be between March 31 to October 1 of any calendar year.
  - If work must occur during the active breeding bird window, a qualified ecologist shall search the structures for active nests prior to work and every two to three days during activity.
- If a nesting migratory bird (or SAR protected under *ESA, 2007*) is identified within or adjacent to the construction Site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the *Migratory Birds Convention Act, 1994* or *ESA, 2007*, all activities shall stop and the Contract Administrator (with assistance from a qualified Avian Biologist) shall discuss mitigation measures with the Township.
- Should SAR be identified, all activities will stop, and MECP shall be contacted immediately to ensure compliance with the ESA. The Contract Administrator shall instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the County, the MECP and / or Environment Canada.
- Daily sweeps of the construction zone and equipment should be conducted to ensure wildlife, including SAR snakes or turtles, have not entered the work limits. In the event that an animal is encountered during construction and does not move from the construction zone, the Contract Administrator will be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location will temporarily stop, and the MECP shall be contacted for direction.

- Wet weather restrictions shall be applied during Site preparation and excavation. Work will be avoided near watercourses and headwater drainage features during periods of excessive precipitation and / or excessive snow melt.
- Any in-water works shall occur in isolation of flowing waters, with work zone isolation achieved by placing cofferdams constructed of clean, non-erodible materials at the upstream and downstream limits of a given work area. Stream flows must be maintained downstream of in-water work areas through by-passing flows (by-pass culvert, channel, pumping etc.). Any isolated work areas shall be de-watered and dewatering shall be conveyed to a filtering system and flow dissipation device to mitigate sedimentation and erosion of the receiving waterbody.
- Any fish trapped in an isolated work area shall be captured and released outside of it prior to the commencement of in-water works. Any fish rescue shall be performed by a qualified aquatic ecologist / biologist. A License to Collect Fish (LCF) shall be obtained from the NDMNRF prior to any fish rescue occurring.
- In-water works will only be permitted to occur during the appropriate in-water works timing, which shall be confirmed with DFO and NDMNRF during the detailed design.
- Embankments shall be restored with erosion control blankets, topsoil, seeding mixtures approved by the GRCA, and plantings, where appropriate.
- Any stockpiled material shall be stored and stabilized away from the surface water features. All materials and equipment used for the purpose of Site preparation and road construction shall be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum fuel, hydraulic fluids) from entering the environment.
- Refueling and maintenance of construction equipment should occur within designated areas only. Any hazardous materials used for construction will be handled in accordance with appropriate regulations.
- Should previously undocumented archaeological resources be discovered, they may qualify as a new archaeological site and therefore be subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with O. Reg. 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship

and Multiculturalism should also be notified (via email to archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

- A Construction Emergency Response and Communications Plan shall be developed and followed throughout the construction phase (including spill response plans). The Contractor shall develop spill prevention and contingency plans for the construction of new bridge infrastructure. Personnel shall be trained in how to apply the plans and the plans shall be reviewed to strengthen their effectiveness and continuous improvement. Spills or depositions into watercourses shall be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on-site at all times during the work.
  Spills shall be reported to the Ontario Spills Action Centre at 1-800-268-6060.
- The construction contractor shall be required to develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs.
- The construction contractor shall be required to develop a Construction Management Plan (CMP) that specifically addresses noise controls, mitigation to be implemented and frequency of equipment inspection.
- Vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. The contractor shall also be required to implement dust suppression measures to reduce the potential for airborne particulate matter resulting from construction activities. This should be in the form of water applications on exposed soils.
- Considerations shall be given to the use of chemical suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust and equipment washing.
- Noise control measures shall be implemented where required during the construction phase, such as restricted hours of operation and the use of appropriate machinery and mufflers. The noise produced by the equipment can be limited through proper equipment maintenance.
- All construction activities shall conform to the noise criteria set out in NPC115 of 83 dB.
- The contractor shall develop a Health and Safety Plan (HASP) and have it reviewed and approved by the County prior to implementing. The HASP shall follow the Occupational Health and Safety Act, 1990, and regulatory requirements.
- Operation of construction related vehicles shall be done in accordance with all appropriate safety policies and procedures, and based on Canadian Standards (Transport Canada, etc.).

- Contractor will be required to develop and implement a traffic management plan in coordination with Township of Centre Wellington. Adequate signage to give advance notice of disruptions and detours is to be provided by the contractor.

9.3 Permit Requirements

The following list provides a preliminary set of permit requirements that will need to be acquired prior to construction. A final list of permits shall be determined during the detailed design phase of the Project.

- The contractor shall obtain an Occupancy Permit from the Township for working within the ROW.
- A Permit to Take Water may be required should dewatering be necessary. Requirements for dewatering shall be determined during the detailed design phase of the Project.
- The Township is required to comply with the *Ontario Water Resources Act* with respect to the quality of water discharging into natural receivers. The footprint of disturbed area shall be minimized as much as possible. For example, minimizing distribution of excavated soil to minimize sedimentation to storm sewers.
- A permit approval shall be required from GRCA in accordance with O. Reg. 41/24 'Prohibited Activities, Exemptions and Permits Regulation' for construction works in GRCA regulated areas, including culvert extensions, drain relocations and watercourse modifications.
- If portions of woodland providing habitat for SAR bats are to be removed, an Information Gathering Form shall be submitted to MECP, in accordance with the Endangered Species Act.
- A License to Collect Fish will be required for any fish relocations during construction.
- Approval under the *Fisheries Act* from DFO will be required for any in-water works.
- Ground disturbance activities shall not be undertaken until the Ministry of Citizenship and Multiculturalism has provided a letter indicating the recommended technical cultural heritage studies (e.g., Cultural Heritage Report, CHERs, HIAs) have been completed and are consistent with the requirements guidance and standards and with best practice guidance prepared by Ministry of Citizenship and Multiculturalism.
- A Permit from Wellington County to remove trees under By-Law 5515-09 shall be obtained.

10.0 Conclusion

In conclusion, the Bridges and Transportation Network Study completed for Bridges 21-WG, 29-WG, and 30-WG has evaluated the impacts on the technical, natural, economical, social, and cultural environments and has determined that the preferred solution to be carried forward for future capital planning and implementation includes the replacement of Bridges 21-WG and 29-WG, and removal of 30-WG. The preliminary geometry recommended for the replacement bridges is summarized in Table 21 below but should be further evaluated during the detailed design phase of the projects, upon the collection of additional information.

Table 21: Preliminary Bridge Replacement Geometry Recommendations

Bridge ID	Required Span(s) (m)	Recommended Structure Type	Road Profile Design Speed
21-WG	26 m Clear	Two-Lane, Single-Span B800 Prestressed Concrete Box Girder Bridge	50 km/h
29-WG	19 m, 19 m	Two-Lane, Two-Span B700 Prestressed Concrete Box Girder Bridge	50 km/h

This report will be made available for public review and comment through the Township of Centre Wellington's online 'Connect CW' platform. All parties who have identified an interest in the study through previous consultations will be notified of the availability of this report and requested to review and provide any comments within 30 calendar days of the notification.

If comments are received which may impact the previously completed evaluation of alternatives, the Township can consider revisiting and revising the analysis as required to incorporate the additional information. If the additional considerations result in a change in the preferred solution, an updated report will be provided to the public for further review.

If no further comments effecting the preferred solution are received, the Township may move forward to detailed design, approvals process and subsequent implementation of the preferred alternative.

11.0 References

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Appendix A

Supporting Studies

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A.1 Transportation Network Study

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (226) 526-9660 **web** www.rjburnside.com

BURNSIDE
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Technical Memorandum Transportation Network Study

Date:	December 2025	**Project No.:**	300059832.0000
Project Name:	Bridge and Transportation Network Study for Bridges 21-WG, 29-WG & 30-WG		
Client Name:	Township of Centre Wellington		
Submitted To:	Project File		
Submitted By:	Sameem Raheemi, B.Sc., MUP		
Reviewed By:	Alvaro Almuina, P.Eng., M.Eng., PMP, DCE		

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG, which are located in close proximity to one another in the northeast quadrant of the Township. Due to their severely deteriorated condition, these structures have had load limitations applied (21-WG) or have been closed (29-WG and 30-WG) to vehicular traffic.

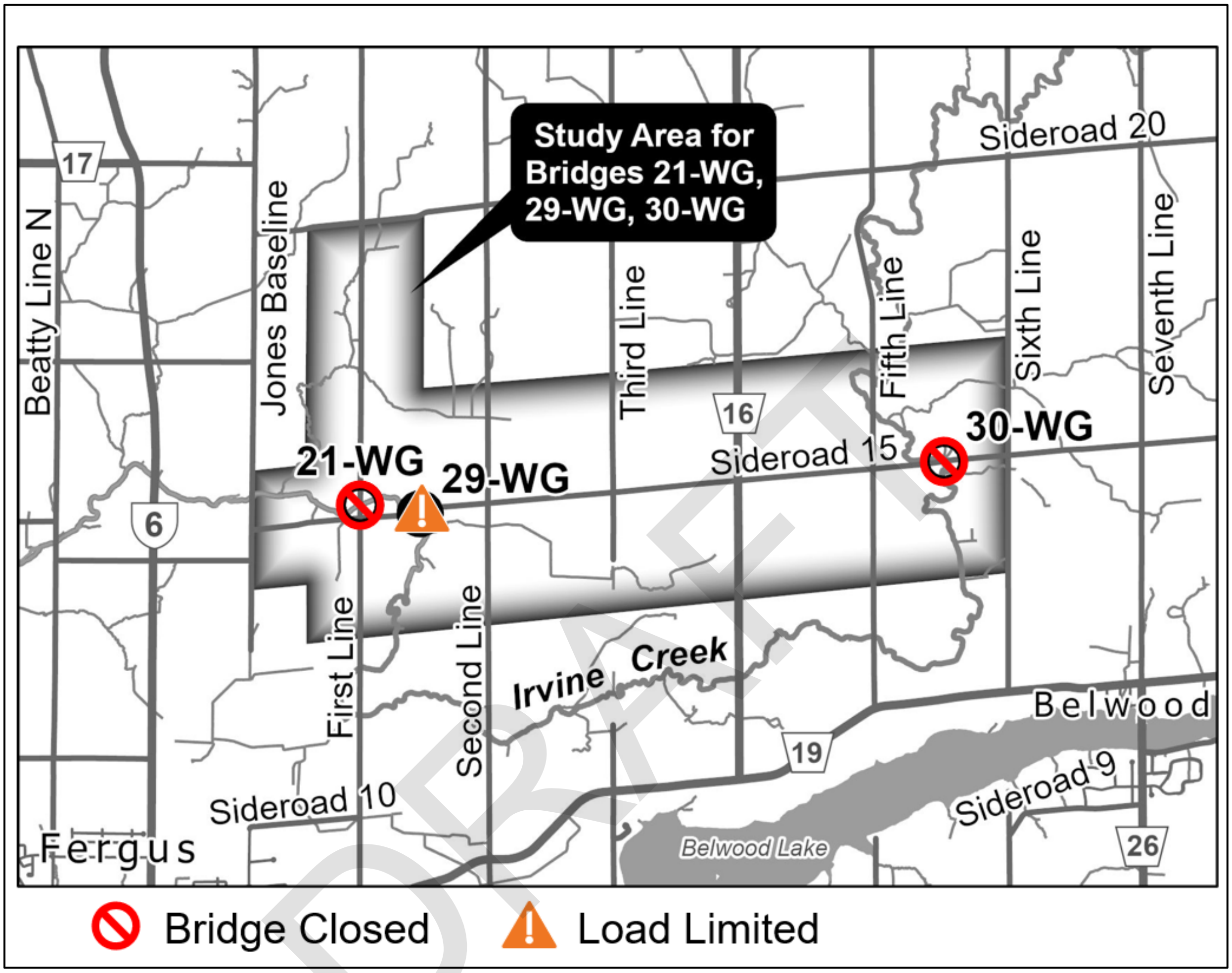
The Township has recognized the impact of numerous closed structures on the local community's overall connectivity and initiated this study to evaluate each structure's role in the overall transportation network and consider improvements to some or all of the subject bridges to improve connectivity within the Study Area. This memo presents the results of a technical review of the road continuity and alignment within the influence areas of the three bridges.

The three bridges are in the southeast quadrant of the Township of Centre Wellington, near Fergus. Their locations are:

- **Bridge 21-WG**: On First Line, approximately 130 m north of Side Road 15.
- **Bridge 29-WG**: On Side Road 15, 600 m east of First Line.
- **Bridge 30-WG**: On Side Road 15, 660 m west of 6 Line.

The location of the three bridges is illustrated in Figure 1 below.

Figure 1: Study Area and the Location of Three Bridges



2.0 Existing Conditions

2.1 Land Use

The three bridges are located in the Township's northeastern quadrant, primarily a rural community. The existing land use designation identified by the Township Official Plan includes mainly agricultural land, green land, and core green land and some industrial. The network of roads in this quadrant mainly serves the agricultural farmlands and connects them to the neighbouring Towns of Alma, Arthur, Elora, Fergus, Belwood, Grand Valley and Guelph. The land use map of the study area is shown in Figure 2.

Figure 2: Land Use Map of the Study Area

2.2 Road Network and Traffic Volumes

The existing road network is described in Table 1. Several of the roads in the Study Area do not have posted speed limits. These unposted roadways may technically be considered to have statutory speed limits of 80 km/h in accordance with the Highway Traffic Act (located outside of built-up areas).

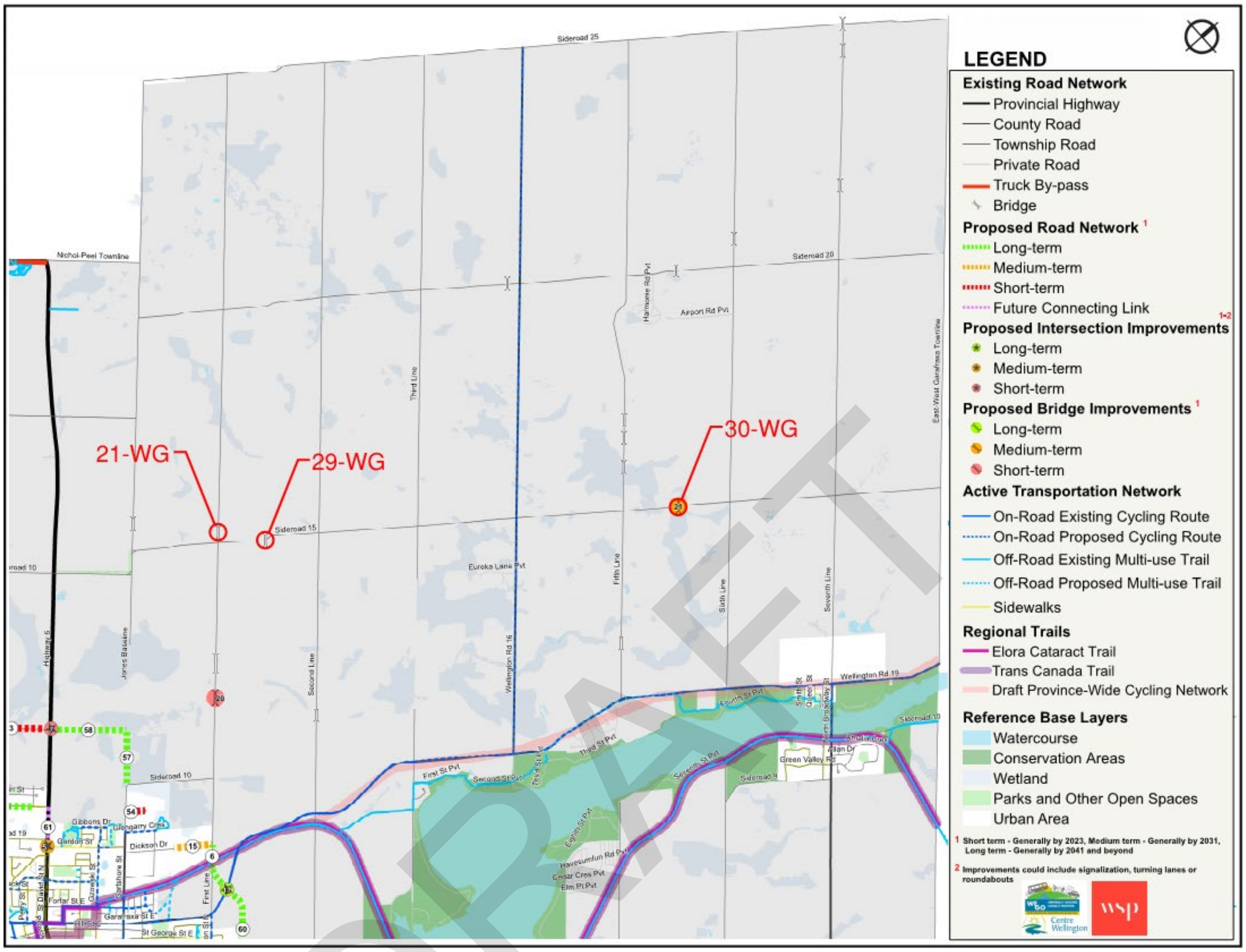
Table 1: Study Area Roadways

Roadway	General Description
Wellington Road 19	Wellington Road 19 (CR 19) is an east-west asphalt arterial road under the County's jurisdiction. It has a posted speed limit of 80 km/hr and a two-lane rural cross-section with no sidewalks. CR 19 provides and serves high volumes of traffic including truck traffic. As a major roadway, it is designed for servicing high volumes of intra-urban traffic at moderate speeds and with limitations on property access.
Side Road 15	Side Road 15 is an east-west gravel local road under the jurisdiction of the Township. Side Road 15 within the study area (from Jones Baseline to 6 Line) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. Side Road 15 serves local traffic and provides access to individual properties. Bridge 29-WG and 30-WG are located along this road.
Side Road 20	Side Road 20 is an east-west asphalt (except for the gravel segment between 2 Line and 5th Line) local road with a posted speed limit of 60 km/h under the jurisdiction of the Township. Side Road 20 within the study area (from Jones Baseline to 6 Line) consists of a two-lane rural cross-section with no sidewalks. Side Road 15 serves local traffic and provides access to individual properties.
Side Road 25	Side Road 25 is an east-west gravel local road under the jurisdiction of the Township. Side Road 25 within the study area (from Jones Baseline to 6 Line) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. Side Road 25 serves local traffic and provides access to individual properties.
Wellington Road 109	Wellington Road 109 (CR 109) is an east-west asphalt arterial road under the County's jurisdiction. It has a posted speed limit of 80 km/hr and a two-lane rural cross-section with no sidewalks. CR 109 provides and serves high volumes of traffic including truck traffic. As a major roadway, it is designed for servicing high volumes of intra-urban traffic at moderate speeds and with limitations on property access.
Jones Baseline	Jones Line is a north-south gravel (except for the asphalt segment between Side Road 20 and Nichol Peel Townline) local road under the jurisdiction of the Township. Jones Baseline within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks and a posted speed limit of 60 km/hr. Jones Baseline serves local traffic and provides access to individual properties.

Roadway	General Description
First Line	First Line is a north-south gravel local road under the jurisdiction of the Township. First Line within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. First Line serves local traffic and provides access to individual properties. Bridge 21-WG is located along this road.
2 Line	2 Line is a north-south local road under the jurisdiction of the Township. It has an asphalt surface south of Side Road 20 and a gravel surface north of Side Road 20. 2 Line within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. 2 Line serves local traffic and provides access to individual properties.
3 Line	3 Line is a north-south gravel local road under the jurisdiction of the Township. 2 Line within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. 3 Line serves local traffic and provides access to individual properties.
Wellington Road 16	Wellington Road 16 (CR 16) is a north-south asphalt arterial road under the County's jurisdiction. It has a posted speed limit of 80 km/hr and a two-lane rural cross-section with no sidewalks. CR 16 provides and serves high volumes of traffic including truck traffic. As a major roadway, it is designed for servicing high volumes of intra-urban traffic at moderate speeds and with limitations on property access.
5th Line	5th Line is a north-south gravel local road under the jurisdiction of the Township. 5th Line within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. 5th Line serves local traffic and provides access to individual properties.
6 Line	6 Line is a north-south local road under the jurisdiction of the Township. It has an asphalt surface south of Side Road 20 and a gravel surface north of Side Road 20. 6 Line within the study area (from Side Road 15 to Side Road 25) consists of a two-lane rural cross-section with no sidewalks. No posted speed limit is present for this road within the study area, so an assumed unposted speed of 80 km/h has been used for this study. 6 Line serves local traffic and provides access to individual properties.

The existing and proposed road network in the study area is shown in Figure 3.

Figure 3: Study Area Road Network



2.3 Transit

Currently, neither the Township nor the County operate a fixed route transit system. However, the Township is served by the County's RIDE WELL program. RIDE WELL is an on-demand, publicly funded, rural transit pilot project, offering door-to-door transportation in Wellington County and Guelph. This is a ridesharing service, meaning bookings made at similar times, and in similar locations, will be paired into one vehicle. The Elora and Fergus Downtown Shuttle Program is an initiative designed to enhance transportation accessibility and connectivity within these two communities while helping to alleviate parking constraints. This program involves providing a weekend shuttle service during peak tourism hours (11:00 a.m. – 5:00 p.m.) during the summer months, operating between key locations identified between Elora and Fergus.

2.4 Active Transportation

There is no formal active transportation (AT) network within the study area to accommodate pedestrians or cyclists.

2.5 Truck and Goods / Agricultural Movement

As illustrated in Figure 3, Highway 6 (west of the study area) serves as the primary route facilitating the transportation of goods, both internally and externally, via trucking operations. Notably, it plays a pivotal role in the efficient movement of commercial vehicles coming into Centre Wellington or bypassing it. The study area road network experiences trucking operations for moving products of various farmlands, and some industrial businesses. The transportation of the farmland products rests on light-duty trucks which are the only type of heavy vehicles allowed to use the local roads in the study area.

3.0 Bridge Closure Impact

The three structures being assessed have exceeded their typical design life span. Due to their deteriorated state, two structures (21-WG & 30-WG) have been closed, and one structure (29-WG) has been load-restricted. It is recognized that these structures once served mainly local residents and agricultural operations, on sections of roadways with low Average Daily Traffic values.

The closure of the three bridges increases travel time and distance for all vehicle types operating in the study area. These bridges serve as local connections, and their closure disrupts direct east–west and north–south travel patterns, requiring vehicles to take longer detour routes. For passenger vehicles, this results in longer commute times for daily trips between rural residences and nearby urban centres. Emergency vehicles such as ambulances, police and fire trucks experience the negative impacts, as the increased detour distances can delay response times. For slow-moving agricultural vehicles, the impact is higher. The longer travel routes, particularly with limitation on their travel along the county roads, not only add substantial distance but also create operational challenges, as these vehicles are not designed for extended travel. The closures lead to overall network inefficiency, reduced connectivity for rural residents, and potential safety concerns due to delayed emergency response and increased interaction between slow-moving and faster traffic on detour routes.

In this section of the technical memorandum, we assess how the closure / reopening of the subject bridges would impact emergency response, travel time, and travel distance. To assess the impact of the bridge closure, the whole northeast quadrant of the Township has been divided into four areas as illustrated in Figure 4. The method adopted for dividing the four areas is based on the location and proximity to the bridges. Travel time is a fundamental measure of transportation, and it is the time required for a transportation mode (vehicles including slow moving vehicles, trucks, buses, persons, etc.) to travel from one point of interest to another on a specific route. Travel time has been used as a measure of efficiency to evaluate transportation facilities and make decisions for future improvements. Travel time is an attribute of travel distance and the speed of the segment of transportation facility.

This study examined the impact of bridge closure and reopening on travel time and travel distance for the following trip types:

- Cross-Community Trips;
- Local Community Trips;
- Emergency Trips; and
- Slow-Moving Vehicle Trips.

For each trip type, an origin-destination matrix was developed and utilized to evaluate differences in travel time and distance under various bridge closure and reopening scenarios.

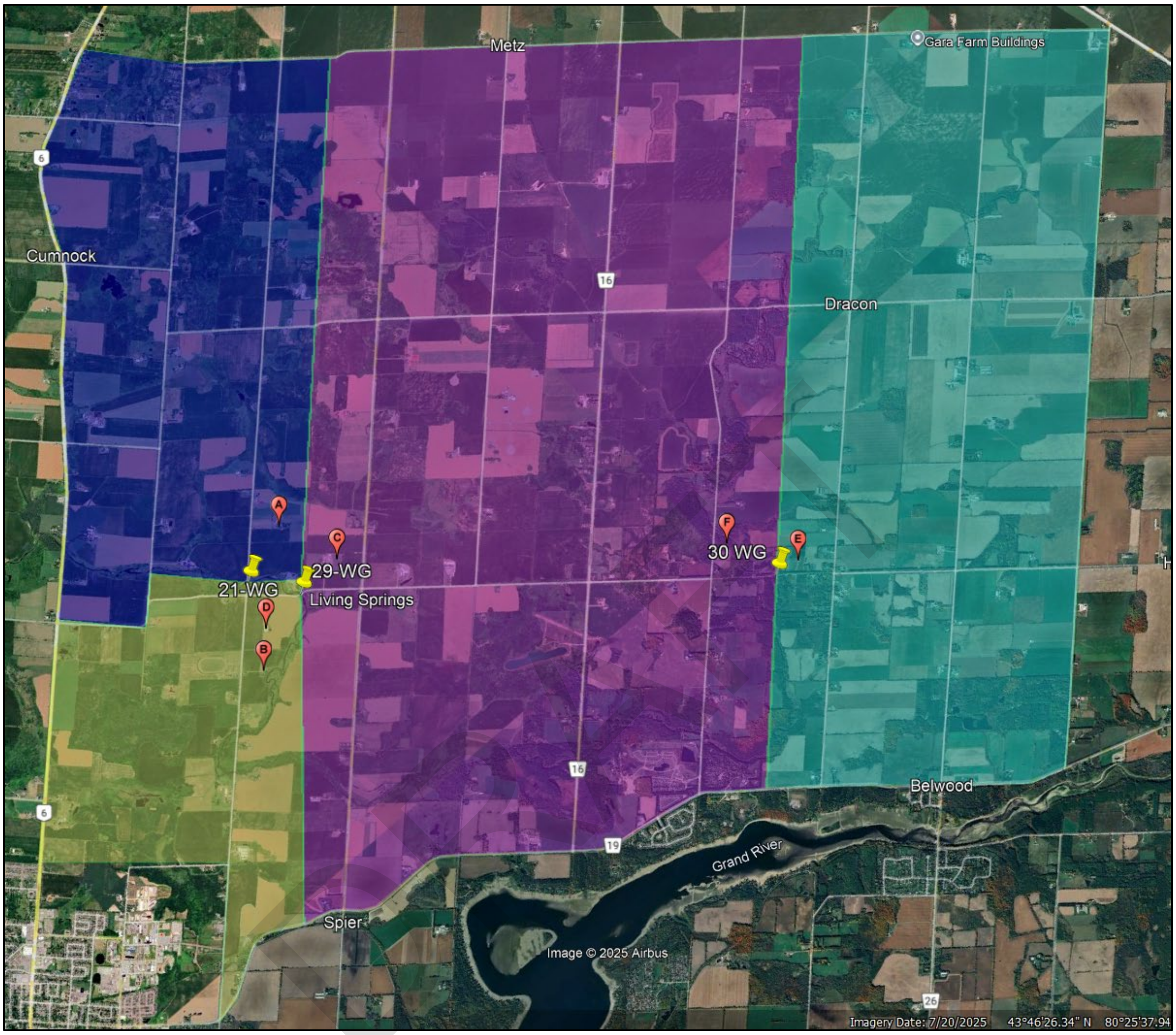
The following seven scenarios were considered to evaluate the impact of a bridge closure / reopening:

1. All bridges Closed
2. Opening all the bridges
3. Opening bridge 21-WG
4. Opening bridge 29-WG
5. Opening bridge 30-WG
6. Opening bridges 21-WG and 29-WG
7. Opening bridges 21-WG and 30-WG
8. Opening bridges 29-WG and 30-WG

All scenarios were compared against the base scenario in which all bridges were assumed to be closed. For each scenario, alternate travel routes were analyzed to assess differences in travel time and distance and are summarized in figures in the appendices attached to this technical memorandum, as further detailed below.

In the following tables, results for ‘Total Time Saved’ and ‘Maximum Time Saved’ are presented. The ‘Total Time Saved’ represents the total time savings for all the OD pairs identified and is not representative of a single trip; whereas the ‘Maximum Time Saved’ represents the most benefit for a single route from the OD pairs. The ‘Total Time Saved’ is dependent on the number of OD pairs for each scenario; therefore they should be used only for comparison within a trip type (i.e. comparing cross community travel to cross community travel) and not for comparison of different trip types (i.e. don’t compare cross community travel to emergency response).

Figure 4: Study Division and Boundaries



Note: Courtesy of Google Earth

3.1 Cross-Community Trips

The ‘Cross-Community’ analysis looked at how the bridge closure impacts travel between the locations shown in Figure 4 and major destinations within the proximity of the study area such as Guelph, Belwood, Alma, Fergus, Arthur, and Grand Valley. An origin-destination (OD) matrix was created to investigate the impact of bridge closure on various travel patterns. The OD matrix is summarized in Table 2.

Table 2: OD Matrix for Cross-Community Trips

Origin						Destinations	
						Label	**Description**
Guelph (Central Station)	Belwood (Country Market)	Fergus (JJ's Dinner)	Alma (NAPA AUTOPRO - Buehler Automotive)	Arthur (Chuck's Roadhouse Bar & Grill)	Grand Valley (Grand Valley & District Community Centre)	A	Residential North of 21-WG
						B	Residential South of 21-WG
						C	Residential East of 29-WG
						D	Residential West of 29-WG
						E	Residential East of 30-WG
						F	Residential West of 30-WG

The results of the ‘Cross-Community’ analysis are shown in the Figures of Appendix A.

In order to consider that certain routes may impact more or less individual users or trips per day, the time savings were weighted by the Average Annual Daily Traffic (AADT) volumes provided by the Township. The AADT records were from various years, and records from prior to bridge closures were used where applicable. Accordingly, the AADT records were indexed to the current year of 2025. No specific studies have been completed related to the expected growth rates of traffic in the Study Area; therefore, a 2% volume increase per year was assumed. This is considered a conservative value, given that the estimated annual population growth rate of the Township is approximately 2.33% per year as per the Township’s Growth Management Plan and the study area is located outside of planned development areas.

The applicable AADT values used in the weighting of the Cross-Community analysis are as shown in Table 3:

Table 3: Record and Indexed Average Annual Daily Traffic Values

Location	Recorded AADT (vpd)	Year of AADT Record	Indexed AADT for 2025
First Line, North of 21-WG	101	2018	116
First Line, South of 21-WG to Gartshore St.	196	2018	225
Sideroad 15, West of 29-WG to Jones Baseline	305	2022	324
Sideroad 15, East of 29-WG to Wellington Rd 16	143	2021	155
Sideroad 15, West of 30-WG to Wellington 16	203	2022	215
Sideroad 15, East of 30-WG to East-West Garafraxa Townline	136	2008	190

A summary of the benefits for each alternative, as compared to the scenario of all bridges closed, is presented in Table 4 below.

Table 4: Cross-Community Travel Results Summary

Alternative	2	3	4	5	6	7	8
Bridges Open	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Savings (mm:ss)	43:54	16:54	15:04	08:08	27:03	25:02	32:12
Maximum Time Savings (mm:ss)	6:00	4:00	4:19	02:33	6:00	4:00	4:19

Alternative	2	3	4	5	6	7	8
Traffic Weighted Time Savings(1)	8990	3243	4002	1570	6588	4813	6514
Total Distance Savings (km)	47.10	24.25	21.60	5.99	29.21	30.24	38.60
Maximum Distance Savings (km)	7.01	5.96	6.25	1.69	7.01	5.96	6.25
Traffic Weighted Distance Savings (1)	9727	5079	5565	1177	7178	6257	8011

(1) Traffic Weighted Savings are calculated by summing the product of the time (minutes) or distance (km) saved for each OD pair by the applicable AADT value along that route.

3.2 Emergency Response

Emergency response time is a critical factor in ensuring the safety and well-being of a community. Rapid and effective responses from emergency services, including police, firefighters, and medical care providers, can mean the difference between life and death, injury and recovery, or property loss and preservation. Therefore, understanding how bridge closures can impact emergency response times is crucial.

A robust methodology was employed to evaluate the impact of bridge closures on emergency response times, involving three essential entities: the fire station, hospital, and police station located in Fergus, and the police and fire station located in Rockwood. The approach integrates geographic information system (GIS) technology, transportation analysis, and empirical data to conduct a comprehensive assessment of emergency response times.

The analysis focuses on response times from the surrounding emergency response stations to six strategically chosen locations that represent the broader areas of the Township influenced by bridge closures. Table 5 summarizes the OD matrix for emergency response trips.

Table 5: Origin and Destination Matrix for Emergency Response Trips

<table>
<tr><th colspan="7" rowspan="2">Origin</th><th colspan="2">Destinations</th></tr>
<tr><th>Label</th><th>Description</th></tr>
<tr><td rowspan="6">Centre Wellington Fire Department - Fergus</td><td rowspan="6">OPP - Fergus</td><td rowspan="6">Groves Memorial Community Hospital</td><td rowspan="6">Guelph Eramosa Fire Station 20</td><td rowspan="6">GW-EMS "05" Station Arthur</td><td rowspan="6">GW-EMS "02" Station Fergus</td><td rowspan="6">Ambulance Station Grand Valley</td><td>A</td><td>Residential North of 21-WG</td></tr>
<tr><td>B</td><td>Residential South of 21-WG</td></tr>
<tr><td>C</td><td>Residential East of 29-WG</td></tr>
<tr><td>D</td><td>Residential West of 29-WG</td></tr>
<tr><td>E</td><td>Residential East of 30-WG</td></tr>
<tr><td>F</td><td>Residential West of 30-WG</td></tr>
</table>

The results of the 'Emergency Response' analysis are shown in the Figures of Appendix B.

The analysis below also provides a 'Weighted time Savings' value. This value considers two additional considerations in the overall benefit including:

1. The number of properties benefitted by the time savings along each route:

Destination	Number of properties
East of 29-WG	5
West of 29-WG	1
East of 30-WG	7
West of 30-WG	3
North of 21-WG	8
South of 21-WG	6

2. Whether the benefit is provided along a route from a first, secondary, tertiary or quaternary response station.

Response Order	Applicable Factor
First	1.0
Secondary	0.75
Tertiary	0.5
Quaternary	0.25

The ‘Weighted Time Savings’ value is the sum of the products of the time savings, the number of properties and the response order factor applicable to each route associated with the OD pairs.

A summary of the impacts for each alternative is presented in Table 6 below.

Table 6: Emergency Response Results Summary

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Savings (mm:ss)	50:45	26:06	14:59	07:27	25:53	33:33	38:19
Max Time Savings (mm:ss)	06:02	04:00	04:21	02:33	06:02	04:00	04:21
Total Properties Benefited	30	15	15	15	22	30	23
Weighted Time Savings(1) (h:mm:ss)	1:50:40	1:11:17	0:17:50	0:12:45	0:33:36	1:24:01	1:31:59

Alternative	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total Distance Savings (km)	42.50	31.47	10.96	6.76	10.96	6.76	17.26
Max Distance Savings (km)	6.23	5.61	5.48	1.69	5.48	1.69	6.23
Weighted Distance Savings(1)	102.50	86.16	12.45	13.70	20.47	99.86	92.96

(1) Weighted Savings is the sum of the product of the individual time or distance savings along each OD pair route, multiplied by the number of benefitting properties and the response order factor.

3.3 Local Community Trips

This set of analyses examined the impact of bridge closures on local community trips within the study area between the locations illustrated in Figure 4. An OD matrix was developed to assess how bridge closures affect various travel patterns related to travel time and distance when travelling between a pair of origin-destination immediately on two sides of the bridges, in order to capture the impacts to travel including deliveries, buses, garbage collection, snow ploughs and similar services. This evaluation also captures the impact to travel for between neighbouring properties each side of the bridge. A summary of the OD matrix is provided in Table 7.

Table 7: OD Matrix for Local Community Trips

Origin		Destinations	
Label	**Description**	**Label**	**Description**
E	Residential East of 30-WG	A	Residential North of 21-WG
		D	Residential West of 29-WG
		F	Residential West of 30-WG
C	Residential East of 29-WG	A	Residential North of 21-WG
		D	Residential West of 29-WG
		F	Residential West of 30-WG
A	Residential North of 21-WG	B	Residential South of 21-WG

The results of the ‘Local Community’ analysis are shown in the Figures of Appendix C. No additional weighting has been applied to these results, as the vehicles required to travel along these OD pair routes are required to do so regardless of the traffic volumes, number of properties or other factors.

A summary of the impacts for each alternative is presented in Table 8 below.

Table 8: Local Community Travel Results Summary

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Saved (mm:ss)	38:53	08:21	12:07	08:01	24:02	17:52	24:34
Maximum Time Saved (mm:ss)	08:55	05:54	08:55	05:17	08:55	05:54	08:55
Total Distance Saved (km)	0.00	45.48	12.30	14.94	8.45	28.31	20.80
Maximum Distance Saved (km)	0.00	10.96	6.80	10.96	6.70	10.96	6.80

3.4 Slow-Moving Vehicles

This set of analyses examined the impact of bridge closures on local community trips by slow-moving and agricultural vehicles within the study area between the locations illustrated in Figure 4. For the slow-moving vehicles, this set of analyses adopted a 25 km/hr speed limit and prohibited them from using the busier arterial roads. An OD matrix was developed to assess how bridge closures affect various travel patterns. The matrix was designed to evaluate the impact on travel time and distance when traveling from an origin located on one side of a bridge to a destination situated on the other side of the same bridge or to the far side of neighbouring bridges. A summary of the OD matrix is provided in Table 9.

Table 9: OD Matrix for Slow-Moving and Agricultural Vehicle Trips

Origin		Destinations	
Label	**Description**	**Label**	**Description**
E	Residential East of 30-WG	A	Residential North of 21-WG
		D	Residential West of 29-WG
		F	Residential West of 30-WG
C	Residential East of 29-WG	A	Residential North of 21-WG
		D	Residential West of 29-WG
		F	Residential West of 30-WG
A	Residential North of 21-WG	B	Residential South of 21-WG

The results of the ‘Slow-Moving Vehicles’ analysis are shown in the Figures of Appendix D. A summary of the impacts for each alternative is presented in Table 10 below.

Table 10: Slow-Moving Vehicle Results Summary

Alternative	2	3	4	5	6	7	8
Bridges Replaced	**All**	**21-WG**	**29-WG**	**30-WG**	**29-WG & 30-WG**	**21-WG & 30-WG**	**21-WG & 29-WG**
Total Time Saved (h:mm:ss)	1:49:56	0:27:05	0:30:10	0:23:38	1:08:44	0:50:43	1:00:28
Maximum Time Saved (mm:ss)	24:06	16:19	24:06	19:20	24:06	19:20	24:06
Total Distance Saved (km)	0.00	45.82	11.28	12.57	9.86	28.65	21.14
Maximum Distance Saved (km)	0.00	10.04	6.80	10.04	8.06	10.04	8.06

4.0 Alternative Solutions Analysis

Based on the findings presented in Section 2.0, a score has been provided to each of the trip types for each of the eight (8) alternatives being considered as part of the Study. The Transportation related ratings are summarized in Table 11 below.

Table 11: Evaluation Matrix for Transportation Criteria

Criteria / Alternative	**All Bridges Closed**	**All Bridges Open**	**21-WG Open**	**29-WG Open**	**30-WG Open**	**29-WG & 30-WG Open**	**21-WG & 30-WG Open**	**21-WG & 29-WG Open**
Cross-Community Travel	☆☆☆☆	★★★★	★⯪☆☆	★★☆☆	⯪☆☆☆	★★★☆	★★☆☆	★★★☆
Emergency Response	☆☆☆☆	★★★★	★★⯪☆	⯪☆☆☆	⯪☆☆☆	★☆☆☆	★★★☆	★★★⯪
Slow-Moving Equipment	☆☆☆☆	★★★★	★☆☆☆	★⯪☆☆	★☆☆☆	★★★☆	★★☆☆	★★⯪☆
Local Community Travel	☆☆☆☆	★★★★	★☆☆☆	★⯪☆☆	★☆☆☆	★★★☆	★★☆☆	★★★☆
Transportation Rating	☆☆☆☆	★★★★	★⯪☆☆	★☆☆☆	⯪☆☆☆	★★⯪☆	★★☆☆	★★★☆

The following summarizes the key findings of the Traffic Impact Assessment:

- Bridge 21-WG offers the most overall benefit on an individual bridge basis, with significantly greater improvements to emergency response.
- 29-WG offers slightly less benefit than 21-WG on an individual bridge basis, but provides the most improvements to commute times, local community travel and travel with farm equipment.
- 30-WG provides the least benefit overall on an individual bridge basis
- The compounding effects of opening 21-WG and 29-WG is highest option for opening two bridges when considering all criteria, and outweighs the combined effects of opening 29-WG and 30-WG (a through east-west corridor) due to the substantially larger benefit to emergency services related to opening bridge 21-WG versus 30-WG.
- From a transportation perspective, opening all bridges is the most preferred alternative.

The analysis of the various alternatives highlights the significant impact that bridge closures and openings have on various aspects of transportation, including cross-community travel, emergency response times and local community and slow-moving vehicle trips within the study area. Each alternative demonstrates varying levels of improvement in travel time and distance, depending on the combination of bridges opened. Additionally, the analysis underscores the importance of considering not only the total reduction in travel time and distance but also the distribution of these impacts across different OD pairs. Some alternatives provide more localized improvements, benefiting select routes or properties, while others result in more widespread enhancements.

R.J. Burnside & Associates Limited

Sameem Raheemi, B.Sc., MUP	Andrew Dawson, P.Eng.
Transportation Planner	Project Engineer

SR/AD:js

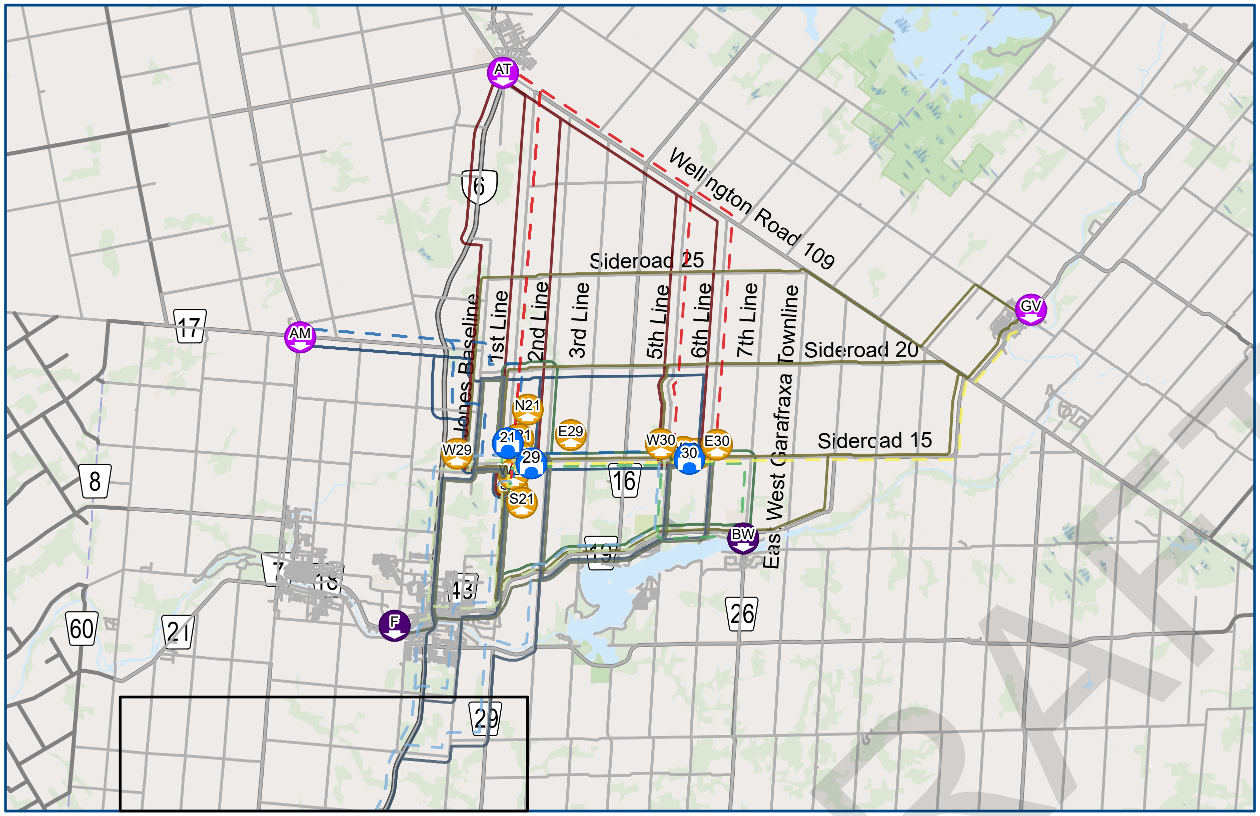
Enclosure(s) Appendix A: Cross-Community Travel Results
Appendix B: Emergency Response Results
Appendix C: Local Community Travel Results
Appendix D: Slow-Moving Vehicle Results

Burnside

[The Difference is our People]

Appendix A

Cross-Community Travel Results



Cross Community Route Scenario: All Bridges Open

Origins
AM Alma
AT Arthur
BW Belwood
F Fergus
GV Grand Valley
G Guelph

Destinations
E29 Residential East of 29-WG
E30 Residential East of 30-WG
N21 Residential North of 21-WG
S21 Residential South of 21-WG
W29 Residential West of 29-WG
W30 Residential West of 30-WG

Route Scenarios
Alma
Arthur
Belwood
Fergus
Grand Valley
Guelph

Routes Bridges Closed
Alma
Arthur
Belwood
Fergus
Grand Valley
Guelph

Bridges
29 29-WG
30 30-WG
21 21-WG

Kilometres
0 2 4 6 8 10 12 14 16 18 20

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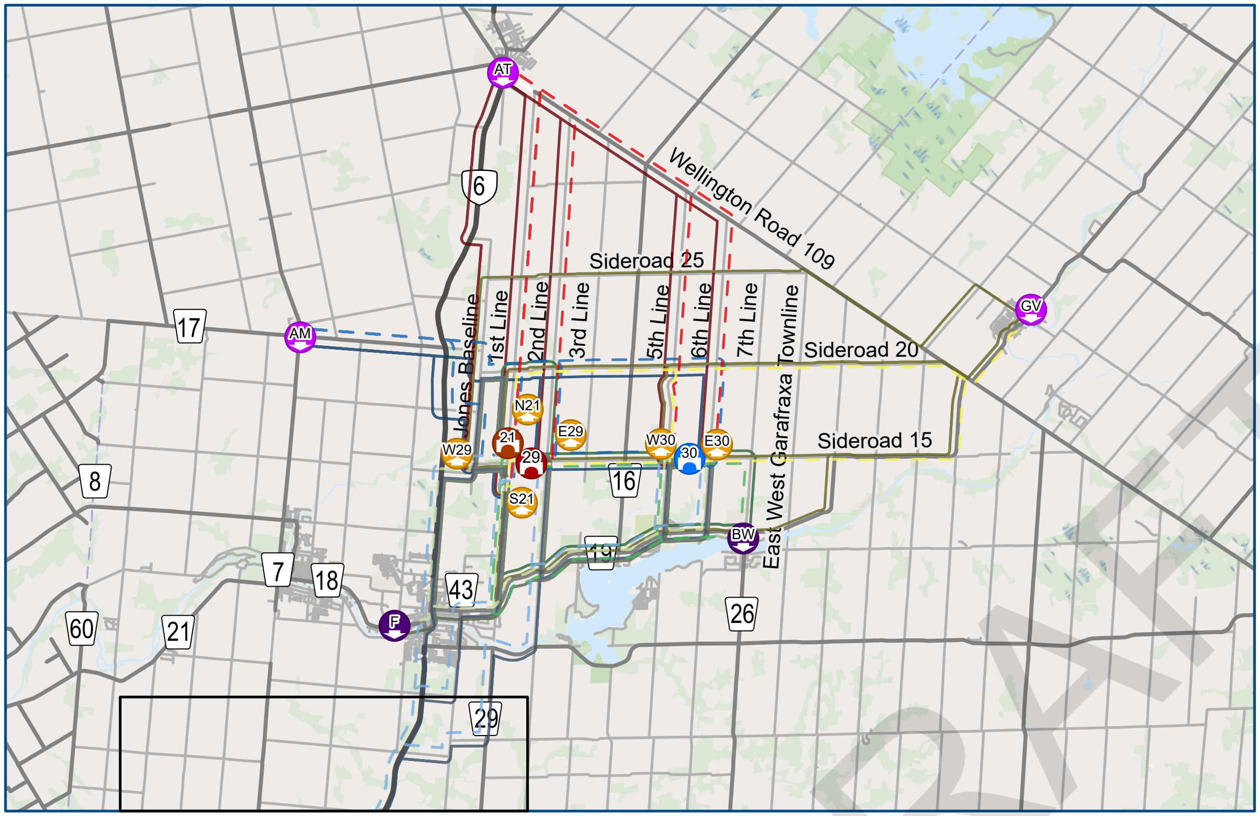
Cross Community- Estimated Time & Routing

Orgins	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 29-WG	10:15	11.84	11:40	13.24	1:24	1.4
Alma	Res East of 30-WG	14:42	17.32	17:06	18.33	2:24	1.01
Alma	Res West of 30-WG	14:26	16.92	14:55	17.03	0:28	0.11
Arthur	Res South of 21-WG	11:21	14.67	12:53	15.98	1:31	1.31
Arthur	Res East of 29-WG	11:23	14.52	11:47	15.07	0:24	0.55
Arthur	Res West of 29-WG	11:04	14.14	12:43	15.45	1:38	1.31
Belwood	Res North of 21-WG	9:54	11.87	13:48	16.41	3:54	4.54
Belwood	Res South of 21-WG	10:01	11.89	11:22	13.72	1:21	1.83
Belwood	Res West of 29-WG	9:11	10.93	12:24	14.91	3:12	3.98
Belwood	Res West of 30-WG	4:23	5.24	5:09	6.18	0:46	0.94
Fergus	Res North of 21-WG	9:22	9.77	13:22	14.31	4:00	4.54

Orgins	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus	Res East of 29-WG	9:24	9.64	10:18	10.5	0:53	0.86
Fergus	Res East of 30-WG	12:56	13.93	13:33	14.78	0:37	0.85
Grand Valley	Res North of 21-WG	18:55	22.03	20:41	21.11	1:45	0.92
Grand Valley	Res South of 21-WG	19:03	22.05	23:48	28.28	4:45	6.23
Grand Valley	Res East of 29-WG	17:39	20.53	19:20	21.29	1:40	0.76
Grand Valley	Res West of 29-WG	18:13	21.09	24:14	28.1	6:00	7.01
Grand Valley	Res West of 30-WG	13:24	15.4	15:57	17.09	2:33	1.69
Guelph	Res North of 21-WG	28:59	30.67	33:00	35.21	4:00	4.54
Guelph	Res East of 29-WG	29:01	30.54	29:04	32.41	0:02	1.87
Guelph	Res East of 30-WG	31:34	35.83	32:12	36.68	0:37	0.85



Cross Community Route Scenario: Bridge 21-WG Open

Origins
- AM Alma
- AT Arthur
- BW Belwood
- F Fergus
- GV Grand Valley
- G Guelph

Destinations
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Routes Scenarios: Alma, Arthur, Belwood, Fergus, Grand Valley, Guelph

Routes Bridges Closed: Alma, Arthur, Belwood, Fergus, Grand Valley, Guelph

Bridges Open: 21-WG

Bridges Closed: 30-WG, 29-WG

Kilometres

0 2 4 6 8 10 12 14 16 18 20

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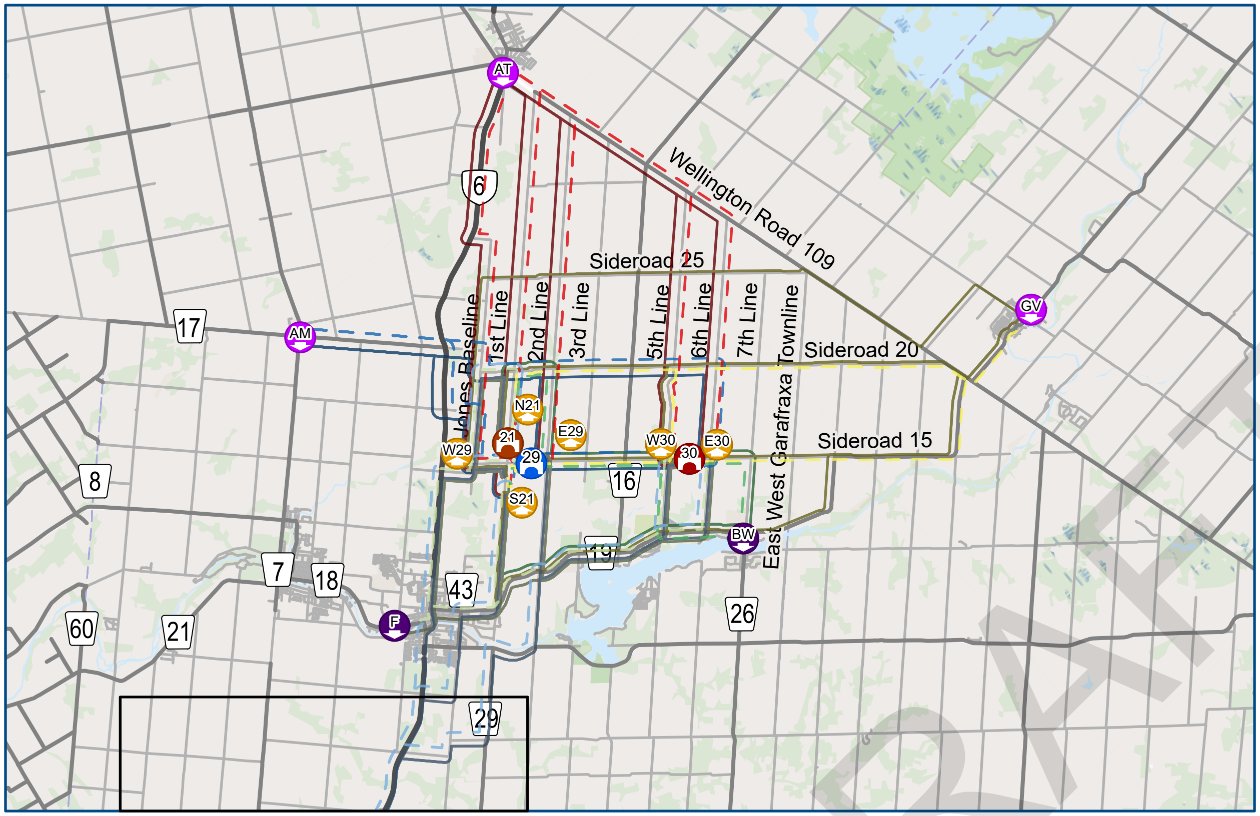
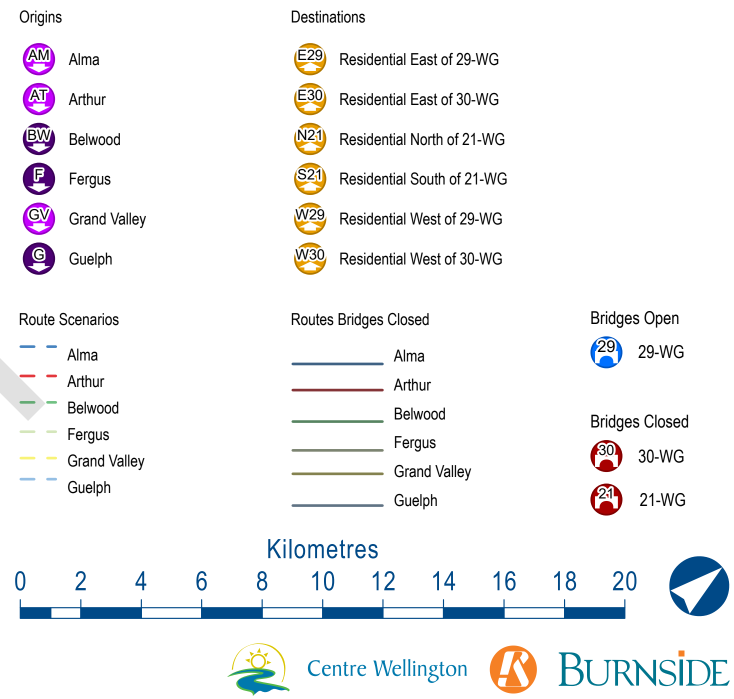
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Distance (km)	Difference Time (m:ss)
Arthur	Res South of 21-WG	11:21	14.67	12:53	15.98	1.31	1:31
Arthur	Res West of 29-WG	11:04	14.14	12:43	15.45	1.31	1:38
Belwood	Res North of 21-WG	12:44	15.43	13:48	16.41	0.98	1:04
Fergus	Res North of 21-WG	9:22	9.77	13:22	14.31	4.54	4:00

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Distance (km)	Difference Time (m:ss)
Grand Valley	Res South of 21-WG	21:49	22.67	23:48	28.28	5.61	1:59
Grand Valley	Res West of 29-WG	21:32	22.14	24:14	28.1	5.96	2:42
Guelph	Res North of 21-WG	28:59	30.67	33:00	35.21	4.54	4:00

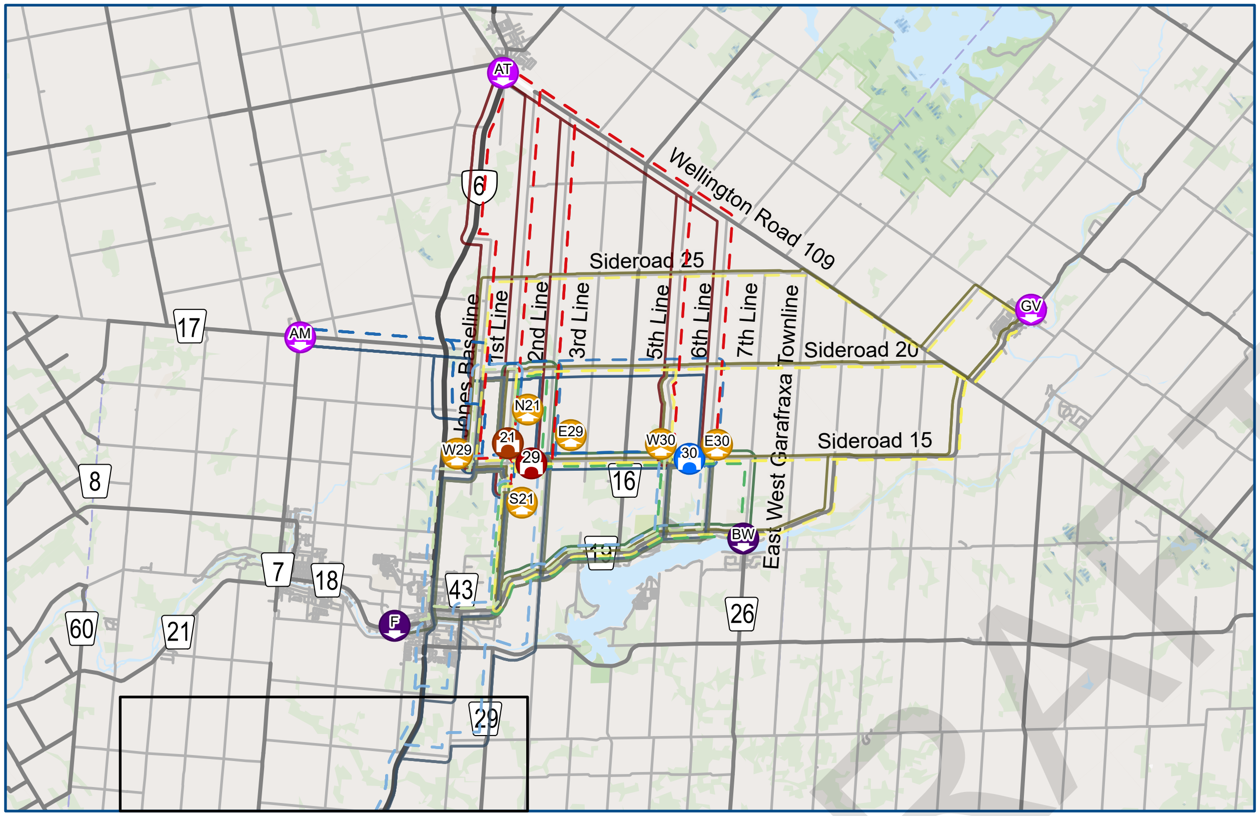


Cross Community Route Scenario: Bridge 29-WG Open



Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 29-WG	10:15	11.84	11:40	13.24	1:24	1.4
Alma	Res West of 30-WG	14:26	16.92	14:55	17.03	0:28	0.11
Arthur	Res West of 29-WG	12:21	15.63	12:43	15.45	0:21	-0.18
Belwood	Res South of 21-WG	10:01	11.89	11:22	13.72	1:21	1.83
Belwood	Res West of 29-WG	9:11	10.93	12:24	14.91	3:12	3.98
Fergus	Res East of 29-WG	9:24	9.64	10:18	10.5	0:53	0.86
Grand Valley	Res South of 21-WG	20:44	22.8	23:48	28.28	3:04	5.48
Grand Valley	Res West of 29-WG	19:54	21.85	24:14	28.1	4:19	6.25
Guelph	Res East of 29-WG	29:01	30.54	29:04	32.41	0:02	1.87



Cross Community Route Scenario: Bridge 30-WG Open

Origins
- AM Alma
- AT Arthur
- BW Belwood
- F Fergus
- GV Grand Valley
- G Guelph

Destinations
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Routes Scenarios
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Routes Bridges Closed
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Bridges Open
- 30 30-WG

Bridges Closed
- 30 30-WG
- 21 21-WG

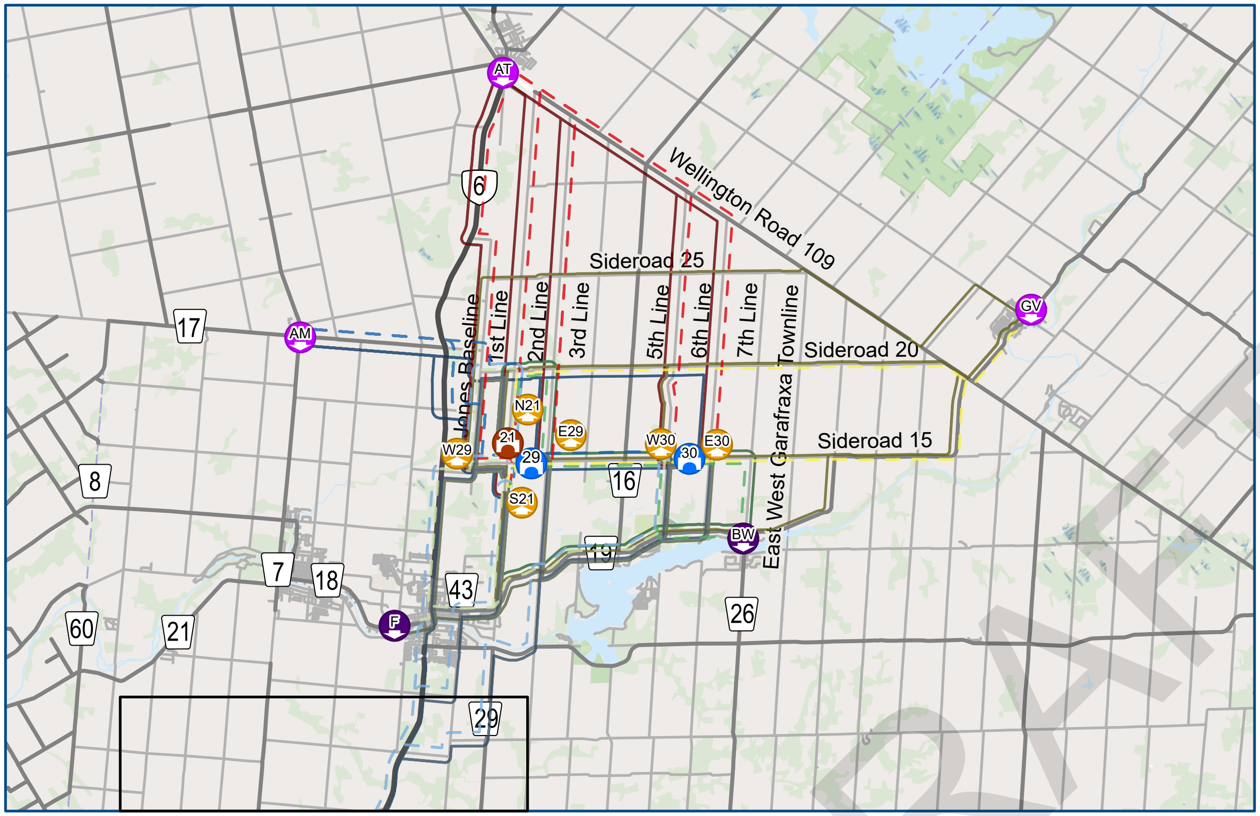
Kilometres
0 2 4 6 8 10 12 14 16 18 20

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 30-WG	15:11	17.43	17:06	18.33	1:55	0.9
Belwood	Res West of 30-WG	4:23	5.24	5:09	6.18	0:46	0.94
Fergus	Res East of 30-WG	12:56	13.93	13:33	14.78	0:37	0.85

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Grand Valley	Res East of 29-WG	17:39	20.53	19:20	21.29	1:40	0.76
Grand Valley	Res West of 30-WG	13:24	15.4	15:57	17.09	2:33	1.69
Guelph	Res East of 30-WG	31:34	35.83	32:12	36.68	0:37	0.85



Cross Community Route Scenario: Bridge 29-WG and 30-WG Open

Origins
- AM Alma
- AT Arthur
- BW Belwood
- F Fergus
- GV Grand Valley
- G Guelph

Destinations
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Routes Scenarios
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Routes Bridges Closed
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Bridges Open
- 29 29-WG
- 30 30-WG

Bridges Closed
- 21 21-WG

Kilometres

0 2 4 6 8 10 12 14 16 18 20

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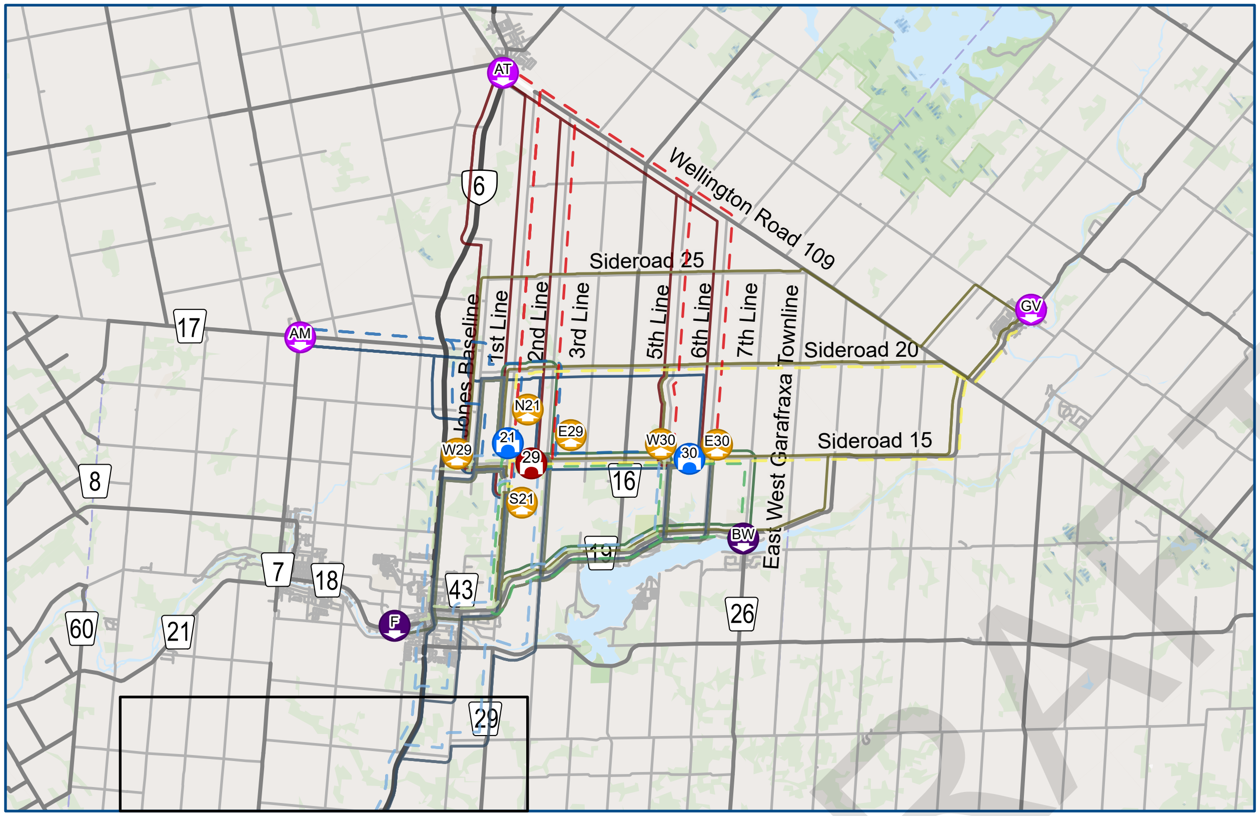
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 29-WG	10:15	11.84	11:40	13.24	1:24	1.4
Alma	Res East of 30-WG	14:42	17.32	17:06	18.33	2:24	1.01
Alma	Res West of 30-WG	14:26	16.92	14:55	17.03	0:28	0.11
Arthur	Res West of 29-WG	12:21	15.63	12:43	15.45	0:21	-0.18
Belwood	Res South of 21-WG	10:01	11.89	11:22	13.72	1:21	1.83
Belwood	Res West of 29-WG	9:11	10.93	12:24	14.91	3:12	3.98
Belwood	Res West of 30-WG	4:23	5.24	5:09	6.18	0:46	0.94
Fergus	Res East of 29-WG	9:24	9.64	10:18	10.5	0:53	0.86

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus	Res East of 30-WG	12:56	13.93	13:33	14.78	0:37	0.85
Grand Valley	Res South of 21-WG	19:03	22.05	23:48	28.28	4:45	6.23
Grand Valley	Res East of 29-WG	17:39	20.53	19:20	21.29	1:40	0.76
Grand Valley	Res West of 29-WG	18:13	21.09	24:14	28.1	6:00	7.01
Grand Valley	Res West of 30-WG	13:24	15.4	15:57	17.09	2:33	1.69
Guelph	Res East of 29-WG	29:01	30.54	29:04	32.41	0:02	1.87
Guelph	Res East of 30-WG	31:34	35.83	32:12	36.68	0:37	0.85



Cross Community Route Scenario: Bridge 21-WG and 30-WG Open

Origins

- AM Alma
- AT Arthur
- BW Belwood
- F Fergus
- GV Grand Valley
- G Guelph

Destinations

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Routes Scenarios

- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Routes Bridges Closed

- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Bridges Open

- 21 21-WG
- 30 30-WG

Bridges Closed

- 29 29-WG

Kilometres

0 2 4 6 8 10 12 14 16 18 20

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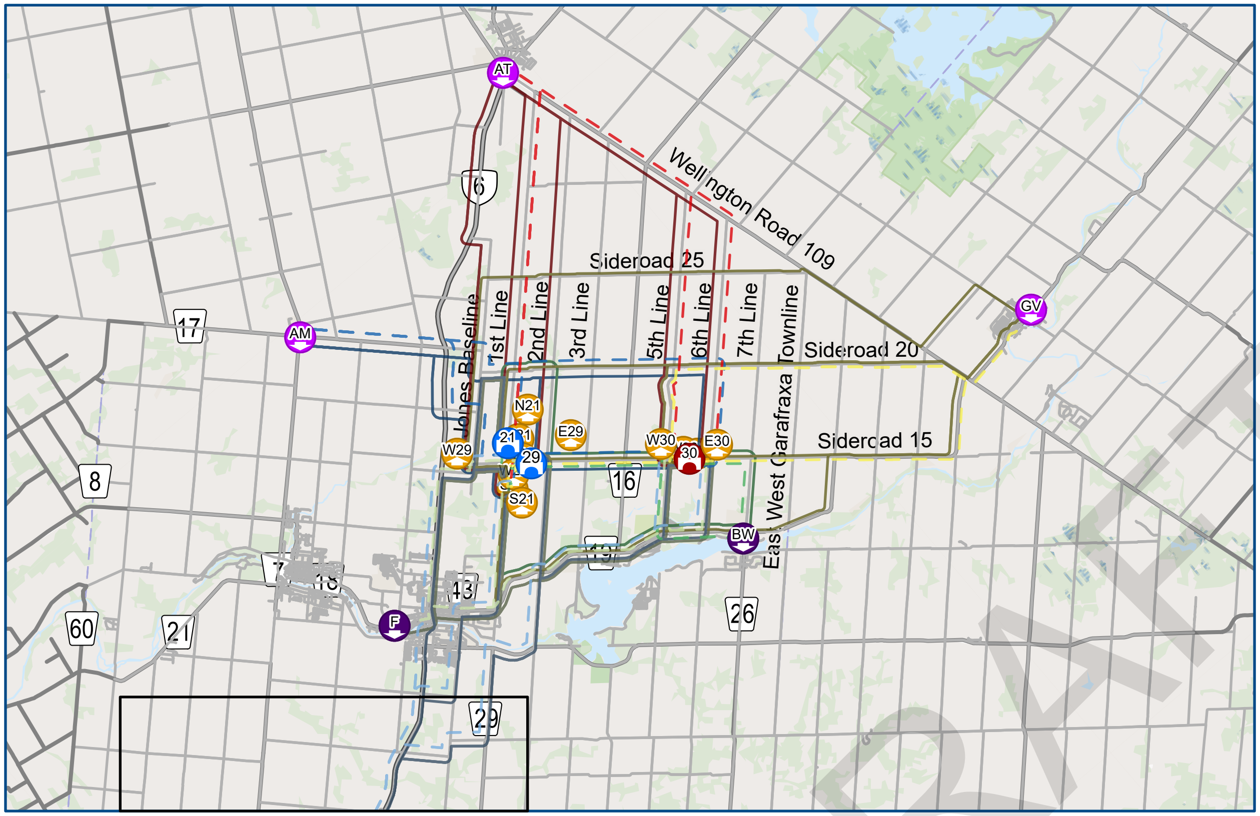
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 30-WG	15:11	17.43	17:06	18.33	1:55	0.9
Arthur	Res South of 21-WG	11:21	14.67	12:53	15.98	1:31	1.31
Arthur	Res West of 29-WG	11:04	14.14	12:43	15.45	1:38	1.31
Belwood	Res North of 21-WG	12:44	15.43	13:48	16.41	1:04	0.98
Belwood	Res West of 30-WG	4:23	5.24	5:09	6.18	0:46	0.94
Fergus	Res East of 30-WG	12:56	13.93	13:33	14.78	0:37	0.85
Fergus	Res North of 21-WG	9:22	9.77	13:22	14.31	4:00	4.54
Grand Valley	Res East of 29-WG	17:39	20.53	19:20	21.29	1:40	0.76
Grand Valley	Res South of 21-WG	21:49	22.67	23:48	28.28	1:59	5.61
Grand Valley	Res West of 29-WG	21:32	22.14	24:14	28.1	2:42	5.96
Grand Valley	Res West of 30-WG	13:24	15.4	15:57	17.09	2:33	1.69
Guelph	Res East of 30-WG	31:34	35.83	32:12	36.68	0:37	0.85
Guelph	Res North of 21-WG	28:59	30.67	33:00	35.21	4:00	4.54



Cross Community Route Scenario: Bridge 21-WG and 29-WG Open

Origins
- AM Alma
- AT Arthur
- BW Belwood
- F Fergus
- GV Grand Valley
- G Guelph

Destinations
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Routes Bridges Closed
- Alma
- Arthur
- Belwood
- Fergus
- Grand Valley
- Guelph

Bridges Open
- 29 29-WG
- 21 21-WG

Bridges Closed
- 30 30-WG

Kilometres

0 2 4 6 8 10 12 14 16 18 20

Centre Wellington BURNSIDE

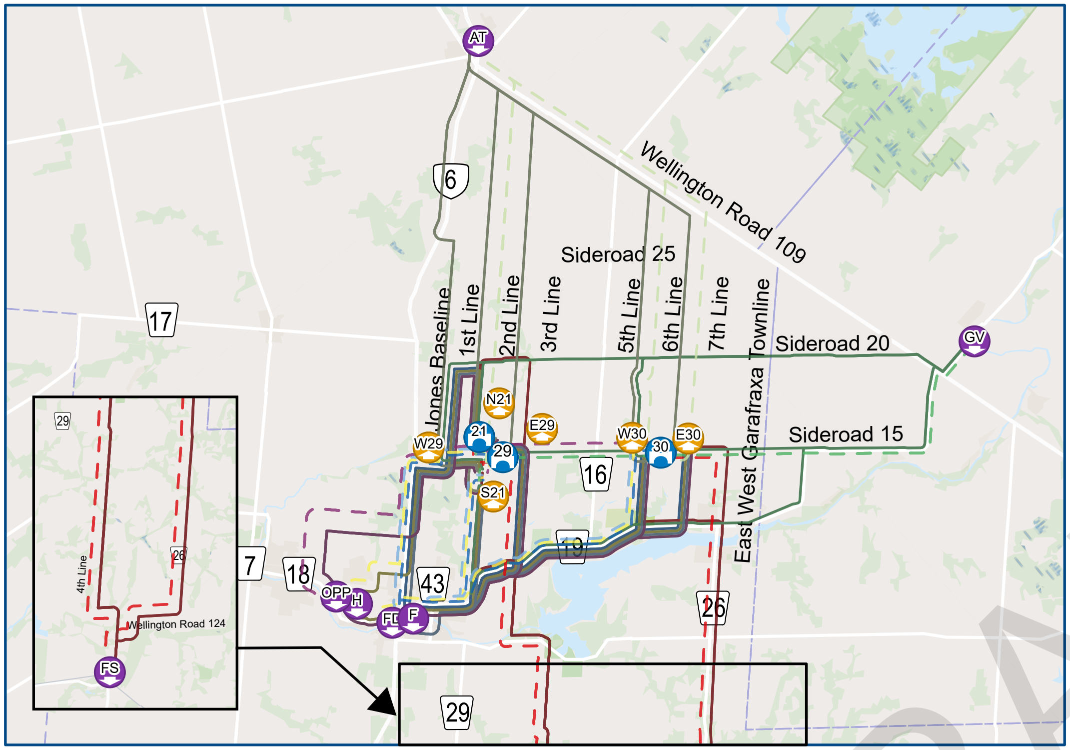
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Alma	Res East of 29-WG	10:15	11.84	11:40	13.24	1:24	1.4
Alma	Res West of 30-WG	14:26	16.92	14:55	17.03	0:28	0.11
Arthur	Res South of 21-WG	11:21	14.67	12:53	15.98	1:31	1.31
Arthur	Res East of 29-WG	11:23	14.52	11:47	15.07	0:24	0.55
Arthur	Res West of 29-WG	11:04	14.14	12:43	15.45	1:38	1.31
Belwood	Res North of 21-WG	9:54	11.87	13:48	16.41	3:54	4.54
Belwood	Res South of 21-WG	10:01	11.89	11:22	13.72	1:21	1.83
Belwood	Res West of 29-WG	9:11	10.93	12:24	14.91	3:12	3.98

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus	Res North of 21-WG	9:22	9.77	13:22	14.31	4:00	4.54
Fergus	Res East of 29-WG	9:24	9.64	10:18	10.5	0:53	0.86
Grand Valley	Res North of 21-WG	20:36	22.79	20:41	21.11	0:04	-1.68
Grand Valley	Res South of 21-WG	20:44	22.8	23:48	28.28	3:04	5.48
Grand Valley	Res West of 29-WG	19:54	21.85	24:14	28.1	4:19	6.25
Guelph	Res North of 21-WG	28:59	30.67	33:00	35.21	4:00	4.54
Guelph	Res East of 29-WG	29:01	30.54	29:04	32.41	0:02	1.87

Appendix B

Emergency Response Results



Emergency Response Route Scenario: All Bridges Open

Origins
- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed
- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open
- 21 21-WG
- 30 30-WG
- 29 29-WG

0 1 2 3 4 5 6 7 8 9
Kilometres

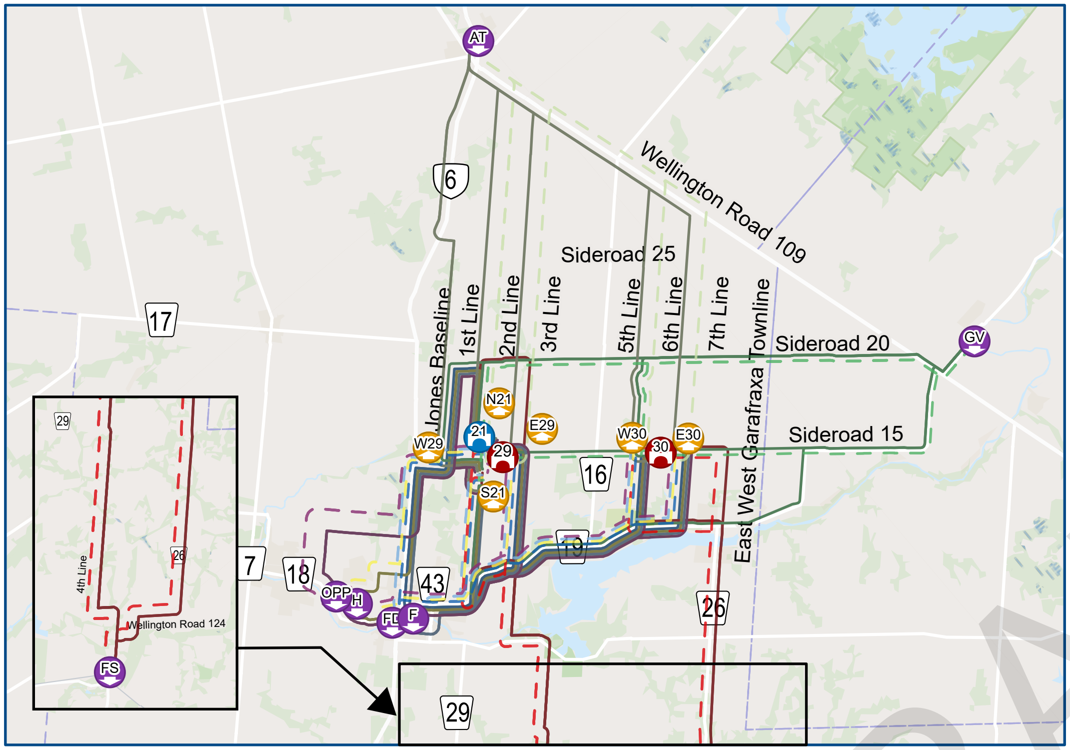
Centre Wellington
BURNSIDE

DRAFT

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res East of 29-WG	8:39	9.06	9:33	9.92	0:53	0.86
Fergus Fire Department	Res East of 30-WG	12:11	13.35	12:48	14.2	0:37	0.85
Fergus Fire Department	Res North of 21-WG	8:36	9.19	12:37	13.73	4:00	4.54
GE Fire Station 20	Res North of 21-WG	24:44	30.44	28:36	34.98	3:51	4.54
GE Fire Station 20	Res South of 21-WG	24:52	30.46	25:07	30.63	0:15	0.17
GE Fire Station 20	Res West of 29-WG	24:02	29.51	26:09	31.83	2:06	2.32
GE Fire Station 20	Res West of 30-WG	24:53	31.7	25:39	32.63	0:46	0.93
GMCH	Res East of 29-WG	9:49	9.81	10:55	10.86	1:05	1.05
GMCH	Res East of 30-WG	13:33	14.29	14:10	15.13	0:37	0.84
GMCH	Res North of 21-WG	9:47	9.94	13:48	14.48	4:00	4.54
GV Ambulance Station	Res East of 29-WG	15:25	18.91	17:06	19.66	1:40	0.75
GV Ambulance Station	Res North of 21-WG	16:41	20.41	18:27	19.49	1:45	-0.92
GV Ambulance Station	Res South of 21-WG	16:48	20.43	21:34	26.66	4:45	6.23

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 29-WG	15:59	19.47	22:02	22.76	6:02	3.29
GV Ambulance Station	Res West of 30-WG	11:10	13.78	13:43	15.47	2:33	1.69
GW-EMS "02" Station	Res East of 29-WG	8:18	8.82	9:10	9.33	0:51	0.51
GW-EMS "02" Station	Res East of 30-WG	11:48	12.75	12:26	13.6	0:37	0.85
GW-EMS "02" Station	Res North of 21-WG	8:16	8.95	12:17	13.49	4:00	4.54
GW-EMS "05" Station	Res East of 29-WG	12:04	15.28	12:28	15.83	0:24	0.55
GW-EMS "05" Station	Res South of 21-WG	12:02	15.43	13:38	16.83	1:35	1.4
GW-EMS "05" Station	Res West of 29-WG	11:45	14.89	13:28	16.3	1:42	1.41
OPP - Fergus	Res East of 29-WG	10:00	11.54	11:54	11.63	1:54	0.09
OPP - Fergus	Res East of 30-WG	14:27	17.02	15:10	15.9	0:42	-1.12
OPP - Fergus	Res North of 21-WG	9:58	11.66	13:59	16.21	4:00	4.55
OPP - Fergus	Res West of 30-WG	14:11	16.62	14:17	14.66	0:05	-1.96



Emergency Response Route Scenario: 21-WG Open

Origins

- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios

- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed

- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open

- 21 21-WG

Bridges Closed

- 29 29-WG
- 30 30-WG

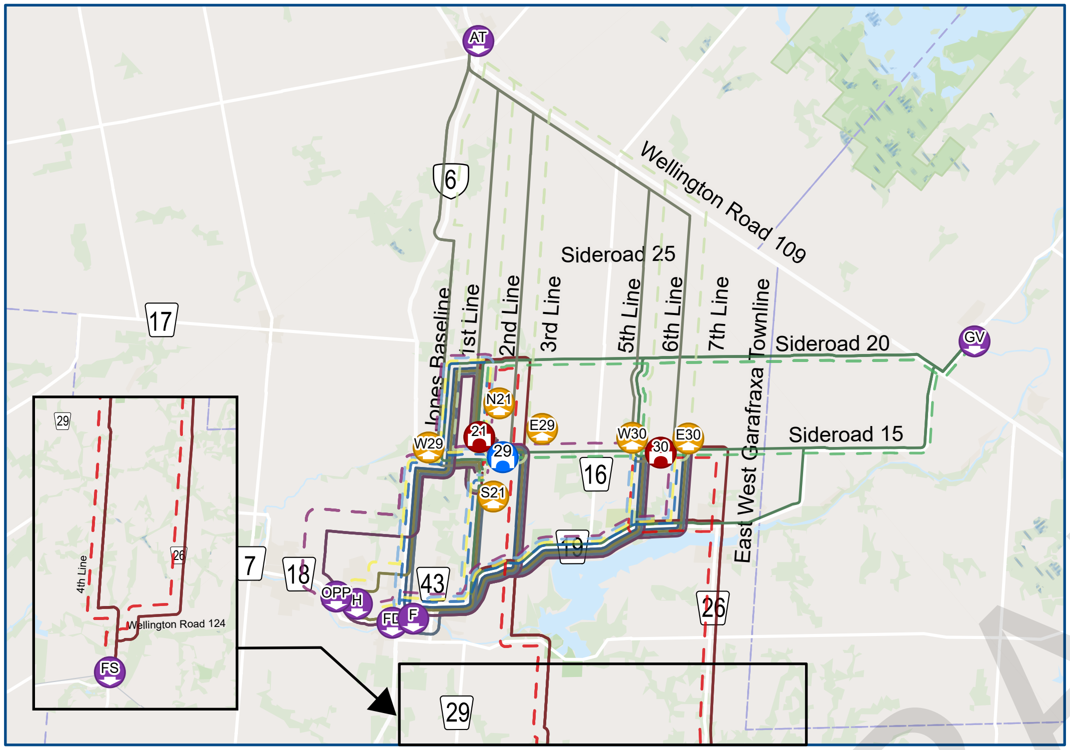
0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington BURNSIDE

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res North of 21-WG	8:36	9.19	12:37	13.73	4:00	4.54
GE Fire Station 20	Res North of 21-WG	26:28	32.34	28:36	34.98	2:07	2.64
GMCH	Res North of 21-WG	9:47	9.94	13:48	14.48	4:00	4.54
GV Ambulance Station	Res South of 21-WG	19:35	21.05	21:34	26.66	1:59	5.61
GV Ambulance Station	Res West of 29-WG	19:18	20.52	22:02	22.76	2:43	2.24

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GW-EMS "02" Station	Res North of 21-WG	8:16	8.95	12:17	13.49	4:00	4.54
GW-EMS "05" Station	Res South of 21-WG	12:02	15.43	13:38	16.83	1:35	1.4
GW-EMS "05" Station	Res West of 29-WG	11:45	14.89	13:28	16.3	1:42	1.41
OPP - Fergus	Res North of 21-WG	9:58	11.66	13:59	16.21	4:00	4.55



Emergency Response Route Scenario: 29-WG Open

Origins
- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed
- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open
- 29 29-WG

Bridges Closed
- 30 30-WG
- 21 21-WG

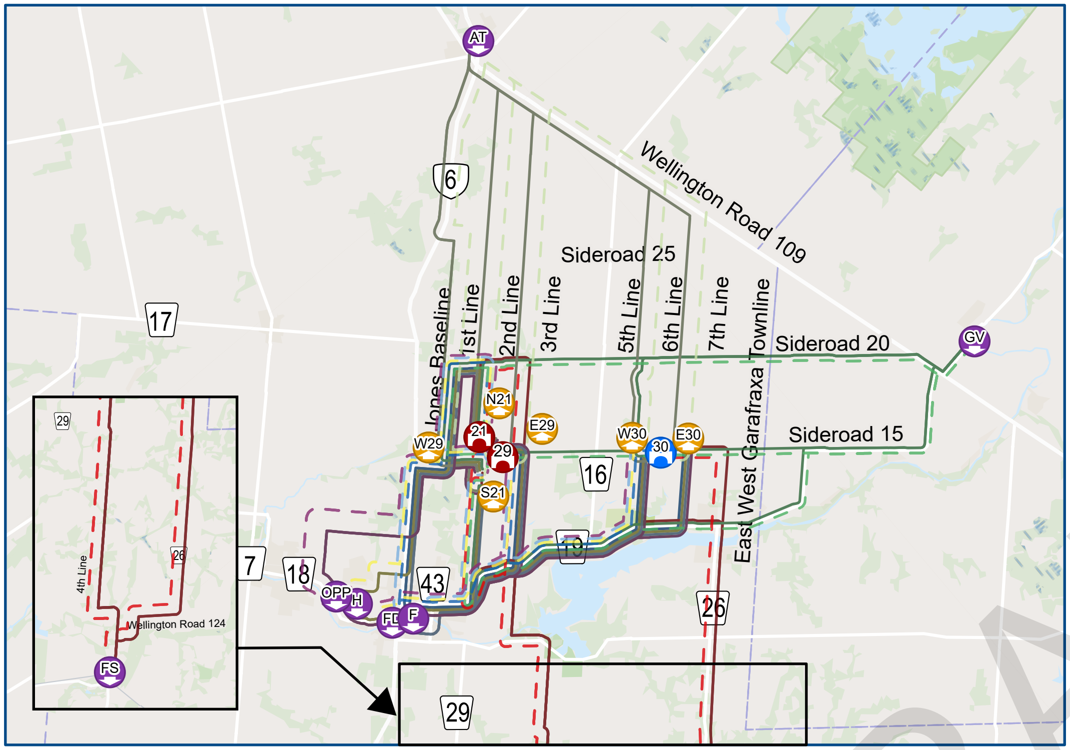
0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington BURNSIDE

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res East of 29-WG	8:39	9.06	9:33	9.92	0:53	0.86
GE Fire Station 20	Res South of 21-WG	24:52	30.46	25:07	30.63	0:15	0.17
GE Fire Station 20	Res West of 29-WG	24:02	29.51	26:09	31.83	2:06	2.32
GMCH	Res East of 29-WG	9:49	9.81	10:55	10.86	1:05	1.05
GV Ambulance Station	Res South of 21-WG	18:29	21.18	21:34	26.66	3:04	5.48

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 29-WG	17:40	20.23	22:02	22.76	4:21	2.53
GW-EMS "02" Station	Res East of 29-WG	8:18	8.82	9:10	9.33	0:51	0.51
GW-EMS "05" Station	Res West of 29-WG	13:02	16.39	13:28	16.3	0:25	-0.09
OPP - Fergus	Res East of 29-WG	10:00	11.54	11:54	11.63	1:54	0.09
OPP - Fergus	Res West of 30-WG	14:11	16.62	14:17	14.66	0:05	-1.96



Emergency Response Route Scenario: 30-WG Open

Origins
- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed
- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open
- 30 30-WG

Bridges Closed
- 29 29-WG
- 21 21-WG

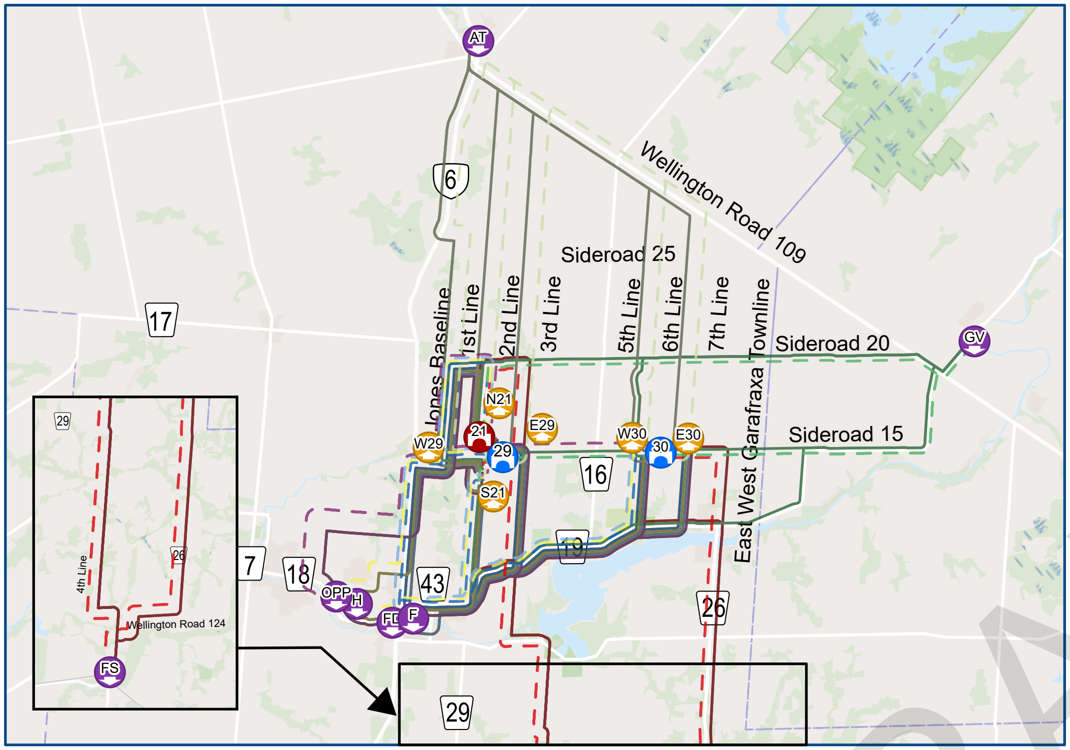
0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington BURNSIDE

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res East of 30-WG	12:11	13.35	12:48	14.2	0:37	0.85
GE Fire Station 20	Res West of 30-WG	24:53	31.7	25:39	32.63	0:46	0.93
GMCH	Res East of 30-WG	13:33	14.29	14:10	15.13	0:37	0.84
GV Ambulance Station	Res East of 29-WG	15:25	18.91	17:06	19.66	1:40	0.75

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 30-WG	11:10	13.78	13:43	15.47	2:33	1.69
GW-EMS "02" Station	Res East of 30-WG	11:48	12.75	12:26	13.6	0:37	0.85
OPP - Fergus	Res East of 30-WG	14:32	15.05	15:10	15.9	0:37	0.85



Emergency Response Route Scenario: Bridge 29-WG and 30-WG Open

Origins
- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed
- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open
- 29 29-WG
- 30 30-WG

Bridges Closed
- 21 21-WG

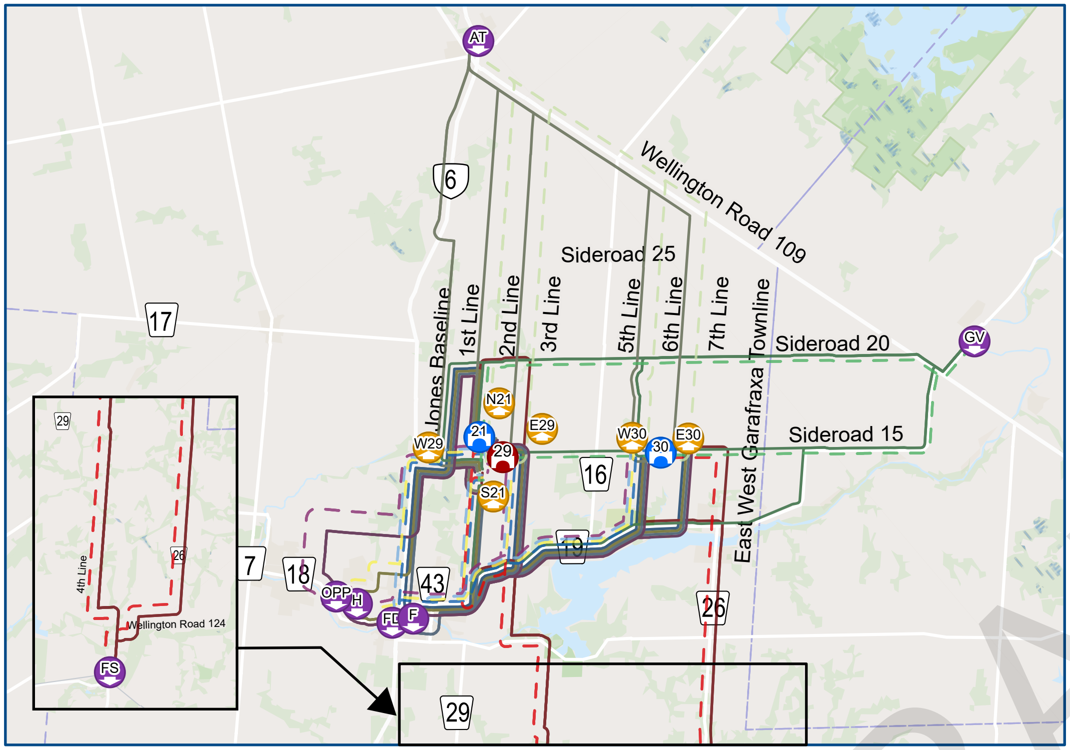
0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington
BURNSIDE

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res East of 29-WG	8:39	9.06	9:33	9.92	0:53	0.86
Fergus Fire Department	Res East of 30-WG	12:11	13.35	12:48	14.2	0:37	0.85
GE Fire Station 20	Res South of 21-WG	24:52	30.46	25:07	30.63	0:15	0.17
GE Fire Station 20	Res West of 29-WG	24:02	29.51	26:09	31.83	2:06	2.32
GE Fire Station 20	Res West of 30-WG	24:53	31.7	25:39	32.63	0:46	0.93
GMCH	Res East of 29-WG	9:49	9.81	10:55	10.86	1:05	1.05
GMCH	Res East of 30-WG	13:33	14.29	14:10	15.13	0:37	0.84
GV Ambulance Station	Res East of 29-WG	15:25	18.91	17:06	19.66	1:40	0.75
GV Ambulance Station	Res South of 21-WG	16:48	20.43	21:34	26.66	4:45	6.23

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 29-WG	15:59	19.47	22:02	22.76	6:02	3.29
GV Ambulance Station	Res West of 30-WG	11:10	13.78	13:43	15.47	2:33	1.69
GW-EMS "02" Station	Res East of 29-WG	8:18	8.82	9:10	9.33	0:51	0.51
GW-EMS "02" Station	Res East of 30-WG	11:48	12.75	12:26	13.6	0:37	0.85
GW-EMS "05" Station	Res West of 29-WG	13:02	16.39	13:28	16.3	0:25	-0.09
OPP - Fergus	Res East of 29-WG	10:00	11.54	11:54	11.63	1:54	0.09
OPP - Fergus	Res East of 30-WG	14:27	17.02	15:10	15.9	0:42	-1.12
OPP - Fergus	Res West of 30-WG	14:11	16.62	14:17	14.66	0:05	-1.96



Emergency Response Route Scenario: Bridge 21-WG and 30-WG Open

Origins
- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios
- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed
- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open
- 21 21-WG
- 30 30-WG

Bridges Closed
- 29 29-WG

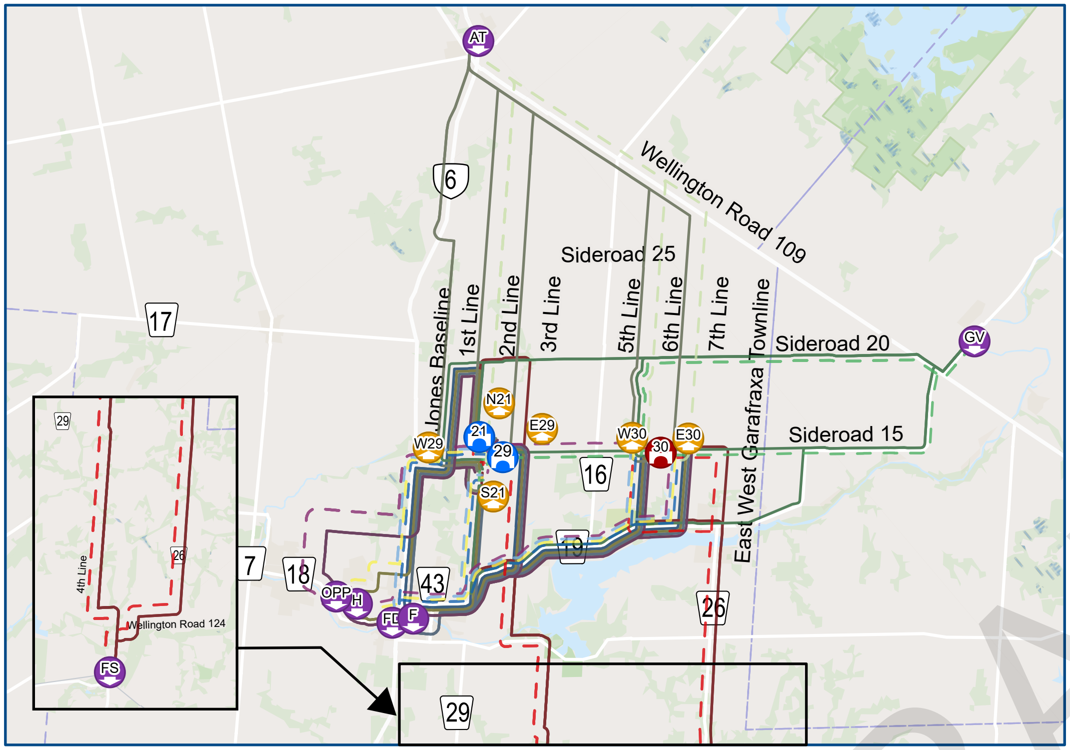
0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington
Burnside

Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res North of 21-WG	8:36	9.19	12:37	13.73	4:00	4.54
Fergus Fire Department	Res East of 30-WG	12:11	13.35	12:48	14.2	0:37	0.85
GE Fire Station 20	Res North of 21-WG	26:28	32.34	28:36	34.98	2:07	2.64
GE Fire Station 20	Res West of 30-WG	24:53	31.7	25:39	32.63	0:46	0.93
GMCH	Res North of 21-WG	9:47	9.94	13:48	14.48	4:00	4.54
GMCH	Res East of 30-WG	13:33	14.29	14:10	15.13	0:37	0.84
GV Ambulance Station	Res South of 21-WG	19:35	21.05	21:34	26.66	1:59	5.61
GV Ambulance Station	Res East of 29-WG	15:25	18.91	17:06	19.66	1:40	0.75

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 29-WG	19:18	20.52	22:02	22.76	2:43	2.24
GV Ambulance Station	Res West of 30-WG	11:10	13.78	13:43	15.47	2:33	1.69
GW-EMS "02" Station	Res North of 21-WG	8:16	8.95	12:17	13.49	4:00	4.54
GW-EMS "02" Station	Res East of 30-WG	11:48	12.75	12:26	13.6	0:37	0.85
GW-EMS "05" Station	Res South of 21-WG	12:02	15.43	13:38	16.83	1:35	1.4
GW-EMS "05" Station	Res West of 29-WG	11:45	14.89	13:28	16.3	1:42	1.41
OPP - Fergus	Res North of 21-WG	9:58	11.66	13:59	16.21	4:00	4.55
OPP - Fergus	Res East of 30-WG	14:32	15.05	15:10	15.9	0:37	0.85



Emergency Response Route Scenario: Bridge 21-WG and 29-WG Open

Origins

- FD Centre Wellington Fire Department - Fergus
- GV Grand Valley Ambulance Station
- H Groves Memorial Community Hospital
- FS Guelph Eramosa Fire Station 20
- F GW-EMS "02" Station Fergus
- AT GW-EMS "05" Station Arthur
- OPP OPP - Fergus

Destinations for visual

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG
- S21 Residential South of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG

Route Scenarios

- Fergus Fire Department
- GE Fire Station 20
- GMCH
- GV Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Routes Bridges Closed

- Centre Wellington Fire Department - Fergus
- Guelph Eramosa Fire Station 20
- Groves Memorial Community Hospital
- Grand Valley Ambulance Station
- GW-EMS "02" Station Fergus
- GW-EMS "05" Station Arthur
- OPP - Fergus

Bridges Open

- 29 29-WG
- 21 21-WG

Bridges Closed

- 30 30-WG

0 1 2 3 4 5 6 7 8 9
Kilometres

Centre Wellington
BURNSIDE

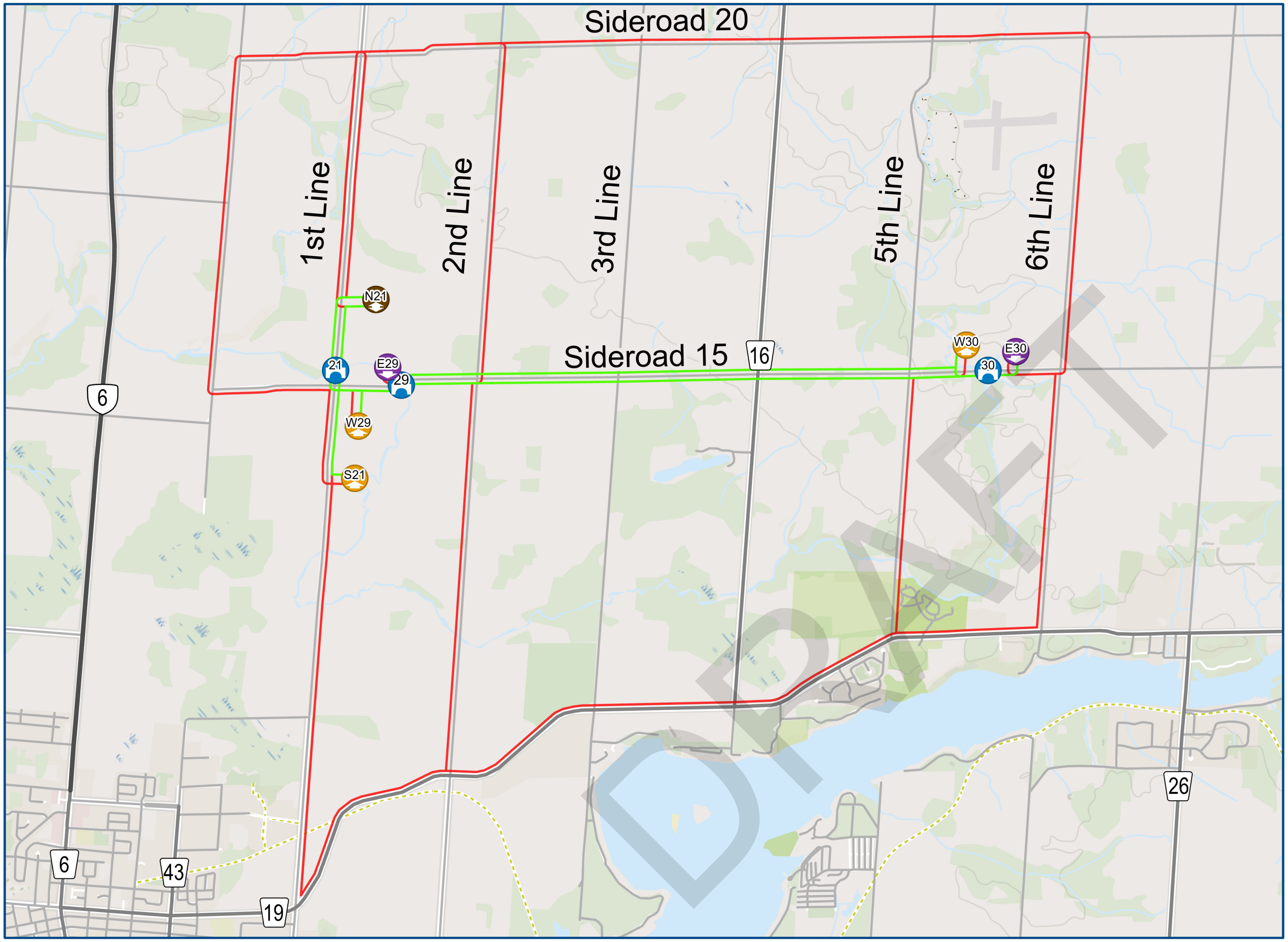
Emergency Response - Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Fergus Fire Department	Res East of 29-WG	8:39	9.06	9:33	9.92	0:53	0.86
Fergus Fire Department	Res North of 21-WG	8:36	9.19	12:37	13.73	4:00	4.54
GE Fire Station 20	Res North of 21-WG	24:44	30.44	28:36	34.98	3:51	4.54
GE Fire Station 20	Res South of 21-WG	24:52	30.46	25:07	30.63	0:15	0.17
GE Fire Station 20	Res West of 29-WG	24:02	29.51	26:09	31.83	2:06	2.32
GMCH	Res East of 29-WG	9:49	9.81	10:55	10.86	1:05	1.05
GMCH	Res North of 21-WG	9:47	9.94	13:48	14.48	4:00	4.54
GV Ambulance Station	Res North of 21-WG	18:22	21.17	18:27	19.49	0:04	-1.68
GV Ambulance Station	Res South of 21-WG	18:29	21.18	21:34	26.66	3:04	5.48

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
GV Ambulance Station	Res West of 29-WG	17:40	20.23	22:02	22.76	4:21	2.53
GW-EMS "02" Station	Res East of 29-WG	8:18	8.82	9:10	9.33	0:51	0.51
GW-EMS "02" Station	Res North of 21-WG	8:16	8.95	12:17	13.49	4:00	4.54
GW-EMS "05" Station	Res East of 29-WG	12:04	15.28	12:28	15.83	0:24	0.55
GW-EMS "05" Station	Res South of 21-WG	12:02	15.43	13:38	16.83	1:35	1.4
GW-EMS "05" Station	Res West of 29-WG	11:45	14.89	13:28	16.3	1:42	1.41
OPP - Fergus	Res East of 29-WG	10:00	11.54	11:54	11.63	1:54	0.09
OPP - Fergus	Res North of 21-WG	9:58	11.66	13:59	16.21	4:00	4.55
OPP - Fergus	Res West of 30-WG	14:11	16.62	14:17	14.66	0:05	-1.96

Appendix C

Local Community Travel Results



Inter-Community Trip Route Scenario: All Bridges Open

Origins

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations

- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open

- 21 21-WG
- 29 29-WG
- 30 30-WG

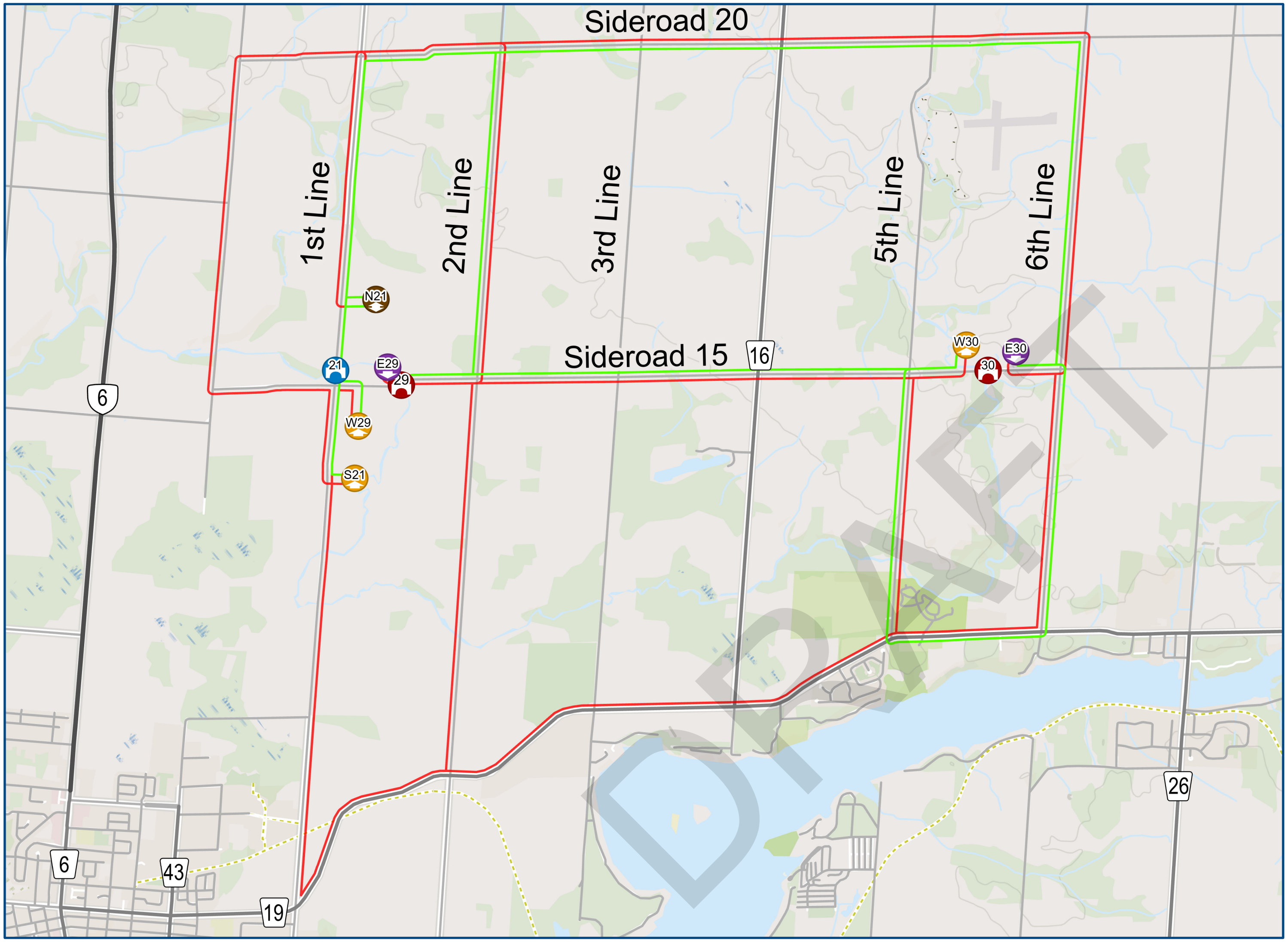
0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	2:10	2.07	7:12	7.91	5:02	5.83
Res East of 29-WG	Res West of 29-WG	1:27	1.14	10:22	12.1	8:55	10.96
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	6:36	7.56	12:38	13	6:02	5.44

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	5:54	6.62	13:38	16.37	7:43	9.75
Res East of 30-WG	Res West of 30-WG	1:05	0.93	6:22	7.63	5:17	6.7
Res North of 21-WG	Res South of 21-WG	2:21	2.22	8:16	9.02	5:54	6.8



Inter-Community Trip Route Scenario: Bridge 21-WG Open

Origins
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Routes Scenario

Routes Bridges Closed

Destinations
- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Bridges Open
- 21 21-WG

Bridges Closed
- 29 29-WG
- 30 30-WG

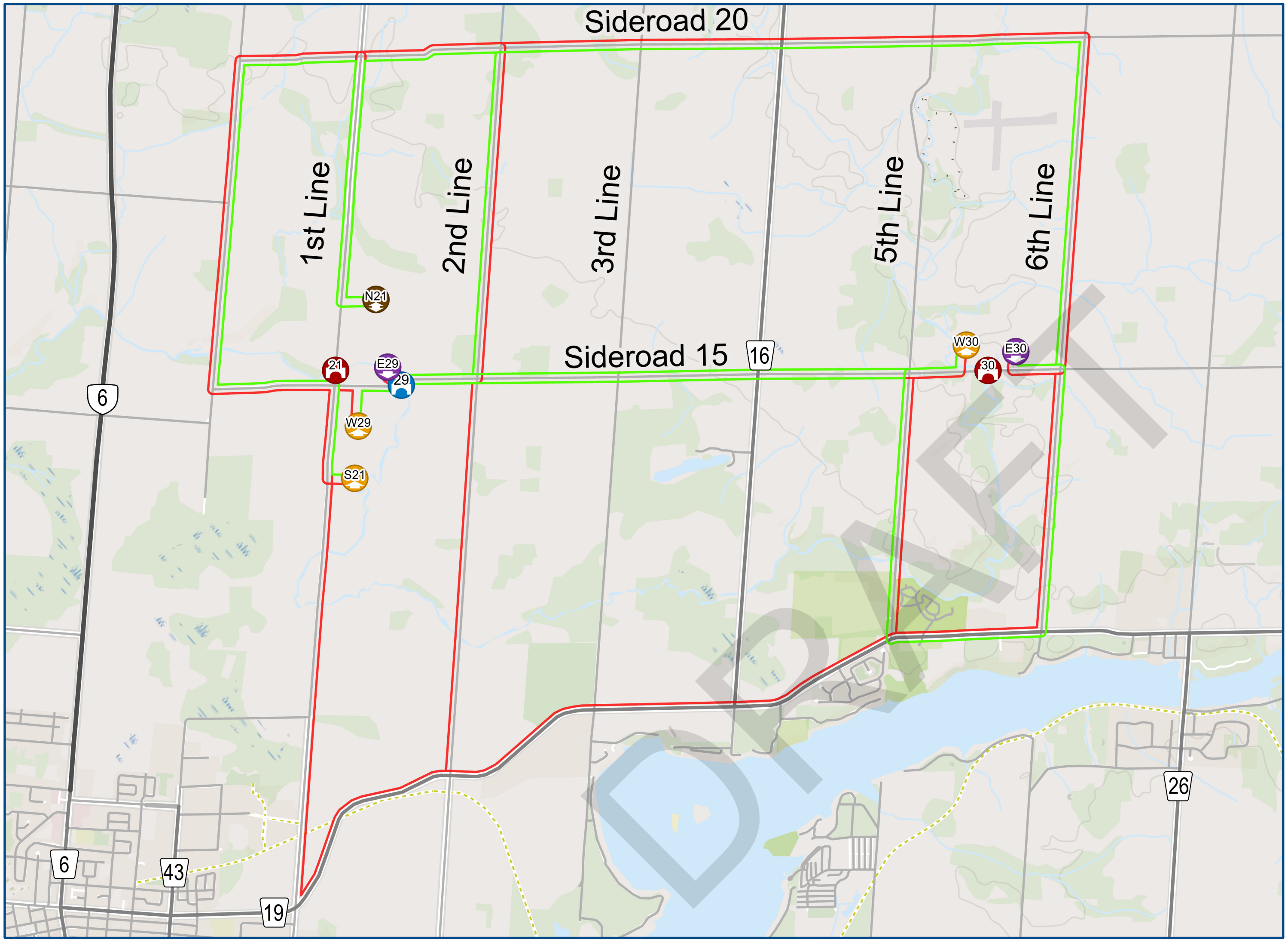
0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	7:12	7.91	7:12	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	8:03	8.94	10:22	12.1	2:19	3.16
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	12:38	13	12:38	13	0:00	0

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	13:29	14.03	13:38	16.37	0:08	2.34
Res East of 30-WG	Res West of 30-WG	6:22	7.63	6:22	7.63	0:00	0
Res North of 21-WG	Res South of 21-WG	2:21	2.22	8:16	9.02	5:54	6.8



Inter-Community Trip Route Scenario: Bridge 29-WG Open

Origins
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations
- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open
- 29 29-WG

Bridges Closed
- 21 21-WG
- 30 30-WG

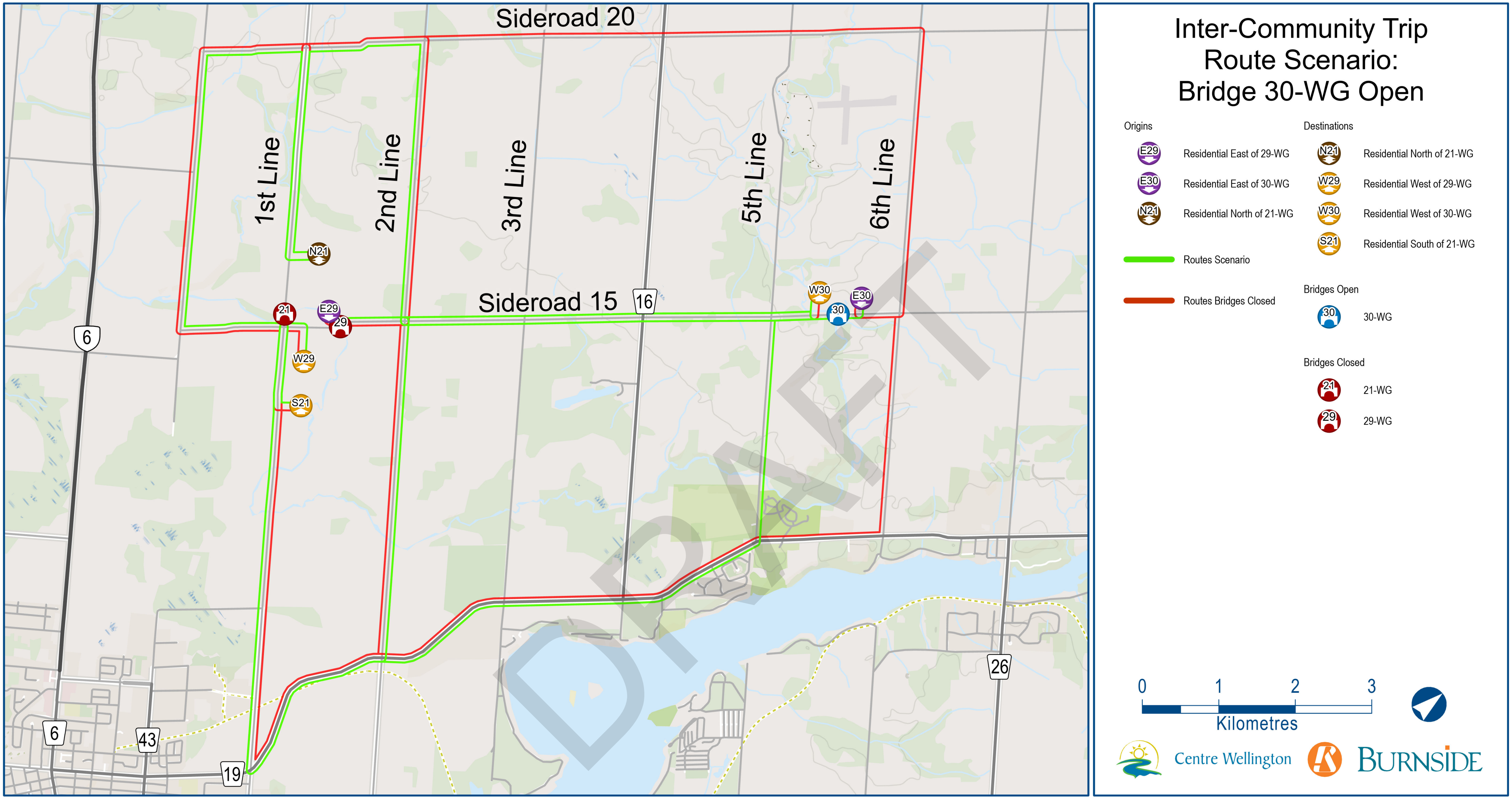
0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	7:12	7.91	7:12	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	1:27	1.14	10:22	12.1	8:55	10.96
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	12:38	13	12:38	13	0:00	0

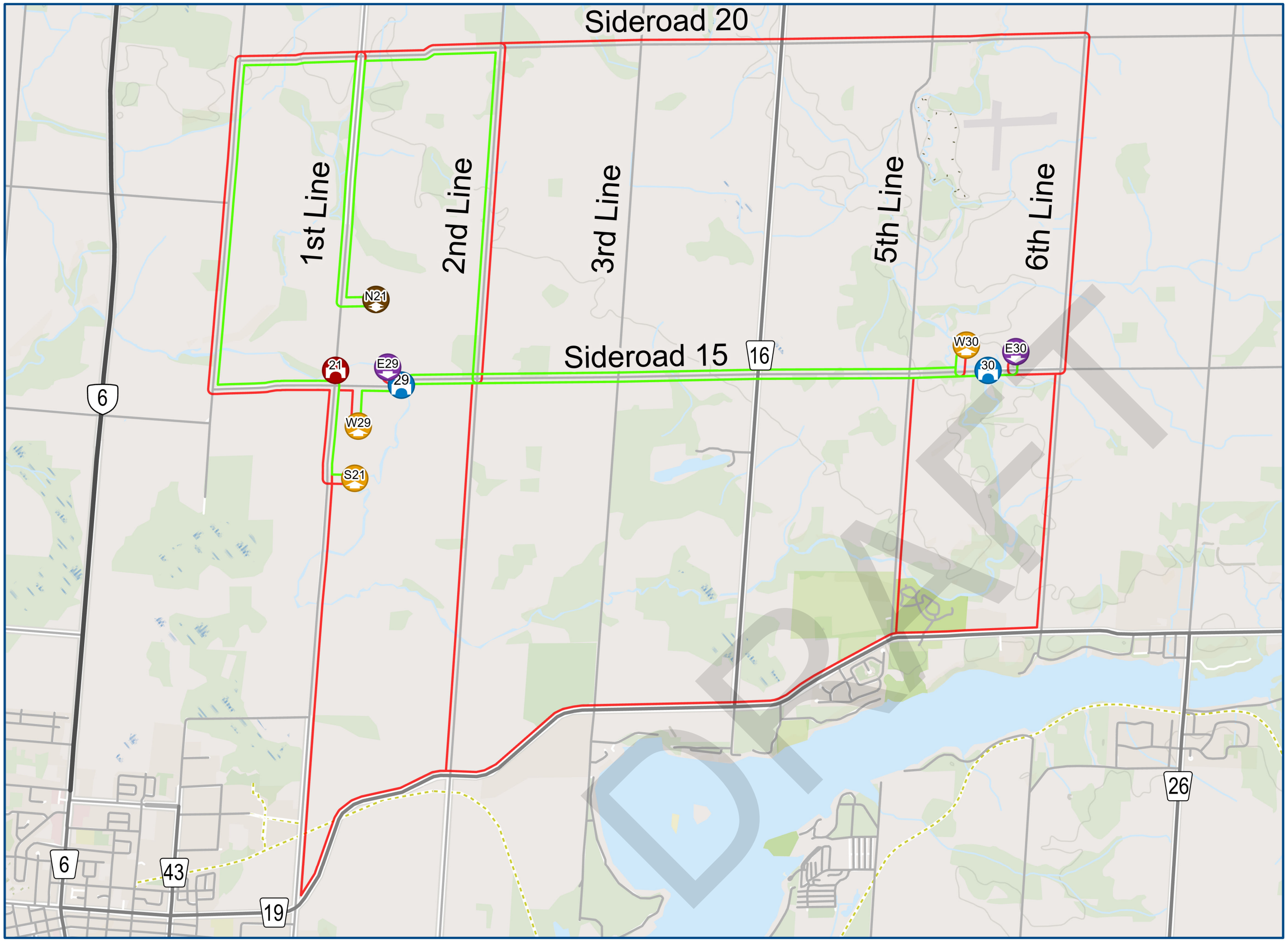
Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	10:25	12.39	13:38	16.37	3:12	3.98
Res East of 30-WG	Res West of 30-WG	6:22	7.63	6:22	7.63	0:00	0
Res North of 21-WG	Res South of 21-WG	8:16	9.02	8:16	9.02	0:00	0



Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	7:12	7.91	7:12	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	10:22	12.1	10:22	12.1	0:00	0
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	10:31	12.1	12:38	13	2:07	0.9

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	13:00	15.52	13:38	16.37	0:37	0.85
Res East of 30-WG	Res West of 30-WG	1:05	0.93	6:22	7.63	5:17	6.7
Res North of 21-WG	Res South of 21-WG	8:16	9.02	8:16	9.02	0:00	0



Inter-Community Trip Route Scenario: Bridge 29-WG and 30-WG Open

Origins

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Routes Scenario

Routes Bridges Closed

Destinations

- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Bridges Open

- 29 29-WG
- 30 30-WG

Bridges Closed

- 21 21-WG

0 1 2 3
Kilometres

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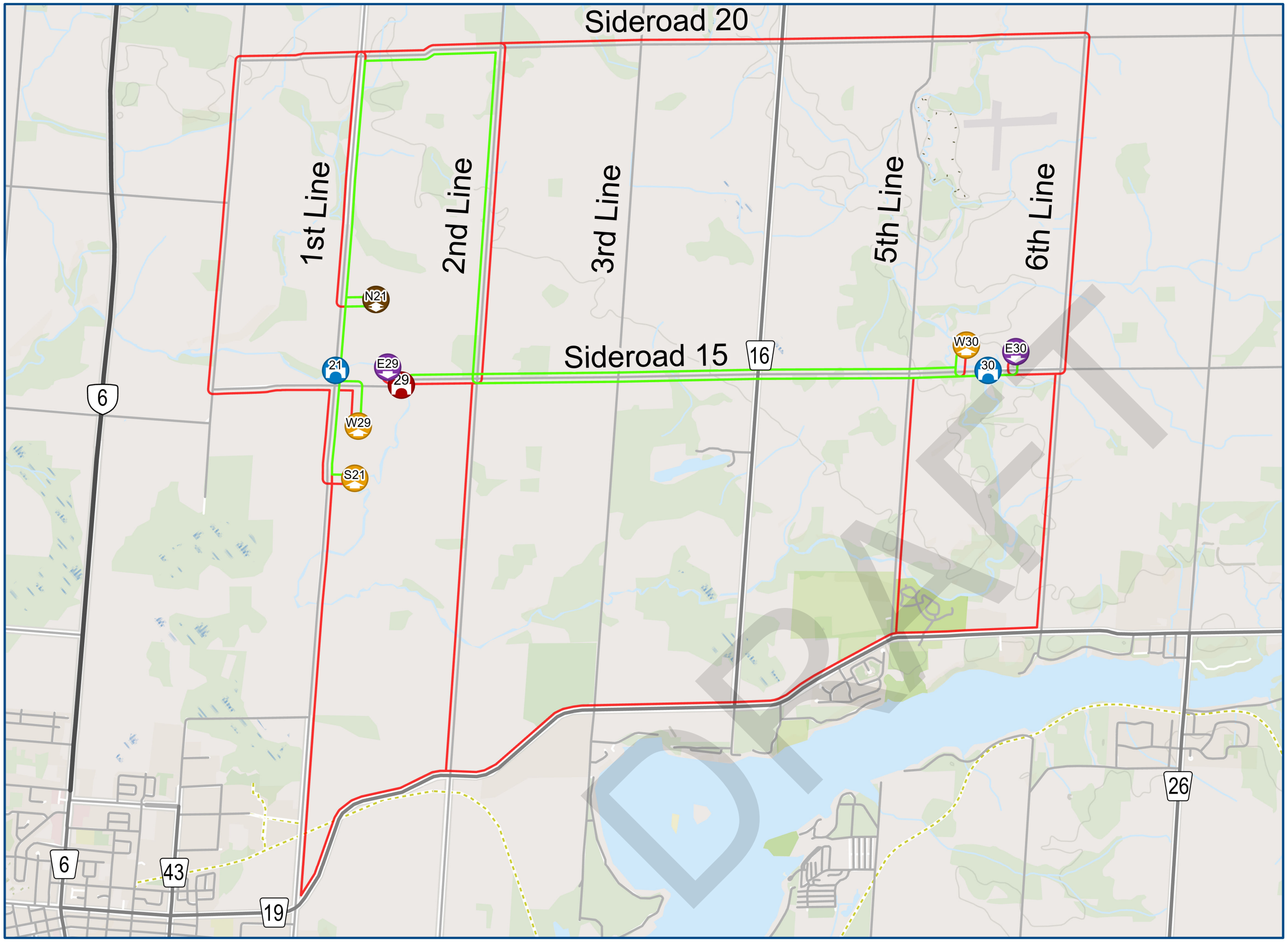
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	7:12	7.91	7:12	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	1:27	1.14	10:22	12.1	8:55	10.96
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	10:31	12.1	12:38	13	2:07	0.9

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	5:54	6.62	13:38	16.37	7:43	9.75
Res East of 30-WG	Res West of 30-WG	1:05	0.93	6:22	7.63	5:17	6.7
Res North of 21-WG	Res South of 21-WG	8:16	9.02	8:16	9.02	0:00	0



Inter-Community Trip Route Scenario: Bridge 21-WG and 30-WG Open

Origins
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations
- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open
- 21 21-WG
- 30 30-WG

Bridges Closed
- 29 29-WG

0 1 2 3
Kilometres

Centre Wellington
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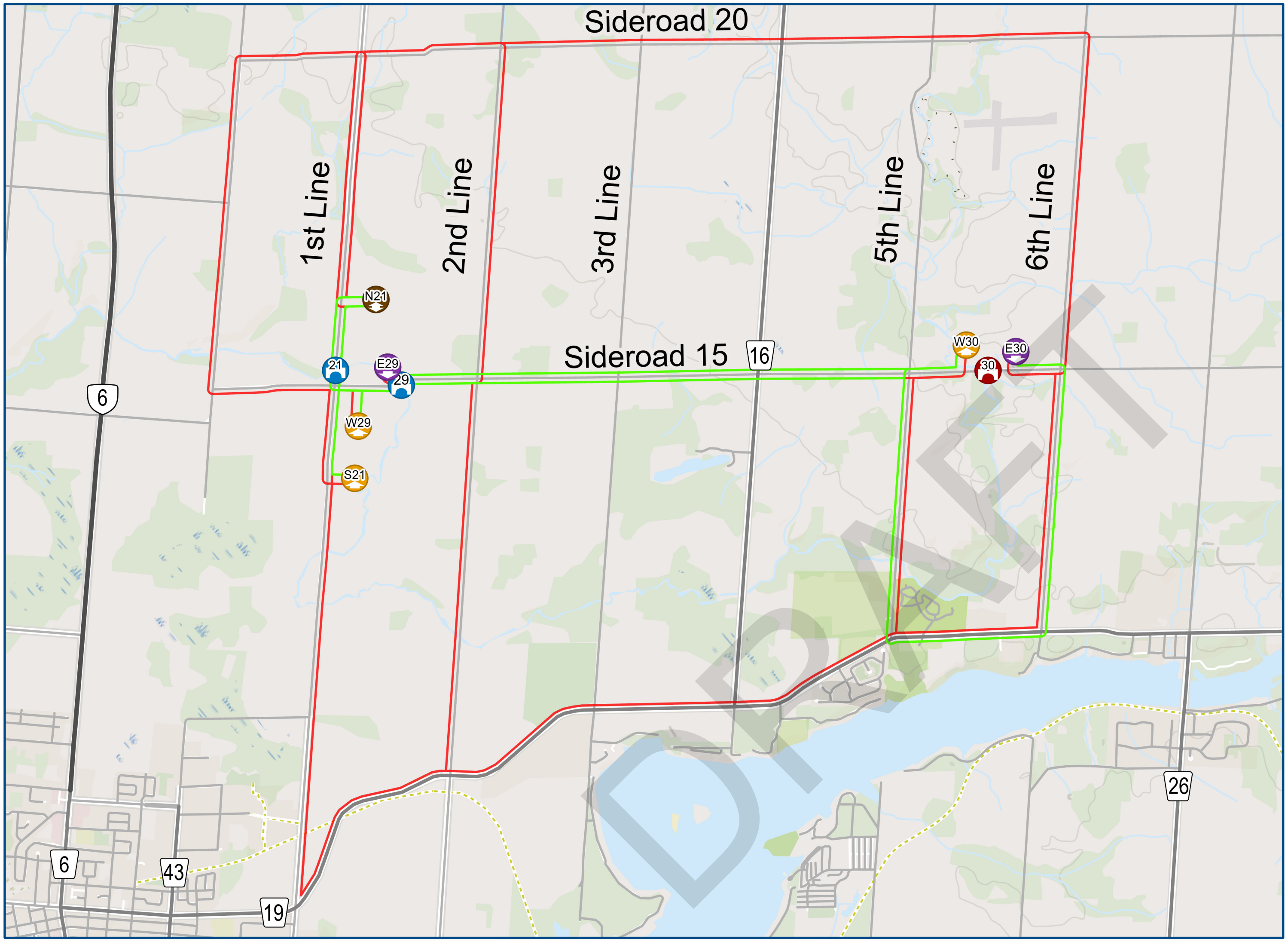
Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	7:12	7.91	7:12	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	8:03	8.94	10:22	12.1	2:19	3.16
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	10:31	12.1	12:38	13	2:07	0.9

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	11:22	13.13	13:38	16.37	2:15	3.24
Res East of 30-WG	Res West of 30-WG	1:05	0.93	6:22	7.63	5:17	6.7
Res North of 21-WG	Res South of 21-WG	2:21	2.22	8:16	9.02	5:54	6.8



Inter-Community Trip Route Scenario: Bridge 21-WG and 29-WG Open

Origins

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations

- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open

- 21 21-WG
- 29 29-WG

Bridges Closed

- 30 30-WG

0 1 2 3
Kilometres

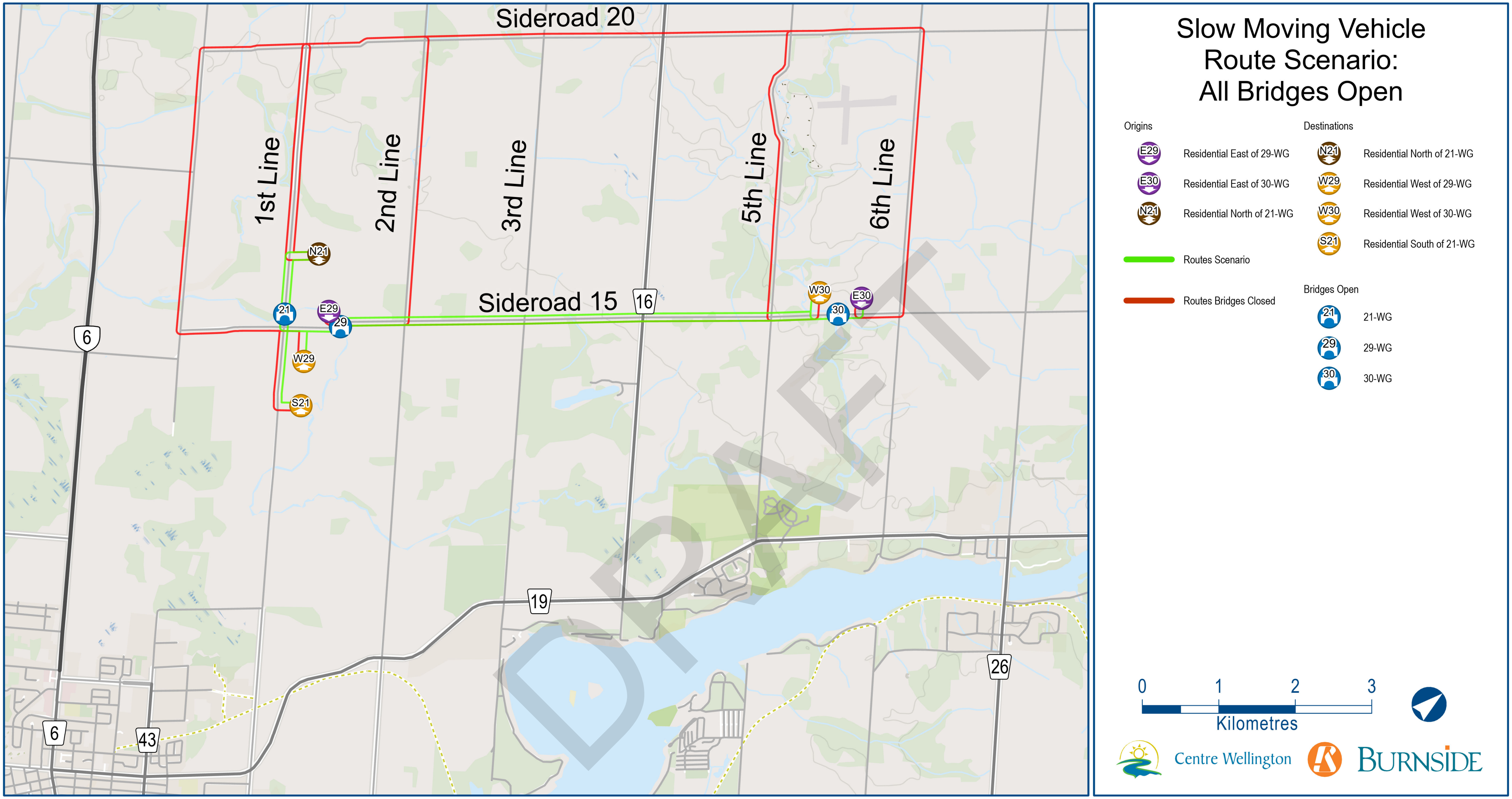
Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	2:10	2.07	7:12	7.91	5:02	5.83
Res East of 29-WG	Res West of 29-WG	1:27	1.14	10:22	12.1	8:55	10.96
Res East of 29-WG	Res West of 30-WG	5:10	5.66	5:10	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	11:07	13.33	12:38	13	1:31	-0.33
Res East of 30-WG	Res West of 29-WG	10:25	12.39	13:38	16.37	3:12	3.98
Res East of 30-WG	Res West of 30-WG	6:22	7.63	6:22	7.63	0:00	0
Res North of 21-WG	Res South of 21-WG	2:21	2.22	8:16	9.02	5:54	6.8

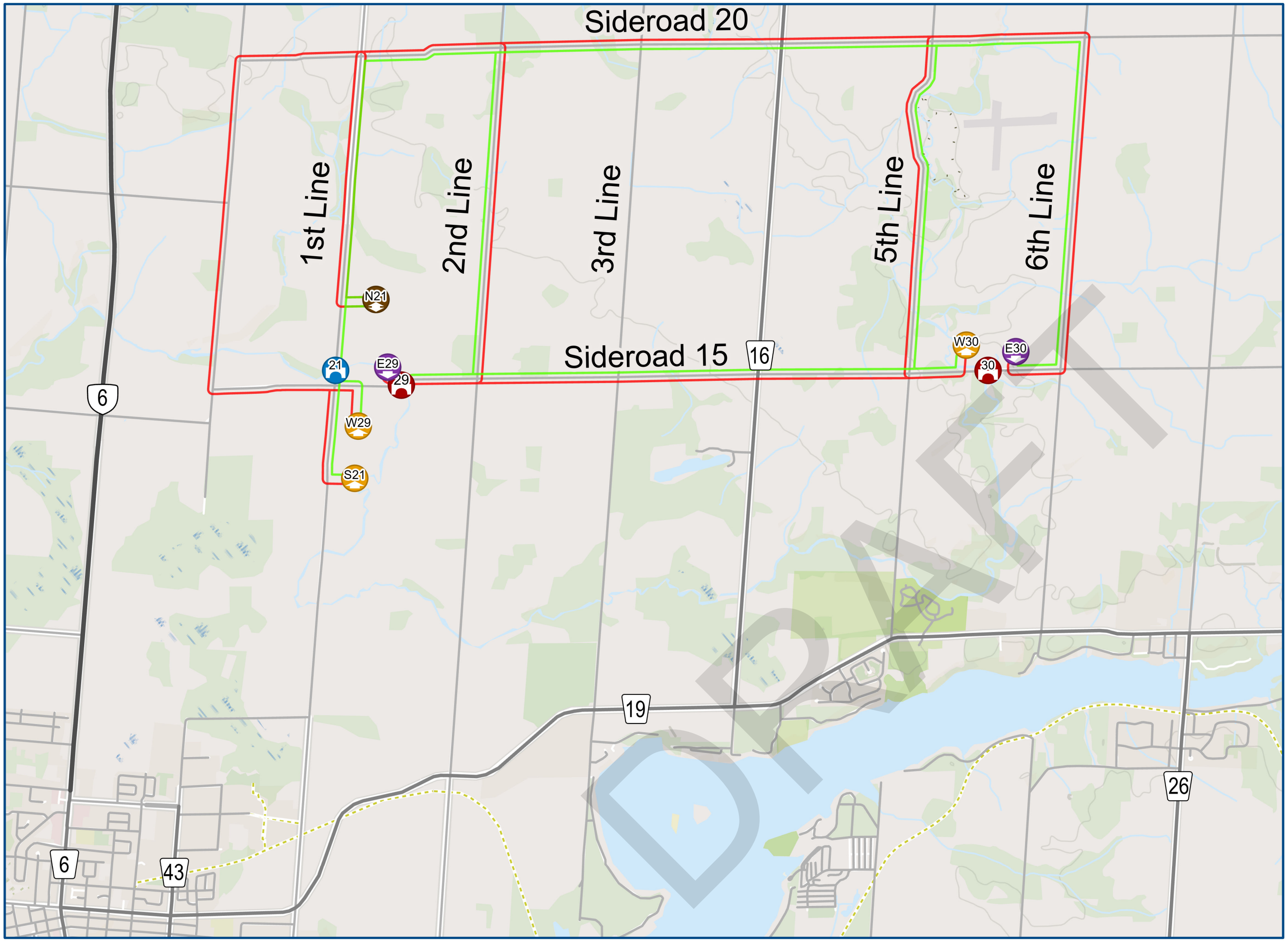
Appendix D

Slow-Moving Vehicle Results



Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	4:58	2.07	18:58	7.91	13:59	5.83
Res East of 29-WG	Res West of 29-WG	2:43	1.14	26:50	11.18	24:06	10.04
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	18:08	7.56	31:11	13	13:03	5.44
Res East of 30-WG	Res West of 29-WG	15:53	6.62	39:03	16.27	23:09	9.65
Res East of 30-WG	Res West of 30-WG	2:13	0.93	21:34	8.99	19:20	8.06
Res North of 21-WG	Res South of 21-WG	5:19	2.22	21:38	9.02	16:19	6.8



Slow Moving Vehicle Route Scenario: Bridge 21-WG Open

Origins

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations

- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open

- 21 21-WG

Bridges Closed

- 29 29-WG
- 30 30-WG

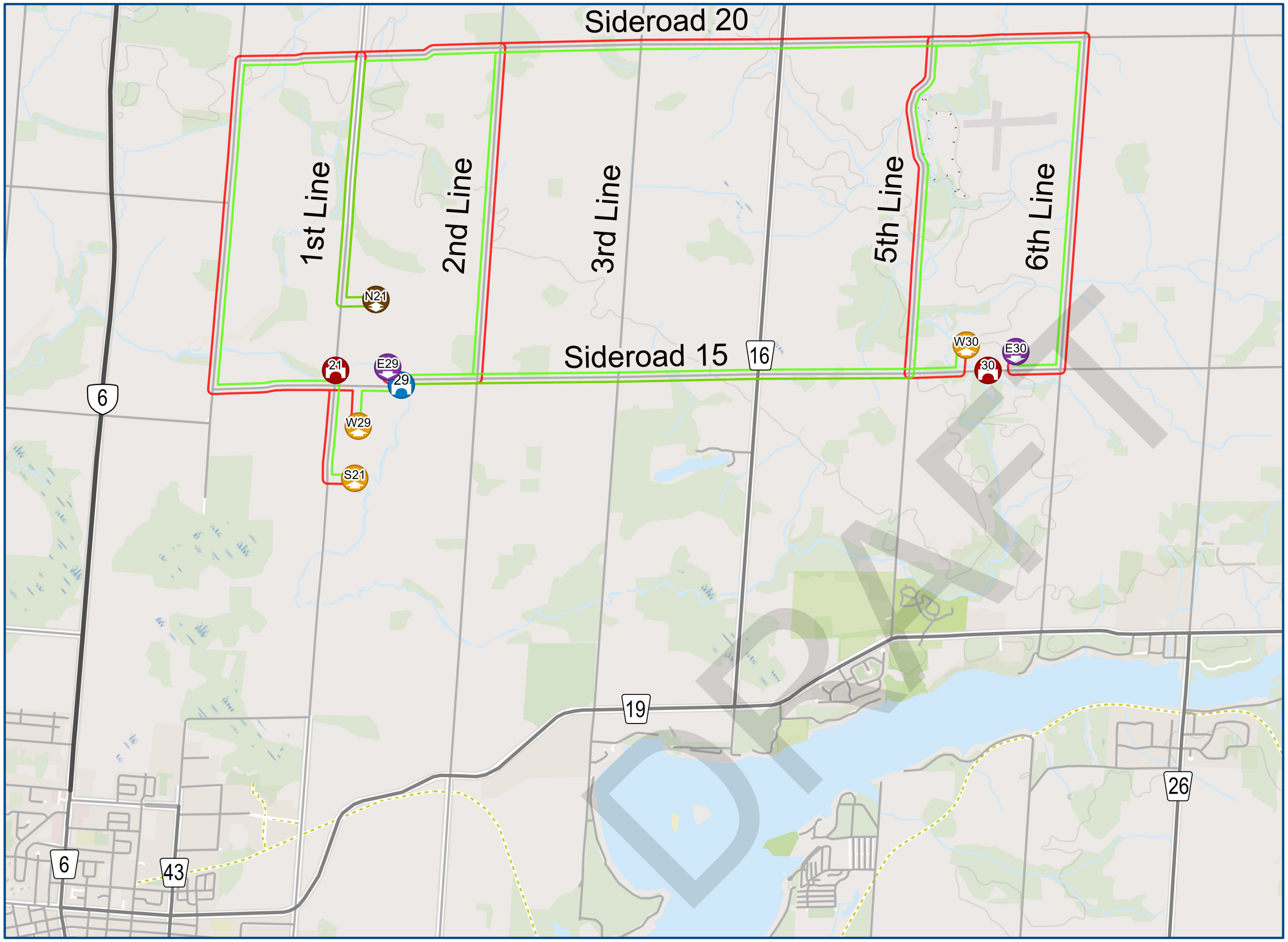
0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	18:58	7.91	18:58	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	21:26	8.94	26:50	11.18	5:23	2.24
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	31:11	13	31:11	13	0:00	0

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	33:40	14.03	39:03	16.27	5:23	2.24
Res East of 30-WG	Res West of 30-WG	21:34	8.99	21:34	8.99	0:00	0
Res North of 21-WG	Res South of 21-WG	5:19	2.22	21:38	9.02	16:19	6.8



Slow Moving Vehicle Route Scenario: Bridge 29-WG Open

Origins
E29 Residential East of 29-WG
E30 Residential East of 30-WG
N21 Residential North of 21-WG
Routes Scenario
Routes Bridges Closed

Destinations
N21 Residential North of 21-WG
W29 Residential West of 29-WG
W30 Residential West of 30-WG
S21 Residential South of 21-WG

Bridges Open
29 29-WG

Bridges Closed
21 21-WG
30 30-WG

0 1 2 3
Kilometres

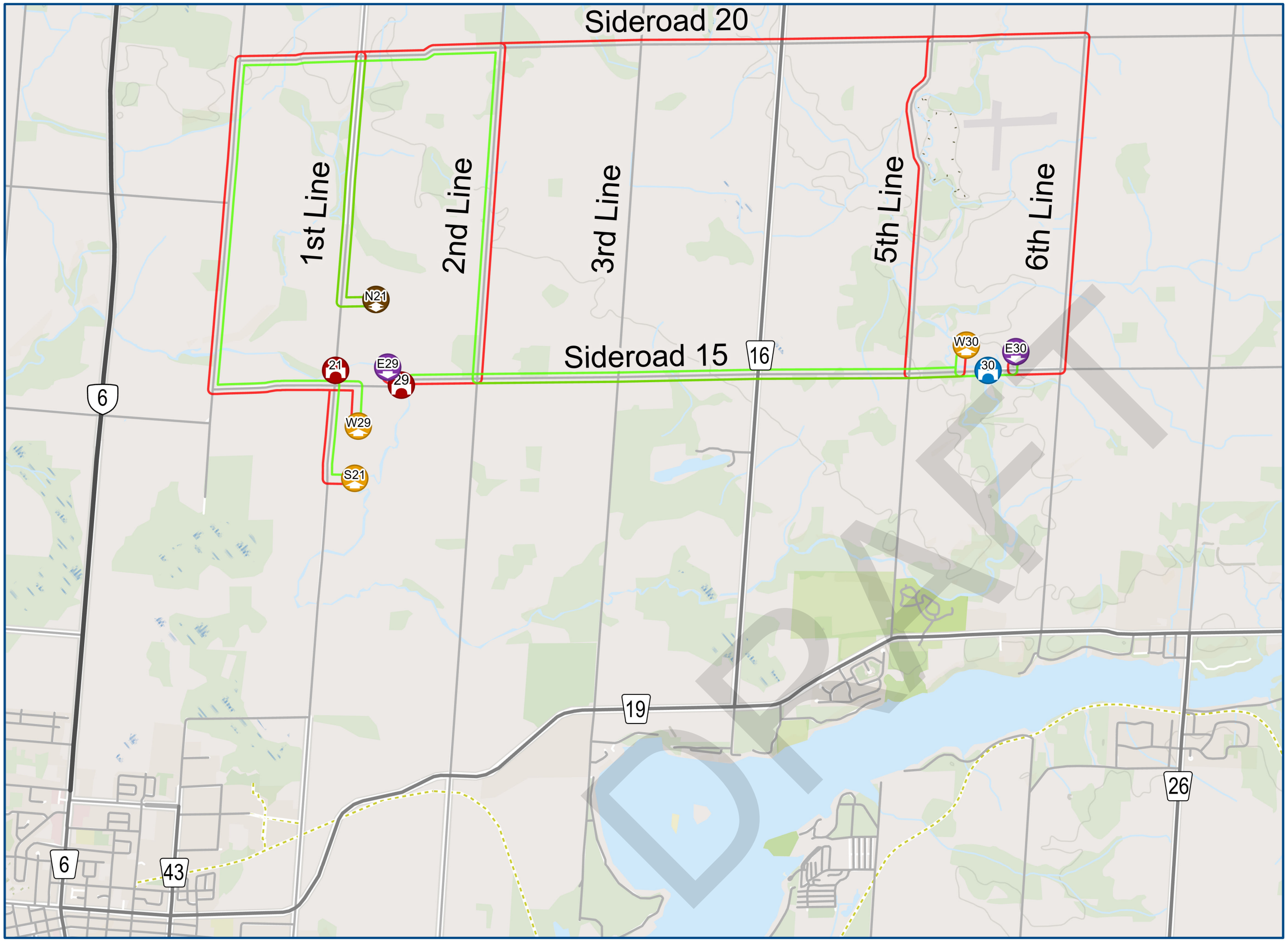
Centre Wellington
BURNSIDE

Cross Community- Estimated Time & Routing

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 29-WG	Res North of 21-WG	18:58	7.91	18:58	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	2:43	1.14	26:50	11.18	24:06	10.04
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	31:11	13	31:11	13	0:00	0

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 30-WG	Res West of 29-WG	32:58	13.74	39:03	16.27	6:04	2.53
Res East of 30-WG	Res West of 30-WG	21:34	8.99	21:34	8.99	0:00	0
Res North of 21-WG	Res South of 21-WG	21:38	9.02	21:38	9.02	0:00	0

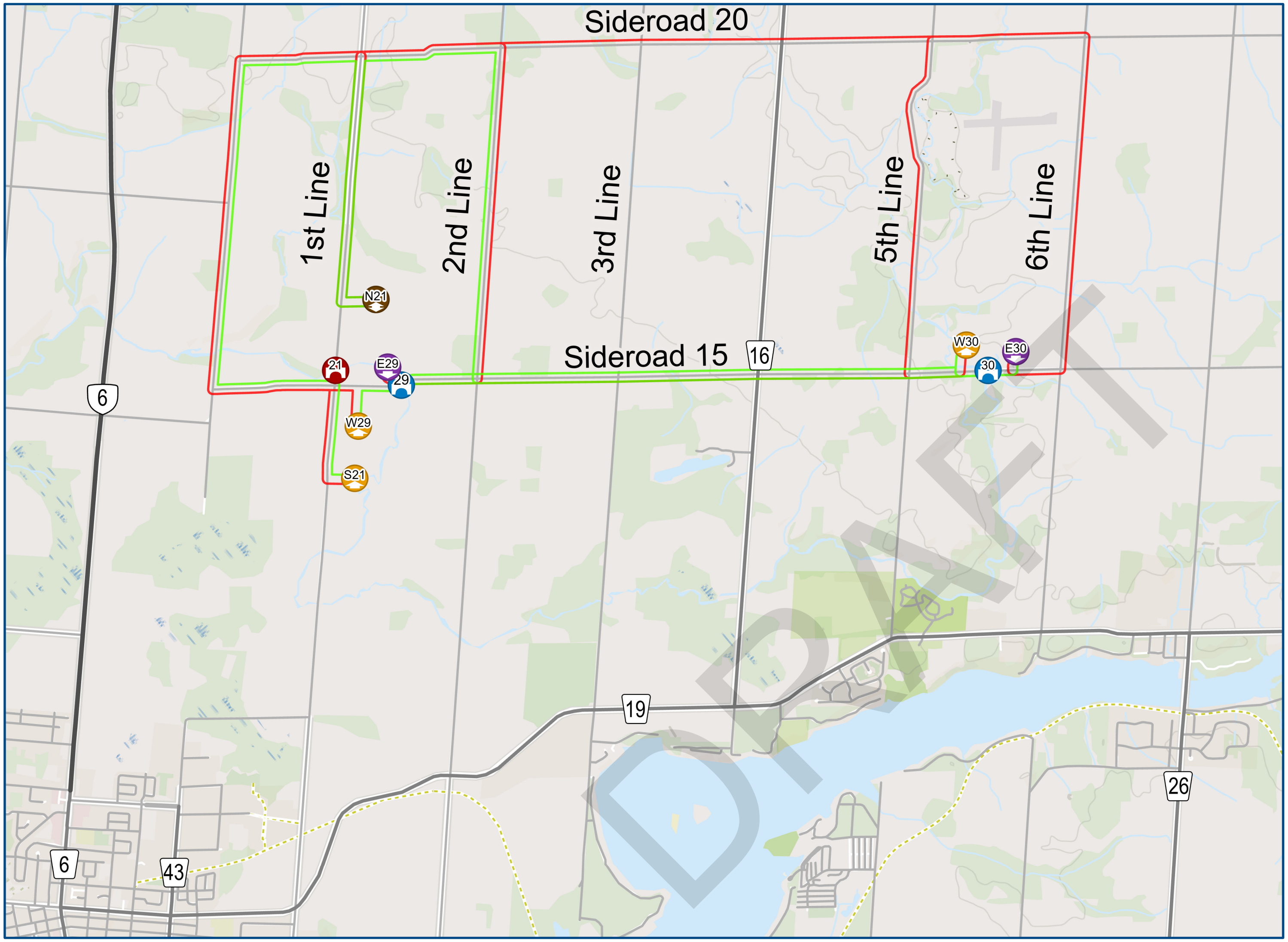
Slow Moving Vehicle Route Scenario: Bridge 30-WG Open



Cross Community- Estimated Time & Routing

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 29-WG	Res North of 21-WG	18:58	7.91	18:58	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	26:50	11.18	26:50	11.18	0:00	0
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	29:02	12.1	31:11	13	2:09	0.9

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 30-WG	Res West of 29-WG	36:53	15.37	39:03	16.27	2:09	0.9
Res East of 30-WG	Res West of 30-WG	2:13	0.93	21:34	8.99	19:20	8.06
Res North of 21-WG	Res South of 21-WG	21:38	9.02	21:38	9.02	0:00	0



Slow Moving Vehicle Route Scenario: Bridge 29-WG and 30-WG Open

Origins
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Routes Scenario

Routes Bridges Closed

Destinations
- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Bridges Open
- 29 29-WG
- 30 30-WG

Bridges Closed
- 21 21-WG

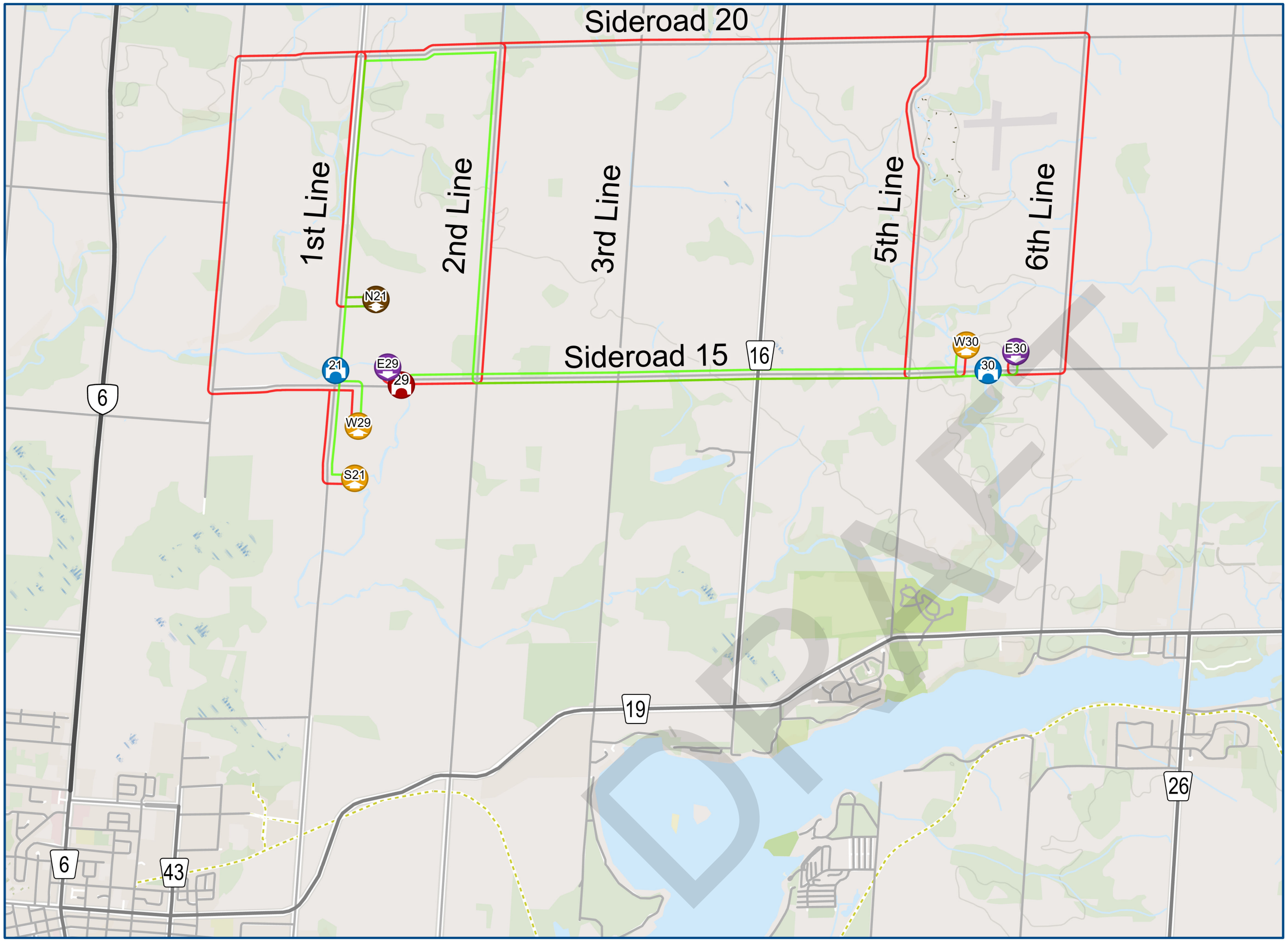
0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	18:58	7.91	18:58	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	2:43	1.14	26:50	11.18	24:06	10.04
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	29:02	12.1	31:11	13	2:09	0.9

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	15:53	6.62	39:03	16.27	23:09	9.65
Res East of 30-WG	Res West of 30-WG	2:13	0.93	21:34	8.99	19:20	8.06
Res North of 21-WG	Res South of 21-WG	21:38	9.02	21:38	9.02	0:00	0



Slow Moving Vehicle Route Scenario: Bridge 21-WG and 30-WG Open

Origins
- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Destinations
- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Routes Scenario

Routes Bridges Closed

Bridges Open
- 21 21-WG
- 30 30-WG

Bridges Closed
- 29 29-WG

0 1 2 3
Kilometres

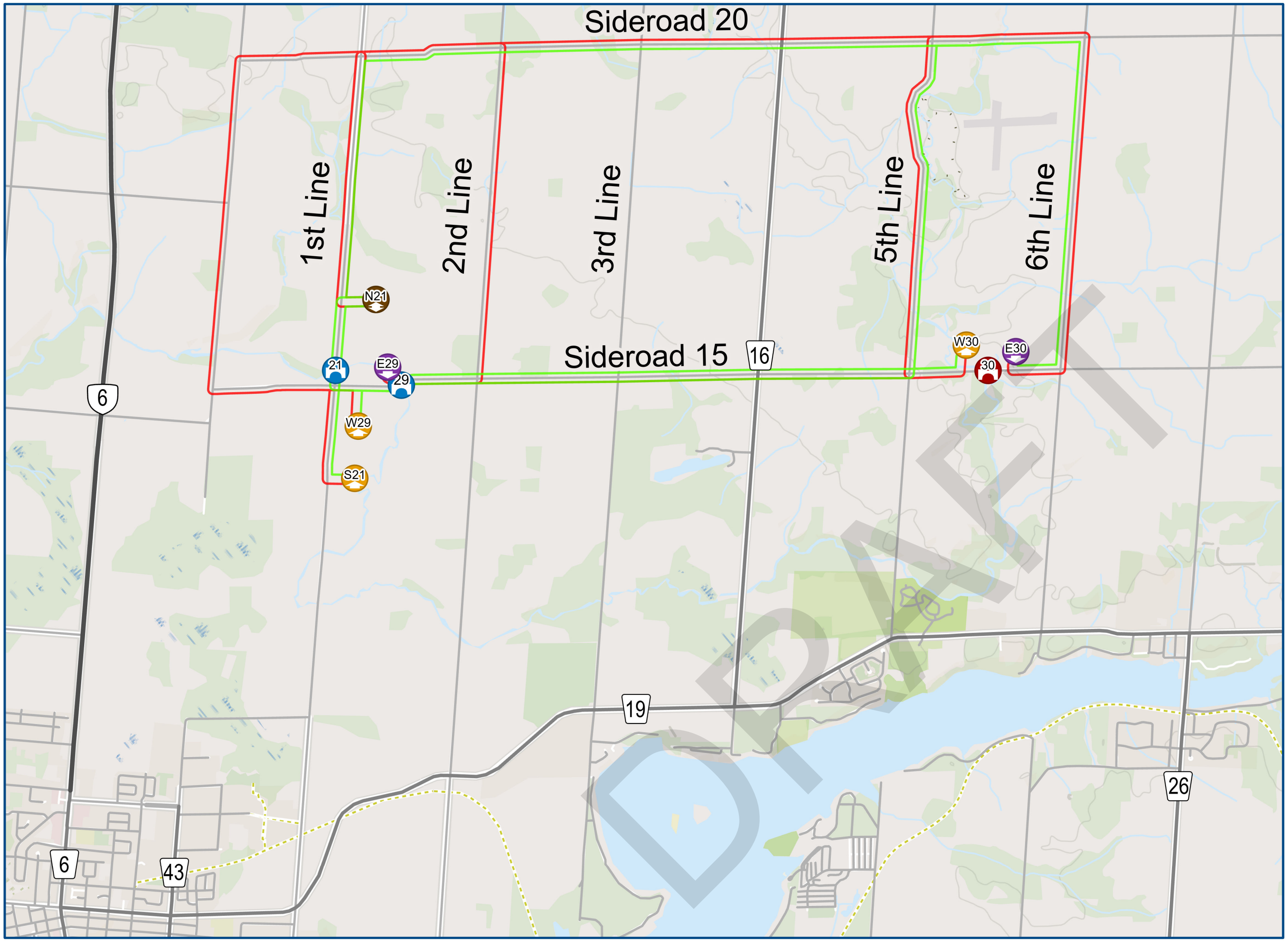
Centre Wellington

Burnside

Cross Community- Estimated Time & Routing

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 29-WG	Res North of 21-WG	18:58	7.91	18:58	7.91	0:00	0
Res East of 29-WG	Res West of 29-WG	21:26	8.94	26:50	11.18	5:23	2.24
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	29:02	12.1	31:11	13	2:09	0.9

		Bridges Open		Bridges Closed		Difference	
Origin	Destination	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)	Time (m:ss)	Distance (km)
Res East of 30-WG	Res West of 29-WG	31:30	13.13	39:03	16.27	7:32	3.14
Res East of 30-WG	Res West of 30-WG	2:13	0.93	21:34	8.99	19:20	8.06
Res North of 21-WG	Res South of 21-WG	5:19	2.22	21:38	9.02	16:19	6.8



Slow Moving Vehicle Route Scenario: Bridge 21-WG and 29-WG Open

Origins

- E29 Residential East of 29-WG
- E30 Residential East of 30-WG
- N21 Residential North of 21-WG

Routes Scenario

Routes Bridges Closed

Destinations

- N21 Residential North of 21-WG
- W29 Residential West of 29-WG
- W30 Residential West of 30-WG
- S21 Residential South of 21-WG

Bridges Open

- 21 21-WG
- 29 29-WG

Bridges Closed

- 30 30-WG

0 1 2 3
Kilometres

Centre Wellington BURNSIDE

Cross Community- Estimated Time & Routing

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 29-WG	Res North of 21-WG	4:58	2.07	18:58	7.91	13:59	5.83
Res East of 29-WG	Res West of 29-WG	2:43	1.14	26:50	11.18	24:06	10.04
Res East of 29-WG	Res West of 30-WG	13:35	5.66	13:35	5.66	0:00	0
Res East of 30-WG	Res North of 21-WG	31:11	13	31:11	13	0:00	0

Origin	Destination	Bridges Open Time (m:ss)	Bridges Open Distance (km)	Bridges Closed Time (m:ss)	Bridges Closed Distance (km)	Difference Time (m:ss)	Difference Distance (km)
Res East of 30-WG	Res West of 29-WG	32:58	13.74	39:03	16.27	6:04	2.53
Res East of 30-WG	Res West of 30-WG	21:34	8.99	21:34	8.99	0:00	0
Res North of 21-WG	Res South of 21-WG	5:19	2.22	21:38	9.02	16:19	6.8

Burnside

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A.2 Technical Memorandum - Existing Geometry & Physical Condition

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (226) 526-9660 **web** www.rjburnside.com

[The Difference is our People]

Technical Memorandum – Existing Geometry and Physical Condition

Date:	September 18, 2025	**Project No.:**	300059832.0000
Project Name:	Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG		
Client Name:	Township of Centre Wellington		
Submitted To:	Project File		
Submitted By:	Christine Beard, P.Eng.		
Reviewed By:	Andrew Dawson, P.Eng.		

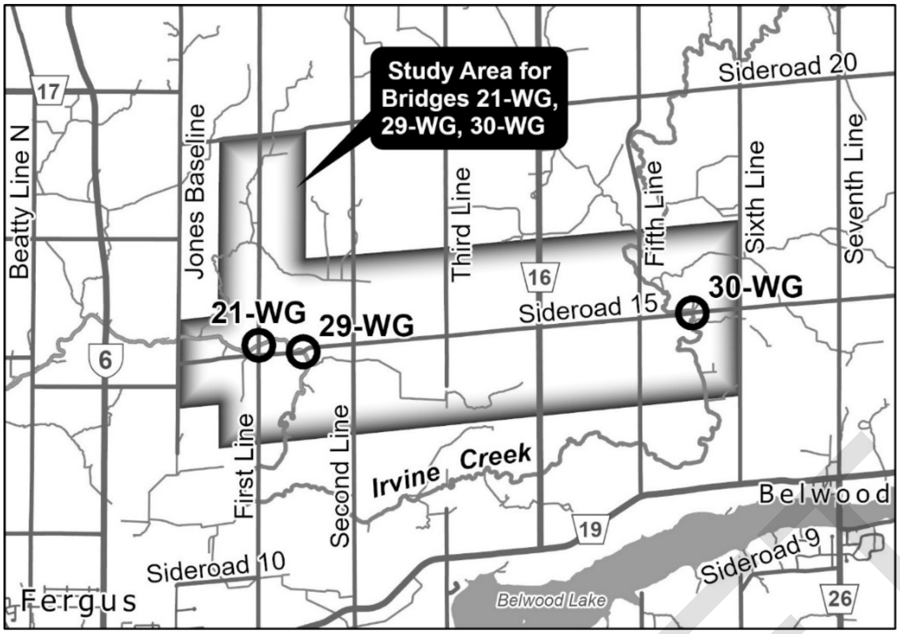
1.0 Context

R.J. Burnside & Associates Limited (Burnside) has been retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG, located northeast of the Community of Fergus. As part of this study, Burnside has reviewed relevant background information and conducted field investigations to assess the existing conditions of the three bridges for consideration when analyzing the potential alternatives related to the bridges.

2.0 Background

The three bridges included in the study are located near the hamlet of Living Springs, northeast of the Community of Fergus, in the Northeast Quadrant of the Township of Centre Wellington. These structures were built prior to the 1999 amalgamation of the Township of Centre Wellington and were part of the Township of West Garafraxa during their original construction. The bridges cross the Irvine Creek, and the location of the structures are illustrated in Figure 1.

Figure 1: Bridge Locations



These three structures were all constructed between 1928 and 1942. At present, a 5-tonne gross vehicle weight load limitation applies to Bridge 29-WG, while Bridges 21-WG and 30-WG have been closed to traffic. A summary of the three bridges being evaluated as part of this study is provided in Table 1.

Table 1: Existing Bridge Information

ID	Structure Type	Road Name	Span (m)	Year Built	Load Posting	Year Repaired	Year Closed
21-WG	Bowstring Arch	First Line	17.9	1929	N/A	2016	2024
29-WG	Bowstring Arch	Sideroad 15	21.3	1928	5-Tonnes	N/A	NA
30-WG	Steel Through Truss	Sideroad 15	26.3	1923	N/A	N/A	2010

3.0 Driving Platform Width

A summary of the characteristics of the existing roadways on the approaches to the bridges are shown in Table 2 below.

Table 2: Existing Road Geometry & Details

ID	Road Name	Surface Type	Speed Limit	Driving Platform Width	
				Approach	Bridge
21-WG	First Line	Gravel	80 km/h (non-posted)	4.8 – 5 m	4.8 m +/-
29-WG	Sideroad 15	Gravel	80 km/h (non-posted)	6.0 – 8.0 m	5.5 m +/-
30-WG	Sideroad 15	Gravel	80 km/h (non-posted)	4.5 – 6 m	4.5 m +/-

Based on pre-closure traffic counts, the Average Annual Daily Traffic (AADT) volumes range from approximately 100 to 300 vehicles per day within the Study Area. The Ontario Ministry of Transportation (MTO) Structural Manual indicates roads with an AADT of less than 400 vehicles per day are low volume roads and may consider certain exemptions given their low level of service. As outlined in Table 2.4.1 of the MTO Structural Manual (Figure 2), bridges with an AADT less than 200 vehicles per day permit the use of single lane bridges are suitable for design speeds of 60km/h or less; whereas single lane bridges are only recommended for design speeds less than 40 km/h for Low Volume Road bridges with AADT between 200 and 400 vehicles per day.

Figure 2: Excerpt of Table 2.4.1 from MTO Structural Manual

TABLE 2.4-1 - MINIMUM LANE, SHOULDER, AND BRIDGE WIDTHS

AADT	Design Speed (km/h)	# Lanes	Min. Lane Width (m)	Min. Shoulder Width (m)	Min. Bridge Width (m)[1]
≤ 200	≤ 60	1	3.0	0.5	4.0[2,3,4] (4.9 m max)[5]
		2[6]	2.75	0.25	6.0
	≥ 70	2	3.0	0.5	7.0
> 200 and ≤ 400[7]	≤ 40	1	3.0	0.5	4.0[2,3,4] (4.9 m max)[5]
		2[6]	2.75	0.25	6.0
	50 to 60	2	3.0	0.5	7.0
	≥ 70	2	3.3[8]	0.6[8]	7.5[8]

Table 2.4-1 Notes:

1 - Width measured between the inside face of the barriers, guiderails, or curbs.

2 - Horizontal and vertical sight distances, or adequate turn-outs, shall be provided to allow approaching motorists to observe an opposing vehicle on a single lane bridge or its far approach. If there are sight distance issues, a single lane bridge should not be used.

3 - Farm or other special vehicles may require larger widths. Consultation shall be made with local officials. It may also be acceptable to have a lower barrier to accommodate these farm or other special vehicles.

4 - For AADT > 400, or for locations where the Seasonal Average Daily Traffic is significantly > 400, consideration should be given to using additional traffic control measures at the bridge for single lane structures (i.e., traffic signals, yield sign for one direction, stop sign, etc.).

5 - New single lane bridges wider than 4.9 m should be avoided as they may give the appearance of a full two-lane bridge.

6 - Two lane bridge is also an acceptable alternative if a 4.9 m single lane bridge cannot accommodate the traffic (i.e., farm or special vehicles, sight distances, etc.).

7 - Range also applies to existing roadways with AADT > 400, where operational issues have been minimal and Approval for use of these guidelines has been obtained from the Owner.

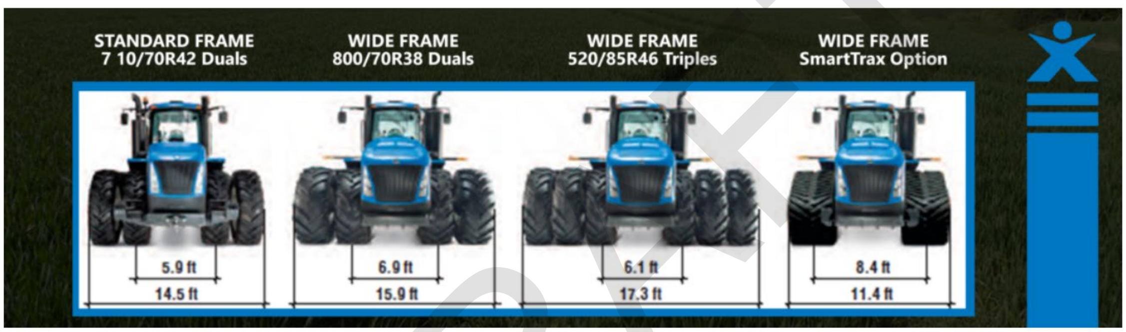
8 - For AADT > 400, or for locations where the Seasonal Average Daily Traffic is significantly > 400, lane width of 3.25 m, shoulder width of 1.0 m and minimum bridge width of 8.5 m shall apply.

The existing bridges do not meet the minimum driving platform width recommendations for a two-lane, Low Volume Road bridge, in consideration that the AADT is currently between 200 and 400, and that the design speed of the road is greater than 40 km/h (no posted speed limit).

If consideration were given to reducing the design speed of the road to 40 km/h, the existing structures would be considered to meet the minimum driving platform widths of a single-lane Low Volume Road bridge. However, it is recommended that single-lane bridges on two-way, undivided roads have a means of right-of-way control, with 'narrow bridge' and 'yield to oncoming traffic' signage recommended to indicate to bridge users the reduction to one-way traffic over the bridge. Accordingly, if the existing bridge geometry were to remain, regulatory speed limits of 40km/h or lower should be posted, and right-of-way control measures should be implemented.

As indicated in Note 3 of Figure 2 above, farm or other special vehicles may require larger widths. A brief desktop investigation was conducted to research the current width of agricultural equipment. As noted in the image below, large articulated four-wheel drive tractors can range in width from 11.4 ft (3.5 m) to 17.3 ft (5.3 m).

Figure 3: Agricultural Equipment



*(Reference - https://agtiretalk.com/4wd-tractor-traction-pulling-550-hp-implement/)

In addition to the width of a tractor, Burnside has reviewed the width of tillage implements. The transport width of field cultivators ranges from 14 ft (4.3 m) to 19 ft -6" (5.9 m). Reference - https://www.sunflowermfg.com/tillage-equipment/field-cultivators.html.

Based on the width of agricultural equipment noted above, there may be limitations to agricultural equipment capable of passing over the bridges based on the available platform width, regardless of whether load limitations are present.

Additionally, when comparing to the Township's standard road cross section, the platform width of the existing structure does not meet the desirable width. The Township's standard road cross section consists of 3.35 m through lanes with 1.2 m shoulders and therefore requires a minimum 9.1 m wide driving platform for a two-lane bridge.

The existing bowstring arches and truss structures cannot be widened, as the main load carrying elements of the structures are above the road platform. To achieve the Township standard, structure replacement would be required at each site.

3.1 Road Profile and Design Speed

The subject roadways do not have posted regulatory speed limits. In accordance with the Highway Traffic Act of Ontario, Section 128.1, the statutory speed limit of 80 km/h is applicable on rural roads in the absence of signage. Review of traffic study data indicates that the 20 km/h pace speed of the road is generally within the approximate range of 60 to 80 km/h, +/- 5 km/h.

The available sightlines of the subject roads have not been designed for the 80km/h operating speed. A review of the topographic survey in the immediate vicinity of each bridge indicates the existing vertical and horizontal profiles do not have adequate sight lines to safely accommodate 80 km/h. Within the surveyed limits, the applicable design speeds for the existing roads are outlined in Table 3 based on the 2017 TAC Geometric Design Guide for Canadian Roads (TAC GDG) and the associated MTO Design Supplement (October 2023).

Table 3: Existing Road Geometry & Details

Bridge No.	Road Name	Rate of Curvature		Radius of Approach Curve (m)	Max Design Speed
		Sag / Crest	K		
21-WG	First Line	Sag	9+/-	N/A	40 km/h
29-WG	Sideroad 15	Sag	18 +/-	45	Less than 40 km/h
30-WG	Sideroad 15	Sag	13 +/-	N/A	50 km/h

The design speeds at the bridges are less than the assumed regulatory speed limit. Regulatory speed limit signs or advisory speed signs, at minimum, should be considered by the Township to ensure drivers have adequate sight lines and stopping distances at the subject bridges if improvements to the vertical road profile are not completed.

4.0 Physical Condition and Load Limit

Burnside has completed a review of the current physical condition of the three structures based on site visits and background information provided by the Township, including:

- 2024 Ontario Structure Inspection Manual (OSIM) inspection reports;
- Closure notice and structure evaluation reports; and
- Record plans of the original and rehabilitation construction works, where available.

All structures have been previously inspected by a structural engineer who determined the current degree of deterioration and recommended a load limitation or closure of the structure to vehicular traffic. A summary of the current status of load limitation or closure is provided in Table 4 and is further expanded upon in the bridge-specific subsections.

Table 4: Current Load Limitations

Bridge No.	Current Load Limitations
21-WG	Closed to Vehicular Traffic
29-WG	5-Tonne Gross Vehicle Weight
30-WG	Closed to Vehicular Traffic

The vintage of these structures, as pre-1930 bridges, means that they would not have been originally designed to carry the live loads associated with the vehicular loads of the current Canadian Highway Bridge Design Code (CHBDC). The required live load (truck / vehicle loading) capacities have increased since the time of the original design of the structure. If any of the existing structures are to remain and be rehabilitated, structural evaluation would require updating to confirm the potential capacity of the rehabilitated bridge, considering options to strengthen the bridges based on current design standards.

4.1 Bridge 21-WG

Bridge 21-WG is a 17.9 m (+/-) single-span, concrete bowstring arch structure located on First Line, spanning Irvine Creek, just north of Sideroad 15. The bridge was constructed in 1929. In 2013, an overhead support beam was added to replace the damaged original overhead concrete brace. A copy of the original construction and rehabilitation drawings are included in Appendix A and B, respectively. Records indicate that the structure was load-posted to 10 tonnes in 2022. In September 2023, it was recommended that the posting be revised to 5-tonnes. Closure was recommended by K. Smart Associates Ltd., based on their review of the state of deterioration of the structure in January 2024. A copy of the closure notice is included in Appendix C.

The 2024 OSIM by HP Engineering and the 2023 monitoring and inspection by K. Smart Associates Ltd. noted the following concerns:

- Tension tie has severe spalling with severely corroded reinforcing near the mid span;
- Observed overloaded vehicles crossing the bridge;
- Severe scour at the north abutment; and
- Concrete components with severe spalling, delamination, and cracking (deck, verticals and arch).

Further details on the bridge condition are available in the enclosed 2024 OSIM Report in Appendix G.

4.2 Bridge 29-WG

Bridge 29-WG is a 21.3 m (+/-) single-span, concrete bowstring arch structure located on Sideroad 15, between First Line and Second Line, spanning Irvine Creek in the former Township of West Garafraxa. The bridge was constructed in 1928, as indicated on the original design drawings included in Appendix D. A structural evaluation performed in 2022 indicated that both the floor beams and hangers are undersized for current Canadian Highway Bridge Design Code (CHBDC) traffic loading. In 2022, subsequent to the structural evaluation, records indicate that the structure was load-posted to 15-tonnes. In 2024, the load posting was reduced further, to 5-tonnes, after an interim inspection observed floor beam shear ties with severed and corroded reinforcing steel. A copy of the recent load posting notice is included in Appendix E.

The 2024 OSIM by HP Engineering and the November 2024 inspection by K. Smart Associates Ltd. found:

- Wide cracks, efflorescence, delamination, and spalling with severe deterioration of exposed corroded reinforcing in the floor beams, including shear ties, which are corroded through and completely ineffective;
- Severe deterioration in the tension ties in the SE, SW and NW corners; and
- Spalls in the tension hangers.

Further details on the bridge condition are available in the enclosed 2024 OSIM Report in Appendix G.

4.3 Bridge 30-WG

Bridge 30-WG is a 26.3 m (+/-) single-span, rivetted steel Pratt through truss with an exposed concrete deck located on Sideroad 15 spanning Irvine Creek in the former Township of West Garafraxa. The bridge was installed in this location in 1942. Local residents have indicated that the truss was part of a previous structure on Wellington Road 26 in Belwood; however, no records have been found that can confirm this. The superstructure is estimated to have been originally constructed in 1930. There is evidence of bridge modifications where rivets have been replaced by bolts in various locations. It is assumed these modifications occurred in 1942 when the structure was moved.

In 2010, the bridge was impacted by an over-height vehicle, which struck the east end portal sway bracing. The resulting force caused permanent buckling deformations at the east end of the bridge to the portal sway bracing, top chord end diagonals (N&S), end verticals, diagonals, top chord connections and top chord bracing, as well as deformations to the bearing connection assemblies on the east abutment. Members in the sway bracing and the bottom chord bracing, as well as railing components, fractured under the impact. The bridge was closed to traffic immediately after the incident. A copy of the original damage assessment is included in Appendix F.

The 2024 OSIM by HP Engineering confirms the damage from the 2010 collision, as well as identifying:

- A newer bell conduit has been installed on the bottom chord of the north truss.
- Light corrosion on all steel members.
- Severe corrosion with perforations in the bottom chord and stringers.
- Severe concrete deterioration in the abutments, wingwalls.

Further details on the bridge condition are available in the enclosed 2024 OSIM Report in Appendix G.

5.0 Summary

Overall, the existing bridges are generally in poor condition with substantial defects that impact their load-carrying capacity. Structure 29-WG remains open to traffic but is load-limited to a maximum 5-tonne gross vehicle weight. The other structures have been closed to traffic due to their advanced state of deterioration and damage.

The bridges are generally substandard in width based on current standards and can only accommodate one vehicle crossing at a time. The assumed speed limit is higher than the estimated design speed based on available stopping sight distances and road widths, horizontal and vertical curves, for all three bridges.

While rehabilitation efforts are technically possible, the bridges were not designed for current vehicular loads, which would limit the effectiveness of the rehabilitation. If rehabilitation were to be considered for Bridges 21-WG and 30-WG, additional load evaluations are required to assess the achievable load capacity. Bridge 29-WG may also be technically repairable, but the previous structural evaluation indicates that it will remain load posted at 15/28/29 Tonnes without efforts to strengthen the floor beams and hangers. All of the bridges, if rehabilitated, would likely remain load posted and require regular maintenance and rehabilitation on a 15-year cycle going forward. The potential for vehicles impacting the overhead truss and cross-beam would still be present, which may result in future downtime for the road and limit the reliability of these crossings for the future. Furthermore, rehabilitation will not be able to address the driving platform width, which would require the bridge to remain as a single-lane structure and may limit certain wider agricultural equipment from crossing the bridges, even if load limitations did not.

R.J. Burnside & Associates Limited

Christine Beard, P.Eng.,
Regional Vice President, Public Sector

Andrew Dawson, P.Eng.,
Project Engineer

CB/ASD:tc

Enclosures:
- Appendix A – Original Drawings 21-WG
- Appendix B – Rehabilitation Drawing 21-WG
- Appendix C – Closure Notification 21-WG
- Appendix D – Original Drawings 29-WG
- Appendix E – Load Posting Notice – 29-WG
- Appendix F – Vehicle Collision Damage Assessment 30-WG
- Appendix G – OSIM Reports 21-WG, 29-WG, 30-WG

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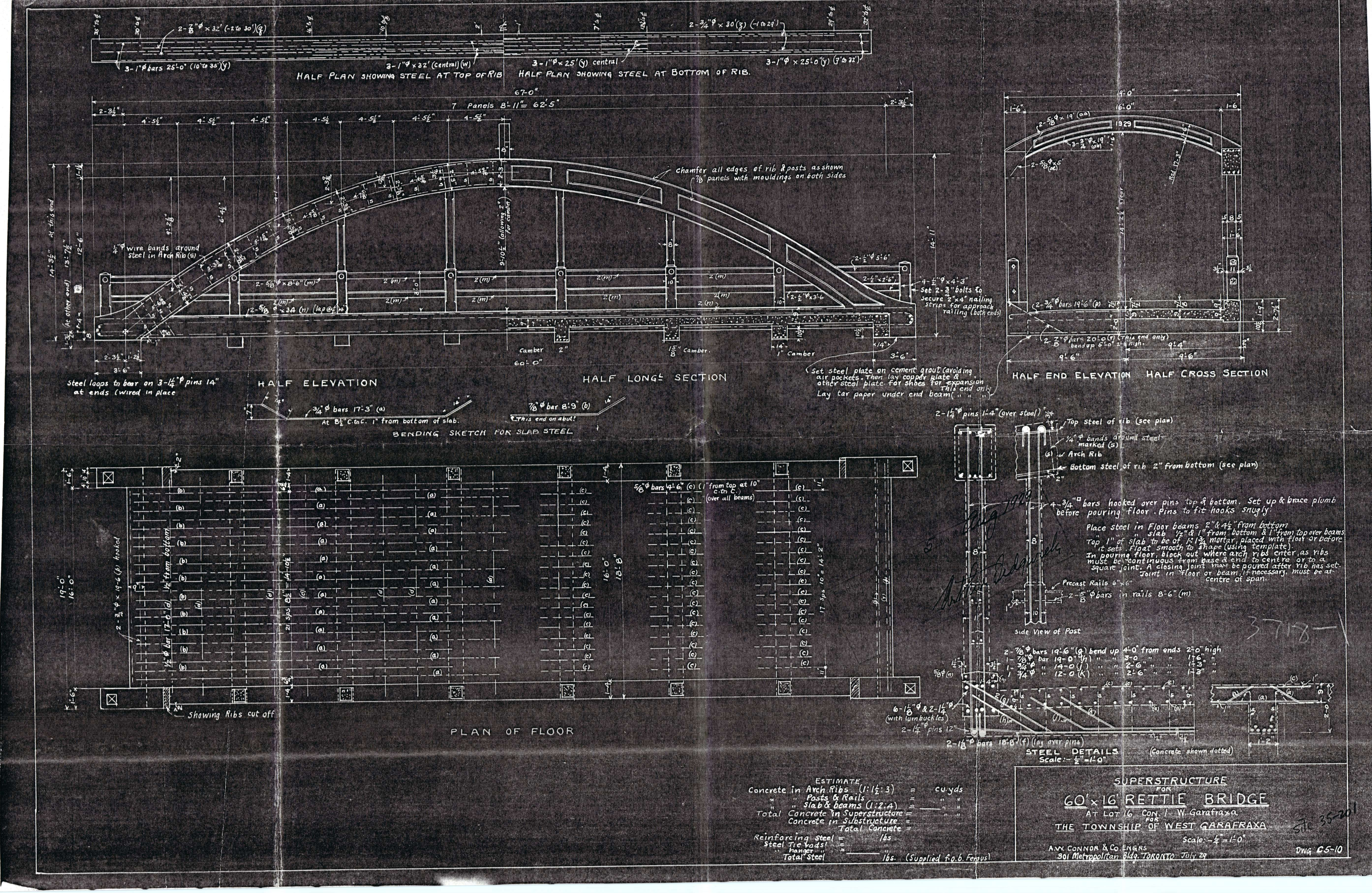
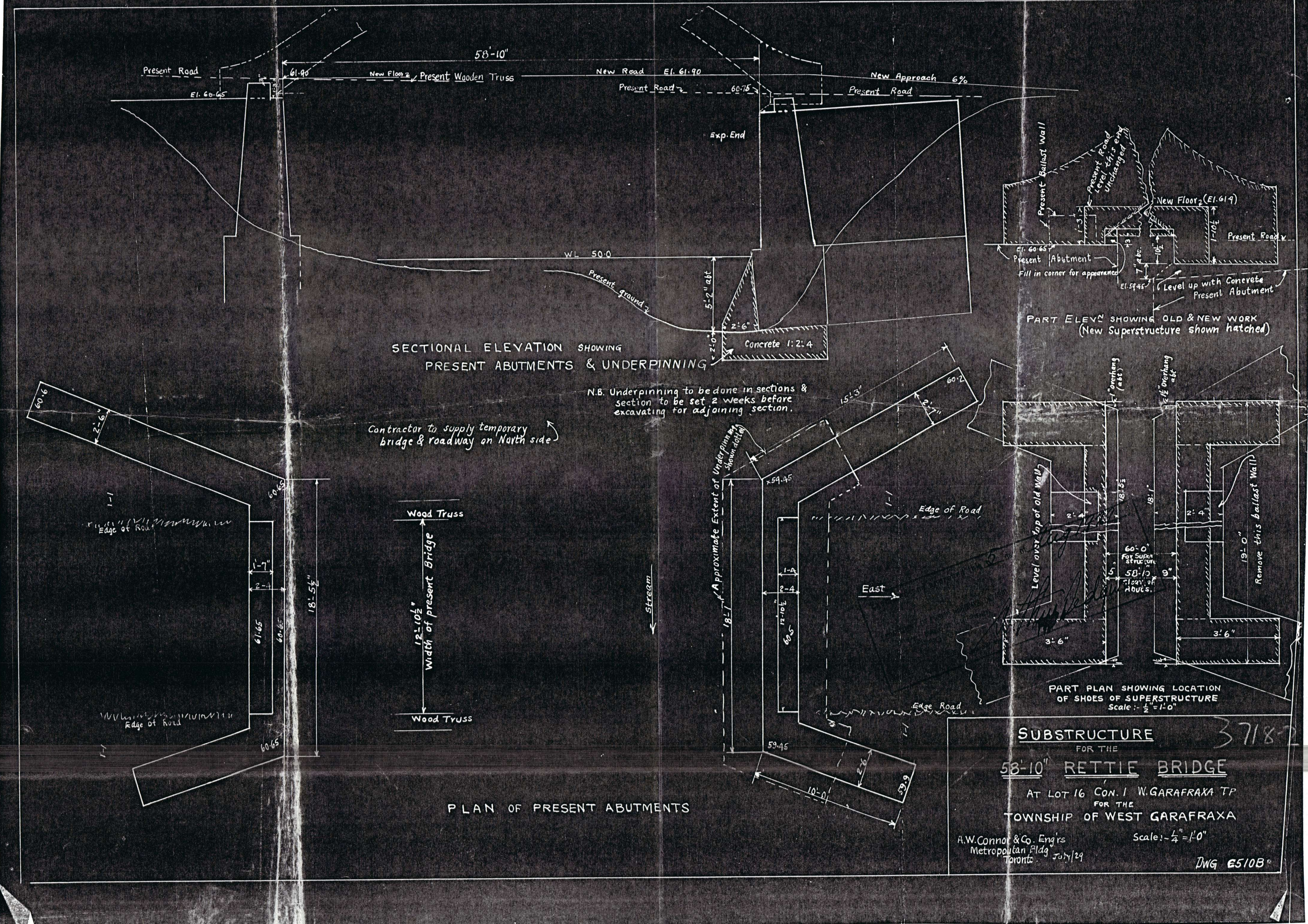
Appendix A

Original Drawings 21-WG


HALF PLAN SHOWING STEEL AT TOP OF RIB
HALF PLAN SHOWING STEEL AT BOTTOM OF RIB
7 Panels 8'-11" = 62'-5"
67'-0"
Chamfer all edges of rib & posts as shown
7/8" panels with mouldings on both sides
4" wire bands around steel in Arch Rib (a)
Steel loops to bear on 3-1¼"φ pins 14" at ends (wired in place
HALF ELEVATION
HALF LONG'L SECTION
Set steel plate on cement grout (avoiding air pockets). Then lay copper plate & other steel plate for shoes for expansion. This end only
Lay tar paper under end beam
BENDING SKETCH FOR SLAB STEEL
HALF END ELEVATION
HALF CROSS SECTION
1929
Side View of Post
Place steel in Floor beams 2" & 4½" from bottom
Showing Ribs cut off
PLAN OF FLOOR
STEEL DETAILS
Scale:- ½" = 1'-0"
(Concrete shown dotted)
ESTIMATE
Concrete in Arch Ribs (1:1½:3) cu.yds
Posts & Rails
Slab & beams (1:2:4)
Total Concrete in Superstructure
Concrete in Substructure
Total Concrete
Reinforcing Steel lbs
Steel Tie rods
hanger
Total Steel lbs. (Supplied f.o.b. Fergus)
SUPERSTRUCTURE
FOR
60' x 16' RETTIE BRIDGE
AT LOT 16 CON. 1 W. Garafraxa
FOR
THE TOWNSHIP OF WEST GARAFRAXA
Scale:- ¼" = 1'-0"
A.W. CONNOR & CO. ENGRS
301 Metropolitan Bldg. TORONTO July 29
DWG. C5-10
Site 35-201
37118-1

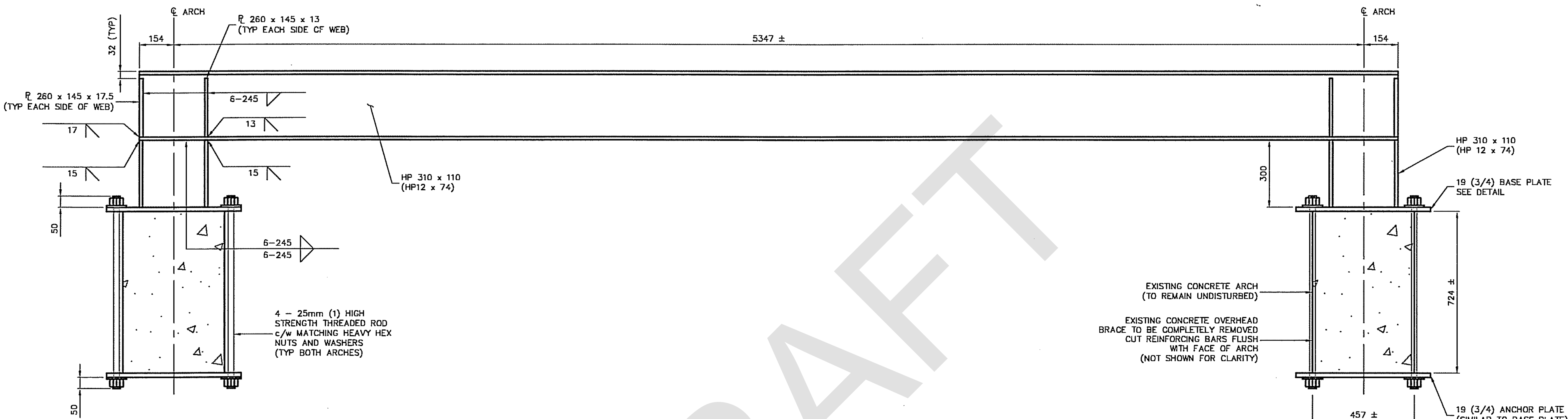
35-201



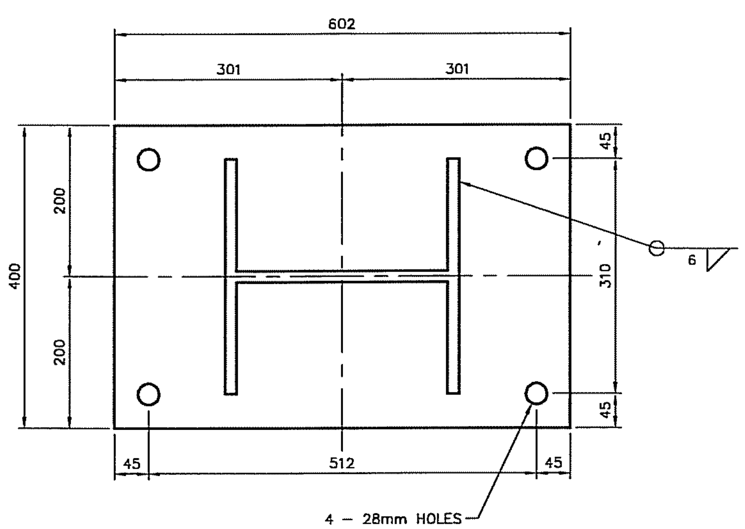
Site map
#35-201

Appendix B

Rehabilitation Drawing 21-WG



ELEVATION



PLAN – BASE PLATE

DRAFT

NOTES:

1. OVERHEAD BRACE DESIGNED FOR WIND LOADING IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE 2006.
2. THE CONTRACTOR SHALL CONFIRM ALL DIMENSIONS IN THE FIELD PRIOR TO STARTING FABRICATION
3. ROLLED SECTIONS AND STEEL PLATE SHALL CONFORM TO CSA STANDARD G40.21 GRADE 300W.
4. ANCHOR RODS SHALL CONFORM TO ASTM A193 TYPE B7. THEY SHALL BE SUPPLIED COMPLETE WITH MATCHING WASHERS AND HEAVY HEX NUTS.
5. WELDING SHALL CONFORM TO CSA STANDARD W59 AND SHALL BE PERFORMED BY A WELDER QUALIFIED UNDER CSA STANDARD W47.
6. ALL STEEL SHALL BE GIVEN ONE (1) PRIME COAT AND ONE (1) FINISH COAT OF PAINT AFTER FABRICATION. TOP COAT COLOUR SHALL BE GREY.
7. ENGINEER TO INSPECT THE FRAME PRIOR TO IT BEING LIFTED IN PLACE, PREFERABLY AT THE SITE OF MANUFACTURE.
8. ANY CONCRETE DAMAGE DONE TO THE EXISTING ARCH REMOVAL / ACCIDENT SHALL BE PATCH REPAIRED WITH CONCRETE PATCHING MATERIAL SUITABLE FOR THE APPLICATION AND WEATHER CONDITIONS. EXPOSED REINFORCEMENT FROM THE OVERHEAD CROSS BRACE ONLY TO BE CUT FLUSH AND PATCHING MATERIAL APPLIED (MIN. 25mm COVER).

No.	REVISION	DATE

DESIGNED BY: A.G.
CHECKED BY: D.H.
DRAWN BY: D.C.P.
CHECKED BY: A.G.
FIELD BOOK:

SCALE
N.T.S

LICENSED PROFESSIONAL ENGINEER
A. L. GARNHAM
100123077
PROVINCE OF ONTARIO

BRIDGE 21-WG REPAIR

TOWNSHIP OF CENTRE WELLINGTON — COUNTY OF WELLINGTON

OVERHEAD SUPPORT BEAM REPLACEMENT

K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS AND PLANNERS
KITCHENER NEW LISKEARD SUDBURY RAINY RIVER

JOB NUMBER
13-001
DATE
JANUARY 2013
DRAWING NUMBER
1

\\server\data\2013\13-001\Drafting\OVERHEAD SUPPORT BEAM.dwg DETAIL 16-Jan-13 11:39:16 AM

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Appendix C

Closure Notification 21-WG

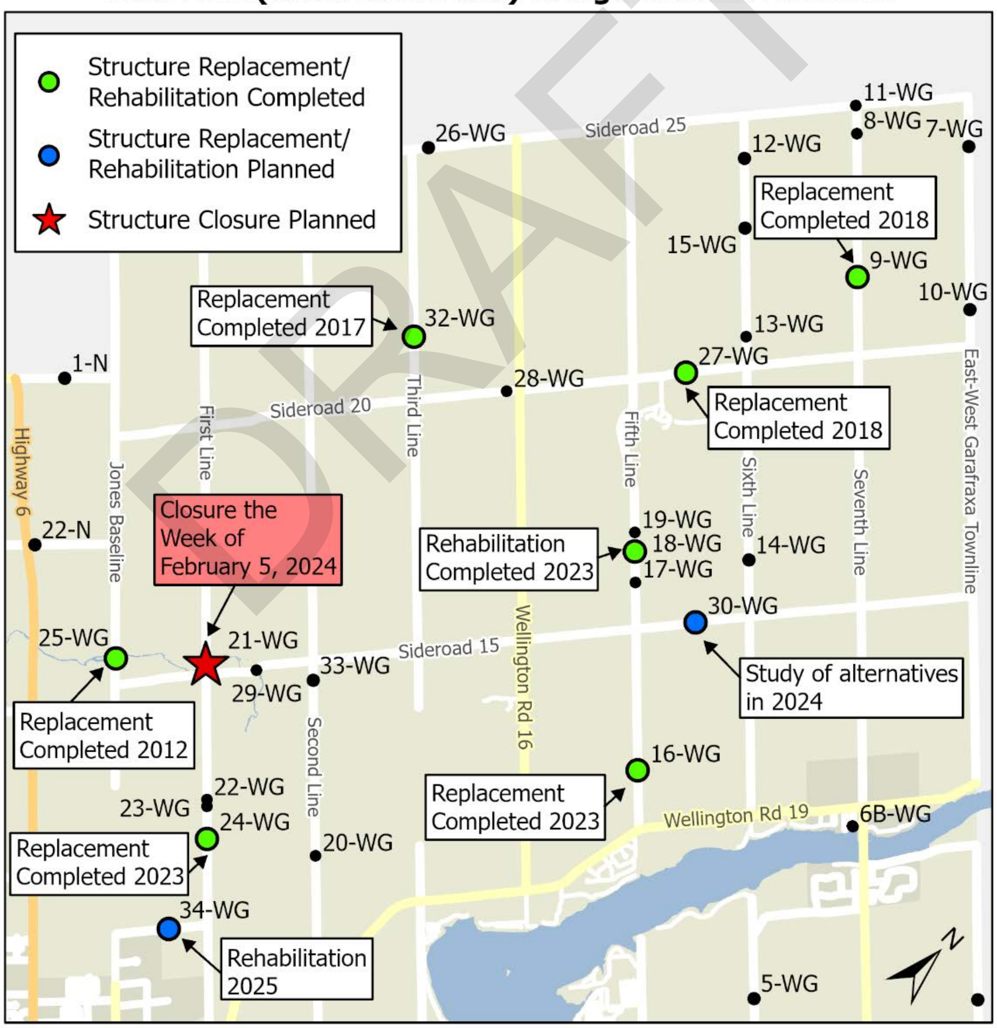
January 15, 2024

Dear Sir / Madam,

Re: Notification of Bridge Closure on First Line (former West Garafaxa Township)

Due to structural deterioration and as a measure to ensure public safety, the **First Line bridge (Bridge 21-WG), between Sideroad 20 and Sideroad 15**, will be closed during the **week of February 5, 2024**. The bridge location is displayed in the map below:

First Line (West Garafraxa) Bridge Closure Location



The Township's bridge engineering consultants conduct regular inspection and monitoring of the condition of Bridge 21-WG, and based on recent observations, it has been determined that this bridge is at the end of its service life and must be closed. Closure signage and dead-end roadway barriers will be constructed by the Township in advance of the closure.

The Township is regretful for the inconvenience that this bridge closure will cause. This bridge and other bridges in the area are planned for replacement and rehabilitation in the Township's capital forecast. These planned projects include:

- A study of alternatives for the closed bridge Sideroad 15 (Bridge 30-WG) between Fifth Line and Sixth Line in 2024;
- Rehabilitation of the open culvert on Sideroad 10 (Bridge 34-WG) between Gartshore St and First Line in 2025;
- Replacement of the open bridge on Sideroad 15 (Bridge 29-WG) between Fifth Line and Sixth Line in 2031; and,
- Replacement of the subject bridge (Bridge 21-WG) in 2032.

Note that the bridge on First Line (Bridge 24-WG) between Sideroad 15 and Sideroad 10, and the bridge on Fifth Line (Bridge 16-WG) between Wellington Road 19 and Sideroad 15 were both replaced and re-opened in late 2023. Since 2014, the Township has completed 11 bridge replacements and 16 major rehabilitations.

If you have any questions or concerns regarding the bridge closure please contact the Township's Manager of Engineering, **Adam Gilmore** at **519.846.9691 ext. 301**, or by email at **agilmore@centrewellington.ca**.

Sincerely,

Adam Gilmore, P.Eng.
Manager of Engineering
Township of Centre Wellington

Appendix D

Original Drawings 29-WG


HALF LONGITUDINAL SECTION
HALF ELEVATION
HALF CROSS SECTION
HALF END ELEVATION
6"x6" Precast Rails
Panels 1" deep
Chamfer all edges
Mouldings around panels
Chamfer all edges of rib
Lay tar paper for expansion.
Abutments to be smooth & level
Lay tar paper & brass between steel plates for expansion.
HALF PLAN OF ARCH RIB SHOWING STEEL AT TOP
HALF PLAN OF ARCH RIB SHOWING STEEL AT BOTTOM
Note. Bars are located by distances of ends from ℄ measured along the top or bottom of Rib, thus (20-46)
2-1½"φ pins 12" wired securely to long. steel.
¼"φ bands around steel (s) as shown (about every 2')
4-¾"φ hangers, hooked snugly around pins at top & bottom.
Tie around ends of hooks to prevent spreading. (top & bottom)
Place steel in Arch Ribs 2" from top & 2" from bottom.
" " " beams 2" & 4" from bottom & bend up ends as shown
" " " slab 1" from bottom & 1" from top over beams.
Top 1" of slab to be of 1:1¾ mortar, placed with slab or before it sets.
Finish to crown & camber using template & roller.
Slab & beams must be poured together. Any break to be against vertical form at centre of slab.
Before pouring floor set up hangers, braced plumb in ctr line of rib
Set main tie rods in line, blocked up to prevent sagging, adjust length so all bear on end pins. Floor may be cast before ribs, but space must be blocked out where ribs enter, so ribs may be cast without a break at ends. Rib is to be broken near centre by pouring against forms square with axis, pouring uniformly from each end to contraction joint which is to be filled after rib has set
Follow figures regardless of scale. For Substructure See Dwg # G35.
Follow specifications.
¼"φ wire stirrups (s) around steel
DETAILS OF STEEL
Scale :- 1" = 2'-0"
HALF FLOOR PLAN
Showing Rib cut off
TOP STRUT
Concrete in Arch Ribs (1:1¾:3½) = 28.0 cu. yds.
" " Hangers, Posts, Railing & Strut = 7.0
" " Slab, Curbs, beams & Coping (1:2:4) = 57.2
Total 92.2
Tie rods & hangers = 8000 lbs
R. Steel (Superst) 13000 "
3379-2
SUPERSTRUCTURE FOR A
70' x 18' CONCRETE ARCHED TRUSS
FOR THE
LIVING SPRINGS BRIDGE
AT LOT #15 CONCESSION #2 TOWNSHIP OF W. GARAFRAXA ROAD #15
FOR THE
TOWNSHIP OF WEST GARAFRAXA
Scale:- 1" = 4'-0"
A.W. CONNOR & CO. ENG'RS
301 Metropolitan Bldg. TORONTO.
July /28
DWG # C-6-9

35-202

SITE MAP
#35-202

Appendix E

Load Posting Notice – 29-WG

Centre Wellington

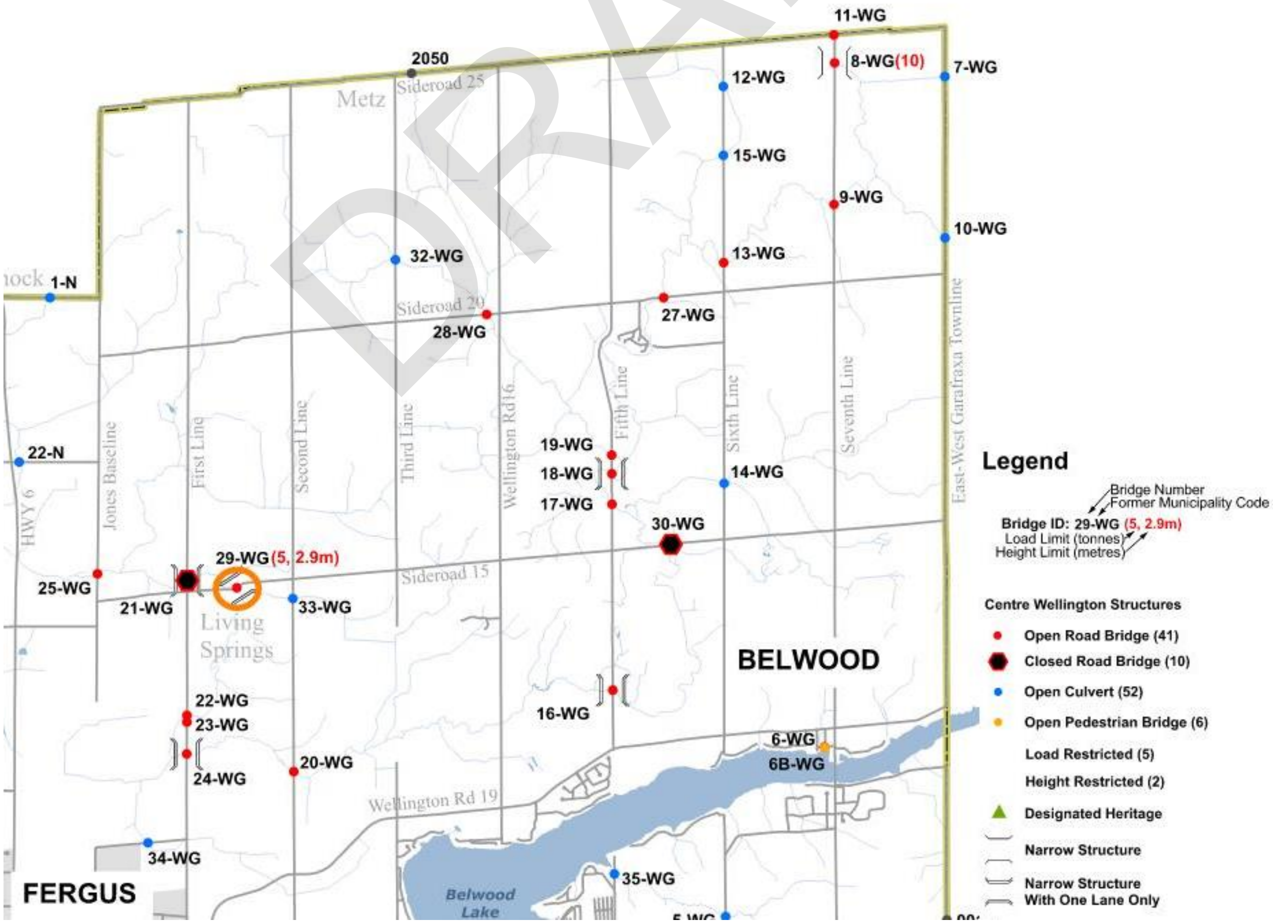
December 9, 2024

Dear Sir / Madam,

Re: Notification of a Required Bridge Load Reduction on Sideroad 15 (former West Garafraxa Township)

Due to structural deterioration and as a measure to ensure public safety, the **Sideroad 15 bridge (Bridge 29-WG), between First Line and Second Line**, will have a 5-tonne maximum load restriction and a vehicle height restriction imposed the **week of December the 16th**. The bridge location is displayed within the orange circle on the map illustrated below.

Sideroad 15 (West Garafraxa) Bridge Load Restriction Location



The Township's bridge engineering consultants conduct regular inspection and monitoring of the condition of Bridge 29-WG, and based on recent observations, it has been determined that the current load restriction must be reduced to ensure that the bridge can remain in service. The current multi-load truck type, maximum tonnage restriction of 15-28-29 is to be reduced to a maximum of 5 tonnes. Additionally, a physical height limiter will be installed to only allow lighter vehicles, such as passenger cars and pick-up trucks to cross the bridge. The height limiter and associated load restriction signage will be installed during the week of December 16, 2024.

The Township is regretful for the inconvenience that these changes will cause; however, this bridge and other bridges in the area are planned for replacement and rehabilitation in the Township's Bridges and Major Culverts 10-Year Forecast. In 2025, the Township will initiate a study for Bridges 21-WG, 29-WG, and 30-WG to establish a long-term solution for these bridges.

Since 2014, the Township has completed 11 bridge replacements and 15 major rehabilitations.

If you have any questions or concerns regarding these changes please contact the Township's Manager of Engineering, **Adam Gilmore** at **519.846.9691 ext. 301**, or by email at **agilmore@centrewellington.ca**.

Sincerely,

Adam Gilmore, P.Eng.
Manager of Engineering
Township of Centre Wellington

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

Vehicle Collision Damage Assessment 30-WG

MRC

December 20, 2010

Township of Centre Wellington
1 MacDonald Square, P.O. Box 10
Elora, ON
N0B 1S0

Attention: Mr. Adam Dickieson
Engineering Services Coordinator

RE: Structure No. WG-30
Vehicle Collision Damage Assessment
MRC File No. 3210188-000

Dear Sir,

As requested, McCormick Rankin Corporation (MRC) has undertaken a visual inspection and assessment of Township Structure WG-30 following damage to the bridge from a recent vehicle collision. This letter presents our assessment and recommendations for the damaged structure based on this inspection which took place on December 8th, 2010.

The bridge is located on Sideroad 15, 0.7 km West of Sixth Line. It is a single span steel through-truss type with an exposed reinforced concrete deck. The superstructure was moved to the current location in 1942 after salvaging it from Wellington Road 26 in Belwood. The estimated age of the superstructure is circa 1930. The abutments were likely constructed in 1942 when the superstructure was moved to this site.

The structure has a span of approximately 26 metres and an overall width of 6.7 m. There is a load restriction with a triple posting of 13/19/23 tonnes.

The 2008 biennial bridge inspection report indicates previous rehabilitations in 1986 and 2006 and repairs to the west portal bracing and top chords of the trusses following a vehicle collision in 1992.

It is understood that the vehicle damage occurred on December 3rd, 2010. The Township subsequently closed the bridge to traffic and has erected 'Dead End' signs and temporary concrete barriers at both approaches.

Damage observed during the inspection near the east end portal where the vehicle collision occurred includes the following:

- Fracture and severe deformation of the end diagonal of the top chord of both north and south trusses;

- Severe deformation of the top chord and gusset plate at the end diagonal - top chord joint of both trusses;
- Fractured connection and severe deformation of the top portal bracing members;
- Severe deformation of the first east vertical of both trusses;
- Severe deformation of the first diagonal from the east in both trusses;
- Severe deformation of the east bay of the top chord cross bracing members;
- Severe deformation of the fixed bearing connection assemblies at the east abutment which include gusset plates, bearing plates and anchor bolts;
- Fracture and severe deformation of the steel railing posts at the east end.

The damage to the east end of the structure is severe and the end diagonals, in their current condition, are not capable of transmitting the required compression force in the top chords of the trusses to the bearings.

In our opinion, the bridge in its current condition is unsafe and could potentially collapse under its own weight. Therefore, it is recommended that the bridge be permanently closed and removed for public safety.

In addition to closing the bridge, the following work is recommended in accordance with the Ontario Traffic Manual and for public safety:

- Installation of barricades and road terminal signs (checker board sign Wa-108) on the bridge approaches in accordance with OPSD 912.532;
- Installation of 'Road Closed' signs (Rb-92) on the approaches to the barricades;
- Installation of 'No Exit' signs (Wa-31) on the Sideroad 15 at the intersection of Sixth Line and at the intersection of Fifth Line.
- Construction of temporary snow fence, preventing pedestrian access to the bridge, across the road and embankments, at the bridge abutments, if the bridge is to be replaced within two years or construction of chain link fence instead of snow fence if the bridge is not to be replaced within two years.

If you have any questions or require any additional information, please do not hesitate to call the undersigned at (905) 823-8500, ext. 1231 (email: bstofko@mrc.ca).

Yours very truly,

McCormick Rankin Corporation

Bob Stofko, P. Eng.
Senior Project Manager, Bridges

Enclosures
File: W:\2010\32\3210188 Structure 30-WG Accident Damage\3210188.300-Structural\3210188 jp letter re accident damage assessment 101209.doc

Township of Centre Wellington
Structure WG-30
Accident Damage, December 3rd, 2010

North Elevation

East end portal

Township of Centre Wellington
Structure WG-30
Accident Damage, December 3rd, 2010

North Truss, Looking West

South Truss, Looking West

Southeast Bearing

Fracture on North truss, East end diagonal at portal frame joint

Fracture on South truss, East end diagonal at portal frame joint

Top chord cross bracing at East end

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Appendix G

OSIM Reports 21-WG, 29-WG, 30-WG

Appendix G

Structure Condition Summary Form

Structure Name 21 - WG
Structure Number 21 - WG
Date of Inspection April 01, 2024
Project No. 18015
Consultant HP Engineering Inc.

Element Group	Element Name	Unit (Qty.)	Unit Price (MTO)	Total Element Quantity	Element Qty. in Excellent Condition (1.00)	Element Quantity in Good Condition (0.75)	Element Quantity in Fair Condition (0.4)	Element Quantity in Poor Condition (0)	Total Replacement Value (TRV)	Current Element Value (CEV)	Element Condition Index	Performance Deficiency	Maintenance Need
Approaches	Wearing Surface	Sq.m	6.00	60.00	0.00	52.00	4.00	4.00	360	244	68	00	18
Barriers	Railing Systems	m	200.00	68.60	0.00	56.60	8.00	4.00	13720	9130	67	08	00
	Posts (Steel/Concrete)	Each	200.00	16.00	0.00	10.00	3.00	3.00	3200	1740	54	08	00
Trusses/ Arches	Top Chords	Sq.m	300.00	147.20	0.00	122.20	15.00	10.00	44160	29295	66	00	08
	Verticals	Sq.m	300.00	6.88	0.00	0.00	3.44	3.44	2064	413	20	01	00
	Bottom Chords	Sq.m	300.00	113.98	0.00	63.98	25.00	25.00	34194	17396	51	01	00
Decks	Deck Top - Thin Slab	Sq.m	120.00	95.00	0.00	65.00	15.00	15.00	11400	6570	58	00	00
	Soffit - Thin Slab	Sq.m	120.00	88.50	0.00	58.50	15.00	15.00	10620	5985	56	00	00
Beams/ Main Longitudinal	Floor Beams - Concrete	Sq.m	200.00	60.18	0.00	47.18	6.50	6.50	12036	7597	63	00	00
Abutment	Wingwalls	Sq.m	350.00	64.00	0.00	15.60	30.60	17.80	22400	8379	37	00	00
	Bearings	Each	1000.00	4.00	0.00	2.00	2.00	0.00	4000	2300	58	00	00
	Abutment Walls	Sq.m	900.00	34.22	0.00	7.00	17.22	10.00	30798	10924	35	01	00
									188952	99972			

Bridge Condition Index (BCI) **53**

Structure Name 21-WG

FIRST LINE

HP Engineering

Municipal Structure Inspection Form

MTO Site Number: 35-201

BCI: 53.00

Inventory Data:

Structure Name:	21-WG				
Main Hwy/Road #		On ☑ Under ☐	Crossing Type:	Navig. Water ☑ Rail ☐ Road ☐	Non-Navig Water ☐ Ped. ☐ Other ☐
Road Name	First Line				
Structure Location	0.17 km North of Sideroad 15				
Latitude	N 43° 45' 14.2"		Longitude	W 80° 24' 31.5"	
Owner(s)	Township of Centre Wellington		Heritage Designation	Not Cons. ☐ List/not Desig. ☐	Cons. /not App ☐ Desig./not List ☐ Desig.& List ☐
MTO Region *	-	-	Road Class	Freeway ☐ Arterial ☐	Collector ☐ Local ☑
MTO District *	-	-	Posted Speed	80	No. of Lanes: 2
Current County*	-	-	AADT		% Trucks
Geographic Twp. *		West Grarafraxa	Special Routes:	Transit ☐ Truck ☐	School ☐ Bicycle ☐
Structure Type*	1	Bowstring Arch	Detour Length	9	(km)
Total Deck Length	19.2	(m)	Fill on Structure		(m)
Overall Str. Width	5.7	(m)	Skew Angle		(degrees)
Total Deck Area	110.2	(sq. m)	Direction of Structure	N-S	
Roadway Width	4.9	(m)	No. of Spans	1	
Span Lengths.	18.0	(m)			

Historical Data:

Year Built	1929		Last Biennial Inspection	May 01, 2022
Current Load Limit	10	(tonnes)	Last BridgeMaster Inspection	
Load Limit By-Law #			Last Evaluation	
By-Law Expiry Date			Last Underwater Inspection	
Min. Vertical Clearance	4.00	(m)	Last Condition Survey	

Rehab History : (Date/description)

Municipal Structure Inspection Form **MTO Site Number:** **35-201**

Field Inspection Information:

Date of Inspection:	April 01, 2024
Inspector:	Tashi Dwivedi, P.Eng., (HP Engineering)
Others in Party:	Sagar Chhayani, EIT, Tusharkumar Khunt, B.Tech. (HP Engineering)
Equipment Used:	Hammer, tape, hipwaders, camera
Weather	Cloudy
Temperature	10 °C

Additional Investigations Required	Priority			Estimated Cost
	None	Normal	Urgent	
Detailed Deck Condition Survey:	☐	☑	☐	$15,000.00
DART Survey:	☑	☐	☐	
Detailed Coating Condition Survey:	☑	☐	☐	
Underwater Investigation	☑	☐	☐	
Fatigue Investigation:	☑	☐	☐	
Seismic Investigation:	☑	☐	☐	
Structure Evaluation:	☐	☑	☐	$17,500.00
Monitoring Deformation	☐	☑	☐	$3,500.00
Load Posting - Estimated Load 0			Total Cost	$36,000.00

Special Notes:
No approach barrier observed, and the existing deck barrier is substandard. Code compliant approach and deck barrier should be installed. Severe erosion noted at the north abutment. The south abutment footing appears to have settled. Should monitor the structure. Spalls with exposed corroded reinforcement and cracks noted on deck barrier and deck soffit. Large areas of delaminations, cracks with efflorescence and spall with exposed corroded reinforcement noted on floor beams. It is recommended that a repalcement / rehabilitation study be performed ($22,000.00)

Next Detailed Inspection: April 2026

Municipal Structure Inspection Form **MTO Site Number:** **35-201**

Repair and Rehabilitation Required		**Priority**				**Estimated Construction Cost**
Element	Repair and Rehabilitation Required	6-10 years	1 - 5 years	Within 1 year	Urgent	
	Replace structure	☐	☑	☐	☐	$1,584,000.00
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
						$1,584,000.00

Associated Work:	Comments	**Estimated Cost**
Approaches		
Detours	Required	$100,000.00
Traffic Control	Required	$60,000.00
Utilities		
Right of Way		
Environmental Study	Approvals	$10,000.00
Other		
Contingencies		
	Total Cost	$170,000.00

Justification

Estimated cost is based on replacement structure being the same size as the existing.

Construction Cost	$1,584,000.00
Associated Costs	$ 170,000.00
TOTAL Estimated Cost	$1,754,000.00

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	900	Abutments			**Length**	5.90
Element Name	901	Abutment Walls			**Width**	
Location	North & South Underside of Structure				**Height**	2.90
Material	Cast-in-place concrete				**Count**	2
Element Type	Conventional closed		**Element code**	1	**Total Qnty.**	34.22
Environment	Moderate				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**: Sq. m.	**Ex.**: 0	**Good**: 7	**Fair**: 17.22	**Poor**: 10	1 Load Carrying capacity

Comments:
Medium to severe scaling and wide cracks noted on both abutments. Wide cracks observed near the southwest & northeast arch corners. Severe erosion of concrete noted at north abutment. South abutment appears to be rotated inwards.

Recommended Work: Rehab ☐ Replace ☒ Urgent ☐ 1-5 yrs ☒ 6-10 yrs ☐ **Maint. Needs** - - Urgent ☐ 1 year ☐

Element Group	900	Abutments			**Length**	
Element Name	904	Bearings			**Width**	
Location	North & South Underside fo Structure				**Height**	
Material	Steel				**Count**	4
Element Type	Plate		**Element code**	6	**Total Qnty.**	4
Environment	Moderate				**Limited Insp.**	X
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**: Each	**Ex.**: 0	**Good**: 2	**Fair**: 2	**Poor**: 0	- -

Comments:
Bearings not visible at the time of inspection due to fill on the wingwalls. Assumed to be generally in good to fair condition.

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐ **Maint. Needs** - - Urgent ☐ 1 year ☐

Element Group	900	Abutments			**Length**	8.00
Element Name	903	Wingwalls			**Width**	
Location	NE, NE, SW & SE of Structure				**Height**	2.00
Material	Cast-in-place concrete				**Count**	4
Element Type	Reinforced concrete		**Element code**	6	**Total Qnty.**	64
Environment	Moderate				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**: Sq. m.	**Ex.**: 0	**Good**: 15.6	**Fair**: 30.6	**Poor**: 17.8	- -

Comments:
Medium to severe scaling and wide cracks noted on the southeast wingwall. Moderate honeycombing and Moderate to localized severe scaling and narrow to medium cracks with damp stains noted on all wingwalls. Severe erosion observed at the base of the northwest wingwall. Wide crack, severe scaling and moderate honeycombing noted at northeast wing wall.

Recommended Work: Rehab ☐ Replace ☒ Urgent ☐ 1-5 yrs ☒ 6-10 yrs ☐ **Maint. Needs** Urgent ☐ 1 year ☐

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	1500	Signs			**Length**	
Element Name	1501	Sign			**Width**	
Location	NE, NW, SE & SW of Structure				**Height**	
Material	Steel				**Count**	8
Element Type	4 Hazard Signs, 2 Load Posting Signs 2 Height Clearance Signs		**Element code**	N/A	**Total Qnty.**	8
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	- / -
	Each	0	8	0	0	

Comments:
Signs are generally in good condition. The northeast and southeast hazard sign were bent at the time of inspection.

Recommended Work:	Rehab ☐	Replace ☐	**Maint. Needs**	- / -
	Urgent ☐	1-5 yrs ☐ 6-10 yrs ☐	Urgent ☐	1 year ☐

Element Group	1600	Approaches			**Length**	6.00
Element Name	1601	Wearing surface (app)			**Width**	5.00
Location	North & South of Structure				**Height**	
Material	Gravel				**Count**	2
Element Type	N/A		**Element code**	N/A	**Total Qnty.**	60
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	- / -
	Sq. m.	0	52	4	4	

Comments: Loose gravel noted throughout and vegetation grown at shoulders. Wearing surface to be regraded at south side and generally in good condition. Roadway is closed at sideroad 15 and 1st line intersection. Small potholes and loose gravel at edge of shoulder noted at north approach wearing surface. Severe erosion noted near deck end at northwest corner.

Recommended Work:	Rehab ☐	Replace ☐	**Maint. Needs**	18 / Regrade Approaches
	Urgent ☐	1-5 yrs ☐ 6-10 yrs ☐	Urgent ☐	1 year ☒

Element Group	400	Barriers			**Length**	0.28
Element Name	403	Posts			**Width**	0.25
Location	East & West Sides of Structure				**Height**	1.05
Material	Cast-in-place concrete				**Count**	16
Element Type	N/A		**Element code**	N/A	**Total Qnty.**	16
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	- / 08
	Each	0	10	3	3	

Comments:
Abrasion damage, spalls, and wide stained cracks with exposed corroded reinforcement observed on multiple posts. Existing barrier does not meet current standards and should be replaced with a code complaint barrier. Northwest posts is detached and damaged.

Recommended Work:	Rehab ☐	Replace ☒	**Maint. Needs**	
	Urgent ☐	1-5 yrs ☒ 6-10 yrs ☐	Urgent ☐	1 year ☐

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	400	Barriers		**Length**	2.45
Element Name	402	Railing Systems		**Width**	0.15
Location	East & West Side of Structure			**Height**	0.15
Material	Cast-in-place concrete			**Count**	28
Element Type	Concrete post and bars	**Element code**	6	**Total Qnty.**	68.6
Environment	Severe			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				-	08

Condition Data	Units	Ex.	Good	Fair	Poor
	m.	0	56.6	8	4

Comments: Spalls with exposed corroded reinforcement and medium to wide crack observed on railing. Existing barrier does not meet current standards and should be replaced with a code compliant barrier. A code compliant approach barrier should be installed.

Recommended Work:				**Maint. Needs**	-	-
Rehab ☐	Replace ☒					
Urgent ☐	1-5 yrs ☒	6-10 yrs ☐		Urgent ☐	1 year ☐	

Element Group	500	Beams/MLE's		**Length**	5.90
Element Name	502	Floor Beams		**Width**	0.30
Location	Underside of Structure			**Height**	0.40
Material	Cast-in-place concrete			**Count**	6
Element Type	Rectangular-solid	**Element code**	4	**Total Qnty.**	60.18
Environment	Moderate			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				-	-

Condition Data	Units	Ex.	Good	Fair	Poor
	Sq. m.	0	47.18	6.5	6.5

Comments:
Large areas of delaminations, narrow cracks with efflorescence and spalls with exposed corroded reinforcement noted at ends of floor beams. Barn swallow nests also observed along the length of floor beam.

Recommended Work:				**Maint. Needs**	-	-
Rehab ☐	Replace ☒					
Urgent ☐	1-5 yrs ☒	6-10 yrs ☐		Urgent ☐	1 year ☐	

Element Group	100	Decks		**Length**	19.00
Element Name	102	Deck top		**Width**	5.00
Location	Top of Deck			**Height**	
Material	Cast-in-place concrete			**Count**	1
Element Type	Cast-in-place conc on supports, composite	**Element code**	1	**Total Qnty.**	95
Environment	Severe			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				-	-

Condition Data	Units	Ex.	Good	Fair	Poor
	Sq. m.	0	65	15	15

Comments:
Moderate to severe scaling and few medium transverse and longitudinal cracks observed.

Recommended Work:				**Maint. Needs**		
Rehab ☐	Replace ☒					
Urgent ☐	1-5 yrs ☒	6-10 yrs ☐		Urgent ☐	1 year ☐	

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	100	Decks	**Length**	17..7
Element Name	103	Soffit Thin Slab	**Width**	5.00
Location	Underside of Deck		**Height**	
Material	Cast-in-place concrete		**Count**	1
Element Type	N/A	**Element code** N/A	**Total Qnty.**	88.5
Environment	Benign		**Limited Insp.**	
Protection System	None		**Suspected Performance Deficiencies**	
			-	-

Condition Data Units	Ex.	Good	Fair	Poor
Sq. m.	0	58.5	15	15

Comments:
Large area of delaminations, medium cracks with area of efflorescence and severe spalls with exposed corroded reinforcement noted throughout. Multiple bar swallow nests noted on bridge deck near beam. Narrow crack with efflorescence at soffit exterior interface.

Recommended Work:				**Maint. Needs**	
Rehab ☐	Replace ☒				
Urgent ☐	1-5 yrs ☒	6-10 yrs ☐		Urgent ☐	1 year ☐

Element Group	1400	Embankments and Streams	**Length**	
Element Name	1402	Embankments	**Width**	
Location	NE, NW, SE & SW of Structure		**Height**	
Material	Other		**Count**	4
Element Type	N/A	**Element code** N/A	**Total Qnty.**	4
Environment	-		**Limited Insp.**	
Protection System	None		**Suspected Performance Deficiencies**	
			-	-

Condition Data Units	Ex.	Good	Fair	Poor
Each	0	0	4	0

Comments:
Erosion observed at all four corners. Moderately sloped and well vegetated embankments.

Recommended Work:				**Maint. Needs**	13 Erosion Control at Bridges
Rehab ☐	Replace ☐				
Urgent ☐	1-5 yrs ☐	6-10 yrs ☐		Urgent ☐	1 year ☒

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	1400	Embankments and Streams			**Length**	
Element Name	1401	Streams and Waterways			**Width**	
Location	Below Structure				**Height**	
Material	Native				**Count**	1
Element Type	N/A		**Element code**	N/A	**Total Qnty.**	1
Environment	-				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	All	0	1	0	0

Suspected Performance Deficiencies: - | -

Comments:
Moderate volume, low flow from East to West with no obstructions observed.

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐

Maint. Needs - | -
Urgent ☐ 1 year ☐

Element Group	1300	Foundations			**Length**	
Element Name	1301	Foundation (below ground level)			**Width**	
Location	Below Abutment Walls				**Height**	
Material	Unknown				**Count**	
Element Type	Unknown		**Element code**		**Total Qnty.**	1
Environment	Benign				**Limited Insp.**	X
Protection System	None				**Suspected Performance Deficiencies**	

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	N/A	0	0	0	1

Suspected Performance Deficiencies: 1 | Load Carrying capacity

Comments:
South abutment has noticeably settled (Top of wingwalls and footings are inclined at 15 degrees).

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐

Maint. Needs - | -
Urgent ☐ 1 year ☐

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-201**

Element Data

Element Group	600	Trusses/Arches			**Length**	20.50
Element Name	602	Bottom chords			**Width**	0.42
Location	East & West Side of Structure				**Height**	0.55
Material	Cast-in-place concrete				**Count**	2
Element Type	Rectangular-solid		**Element code**		**Total Qnty.**	113.98
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	1 Load Carrying capacity
	Sq. m.	0	63.98	25	25	

Comments:
Spalls on underside with exposed reinforcing steel. Long wide crack near mid span on exterior face of both chords. Medium to wide longitudinal crack with efforesnce and delaminations obeved on the interior face of chords.

Recommended Work:	Rehab ☐	Replace ☒	**Maint. Needs** -	-
	Urgent ☐	1-5 yrs ☒ 6-10 yrs ☐	Urgent ☐	1 year ☐

Element Group	600	Trusses/Arches			**Length**	23.00
Element Name	601	Top chords			**Width**	0.45
Location	East & West Side of Structure				**Height**	0.70
Material	Cast-in-place concrete				**Count**	2
Element Type	Rectangular-solid		**Element code**		**Total Qnty.**	147.2
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	- -
	Sq. m.	0	122.2	15	10	

Comments: Localized spalls with exposed corroded reinforcement. Medium to wide cracks with area of heavy efflorescence on inside and underside face of east arch. Light to moderate scaling observed throughout. Small spall with exposed corroded reinforcement at northeast underside of arch. Steel bracing appear to be generally in good condition with localized light corrosion and coating failure.

Recommended Work:	Rehab ☐	Replace ☐	**Maint. Needs** 08	Repair of bridge concrete
	Urgent ☐	1-5 yrs ☐ 6-10 yrs ☐	Urgent ☐	1 year ☒

Element Group	600	Trusses/Arches			**Length**	0.20
Element Name	603	Verticals/diagonals			**Width**	0.20
Location	East & West Side of Structure				**Height**	1.75
Material	Cast-in-place concrete				**Count**	8
Element Type	Rectangular-solid		**Element code**		**Total Qnty.**	6.88
Environment	Severe				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	1 Load Carrying capacity
	Sq. m.	0	0	3.44	3.44	

Comments:
Severe delaminations and spalls with exposed reinforcement observed on most verticals.

Recommended Work:	Rehab ☐	Replace ☒	**Maint. Needs** -	-
	Urgent ☐	1-5 yrs ☒ 6-10 yrs ☐	Urgent ☐	1 year ☐

Photo 1 Structure from north approach

Photo 2 Structure from south approach

Photo 3 North approach from centre of structure

Photo 4 South approach from centre of structure

Photo 5 East elevation

Photo 6 West elevation

Photo 7 South approach wearing surface

Photo 8 Moderate to severe scaling on visible portion of exposed deck top.

Photo 9 Typical view of southwest hazard sign

Photo 10 Wide cracks with efflorescence on east concrete arch.

Photo 11 Spall with exposed corroded reinforcement on east truss vertical.

Photo 12 Erosion and wide cracks noted at north abutment.

Photo 13 South abutment wall appears to be rotated inwards.

Photo 14 Southeast corner of foundation appears to have settled.

Photo 15 Typical view of underside of structure

Photo 16 Wide cacks with stains and spall noted on east exterior soffit

Photo 17 Wide cracks, spall and severe scaling noted on northwest wingwall

Photo 18 Delaminations, medium cracks with area of efflorescence and severe spalls with exposed corroded reinforcement noted soffit

Photo 19 Severe erosion observed at the base of the northwest wingwall.

Photo 20 delaminations, narrow cracks with efflorescence and spalls with exposed corroded reinforcement noted at ends of floor beams

Structure Condition Summary Form

Structure Name 29 - WG
Structure Number 29 - WG
Date of Inspection April 01, 2024
Project No. 18015
Consultant HP Engineering Inc.

Element Group	Element Name	Unit (Qty.)	Unit Price (MTO)	Total Element Quantity	Element Qty. in Excellent Condition (1.00)	Element Quantity in Good Condition (0.75)	Element Quantity in Fair Condition (0.4)	Element Quantity in Poor Condition (0)	Total Replacement Value (TRV)	Current Element Value (CEV)	Element Condition Index	Performance Deficiency	Maintenance Need
Approaches	Wearing Surface	Sq.m	6.00	66.00	0.00	58.00	4.00	4.00	396	271	68	09	18
Barriers	Railing Systems	m	200.00	61.60	0.00	56.60	5.00	0.00	12320	8890	72	08	00
	Posts (Steel/Concrete)	Each	200.00	16.00	0.00	14.00	1.00	1.00	3200	2180	68	08	08
Trusses/ Arches	Top Chords	Sq.m	300.00	173.90	0.00	151.90	12.00	10.00	52170	35618	68	00	00
	Verticals	Sq.m	300.00	12.77	0.00	8.77	2.00	2.00	3831	2213	58	00	00
	Bottom Chords	Sq.m	300.00	120.96	0.00	70.96	25.00	25.00	36288	18966	52	01	00
Decks	Deck Top - Thin Slab	Sq.m	120.00	118.80	0.00	0.00	71.28	47.52	14256	3421	24	09	00
	Soffit - Thin Slab	Sq.m	120.00	117.15	0.00	87.86	17.57	11.72	14058	8751	62	00	00
Beams/ Main Longitudinal	Floor Beams - Concrete	Sq.m	200.00	63.36	0.00	0.00	31.68	31.68	12672	2534	20	01	00
Abutment	Wingwalls	Sq.m	350.00	33.60	0.00	21.60	8.00	4.00	11760	6790	58	00	00
	Bearings	Each	1000.00	2.00	0.00	0.00	2.00	0.00	2000	800	40	00	00
	Abutment Walls	Sq.m	900.00	35.84	0.00	18.84	10.00	7.00	32256	16317	51	01	00
									195207	106751			

Bridge Condition Index (BCI) **55**

Structure Name 29-WG

SIDEROAD 15

HP Engineering

Municipal Structure Inspection Form — **MTO Site Number:** 35-202

BCI: 55.00

Inventory Data:

Structure Name:	29-WG		
Main Hwy/Road #		On ☑ Under ☐	Crossing Type: Navig. Water ☑ Non-Navig Water ☐ Rail ☐ Ped. ☐ Road ☐ Other ☐
Road Name	Sideroad 15		
Structure Location	0.7 km West of Second Line		
Latitude	N 43° 45' 26.3"	Longitude	W 80° 24' 09.5"
Owner(s)	Township of Centre Wellington	Heritage Designation	Not Cons. ☐ Cons. /not App ☐ List/not Desig. ☐ Desig./not List ☐ Desig.& List ☐
MTO Region *	- | -	Road Class	Freeway ☐ Collector ☐ Arterial ☐ Local ☑
MTO District *	- | -	Posted Speed	80 | No. of Lanes: 2
Current County*	- | -	AADT	39 | % Trucks 0.00%
Geographic Twp. *	West Grarafraxa	Special Routes:	Transit ☐ School ☐ Truck ☐ Bicycle ☐
Structure Type*	1 | Bowstring Arch	Detour Length	9 (km)
Total Deck Length	22.6 (m)	Fill on Structure	(m)
Overall Str. Width	6.4 (m)	Skew Angle	(degrees)
Total Deck Area	144.4 (sq. m)	Direction of Structure	E-W
Roadway Width	5.6 (m)	No. of Spans	1
Span Lengths.	21.4 (m)		

Historical Data:

Year Built	1928	Last Biennial Inspection	May 01, 2022
Current Load Limit	Bridge is Closed (tonnes)	Last BridgeMaster Inspection	
Load Limit By-Law #		Last Evaluation	
By-Law Expiry Date		Last Underwater Inspection	
Min. Vertical Clearance	4.00 (m)	Last Condition Survey	

Rehab History : (Date/description)

HP Engineering

Municipal Structure Inspection Form **MTO Site Number:** **35-202**

Field Inspection Information:

Date of Inspection:	April 01, 2024
Inspector:	Tashi Dwivedi, P.Eng., (HP Engineering)
Others in Party:	Sagar Chhayani, EIT, Tusharkumar Khunt, B.Tech. (HP Engineering)
Equipment Used:	Hammer, tape, Hipwaders, camera
Weather	Overcast
Temperature	10 °C

Additional Investigations Required		Priority			Estimated Cost
		None	Normal	Urgent	
Detailed Deck Condition Survey:		☑	☐	☐	
DART Survey:		☑	☐	☐	
Detailed Coating Condition Survey:		☑	☐	☐	
Underwater Investigation		☑	☐	☐	
Fatigue Investigation:		☑	☐	☐	
Seismic Investigation:		☑	☐	☐	
Structure Evaluation:		☑	☐	☐	
Monitoring Deformation		☑	☐	☐	
Load Posting - Estimated Load	0			Total Cost	

Special Notes:
The structure is in poor condition and it is recommended to be rehabilitated/replaced. It is recommended that a rehabilitation / replacement study be performed ($22,000.00)

Next Detailed Inspection: April 2026

HP Engineering

Municipal Structure Inspection Form **MTO Site Number:** **35-202**

Repair and Rehabilitation Required		**Priority**				**Estimated Construction Cost**
Element	Repair and Rehabilitation Required	6-10 years	1 - 5 years	Within 1 year	Urgent	
	Replace Structure	☐	☑	☐	☐	$1,174,000.00
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
		☐	☐	☐	☐	
						$1,174,000.00

Associated Work:	Comments	**Estimated Cost**
Approaches		
Detours	Engineerinlg Fees (15%)	$100,000.00
Traffic Control	Approach SBGR	$60,000.00
Utilities		
Right of Way		
Environmental Study	Approvals	$10,000.00
Other		
Contingencies		
	Total Cost	$170,000.00

Justification

The outcome of condition survey, structural evaluation and other project constraints could result in significant escalation of estimated cost.

Construction Cost	$1,174,000.00
Associated Costs	$ 170,000.00
TOTAL Estimated Cost	$1,344,000.00

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	900	Abutments			**Length**	6.40
Element Name	901	Abutment Walls			**Width**	
Location	East & West Underside of Structure				**Height**	2.80
Material	Cast-in-place concrete				**Count**	2
Element Type	Conventional closed		**Element code**	1	**Total Qnty.**	35.84
Environment	Moderate				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
					1	Load Carrying capacity

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	18.84	10	7

Comments: Medium scaling observed throughout abutments. Wide vertical cracks with areas of disintegration around crack noted on west wall and below northwest arch. Concrete disintegration observed at the top of east abutment wall below the northeast arch, and at the interface of the southeast wingwall. Narrow stained cracks, light to localized moderate scaling noted at east wall.

Recommended Work:						
	Rehab ☐	Replace ☒		**Maint. Needs**		
	Urgent ☐	1-5 yrs ☒	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	900	Abutments			**Length**	
Element Name	904	Bearings			**Width**	
Location	On East Abutment Wall				**Height**	
Material	Steel				**Count**	2
Element Type	Plate		**Element code**	6	**Total Qnty.**	2
Environment	Moderate				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
					-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Each	0	0	2	0

Comments:
Moderate corrosion noted on visible portion of steel bearing plates.

Recommended Work:						
	Rehab ☐	Replace ☐		**Maint. Needs**	-	-
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	900	Abutments			**Length**	4.00
Element Name	903	Wingwalls			**Width**	
Location	NE, NW, SE & SW Of Structre				**Height**	2.10
Material	Cast-in-place concrete				**Count**	4
Element Type	Reinforced concrete		**Element code**	6	**Total Qnty.**	33.6
Environment	Moderate				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
					-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	21.6	8	4

Comments:
Medium to severe scaling and honeycombing observed throughout wingwall. Vertical wide crack on southwest wingwall. Concrete disintegration observed on northeast and southeast wingwall.

Recommended Work:						
	Rehab ☐	Replace ☒		**Maint. Needs**		
	Urgent ☐	1-5 yrs ☒	6-10 yrs ☐	Urgent ☐	1 year ☐	

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	1500	Accessories				**Length**	-
Element Name	1501	Signs				**Width**	
Location	NE, NW, SE & SW of Structure					**Height**	
Material	Steel					**Count**	6
Element Type	4 Hazard Signs, 2 Height Clearance		**Element code**	N/A		**Total Qnty.**	6
Environment	Severe					**Limited Insp.**	
Protection System	None					**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	-	-
	Each	0	4	2	0		

Comments:
Signs are generally in good condition with the northeast hazard sign being twisted/leaning. Southwest sign slightly leaning. Small dents and light abrasion noted on signs.

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐

Maint. Needs - - Urgent ☐ 1 year ☐

Element Group	1600	Approaches				**Length**	6.00
Element Name	1601	Wearing surface				**Width**	5.50
Location	East & West of Structure					**Height**	
Material	Gravel					**Count**	2
Element Type	Approach Wearing Surface		**Element code**	N/A		**Total Qnty.**	66
Environment	Severe					**Limited Insp.**	
Protection System	None					**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	9	Rough riding surface
	Sq. m.	0	58	4	4		

Comments:
Small to medium potholes noted on both approaches. Loose gravel noted throughout. Vegetation growth observed at shoulder.

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐

Maint. Needs 18 Regrade Approaches Urgent ☐ 1 year ☒

Element Group	400	Barriers				**Length**	0.35
Element Name	403	Posts				**Width**	0.26
Location	North & South Sides of Structure					**Height**	1.05
Material	Cast-in-place concrete					**Count**	16
Element Type	N/A		**Element code**	N/A		**Total Qnty.**	16
Environment	Severe					**Limited Insp.**	
Protection System	None					**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	8	Pedestrian / Vehicular Hazard
	Each	0	14	1	1		

Comments:
Spall with exposed corroded reinforcement observed on two post. Light scaling noted throughout. Deck barrier is substandard and should be replaced with a code complaint barrier.

Recommended Work: Rehab ☐ Replace ☐ Urgent ☐ 1-5 yrs ☐ 6-10 yrs ☐

Maint. Needs 8 Repair of Bridge Concrete Urgent ☐ 1 year ☒

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	400	Barriers		**Length**	2.20
Element Name	402	Railing Systems		**Width**	0.15
Location	North & South Underside of Structure			**Height**	0.15
Material	Cast-in-place concrete			**Count**	28
Element Type	Concrete post and bars	**Element code**	6	**Total Qnty.**	61.6
Environment	Severe			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				8	Pedestrian Vehicular Hazard

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	m.	0	56.6	5	0

Comments:
Railings on wingwalls omitted since approach barrier has been installed. However, in northeast, southeast & northwest quadrants there are no approach barrier posts for the entire length of the wingwall (inadequate stiffness). Light to medium scaling noted throughout deck barrier.

Recommended Work:				**Maint. Needs**	-	-
	Rehab ☐	Replace ☐				
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	500	Beams/MLE's		**Length**	0.40
Element Name	502	Floor Beams (Intermediate)		**Width**	6.40
Location	Underside of Structure			**Height**	0.30
Material	Cast-in-place concrete			**Count**	8
Element Type	Rectangular-solid	**Element code**	4	**Total Qnty.**	63.36
Environment	Moderate			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				1	Load Carrying capacity

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	0	31.68	31.68

Comments:
Numerous severe wide cracks, area of efflorescence stains, delaminations and spalls with exposed corroded reinforcement noted on floor beams, with the majority located at the end section of beams.

Recommended Work:				**Maint. Needs**		
	Rehab ☐	Replace ☒				
	Urgent ☐	1-5 yrs ☒	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	100	Decks		**Length**	21.60
Element Name	102	Deck top		**Width**	5.50
Location	Top of Deck			**Height**	
Material	Cast-in-place concrete			**Count**	1
Element Type	Cast-in-place conc on supports, composite	**Element code**	1	**Total Qnty.**	118.8
Environment	Severe			**Limited Insp.**	
Protection System	None			**Suspected Performance Deficiencies**	
				9	Rough riding surface

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	0	71.28	47.52

Comments:
Moderate to severe scaling noted throughout with some small spalls and exposed corroded reinforcement.

Recommended Work:				**Maint. Needs**	-	-
	Rehab ☐	Replace ☒				
	Urgent ☐	1-5 yrs ☒	6-10 yrs ☐	Urgent ☐	1 year ☐	

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	100	Decks				**Length**	21.30	
Element Name	103	Soffit Thin Slab (Interior)				**Width**	5.50	
Location	Underside of Deck					**Height**		
Material	Cast-in-place concrete					**Count**	1	
Element Type	N/A		**Element code**	N/A		**Total Qnty.**	117.15	
Environment	Benign					**Limited Insp.**		
Protection System	None					**Suspected Performance Deficiencies**		
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	-	-	
	Sq. m.	0	87.86	17.57	11.72			

Comments:
Moderately large areas of delaminations, medium to wide cracks, area of efflorescence stains and spalls with exposed corroded reinforcement observed throughout. Lots of birds nests observed on the soffit interior.

Recommended Work:	Rehab ☐	Replace ☒		**Maint. Needs**		
	Urgent ☐	1-5 yrs ☒	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	1400	Embankments and Streams				**Length**		
Element Name	1402	Embankments				**Width**		
Location	NE, NW, SE & SW of Structure					**Height**		
Material	Native					**Count**	4	
Element Type	N/A		**Element code**	N/A		**Total Qnty.**	4	
Environment	-					**Limited Insp.**		
Protection System	None					**Suspected Performance Deficiencies**		
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**	-	-	
	Each	0	4	0	0			

Comments:
Steeply sloped, well vegetated and stable embankments. Light erosion noted at all corners.

Recommended Work:	Rehab ☐	Replace ☐		**Maint. Needs**	-	-
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐	

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	1400	Embankments and Streams			**Length**	
Element Name	1401	Streams and Waterways			**Width**	
Location	Below Structure				**Height**	
Material	Native				**Count**	1
Element Type	N/A		**Element code**	N/A	**Total Qnty.**	1
Environment	-				**Limited Insp.**	
Protection System	None				**Suspected Performance Deficiencies**	
					-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	All	0	1	0	0

Comments:
High volume, and low flow from south to north with no visible flow obstructions.

Recommended Work:				**Maint. Needs**	-	-
	Rehab ☐	Replace ☐				
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐	

Element Group	1300	Foundations			**Length**	
Element Name	1301	Foundation (below ground level)			**Width**	
Location	Below Abutment Walls				**Height**	
Material	Unknown				**Count**	
Element Type			**Element code**		**Total Qnty.**	1
Environment	Benign				**Limited Insp.**	X
Protection System	None				**Suspected Performance Deficiencies**	
					-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	N/A	0	1	0	0

Comments:
No visible evidence of foundation instability at the time of inspection.

Recommended Work:				**Maint. Needs**	-	-
	Rehab ☐	Replace ☐				
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐	

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** **35-202**

Element Data

Element Group	600	Trusses/Arches	**Length**	21.60
Element Name	602	Bottom chords	**Width**	0.45
Location	North & South Sides of Structure		**Height**	0.50
Material	Cast-in-place concrete		**Count**	2
Element Type	Rectangular-solid	**Element code**	**Total Qnty.**	120.96
Environment	Severe		**Limited Insp.**	
Protection System	None		**Suspected Performance Deficiencies**	
			1	Load Carrying capacity

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	70.96	25	25

Comments:
Numerous large delaminations on the north face and underside and spalls with exposed corroded reinforcement noted along length of bottom chord. Medium delaminations noted on the inside face of bottom chords.

Recommended Work: Rehab ☐ Replace ☒ Urgent ☐ 1-5 yrs ☒ 6-10 yrs ☐

Maint. Needs Urgent ☐ 1 year ☐

Element Group	600	Trusses/Arches	**Length**	23.50
Element Name	601	Top chords	**Width**	0.50
Location	North & South Sides of Structure		**Height**	0.85
Material	Cast-in-place concrete		**Count**	2
Element Type	Rectangular-solid	**Element code**	**Total Qnty.**	173.9
Environment	Severe		**Limited Insp.**	
Protection System	None		**Suspected Performance Deficiencies**	
			-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	151.9	12	10

Comments:
Spalls with exposed corroded reinforcement and medium delamination on underside of both arches with majority on the north arch. Light to moderate scaling noted throughout. Graffitti noted at inside face of north arch of structure at the time of inspection.

Recommended Work: Rehab ☐ Replace ☒ Urgent ☐ 1-5 yrs ☒ 6-10 yrs ☐

Maint. Needs - - Urgent ☐ 1 year ☐

Element Group	600	Trusses/Arches	**Length**	0.20
Element Name	603	Verticals/diagonals	**Width**	0.28
Location	North & South Sides of Structure		**Height**	2.10
Material	Cast-in-place concrete		**Count**	12
Element Type	Rectangular-solid	**Element code**	**Total Qnty.**	12.77
Environment	Severe		**Limited Insp.**	
Protection System	None		**Suspected Performance Deficiencies**	
			-	-

Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**
	Sq. m.	0	8.77	2	2

Comments:
Spall with exposed corroded reinforcement on 3rd vertical from east on south side and 4th vertical from west on north side. Light to moderate scaling noted throughout.

Recommended Work: Rehab ☐ Replace ☒ Urgent ☐ 1-5 yrs ☒ 6-10 yrs ☐

Maint. Needs - - Urgent ☐ 1 year ☐

HP Engineering

Municipal Structure Inspection Form **MTO Site Number** # **35-202**

Element Data

Element Group	600	Accessories					**Length**	-
Element Name	603	Utilities					**Width**	-
Location	North Side of Strucutre						**Height**	-
Material	Metal						**Count**	1
Element Type	Metal Conduit			**Element code**			**Total Qnty.**	1
Environment	Severe						**Limited Insp.**	
Protection System	None						**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**		-	-
	each	0	1	0	0			

Comments:
Metal conduit is generally in good condition.

Recommended Work:	Rehab ☐	Replace ☐		**Maint. Needs**	-	-	
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☐		

Element Group	1600	Approaches					**Length**	NE & SE 28.6, NW & SW 32.4
Element Name	1601	Approach Barrier					**Width**	
Location	NE, NW, SE & SW of Structure						**Height**	
Material	Steel						**Count**	4
Element Type	Steel flex beam on steel posts			**Element code**	N/A		**Total Qnty.**	122
Environment	Severe						**Limited Insp.**	
Protection System	None						**Suspected Performance Deficiencies**	
Condition Data	**Units**	**Ex.**	**Good**	**Fair**	**Poor**		-	-
	m	0	118	2	2			

Comments:
Small dent observed at northeast end treatment. Small collision damage and dents observed throughout. Severe erosion noted near southwest end treatment.

Recommended Work:	Rehab ☐	Replace ☐		**Maint. Needs**	13	Erosion control at bridges	
	Urgent ☐	1-5 yrs ☐	6-10 yrs ☐	Urgent ☐	1 year ☒		

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from centre of structure

Photo 4 West approach from centre of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Vehicle damage on northeast end treatment

Photo 8 Potholes on west approach near deck

Photo 9 Typical barrier panel with arch on north side of structure

Photo 10 Moderate to severe scaling on deck wearing surface

Photo 11 Spall with exposed corroded reinforcement on north truss

Photo 12 Spall with exposed corroded reinforcement on floor beams and soffit exterior

Photo 13 Wide crack on north corner of east abutment wall

Photo 14 Typical underside of structure

Photo 15 Scaling on foundation of east abutment wall

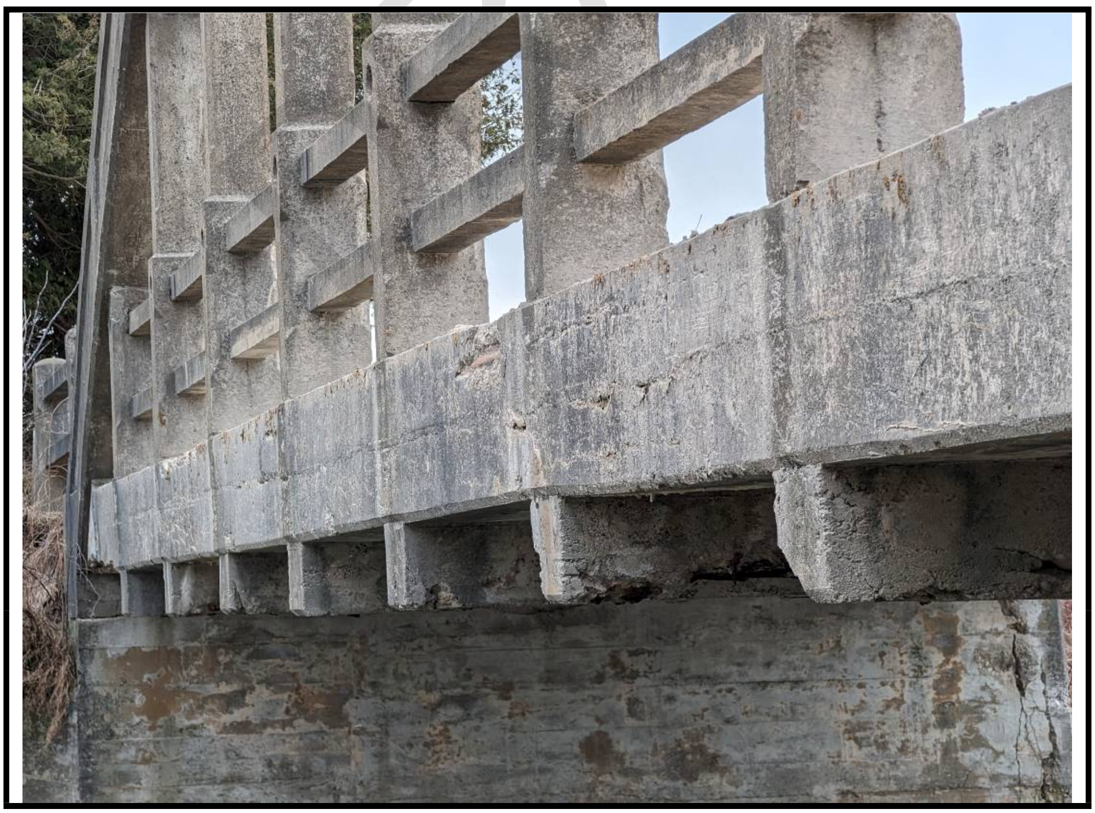


Photo 16 Cracks with stains and small spalls noted on south exterior soffit

Photo 17 Typical hazard sign and end treatment at southeast corner

Photo 18 Large spall with exposed corroded reinforcement at northwest wingwall

Photo 19 Small spall, scaling and narrow cracks with efflorescence stains noted on arch ribs

Photo 20 Moderate scaling and severe concrete disintegration southeast wingwall interface

Photo 21 Vertical wide crack on southwest wingwall

Photo 22 Concrete disintegration observed east abutment and at the interface of the southeast wingwall

Structure Condition Summary Form

Structure Name 30-WG
Structure Number TS-BR-00024
Date of Inspection April 01,2024
Project No. 18015
Consultant HP Engineering Inc.

Element Group	Element Name	Unit (Qty.)	Unit Price (MTO)	Total Element Quantity	Element Qty. in Excellent Condition (1.00)	Element Quantity in Good Condition (0.75)	Element Quantity in Fair Condition (0.4)	Element Quantity in Poor Condition (0)	Total Replacement Value (TRV)	Current Element Value (CEV)	Element Condition Index	Performance Deficiency	Maintenance Need
Trusses/ Arches	Top Chords	Sq.m	300.00	100.00			50.00	50.00	30000	6000	20	00	00
	Verticals	Sq.m	300.00	100.00		50.00	50.00		30000	17250	58	00	00
	Diagonals	Sq.m	300.00	100.00		50.00	50.00		30000	17250	58	00	00
	Bottom Chords	Sq.m	300.00	100.00			50.00	50.00	30000	6000	20	00	00
Decks	Deck Top - Thin Slab	Sq.m	120.00	100.00	0.00	50.00	50.00	0.00	12000	6900	58	00	00
Beams/ Main Longitudinal	Floor Beams - Steel	Sq.m	420.00	100.00		25.00	50.00	25.00	42000	16275	39	00	00
Bracing	Bracing - Steel	Each	500.00	100.00			50.00	50.00	50000	10000	20	00	00
Abutment	Wingwalls	Sq.m	350.00	110.00		40.00	60.00	10.00	38500	18900	49	00	00
	Abutment Walls	Sq.m	900.00	110.00		40.00	60.00	10.00	99000	48600	49	00	00
									361500	**147175**			

Bridge Condition Index (BCI) **41**

Township of Centre Wellington

Municipal Structure Inspection Form

Structure Name: 30-WG
Structure No: TS-BR-00024
MTO Site No:

Inventory Data

Structure Name:	30-WG	Hwy No.			
Crossing Over:	Road	Crossing Under:	Road		
Road Name:	Sideroad 15				
Location:	Sideroad 15				
Owner:	TCW, Township of Centre Wellington (100 %)				
		Heritage Status:	N		
Latitude/Northing:		Longitude/Easting:			
MTO Region:		Road Class:	5		
MTO District:		Lane Type:			
Old County:		Posted Speed:		Lanes:	2
Geo Twp.:	West Garafraxa	AADT:		Trucks:	0 %
Structure Type:	TT - Through Truss	Min Vert. Clear.:	m		
Material:	S - Steel	No. of Spans:	1		
Articulation:					
Deck Length:	26.0 m	Special Routes:	☐ Transit ☐ Truck		
Deck Width:	6.7 m		☐ School ☐ Bicycle		
Deck Area:	174.2 m2	Detour Length:	8.00 km	Skew Angle:	degrees
Trav Deck Wdt	4.7 m		m	Structure Dir.:	E-W

Key Photo

West Garafraxa
<NONE>
6
<NONE>

Historical Data

Year Built: 1942	Superstruct. Year:	Year of Last Major Rehab:	
Last OSIM Inspection:	May 01, 2022	Contract No. When Built:	
Last Enhanced OSIM:		Last Evaluation:	
Last Enhanced Access:		Current Load Limit:	t t t
Last Underwater Insp.		Bylaw No.:	
Last Condition Survey:.		Bylaw Exp. Date:	

Township of Centre Wellington

Municipal Structure Inspection Form

Structure Name: 30-WG
Structure No: TS-BR-00024
MTO Site No:

Field Inspection Information

Inspection Date: April 01,2024
Inspection Type: ☒ OSIM ☐ Enhanced OSIM BCI: 0.0
Inspector: Tashi Dwivedi, P.Eng., (H.P. Engineering)
Eng. Responsible:
Others in Party: Sagar Chhayani and Tusharkumar Khunt, B.Tech. (H.P. Engineering)
Access Equip: ☐ Lift ☐ Ladder ☐ Boat ☐ Bridge Master Other:
Other Equipment: Hammer, tape, Camera, Chest waders
Weather: Sunny
Temperature: 8 °C

Additional Investigations Required

Investigation	Priority: None	Priority: Normal	Priority: Urgent	Estimated Cost
Detailed Deck Condition Survey	☒	☐	☐	0.00
Delamination Survey of Asphalt-Covered Deck	☒	☐	☐	0.00
Concrete Substructure Condition Survey	☒	☐	☐	0.00
Detailed Coating Condition Survey	☒	☐	☐	0.00
Detailed Timber Investigation	☒	☐	☐	0.00
Post-Tension Strand Investigation	☒	☐	☐	0.00
Underwater Investigation	☒	☐	☐	0.00
Fatigue Investigation	☒	☐	☐	0.00
Seismic Investigation	☒	☐	☐	0.00
Structure Evaluation	☒	☐	☐	0.00
Monitoring of Deformations, Movements and Settlements	☒	☐	☐	0.00
Monitoring of Crack Widths	☒	☐	☐	0.00
			Total Cost:	0.00

Overall Structure Notes

Recommended Work On Structure: Major Rehab / replacement
Timing of Recommended Work: ADEC
Next Inspection Date: April 2026 Estimated Load Limit: 0 t 0 t 0 t

Overall

It is recommended that a rehabilitation / replacement study be performed.

BCI Change Justification

The inspection was conducted on April 01, 2024 by Tushar Khunt (HP Engineering), Sagar Chhayani (HP Engineering). The bridge was closed at the time of the inspection. The following was noted during the inspection:

The existing end-treatments are substandard and should be replaced with code compliant end treatments. Moderate to severe rot was noted on the approach guiderail posts. Both diagonal members at the east end of the truss structure exhibited apparent deformations; possibly due to a vehicular collision.
Bracing members at the east end of the truss structure also exhibited apparent deformations; possibly due to a vehicular collision.
Light scaling was noted throughout the exposed concrete deck. Medium transverse cracks noted on bridge deck.
Severe concrete disintegration with exposed corroded reinforcement and area of heavy efflorescence damp stained narrow cracks throughout noted at the NE & SE wingwalls.
The floor beam at the east end of the structure was disconnected and had fallen into the stream. Several bracing members were also disconnected from the structure.
Multiple perforations were noted in the floor beams, stringers, bracing members and in the bottom chord of the truss structures.
Severe corrosion and section loss was observed at several of the connections in the truss structure.
Severe concrete disintegration was noted at both the east and west abutments. Localized spalls and delamination noted at west abutment. Moderate to severe concrete disintrigation with area of heavy efflorescence noted at west abutment.
Moderate spalls and delamination with area of heavy efflorescence noted both abutment walls. Top of east of ballast wall is completely disintegrated with severe scaling. Graffiti on northwest wing wall.

Township of Centre Wellington

Municipal Structure Inspection Form

Structure Name: 30-WG
Structure No: TS-BR-00024
MTO Site No:

Element Data

Repair/Rehabilitation Required

Associated Work

Comments	Estimated Cost
Approaches	0.00
Detours	100,000.00
Traffic Control	60,000.00
Utilities	0.00
Right-of-Way	0.00
Environmental Study	10,000.00
Other	0.00
Contingencies	0.00
Engineering	0.00

Total Associated Work Cost	**$ 170,000.00**
Total Repair/Rehabilitation Cost	**$ 1,414,000.00**
Total Cost	**$ 1,584,000.00**

Photo 1 Structure from east approach

Photo 2 Structure from west approach

Photo 3 East approach from center of structure

Photo 4 West approach from center of structure

Photo 5 North elevation

Photo 6 South elevation

Photo 7 Substandard approach barrier at NE approach

Photo 8 Previous asphalt patches on deck wearing surface

Photo 9 Deformation of truss elements and bracing at east side of structure

Photo 10 Perforations on north bottom chord

Photo 11 Perforations at girder ends at the east side of structure

Photo 12 Damaged bracing at east end of structure

Photo 13 Concrete Disintegration at SE wingwall

Photo 14 Concrete Disintegration, Scaling, and Cracks at east abutment wall

Photo 15 Severe corrosion and section loss at connections in the structure.

Photo 16 Severe concrete disintegration with area of heavy efflorescence at west abutment.

Photo 17 Top of east of ballast wall is completely disintegrated with severe scaling

Photo 18 Cracks with efflorescence and graffiti at northeast wing wall

[THE DIFFERENCE IS OUR PEOPLE]

A.3 Technical Memorandum - Evaluation of Structure Improvement Types

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
telephone (519) 823-4995 **fax** (226) 526-9660 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Technical Memorandum - Evaluation of Structure Improvement Types

Date: January 15, 2026 **Project No.:** 300059832.0000

Project Name: Bridge & Transportation Network Study for Bridges 21-WG, 29-WG & 30-WG

Client Name: Township of Centre Wellington

Submitted To: Project File Report

Submitted By: Andrew Dawson, P.Eng.

Reviewed By: Matthew Brooks, P.Eng.

As part of the Bridges and Transportation Network Study of Bridges 21-WG, 29-WG, and 30-WG, R.J. Burnside & Associates Limited (Burnside) has completed a review of alternatives for improvements to the existing bridges for consideration during the overall study in evaluating the individual site and the overall transportation network.

1.0 Design Alternatives

The study has identified the following four options for consideration for improvements to the bridge structures:

1. Rehabilitation;
2. Replacement, Two-lane;
   a) Single-Span, Slab on Prestressed Girder Bridge.
   b) Two-Span, Slab on Prestressed Girder Bridge.
3. Replacement, Narrow Two-Lane – Steel Through Truss; or
4. Replacement, Single Lane – Prefabricated Modular Bridge.

It is noted that the preliminary hydraulic analysis completed for these structures identified that all three bridges and approach roads are overtopped during the Regional Storm event. Accordingly, any increase to the elevation of the road on the approaches will require an increased hydraulic opening to offset the relief flow blocked by the higher road platform. As such, the structure types considered herein offer a shallow girder depth to span ratio or consider a truss-type structure where depth from the soffit to the road is minimized. Side-by-Side Prestressed Concrete Box Girders provide some of the highest ratios for span to superstructure depth and, therefore, have been considered over bridge configurations with spaced out girder lines (CPCO, NU, Steel Girders, etc.). For steel through-truss type structures, the superstructure depth is comparable to side-by-side prestressed box girders for a driving platform width of approximately 6 m, but becomes deeper relative to box girders for a wider road width.

Options using culvert-type structures (including large span arch culverts or deep corrugated structural steel plate culverts) were also investigated. However, due to the arched geometry required for these structures, they are not as hydraulically efficient as rectangular opening shaped structures such as slab-on-girder bridges. The additional span needed to provide an equivalent hydraulic / end area, also requires additional rise. The increased rise of the structure results in a need to excavate deeper or increase the road profile. Due to limitations of increasing the road profile due to associated impacts on Regional flood elevations, the large span culverts are not suitable for these sites and were not evaluated further, since they would not meet the requirements for permitting and approvals by Conservation Authorities.

The use of a two-span configuration was considered as it would reduce the overall depth of girders and superstructure required, thus limiting the increases to the centreline of road profile. Given that the hydraulics of these sites indicate the road overtops during the Regional Storm event, minimizing the increases to the road profile on the approaches of the bridge provides significant hydraulic benefit, which helps counter the hydraulic impacts of the additional pier in the watercourse. However, it is recognized that where a single-span configuration would be acceptable for hydraulics, it would be preferred over a two-span option.

1.1 Rehabilitation

This alternative considers the option of repairing the existing elements of the current bridges. Based on the current condition of the bridges, the rehabilitation program would require the following improvements:

- Reconstruction of the main load-carrying elements (concrete or steel truss members).
- External or near-surface-mounted strengthening of the existing main load-carrying elements (through girder barriers, concrete truss, and / or floor beams) to compensate for section loss and to gain additional capacity.
- Concrete deck overlay or replacement.
- Waterproofing and paving.
- Partial depth concrete repairs and / or refacing of the substructures.
- Installation of erosion and scour protection.

The work required to reopen these bridges and / or to increase their load capacities would be extensive and involve costly procedures for strengthening the existing bridges' elements to reinstate capacity that has been lost due to the vintage of the structures and deterioration of the main structural elements and the embedded reinforcing steel.

With rehabilitation, all available platform widths would remain as a sub-standard single-lane bridge. The load-carrying capacity of the bridges would also remain limited. The achievable load-carrying capacity with external or near-surface-mounted strengthening would need to be determined at detailed design stage for each structure, but given the vintage of the substructures, it would be anticipated that the maximum load that could be accomplished would be 12 to 18 tonnes, based on the design loading at the time the bridges were constructed.

To achieve strengthening, it is anticipated that building out the underside of the structures may be required. This would result in negative impacts on the hydraulic capacity of the structures by lowering the soffit of the bridges. The lowered soffits would result in increased flooding upstream, which would be required to be offset by the installation of a relief flow culvert immediately adjacent to the bridges.

The condition of the bridge structures may be improved, and the overall service life of the structures can be increased with rehabilitation; however, it is anticipated that rehabilitating the structures would extend the service life by a maximum of approximately 15 to 20 years.

1.2 Replacement – Two-Lane, Prestressed Concrete Box Girder Bridge

The two-lane replacement structure option considers the removal of the existing bridges and replacement with a new, two-lane vehicular structure. The proposed structures considered in these alternatives would be of sufficient width to carry a 9.1 m driving platform consisting of 3.35 m lanes and 1.2 m wide shoulders to meet the Township's typical cross-section. The roadway width would taper to match the existing road width beyond the structures, but could be widened in the future as required.

With a two-lane structure designed to meet unrestricted vehicular load requirements, these alternatives allow for increased traffic utilization in the future, if it were to be required. It also permits larger farm equipment access to the agricultural lands surrounding the study area.

A total structure width (perpendicular to the road centreline) of 9.8 m would be required to provide the desired platform width and parapet walls. Wingwalls would be utilized to maintain the infrastructure within the Township right-of-way (ROW.).

As previously noted, the use of Single-Span and Two-Span bridge configurations were considered utilizing Side-by-Side Prestressed Concrete Box Girders due to their efficient span to superstructure depth ratios. The depth of girder required depends on the span(s) between supports. The Span Applicability Charts of Figures 11 and 12 from the MTO's Prestressed Concrete Girder Guidelines were used to estimate the required depth of girders for the associated spans required at each of the sites.

The evaluation of the single-span and two-span configurations identified that, where the hydraulics permit the use of a deeper superstructure, a single-span structure is preferred over the two-span option. However, based on preliminary hydraulic analysis, it was found in some instances (Bridge 29-WG) that the increased road profiles from a single-span structure using deeper girders resulted in larger spans being required. The larger spans required deeper girders, causing further flood increases. In such instances, it was determined that a single-span configuration was not achievable within the hydraulic design criteria of maintaining the existing Regional flood elevations. As such, while the preference is to use a single-span prestressed concrete girder, the use of a two-span configuration with shallowed girders may be warranted based on hydraulic requirements.

Although the two-span side-by-side prestressed girder configuration was found to be less preferred than the single-span side-by-side prestressed girder configuration, it was still considered more preferred over the other structure type alternatives.

1.3 Replacement – Narrow Two-Lane, Streel Through-Truss Bridge

Consideration was also given to the use of a steel truss system with a narrower bridge driving platform, in consideration of the low volumes of traffic experienced at these structures. The use of a steel through-truss bridge for the full two-lane width to meet Township standards was originally considered; however, the depth from the soffit of the truss to the top of the deck was significantly greater than the side-by-side prestressed box girder bridges and caused negative impacts to hydraulics and, therefore, was not carried forward for further analysis. However, when the driving platform width is reduced to approximately 6 m, the depth from the soffit of the truss to the deck top is within an acceptable range that is suitable based on the hydraulic analysis.

Through consultation with local residents, comments have been received that replacement structures should be designed to carry agricultural equipment, in consideration of the agricultural land-use within the study area. As such, this alternative reviews the use of a narrow bridge structure with the minimum driving platform width capable of carrying most agricultural equipment.

As per the MTO Structural Manual, Revision 61, dated December 2025 – Section 2, Appendix A Guidelines for the Design of Bridges on Low Volume Roads, the minimum lane shoulder and bridge widths are outlined in Table 1 below.

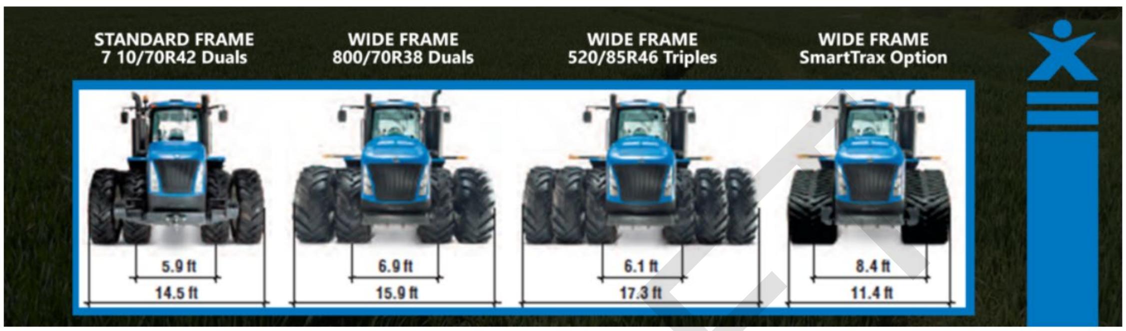
Table 1: Minimum Lane, Shoulder, and Bridge Widths

AADT	Design Speed (km/h)	# of Lanes	Minimum Lane Width (m)	Minimum Shoulder Width (m)	Minimum Bridge Width (m)
≤ 200	≤ 60	1	3.0	0.5	4.0 (4.9 m max)
		2	2.75	0.25	6.0
	≥ 70	2	3.0	0.5	7.0
≥ 200 and ≤ 400	≤ 40	1	3.0	0.5	4.0 (4.9 m max)
		2	2.75	0.25	6.0
	50 to 60	2	3.0	0.5	7.0
	≥ 70	2	3.3	0.6	7.5

Table 2, Note 3 (MTO Structural Manual) also states that “Farm or other special vehicles may require larger widths”. Consultation shall be made with local officials. It may also be acceptable to have a lower barrier to accommodate farm or other special vehicles.

A brief desktop investigation was conducted to research the current width of agricultural equipment. As noted in the image below, large articulated four-wheel drive tractors can range in width from 11.4 ft (3.5 m) to 17.3 ft (5.3 m).

Figure 1: Agricultural Equipment



(Reference - https://agtiretalk.com/4wd-tractor-traction-pulling-550-hp-implement/)

In addition to the width of a tractor, Burnside has reviewed the width of tillage implements. The transport width of field cultivators ranges from 14 ft (4.3 m) to 19 ft -6” (5.9 m). [Reference - https://www.sunflowermfg.com/tillage-equipment/field-cultivators.html]

Based on the width of agricultural equipment noted above, it would be prudent to provide a wider bridge deck width, which is in line with Table 1, Note 6, (MTO Structural Manual) which states “Two lane bridge is also an acceptable alternative if a 4.9 m single lane bridge cannot accommodate the traffic (i.e., farm or special vehicles, sight distances, etc.)”. As noted in Table 1 above, the minimum width of a two-lane bridge would be 6.0 m between barriers. A 6.0 m wide driving platform would also provide clearance for the majority of farm equipment. As such, this Narrow Bridge alternative will consider a driving platform width of 6.0 m.

1.4 Replacement – Single-Lane, Prefabricated Modular Panel Bridge

To assess the option that would be considered the most cost-effective solution for maintaining vehicular traffic crossing without load limitations, the use of Single-Lane prefabricated modular panel bridges, such as a Bailey Bridge or similar, was also considered.

As outlined in Table 1 above, this alternative would require a bridge with a clear width between barriers in the range of 4.0 to 4.9 m and would require that the speed in the area of the bridge be limited to 40 km/h.

The proposed structures would be designed to support full live loading to remove all limitations related to vehicle weight. However, the single lane, narrow driving platform may not permit larger agricultural equipment to cross the structures.

2.0 Evaluation of Alternatives

Each alternative was evaluated based on its ability to improve the physical and technical environments at the sites, which is the intent of this Technical Memo. Table 2 gives a summary of the criteria that were considered, the noted deficiencies, and the effectiveness of each option to address the problems and opportunities.

Table 2: Evaluation of Structure Type Alternatives

Alternative	Rehabilitation	Replace –Two-Lane, Single-Span Prestressed Conc. Box Girder Bridge	Replace – Two-Lane, Two-Span Prestressed Conc. Box Girder Bridge	Replace – Narrow Two-Lane, Steel Through-Truss Bridge	Replace – Single-Lane, Prefabricated Modular Panel Bridge
Driving Platform Width	Single-lane driving platform. Does not conform to Township standards for two-lane structure. Some wide frame agricultural equipment unable to cross structure.	9.2 m wide, two-lane driving platform to meet Township standards. Wide enough for all typical farm equipment.	9.2 m wide, two-lane driving platform to meet Township standards. Wide enough for all typical farm equipment.	6.0 m wide driving platform. Does not conform to Township standards. Does not provide side clearances. Wide enough for most farm equipment.	Single-lane driving platform. Does not conform to Township standards for two-lane structure. Some wide frame agricultural equipment unable to cross structure.
Weight = 5	**Score = 1.0**	**Score = 5.0**	**Score = 5.0**	**Score = 3.0**	**Score = 1.0**
Safety	Single-lane bridge increases potential for head-on collisions. Requires right-of-way control measures. Existing barriers do not conform to current standards. Narrow platform increases risk of collision with barriers. No additional shoulder width to be used by pedestrians. Main load-carrying elements are exposed to traffic and could result in failure if impacted.	Additional width and side clearances reduce risk of collision and provide 'shoulder' for pedestrian use. Barriers designed to current standards.	Additional width and side clearances reduce risk of collision and provide 'shoulder' for pedestrian use. Barriers designed to current standards.	Narrow lanes increase potential for accidents. Narrow platform increases risk of collision with barriers. No additional shoulder width to be used by pedestrians. Main load-carrying elements are exposed to traffic (but protected by barrier) and could result in failure if impacted.	Single-lane bridge on two-way road increases potential for head-on collisions. Narrow platform increases risk of collision with barriers. No additional shoulder width to be used by pedestrians. Main load-carrying elements are exposed to traffic (but protected by barrier) and could result in failure if impacted.
Weight = 5	**Score = 1.0**	**Score = 5.0**	**Score = 5.0**	**Score = 3.0**	**Score = 2.0**
Load Carrying Capacity	Requires load posting to limit vehicle weight. Limits the use by heavy vehicles and farm equipment.	No load limitations. Designed to current standards for load carrying capacity.	No load limitations. Designed to current standards for load carrying capacity.	No load limitations. Designed to current standards for load carrying capacity.	No load limitations. Designed to current standards for load carrying capacity.
Weight = 5	**Score = 1.5**	**Score = 5.0**	**Score = 5.0**	**Score = 5.0**	**Score = 5.0**
Maintenance	Ongoing repairs due to accelerating rate of deterioration due to overall age. Increased potential for repairs to barriers caused by ploughs or farm equipment due to narrow width.	Jointless construction, which minimizes maintenance needs.	Jointless construction, which minimizes maintenance needs.	Maintenance required on joints at deck / abutment interface. Increased potential for required repairs on barriers from ploughs or farm equipment due to narrow width.	Maintenance required on joints at deck / abutment interface. Increased potential for required repairs on barriers from ploughs or farm equipment due to narrow width.
Weight = 5	**Score = 1.0**	**Score = 5.0**	**Score = 5.0**	**Score = 3.0**	**Score = 3.0**
Property Impacts	No additional property easements / acquisition required.	Permission to grade / easement for road widening and increased road elevations on approaches to bridge.	Permission to grade / easement for road widening and increased road elevations on approaches to bridge.	Permission to grade / easement for road widening and increased road elevations on approaches to bridge.	Permission to grade / easement for road widening and increased road elevations on approaches to bridge.
Weight = 5	**Score = 5.0**	**Score = 3.0**	**Score = 3.0**	**Score = 3.0**	**Score = 3.0**

Alternative	Rehabilitation	Replace –Two-Lane, Single-Span Prestressed Conc. Box Girder Bridge	Replace – Two-Lane, Two-Span Prestressed Conc. Box Girder Bridge	Replace – Narrow Two-Lane, Steel Through-Truss Bridge	Replace – Single-Lane, Prefabricated Modular Panel Bridge
Environmental	No disturbance to the creek bed. Open-bottom structure. Requires temporary flow diversion for substructure work.	Abutments constructed beyond creek bed. Minor disturbance to creek bed for removal of existing substructure. Requires temporary partial flow diversion for substructure work.	Disturbance to creek bed for pier. Requires temporary flow diversion for substructure work. Potential for scour / sediment disposition due to flows around pier.	Abutments constructed beyond creek bed. Minor disturbance to creek bed for removal of existing substructure. Requires temporary partial flow diversion for substructure work.	Abutments constructed beyond creek bed. Minor disturbance to creek bed for removal of existing substructure. Requires temporary partial flow diversion for substructure work.
Weight = 5	**Score = 4.5**	**Score = 4.0**	**Score = 2.5**	**Score = 4.0**	**Score = 4.0**
Hydraulics	No change to hydraulics. No opportunity for improvements. Potential negative impact to upstream flooding if beam strengthening lowers soffit.	Depth of Superstructure approximately 1.2 m to 1.4 m for span range of 24 m – 32 m. Requires largest increase to road profile, with most potential to impact Regional flood elevations. No obstructions in watercourse allows larger spans to improve flood elevations of more frequent events.	Depth of Superstructure approximately 0.8 m to 0.9 m for span ranges of 12 m – 16 m (24 m to 32 m total). Lesser road profile increases than single-span resulting in less impact to Regional flood elevations. Pier in watercourse impacts flood elevations for more frequent storm events, requiring slightly larger overall span for comparable effects.	Depth of Superstructure approximately 0.8 m to 1.0 m (top of deck to underside of bottom chord) for span range of 24 m – 32 m. Lesser road profile increases than single-span box girders, resulting in less impact to Regional flood elevations. No obstructions in watercourse allows larger spans to improve flood elevations of more frequent events. Debris / ice catching in truss could result in blockages during significant overtopping flood events.	Depth of Superstructure approximately 0.65 - 0.75 m (top of deck to underside of bottom chord). The least profile increases to road, resulting in least impact to Regional flood elevations. No obstructions in watercourse allows larger spans to improve flood elevations of more frequent events. Debris / ice catching in truss could result in blockages during significant overtopping flood events.
Weight = 5	**Score = 4.5**	**Score = 3.0**	**Score = 3.5**	**Score = 4.0**	**Score = 4.5**
Heritage	Existing bridge remains and any built Heritage is conserved.	Built Heritage lost with structure removal. Option for commemorative design detail in barriers.	Built Heritage lost with structure removal. Option for commemorative design detail in barriers.	Built Heritage lost with structure removal. Option for commemorative truss detail similar to existing shape (additional costs).	Built Heritage lost with structure removal. No barriers to allow for commemorative design detail on bridge.
Weight = 5	**Score = 5.0**	**Score = 2.0**	**Score = 2.0**	**Score = 3.0**	**Score = 1.0**
Construction Cost (+/-)	$600,000 - $900,000	$2,500,000 - $3,000,000	$3,500,000 - $4,000,000	$2,750,000 - $3,250,000	$2,500,000 - $3,000,000
Weight = 5	**Score = 5.0**	**Score = 1.6**	**Score = 0.0**	**Score = 1.2**	**Score = 1.6**
Construction Duration	10 - 12 weeks	20 - 22 weeks	26 - 30 weeks	18 - 20 weeks	10– 12 weeks
Weight = 5	**Score = 5.0**	**Score = 3.0**	**Score = 2.5**	**Score = 3.5**	**Score = 5.0**
Service Life	15 years	75 years	75 years	75 years	50 years
Weight = 5	**Score = 1.0**	**Score = 5.0**	**Score = 5.0**	**Score = 5.0**	**Score = 3.4**
Total Score /55	**34.5**	**41.6**	**38.5**	**37.7**	**33.5**
Ranking	**4**	**1**	**2**	**3**	**5**

3.0 Summary & Recommendations

As outlined in Table 2, the preferred structure type is the replacement of the bridge with a Two-Lane, Side-by-Side Prestressed Concrete Box Girder bridge.

It is recommended that, where replacement is selected as the preferred alternative, a two-lane, 9.1 m driving platform width between barriers be utilized to meet Township standards and provide adequate width for large agricultural equipment to cross the structure.

A single span configuration is preferred where hydraulics permit the use of a deeper girder capable of spanning the entire watercourse, without the road profile increases impacting Regional flood elevations. Where single-span side-by-side prestressed concrete box girders are not achievable due to hydraulic constraints, the use of a two-span side-by-side prestressed concrete box girder configuration, with a pier in the watercourse is still considered preferred over the other alternatives considered.

Based on preliminary hydraulic analysis, it is anticipated that Bridge 29-WG would require the use of a two-span configuration, whereas Bridges 21-WG and 30-WG could consider the use of a single-span configuration. However, the ability to meet hydraulic criteria for a given structure geometry should be further confirmed during the detailed design stage of the project if replacement is selected as the preferred alternative.

If you have any questions or comments, do not hesitate to contact the undersigned.

R.J. Burnside & Associates Limited

Andrew Dawson, P.Eng.
Project Engineer
AD:tc

Reviewed by:
Matthew Brooks, P.Eng.,
Sector Leader, Bridges and Culverts

Burnside

[The Difference is our People]

A.4 Technical Memorandum - Hydrology and Hydraulic Report

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Technical Memorandum – Hydrology and Hydraulic

Date:	January 16, 2026	**Project No.:**	300059832.0000
Project Name:	Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG		
Client Name:	Township of Centre Wellington		
Submitted To:	Township of Centre Wellington, Project File		
Submitted By:	Dil Kankanamge, MASc., EIT		
Reviewed By:	Rachel Walton, P.Eng., MASc.		

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG. As part of the study completion of a preliminary hydraulic analysis of the three bridges was completed to determine preliminary sizing for replacement options, in order to aid in the analysis of alternatives. The structures are located within the northeastern quadrant of the Township, which was formerly West Garafraxa. Bridge 21-WG is located on 1st Line, approximately 130 m northwest of Side Road 15. Bridge 29-WG is located on Side Road 15, approximately 620 m northeast of 1st Line. Bridge 30-WG is also located on Side Road 15, approximately 730 m northeast of 5th Line. All the bridges are located within the Grand River Conservation Authority (GRCA) regulated area, over the Irvine Creek. The location of each bridge is shown in Figure 1 in Section 4.

This report provides commentary and methodology used in the hydrological and hydraulic analysis of the existing structures while providing recommendations for the proposed replacement structures.

2.0 Background Information

A detailed topographic survey was completed by Burnside in June 2025 to obtain the existing bridge geometry, roadway and driveway elevations, building locations, existing ground topographic data, and other relevant features. This survey data has been used in the analysis of the existing bridges and used for the preliminary design of the proposed replacement structures.

The hydrology and hydraulic studies are being conducted to assess the existing conditions of the current bridge structures and determine the geometry that would be required for replacement options considered as part of the Bridges and Transportation Network Study. The structures are being considered for replacement based on the poor physical condition of the existing structures. Bridges 21-WG and 30-WG are currently closed for vehicular traffic. Site photos are provided in Appendix A.

Peak flows have been calculated using Unified Ontario Flood Method (UOFM). A Visual-OTTHYMO (VO) model has also been developed to calculate the peak flow from the Regional Storm event (Hurricane Hazel) as well to provide a comparison of the UOFM peak flows.

Short reach HEC-RAS models have been developed to assess the hydraulics of bridges. A combination of LiDAR data and survey data has been used to develop the model.

The LiDAR has been obtained from Ontario GeoHub. The structures are within the LiDAR2016to18_DTM-LkErie-W. This data is in CGVD2013 vertical datum.

3.0 Design Criteria

The hydrologic and hydraulic design criteria will incorporate the policies and criteria of three agencies, the Ministry of Transportation (MTO), the Township, and the GRCA.

The following criteria have been used in the hydraulic analysis of the existing and proposed structures:

- The existing bridges are located on Low-Volume Local Roads and in accordance with the MTO Highway Drainage Design Standards WC-1, 1.2.1, the Design flow for the bridge analysis is the 4% Annual Exceedance Probability (AEP) or 25-year peak flow, given that the total span exceeds 6.0 m.
- In accordance with the MTO Highway Drainage Design Standards WC-2, 3.3.1, there are no freeboard requirements for Low-Volume Local Roads.
- In accordance with the MTO Highway Drainage Design Standards WC-2, 3.3.2, the minimum Clearance to the soffit shall be ≥ 0.0 m.
- As per the policies of the GRCA, the pre- to post-development conditions shall not result in negative impacts to the flood levels or erosion potential.

4.0 Hydraulic and Hydrological Analysis

4.1 General

In accordance with the design criteria outlined in Section 3.0, three design considerations have been used in the analysis of all structures, and have been summarized as follows:

- Analyze the existing bridges under the 4% AEP Storm Event (25-year storm event) to determine the existing flood impacts.
- Determine the required size of the crossing to convey the 4% AEP peak flow (25-year storm event).
- Size the bridge crossing to maintain or improve the backwater flood elevation during all design flood events.

4.2 Hydraulic Model

The HEC-RAS version 6.6 computer model developed by the U.S. Army Corps of Engineers has been utilized. This model estimates the change in water surface elevation between selected valley cross sections and routines to account for local increases in water levels due to bridges, culverts, or other flow obstructions. The model is intended for utilization in the analysis of water surface profiles of steady state, gradually varied, one-dimensional flow in natural, and man-made channels.

A number of considerations are required in the selection of data and variables to be used in the application of the HEC-RAS model to the floodplain of the study area, as follows:

- Cross sections.
- Hydraulic Structures and Computational Routines.
- Hydraulic Parameters.
- Boundary Conditions.

4.3 Hydrological Model

According to the MTO Highway Drainage Design Standards, the UOFM shall be used in designing watercourse crossings. UOFM uses empirical equations derived through regression analysis to calculate the peak flow. In addition to the UOFM method, peak flows shall be calculated using an alternative hydrology model to determine which UOFM peak flow limits are to be used in the design. The UOFM shall be applied as follows:

- If the flow value from the UOFM is higher than from any other applicable method, the UOFM mean quantile values shall be used as Design Flows.
- If the flow value from the UOFM is lower than from any other applicable method, the value at the upper limit of the range shall be applied in design.

The drainage area, eco zone, wetland area, mean annual precipitation and lake attenuation index are used in calculating the mean, upper and lower limits of the peak flow for each design storm using UOFM.

VO has been selected as the alternative hydrology model to compare the UOFM flows. IDF coefficients derived from MTO Lookup Tool, land use data extracted from ArcHydro, and contour data from LiDAR have been used to set up the VO model. Using the SCS curve number method, peak flows were calculated for the 24-hr SCS Type II design storms in VO. The Hurricane Hazel Regional Storm has also been modeled in VO. Appendix B provides the IDF coefficient, land use data and all the other inputs used in the VO model.

Catchments that are draining towards the bridges have been derived using GIS. Figure 1 shows the entire catchment. The catchment boundary is shown in “Red”, and the flow path is shown in “Blue” and “Cyan”.

The entire catchment area is divided into 45 subcatchments. All subcatchments have been modelled in VO using the NASHYD command as they consist of rural type land use. All the subcatchments that are draining towards 30-WG-02.A (the furthest upstream bridge) are routed directly to 30-WG-02.A and hydrographs are added using ADDHYD command. Through the use of the ADDHYD command all the hydrographs are added together. To account for the timing of the hydrographs a ROUTECHANNEL command was added with the attributes of the upstream tributary channel. Figure 2 and Appendix C.5 show the schematic of the developed VO model.

The remaining subcatchments, except for the subcatchment that Bridge 21-WG is located in, are directly routed towards Bridge 29-WG. Subcatchment Hydrographs and the preceding ADDHYD of 30-WG are added using a new ADDHYD command to calculate the cumulative peak flow at 29-WG. Using ROUTECHANNEL command, the adjustment was made for the different peak times of the upstream tributary.

Similarly, all the preceding ADDHYD commands and the subcatchment which 21-WG is located are routed towards the Bridge 21-WG and peak flows are calculated. All the subcatchment information derived from GIS is shown in Appendix B.

Figure 1: Catchment Area

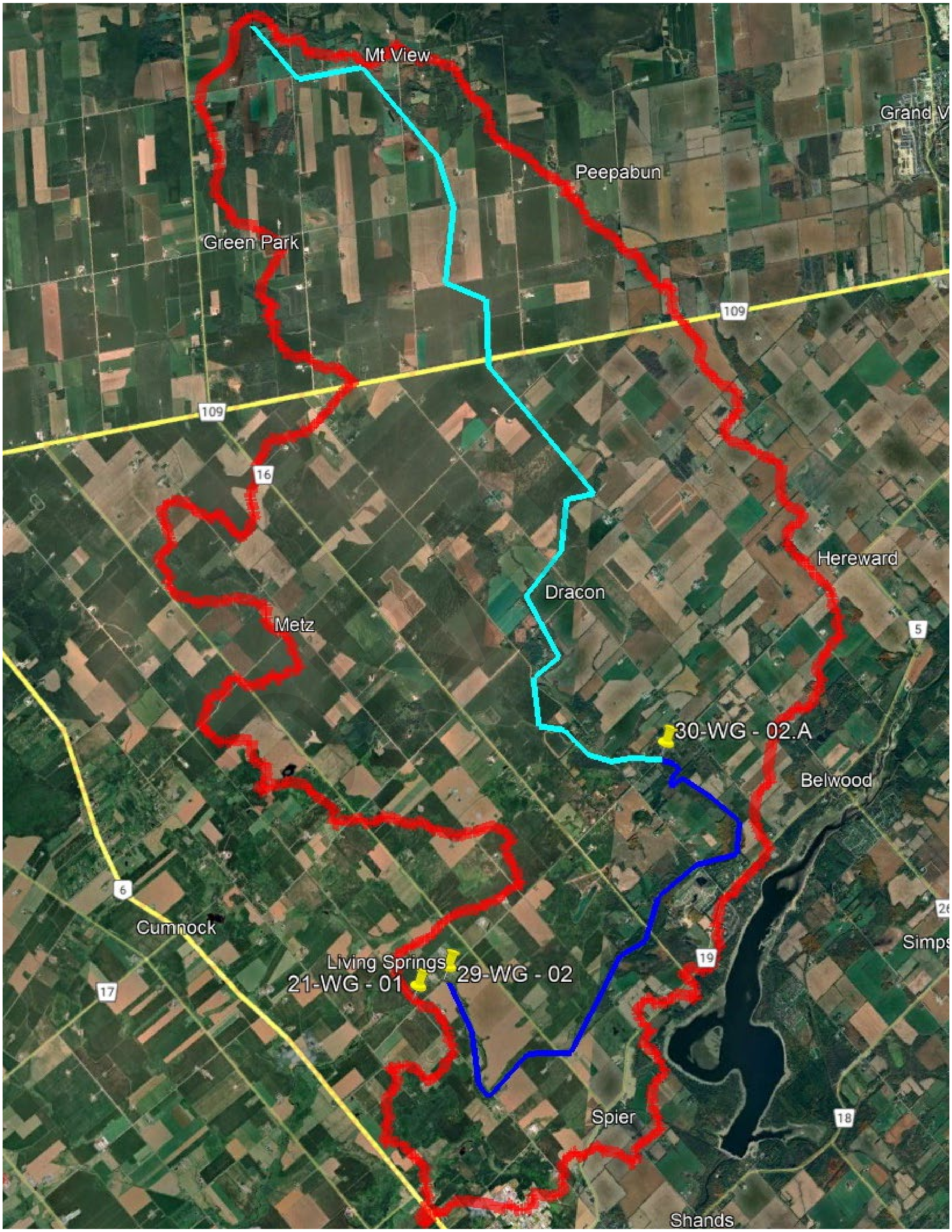


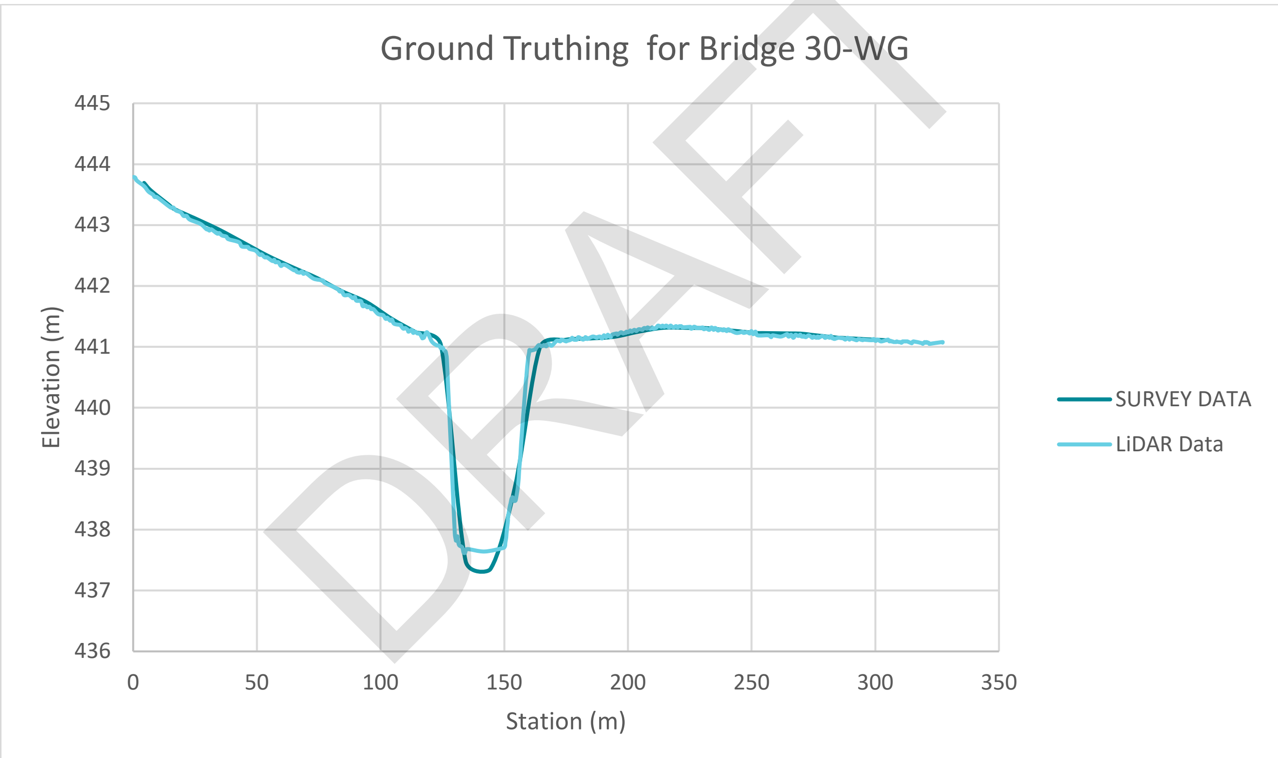
Figure 2: VO Model Schematic

5.0 Bridge Analysis: 30-WG

5.1 Ground Truthing

Burnside has compiled the topographic survey data and the LiDAR data, as noted in Section 2.0. To assess the vertical tolerance between the data sets, a ground truthing exercise has been completed. The LiDAR package was combined in the HEC-RAS RAS-Mapper tool, and the road centreline of the LiDAR was compared to that of the road centreline obtained in the survey. The analysis shows that the elevation difference is less than 0.1% between the surveyed data and LiDAR data. Therefore, no adjustments were required for the LiDAR data which was used in analyzing the overall system. Figure 3 below shows both profiles.

Figure 3: Road Centreline Comparison – 30-WG



5.2 Hydrology

Peak flows for the hydraulic analysis have been based on flows calculated in VO model and the UOFM.

Key hydrologic parameters calculated in ArcHydro include drainage areas, catchment lengths, catchment slope, soils, and land use. The remaining hydrologic parameters including CN, I_a, have been calculated by Burnside and are outlined in Table 1 below. Detailed calculations are included in Appendix B. Time of concentration (T_c) was calculated based on Airport method or

Bransby William method (T_c in "Bold" font) depending on the runoff coefficient. The total catchment area contributing to Bridge 30-WG is 10214 ha (102.14 km^2).

Table 1: Hydrology Parameters – 30-WG

Catchment ID	Catchment Area (ha)	Runoff Coefficient	Time of Concentration (min)	I_a (mm)	CN (II)
NASHYD-08	185.44	0.32	169	7.2	74
NASHYD-08.A	459.63	0.39	163	7.3	80
NASHYD-08.A.1	401.07	0.38	184	7.1	79
NASHYD-08.B	188.89	0.35	112	7.7	77
NASHYD-09	378.41	0.40	**238**	7.2	80
NASHYD-09.A	361.98	0.40	**168**	7.3	80
NASHYD-09.A.1	310.72	0.42	**105**	7.1	82
NASHYD-09.A.1.A	345.92	0.40	**98**	7.0	79
NASHYD-09.A.1.B	266.68	0.42	**89**	7.0	81
NASHYD-09.A.1.B.1	354.50	0.44	**160**	7.0	82
NASHYD-09.A.1.B.1.A	165.74	0.40	191	7.3	79
NASHYD-09.A.1.B.2	288.15	0.42	**171**	7.2	81
NASHYD-09.A.1.C	402.30	0.38	182	7.5	79
NASHYD-09.A.1.C.1	185.44	0.40	186	7.3	80
NASHYD-09.B	186.45	0.37	170	7.3	79
NASHYD-10	236.59	0.40	154	7.5	80
NASHYD-10.A	163.67	0.43	**80**	6.9	82
NASHYD-10.B	311.61	0.43	**132**	6.9	81
NASHYD-11	342.21	0.40	**194**	7.2	80
NASHYD-12	436.48	0.45	**174**	7.1	82
NASHYD-12.A	439.56	0.42	**149**	7.0	81
NASHYD-12.B	260.28	0.44	**134**	7.4	82
NASHYD-12.B.1	339.24	0.36	252	7.3	77
NASHYD-13	355.53	0.41	**154**	6.8	81
NASHYD-14	437.41	0.41	**179**	7.0	81
NASHYD-14.A	316.28	0.40	222	7.2	81
NASHYD-14.A.1	157.21	0.45	**116**	6.5	83
NASHYD-15	491.57	0.41	**144**	7.1	80
NASHYD-15.A	341.01	0.35	158	7.0	76
NASHYD-15.A.1	112.74	0.34	147	8.3	68
NASHYD-15.B	306.27	0.36	214	7.5	76
NASHYD-16	361.23	0.40	207	7.7	80
NASHYD-16.A	201.13	0.40	161	7.9	80
NASHYD-17	123.12	0.33	138	7.1	75

The 24-hour SCS Type-II rainfall distribution was used for the design Storm Event calculations. The Regional Storm event was based on the Hurricane Hazel storm. Table 2 provides a summary of the VO model results and Appendix C provides calculations and detailed peak flow results.

Table 2: Summarized VO Peak Flows – 30-WG

50% AEP / 2-year (m³/s)	20% AEP / 5-year (m³/s)	10% AEP / 10-year (m³/s)	4% AEP / 25-year (m³/s)	2% AEP / 50-year (m³/s)	1% AEP / 100-year (m³/s)	Regional (m³/s)
47.9	87.7	117.97	159.35	191.59	224.46	519.81

As per the MTO Highway Drainage Design Standards manual, dated March 2024, the UOFM shall be used in the design of water crossing infrastructure when accurate flow data is not available. 102.14 km^2 drainage area is considered for UOFM calculations. Table 3 summarizes the UOFM peak flows.

Table 3: Summarized UOFM Flows – 30-WG

AEP / Return Period	Lower Limit (m³/s)	Mean Values (m³/s)	Upper Limit (m³/s)
50% / 2-year	20.39	28.72	40.20
10% / 10-year	35.37	52.01	75.93
4% / 25-year	42.75	63.81	95.71
2% / 50-year	47.10	72.46	110.87
1% / 100-year	52.08	81.37	127.76

Since the UOFM flows are lower than the VO flows noted above, the UOFM upper limit flows will be used for the 50% to 1% AEP and the VO Regional flow will be used in the analysis of Bridge 30-WG. A summary of the flows used in the hydraulic modelling is provided below in Table 4 and included in Appendix C.

Table 4: Summarized Peak Flows – 30-WG

50% AEP / 2-year (m³/s)	10% AEP / 10-year (m³/s)	4% AEP / 25-year (m³/s)	2% AEP / 50-year (m³/s)	1% AEP / 100-year (m³/s)	Regional (m³/s)
40.20	75.93	95.71	110.87	127.76	519.81

5.3 Hydraulic Analysis

5.3.1 Existing Bridge

The existing structure has been observed to convey storms up to the Regional Storm event with a calculated headwater elevation of 442.10 m at Cross Section 272. The headwater elevation during the 4% AEP is 440.05 m. The lowest roadway profile elevation within the project area is 440.86 m and the lowest edge of travelled lane is 440.84 m. The minimum soffit elevation is measured to be 440.22 m, resulting in an existing freeboard for the 4% AEP design storm of 0.79 m.

The existing bridge is expected to overtop during Regional Storm event but satisfies the design criteria outlined in Section 3.0.

Upstream of structure 30-WG the river reach runs parallel to Sideroad 15. Immediately upstream of the structure, the river reach bends and drains southeast. To cut the cross sections within the model to avoid any cross sections crossing, the upstream cross sections covering the areas parallel to the road were terminated at the bottom of the road embankment. This allowed for the bridge bounding cross sections to extend parallel to the road to allow for proper coding of the bridge structure, and for the downstream cross sections to be extended far enough to capture the extents of the downstream floodplain without crossing the upstream cross sections. However, upon initial iterations of the model, it became apparent that the flow will overtop Sideroad 15 during the Regional Storm event. To account for this overtopping, a lateral structure was added into the model between upstream cross sections 482.5 and the bounding bridge cross section. The lateral structure was coded as a weir, with the weir profile following the road profile. As such, once the water surface elevation in the cross section exceeded the road profile, water would spill over the weir. The lateral structure was coded to allow the weir flow to be added back into the model downstream of the bridge so that the total flow could be considered for the tailwater impacts.

A summary of the Existing Conditions hydraulic outputs has been provided in Appendix D.

5.3.2 Proposed Bridge Replacement

Alternatives were considered to replace the existing structure to improve conveyance and aquatic habitat through the crossing in accordance with the design criteria outlined in Section 3.0 above.

Several iterations of bridge sizes and configurations and associated road profiles were generated and evaluated based on preliminary geometric design. The depth of superstructure used was based on the MTO Prestress Girder Design Guideline Span Applicability Charts or information provided by truss fabricators. The proposed bridge geometry was set to have the proposed soffit within 0 to 20 cm of the existing soffit elevation. As such, where the depth of the superstructure (from soffit to centreline of road) was greater than the existing, increases to the road profile elevations were required. These increases to the road profile results in the relief flow (overtopping of the roadway) area being reduced for storms overtopping the roadway, which generally causes an increase in flood elevations if a similar span is used. As such, the spans were required to be increased to offset the road profile increases. As spans increase, the depth of the superstructure may also increase as required for structural capacity of the crossing. Accordingly, several iterations were made until a solution which did not have negative effects on flood elevations was determined.

Table 5 illustrates the proposed bridge characteristics versus the existing bridge.

Table 5: Structure Comparison – 30-WG

Crossing Characteristic	Existing Conditions	Proposed Conditions
Structure Information		
Material and Type	Steel Truss	Clear Span Prestressed Concrete B900 Box Girder Bridge
Open Footing (Y/N)	Y	Y
Hydraulic Span (m)	26.3	28
Soffit U/S (m)	440.22	NE: 440.60 SW: 440.32
Soffit D/S (m)	440.22	NE: 440.60 SW: 440.32
Hydraulic Length (m)	5.6	10
Barrier Length, from CL Bridge (m)	N/A	20 (each side of centreline)
Barrier Height, from CL Road (m)	N/A	0.735
Roadway Information		
Road Surface (Gravel / Paved)	Gravel	Paved
Low Point in Road Elev. (m)	440.86	441.12
Low Point Edge of Lane Elev. (m)	440.84	441.03
Road Width (m)	4.58	9.2
Guide Rail (Y/N)	N	Y
Watercourse Information		
Tailwater Conditions	Normal Depth	
Normal Depth Slope (m/m)	0.001	
Channel Invert U/S (m)	438.25	
Channel Invert D/S (m)	437.43	

A solid concrete barrier has been assumed in the model, extending from end of wingwall to end of wingwall in the proposed conditions; however, the use of a three-tube railing or similar open type railing may be investigated further during detailed design. Since the existing bridge is a truss bridge and contains partially open panels made of individual steel members which could end up partially blocked by debris during overtopping events, the truss has been modelled as a solid obstruction using 50% of the truss width to represent potential flow obstruction. Table 6 below illustrates the proposed headwater elevations versus existing at the upstream bounding cross section 272.

Table 6: Headwater Comparison Bridge – 30-WG (Cross Section 272)

Discharge Names	Flow (cms)	Existing Headwater Elevation (m)	Proposed Headwater Elevation (m)	Headwater Difference (m)	Proposed Clearance to Effective Soffit Elevation	Proposed Freeboard to Edge of Travelled Lane
					440.32 (m)	441.03 (m)
50% AEP / 2-year	40.20	439.48	439.48	0.00	0.84	1.55
10% AEP / 10-year	75.93	439.87	439.85	-0.02	0.47	1.18
4% AEP / 25-year	95.71	440.05	440.02	-0.03	0.3	1.01
2% AEP / 50-year	110.87	440.18	440.14	-0.04	0.18	0.89
1% AEP / 100-year	127.76	440.33	440.27	-0.06	0.05	0.76
Regional	305.95	442.10	442.15	0.05	-1.83	-1.12

The proposed structure conveys the 1% AEP storm event and exceeds the design criteria outlined in Section 3.0 above.

The water surface elevation has been reduced for all upstream cross sections during 50% AEP - 1% AEP storms. However, the water surface elevations are shown to increase by 0.04 to 0.05 m during the Regional Storm event for all upstream cross sections and downstream bounding cross section 259. The water surface elevation remains unchanged for all the modelled downstream cross sections during the remaining storm events.

Based on a high-level review of the surrounding topography, the increase in water surface elevations throughout the upstream cross sections does not appear to impact any adjacent dwellings and overall are seen to be negligible. This magnitude of increase is noted to be within the range of modelling tolerances generally acceptable by Conservation Authorities.

The velocity is shown to increase by approximately 0.01-0.1 m/s during 50% AEP - 1% AEP storms while the model results indicate the channel velocity decreases by 0.04-0.08 m/s during Regional Storm event at all modelled cross sections.

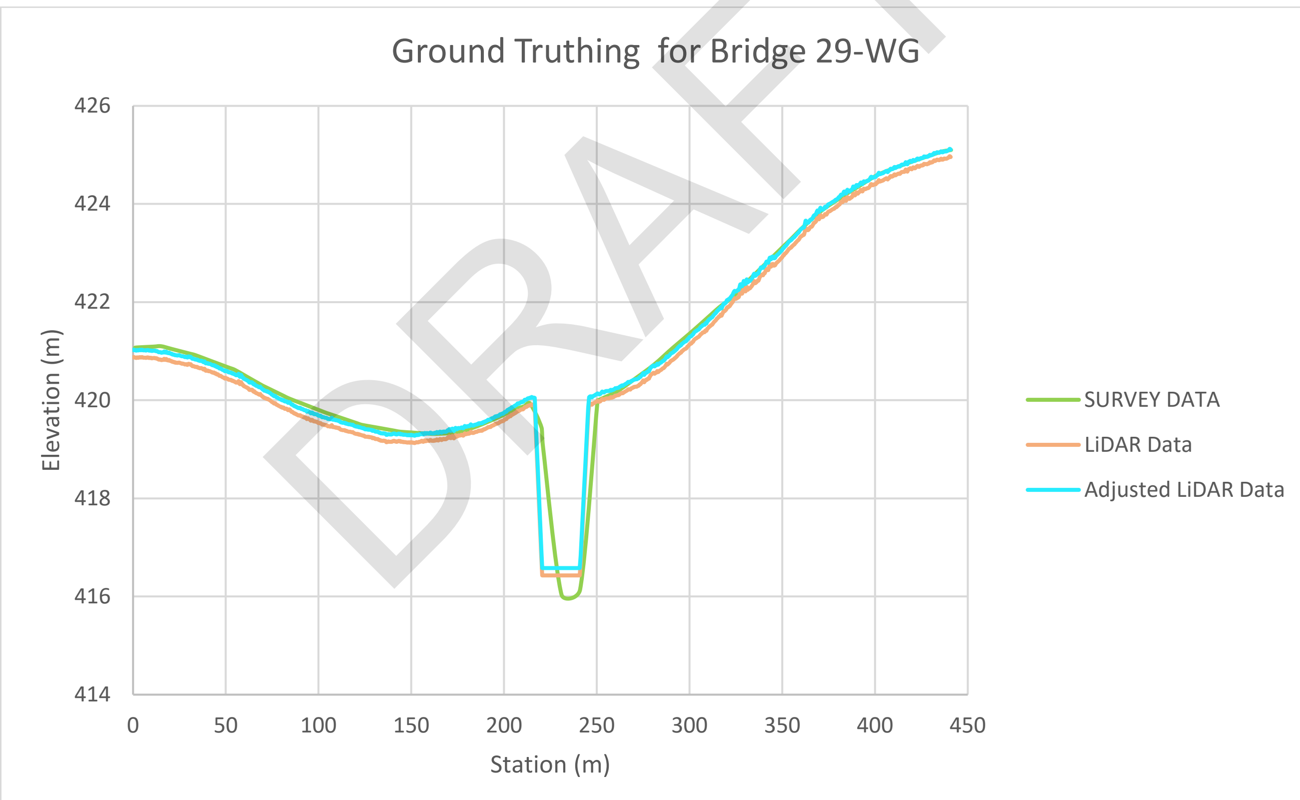
Water surface elevations, velocity, flow and other model results of existing and proposed Bridge 30-WG have been provided in Appendix D. Preliminary Plan and Profile Drawings have been provided in Appendix E.

6.0 Bridge Analysis: 29-WG

6.1 Ground Truthing

Burnside has compiled the topographic survey data and the LiDAR data, as noted in Section 2.0. To assess the vertical tolerance between the data sets, a ground truthing exercise has been completed. The LiDAR package was combined in the HEC-RAS Mapper, and the road centreline of the LiDAR was compared to the road centreline obtained in the survey. The analysis shows that the elevation difference is approximately 0.2 m between the surveyed data and LiDAR data. Ground truthing was also completed for Bridge 21-WG and had an approximate elevation difference of 0.1 m. Since both bridges are modelled in the same river reach, the LiDAR surface elevations were adjusted by the average of 0.15 m. Figure 4 below shows the road profile comparison for Bridge 29-WG.

Figure 4: Road Centreline Comparison – 29-WG



6.2 Hydrology

Peak flows for the hydraulic analysis have been based on flows calculated in the VO model and the UOFM.

Key hydrologic parameters calculated in ArcHydro include drainage areas, catchment lengths, catchment slope, soils, and land use. The remaining hydrologic parameters including CN, I_a, have been calculated by Burnside and outlined in Table 7 below and in Appendix B. Time of concentration (T_c) was calculated based on Airport method as the run off coefficients were less than 0.4.

Table 7: Hydrology Parameters – 29-WG

Catchment ID	Catchment Area (ha)	Runoff Coefficient	Time of Concentration (min)	I_a (mm)	CN (II)
NASHYD-02	247.865	0.36	191	6.7	80
NASHYD-02.A	356.127	0.35	175	7.5	75
NASHYD-03	235.052	0.32	231	7.1	76
NASHYD-03.A	279.022	0.33	209	8.1	77
NASHYD-03.B	365.015	0.35	241	7.4	75
NASHYD-04	121.088	0.29	186	7.6	72
NASHYD-05	390.335	0.28	263	7.3	72
NASHYD-05.A	201.798	0.27	185	7.3	70
NASHYD-06	231.687	0.23	150	7.4	63
NASHYD-07	418.88	0.32	260	7.4	74

In addition to the runoff calculated for the catchments listed in Table 7, the total flow contributing to Bridge 29-WG also includes the flow that contributes to Bridge 30-WG, as Bridge 30-WG is upstream on the same reach. The total catchment area contributing to Bridge 29-WG is 13061 ha (130.61 km^2) including the drainage area from Bridge 30-WG.

The 24-hour SCS Type-II rainfall distribution was used for the design Storm Event calculations. The Regional Storm event was based on the Hurricane Hazel storm. Table 2 provides a summary of the VO model results and Appendix C provides calculations and detailed peak flow results.

Table 8: Summarized VO Peak Flows – 29-WG

50% AEP / 2-year (m^3/s)	20% AEP / 5-year (m^3/s)	10% AEP / 10-year (m^3/s)	4% AEP / 25-year (m^3/s)	2% AEP / 50-year (m^3/s)	1% AEP / 100-year (m^3/s)	Regional (m^3/s)
47.85	87.97	118.77	163.15	191.8	226.04	562.754

As per the MTO Highway Drainage Design Standards manual, dated March 2024, the Unified Ontario Flood Method (UOFM) shall be used in the design of water crossing infrastructure when accurate flow data is not available. 130.61 km^2 drainage area is considered for UOFM calculations. Table 9 summarizes the UOFM peak flows.

Table 9: Summarized UOFM Flows – 29-WG

AEP / Return Period	Lower Limit (m^3/s)	Mean Values (m^3/s)	Upper Limit (m^3/s)
50% / 2-year	22.52	31.72	44.41
10% / 10-year	38.17	56.13	81.95

AEP / Return Period	Lower Limit (m^3/s)	Mean Values (m^3/s)	Upper Limit (m^3/s)
4% / 25-year	45.80	68.36	102.55
2% / 50-year	50.24	77.29	118.25
1% / 100-year	55.33	86.46	135.74

Since the UOFM flows are lower than the VO flows noted above, the UOFM upper limit flows will be used for the 50% - to 1% AEP and the VO Regional flow will be used in the analysis of Bridge 29-WG. A summary of the flows used in the hydraulic modelling is provided below in Table 10 and included in Appendix C.

Table 10: Summarized Peak Flows – 29-WG

50% AEP / 2-year (m^3/s)	10% AEP / 10-year (m^3/s)	4% AEP / 25-year (m^3/s)	2% AEP / 50-year (m^3/s)	1% AEP / 100-year (m^3/s)	Regional (m^3/s)
44.41	81.95	102.55	118.25	135.74	562.754

6.3 Hydraulic Analysis

6.3.1 Existing Bridge

The existing structure has been observed to drain all storms up to the Regional Storm event with a calculated headwater elevation of 421.36 m at Cross Section 1136. The headwater elevation during the 4% AEP is 418.74 m. The lowest roadway profile elevation within the project area is 419.3 m and the lowest edge of travelled lane is 419.25 m. The minimum soffit elevation is 419.42 m based on field measurements and survey data, resulting in an existing freeboard for the 4% AEP design storm of 0.51 m.

The existing bridge is expected to overtop during Regional Storm event but satisfies the design criteria outlined in Section 3.0.

A summary of the existing conditions hydraulic output files has been provided in Appendix D.

6.3.2 Proposed Bridge Replacement

Alternatives were considered to replace the existing structure to improve conveyance and aquatic habitat through the crossing in accordance with the design criteria outlined in Section 3.0 above.

Several iterations of bridge sizes and configurations and associated road profiles were generated and evaluated based on preliminary geometric design. The depth of superstructure used was based on the MTO Prestress Girder Design Guideline Span Applicability Charts or information provided by truss fabricators. Where the depth of the superstructure (from soffit to centreline of road) was greater than the existing, the geometry and road profile were adjusted to minimize the impacts to the Regional Storm flood elevations (overtopping condition) increases to the road profile elevations where required. For this site, increases to the road profile resulted in significant loss to relief flow and increases to Regional Storm headwater elevations beyond acceptable limits. As such, the preferred solution hydraulically involved lowering the soffit of the structure to approximately match the existing road profile and increasing the span to offset the hydraulic impacts of the lowered soffit. Table 11 illustrates the proposed bridge characteristics versus the existing bridge.

Table 11: Structure Comparison – 29-WG

Crossing Characteristic	Existing Conditions	Proposed Conditions
Structure Information		
Material and Type	Steel Truss	Two span, Prestressed Concrete Box Girder Bridge
Open Footing (Y/N)	Y	Y
Hydraulic Span (m)	21.45	18.5, 18.5 (Total 38 m between Abutments with 1 m wide pier at center)
Soffit U/S (m)	S 419.53 N 419.42	S 419.19 N 419
Soffit D/S (m)	S 419.53 N 419.42	S 419.19 N 419
Hydraulic Length (m)	6.4	10
Barrier Length, from CL Bridge (m)	NA	N 26 S 23.5
Barrier Height, from CL Road (m)	NA	0.73
Roadway Information		
Road Surface (Gravel / Paved)	Gravel	Paved
Low Point in Road Elev. (m)	419.3	419.3
Low Point Edge of Lane Elev. (m)	419.25	419.23
Road Width (m)	5.36	9.2
Guide Rail (Y/N)	N	Y
Watercourse Information		
Tailwater Conditions	Normal Depth	
Normal Depth Slope (m/m)	0.001	
Channel Invert U/S (m)	416.65	
Channel Invert D/S (m)	415.98	

A solid concrete barrier has been assumed in the model, extending from end of wingwall to end of wingwall in the proposed conditions; however, the use of a three-tube railing or similar open type railing may be investigated further during detailed design. Since the existing bridge is a truss bridge and contains partially open panels which could end up partially blocked by debris during overtopping events, the truss has been modelled as a solid obstruction using 50%of the truss width to represent potential flow obstruction. Table 12 below illustrates the Proposed Headwater Elevations versus Existing Conditions.

Table 12: Headwater Comparison at Bridge – 29-WG (Cross Section 1136)

Discharge Names	Flow (cms)	Existing Headwater Elevation (m)	Proposed Headwater Elevation (m)	Headwater Difference (m)	Proposed Clearance to Effective Soffit Elevation	Proposed Freeboard to Edge of Travelled Lane
					419 (m)	419.23 (m)
50% AEP / 2-year	44.41	418.19	418.13	-0.06	0.87	1.10
10% AEP / 10-year	81.95	418.73	418.59	-0.14	0.41	0.64
4% AEP / 25-year	102.55	418.98	418.78	-0.2	0.22	0.45
2% AEP / 50-year	118.25	419.16	418.91	-0.25	0.09	0.32
1% AEP / 100-year	135.74	419.35	419.05	-0.3	-0.05	0.18
Regional	562.76	421.36	421.34	-0.02	-2.34	-2.11

The proposed structure conveys up to the 2% AEP storm event while adhering to the design criteria outlined in Section 3.0 above.

The headwater elevation has decreased at the proposed bridge during all the modelled storm events as shown in Table 12 above.

The water surface elevation has decreased by 0.01 m to 0.3 m for the all the upstream cross sections in the modelled river reach during 50% AEP – Regional storms. The water surface elevation is shown to increase by approximately 0.03 m during the Regional Storm event for the downstream cross sections. However, based on a review of the surrounding topography, the slight increase in water surface elevation is not shown to impact any dwellings and in general can be considered negligible.

The velocity in the channel is shown to increase by 0.01-0.2 m/s during all the modelled storms in upstream cross sections, while downstream cross section channel velocity is shown to decrease by 0.01-0.19 m/s.

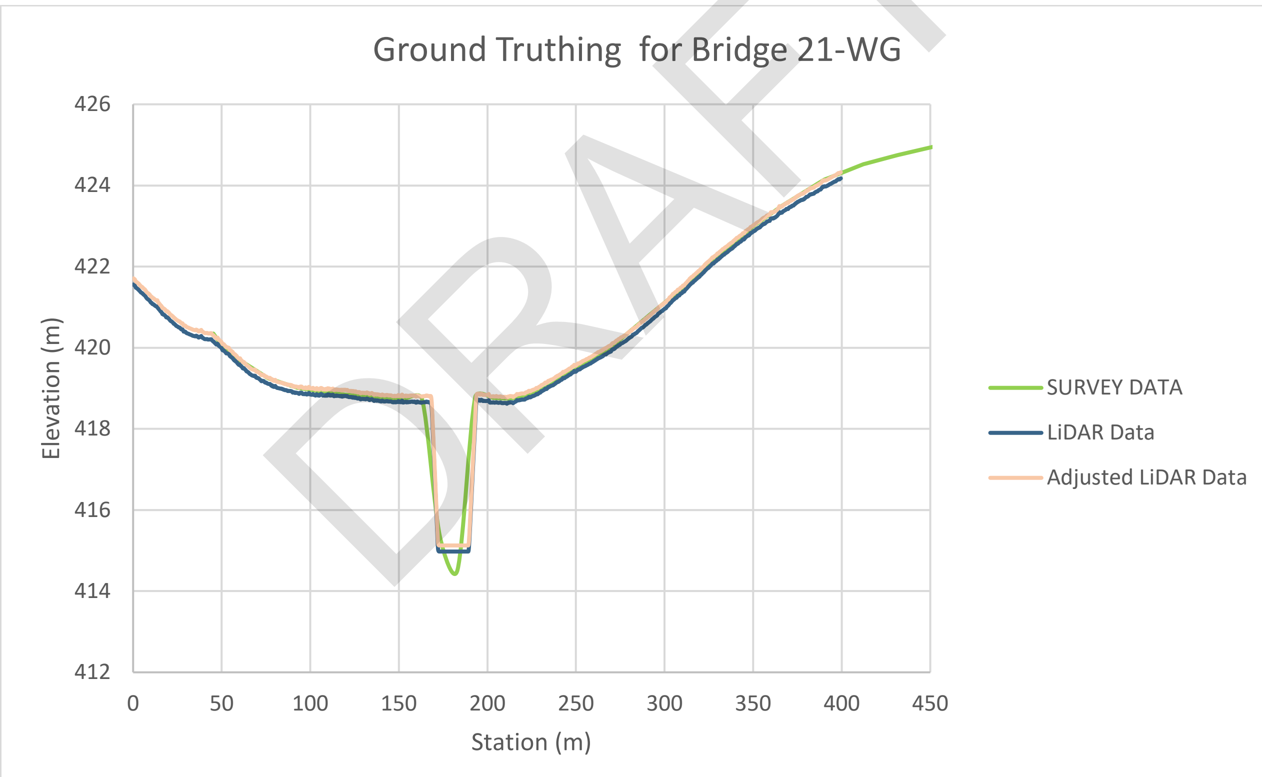
Water surface elevations, velocity, flow and other model results of existing and proposed Bridge 29-WG have been provided in Appendix D. Preliminary Plan and Profile Drawings have been provided in Appendix E.

7.0 Bridge Analysis: 21-WG

7.1 Ground Truthing

Burnside has compiled the topographic survey data and the LiDAR data, as noted in Section 2.0. To assess the vertical tolerance between the data sets, a ground truthing exercise has been completed. The LiDAR package was combined in the HEC-RAS RAS-Mapper and the road centreline of the LiDAR was compared to that of the road centreline obtained in the survey. The analysis shows that the elevation difference is approximately 0.1 m between the surveyed data and LiDAR data. Ground truthing was also completed for Bridge 29-WG which showed that the approximate elevation difference is 0.2 m. Since both bridges are modelled in the same river reach, the LiDAR surface elevations were adjusted by the average of 0.15m. Figure 5 below shows both profiles.

Figure 5: Road Centreline Comparison – 21-WG



7.2 Hydrology

Peak flows for the hydraulic analysis have been based on flows calculated in VO model and the UOFM.

Key hydrologic parameters calculated in ArcHydro include drainage areas, catchment lengths, catchment slope, soils, and land use. The remaining hydrologic parameters including CN, I_a, have been calculated by Burnside and outlined in Table 13 below and in Appendix B. Time of concentration (T_c) was calculated based on Bransby Williams method as the runoff coefficient is slightly above 0.4

Table 13: Hydrology Parameters – 21-WG

Catchment ID	Catchment Area (ha)	Runoff Coefficient	Time of Concentration (min)	I_a (mm)	CN (II)
NASHYD-01	121.563	0.40	82	7.3	80

In addition to the runoff calculated from catchment NASHYD-01, the total runoff contributing to Bridge 21-WG also includes the peak flows that contribute to Bridge 29-WG and Bridge 30-WG as all three bridges are on the same reach. Therefore, the total catchment area contributing to Bridge 21-WG is 13182 ha (131.82 km^2) including Bridge 30-WG and Bridge 29-WG catchment areas.

The 24-hour SCS Type-II rainfall distribution was used for the design Storm Event calculations. The Regional Storm event was based on the Hurricane Hazel storm. Table 2 provides a summary of the VO model results and Appendix C provides calculations and detailed peak flow results.

Table 14: Summarized VO Peak Flows – 21-WG

50% AEP / 2-year (m³/s)	20% AEP / 5-year (m³/s)	10% AEP / 10-year (m³/s)	4% AEP / 25-year (m³/s)	2% AEP / 50-year (m³/s)	1% AEP / 100-year (m³/s)	Regional (m³/s)
48.1	88.38	119.28	163.78	192.55	226.88	563.403

As per the MTO Highway Drainage Design Standards manual, dated March 2024, the UOFM shall be used in the design of water crossing infrastructure when accurate flow data is not available. 131.82 km^2 drainage area is considered for UOFM calculations. Table 15 summarizes the UOFM peak flows.

Table 15: Summarized UOFM Flows – 21-WG

AEP / Return Period	Lower Limit (m³/s)	Mean Values (m³/s)	Upper Limit (m³/s)
50% / 2-year	22.68	31.94	44.72
10% / 10-year	38.44	56.53	82.54
4% / 25-year	46.13	68.86	103.28
2% / 50-year	50.60	77.85	119.10
1% / 100-year	55.74	87.09	136.73

Since the UOFM flows are lower than the VO flows noted above, the UOFM upper limit flows will be used for the 50% - to 1% AEP and the VO Regional flow will be used in the analysis of Bridge 21-WG. A summary of the flows used in the hydraulic modelling is provided below in Table 16 and included in Appendix C.

Table 16: Summarized Peak Flows – 21-WG

50% AEP / 2-year (m^3/s)	10% AEP / 10-year (m^3/s)	4% AEP / 25-year (m^3/s)	2% AEP / 50-year (m^3/s)	1% AEP / 100-year (m^3/s)	Regional (m^3/s)
44.72	82.54	103.28	119.1	136.73	563.403

7.3 Hydraulic Analysis

7.3.1 Existing Bridge

The existing structure has been observed to drain all storms up to the Regional Storm event with a calculated headwater elevation of 420.6 m at cross section 384. The headwater elevation during the 4% AEP is 417.64 m. The lowest roadway profile elevation within the project area is 418.74 m and the lowest edge of travelled lane is 418.68 m. The minimum soffit elevation is measured to be 418.20 m, resulting in an existing freeboard for the 4% AEP design storm of 1.04 m.

The existing bridge is expected to overtop during Regional Storm event but satisfies the design criteria outlined in Section 3.0.

A summary of the existing condition hydraulic output files has been provided in Appendix D.

7.3.2 Proposed Bridge Replacement

Alternatives were considered to replace the existing structure to improve conveyance and aquatic habitat through the crossing in accordance with the design criteria outlined in Section 3.0 above.

Several iterations of bridge sizes and configurations and associated road profiles were generated and evaluated based on preliminary geometric design. The depth of superstructure used was based on the MTO Prestress Girder Design Guideline Span Applicability Charts or information provided by truss fabricators. Where the depth of the superstructure (from soffit to centreline of road) was greater than the existing, the geometry and road profile were adjusted to minimize the impacts to the Regional Storm flood elevations (overtopping condition) increases to the road profile elevations where required. For this site, increases to the road profile resulted in loss to relief flow and increases to Regional Storm headwater elevations beyond acceptable limits. As such, the preferred solution hydraulically involved lowering the soffit of the structure and increasing the span to offset the hydraulic impacts of the lowered soffit. Table 17 illustrates the proposed bridge characteristics compared to the existing bridge.

Table 17: Structure Comparison – 21-WG

Crossing Characteristic	Existing Conditions	Proposed Conditions
Structure Information		
Material and Type	Steel Truss	Prestressed Concrete B800 Box Girder Bridge
Open Footing (Y/N)	Y	Y
Hydraulic Span (m)	17.44	26
Soffit U/S (m)	E 418.2 W 418.2	E 418 W 418
Soffit D/S (m)	E 418.2 W 418.2	E 418 W 418
Hydraulic Length (m)	5.6	10
Barrier Length, from CL Bridge (m)	NA	19 (each side of CL)
Barrier Height, from CL Road (m)	NA	0.73
Roadway Information		
Road Surface (Gravel / Paved)	Gravel	Paved
Low Point in Road Elev. (m)	418.74	418.82
Low Point Edge of Lane Elev. (m)	418.68	418.75
Road Width (m)	4.855	9.2
Guide Rail (Y/N)	N	Y
Watercourse Information		
Tailwater Conditions	Normal Depth	
Normal Depth Slope (m/m)	0.001	
Channel Invert U/S (m)	415.48	
Channel Invert D/S (m)	414.46	

A solid concrete barrier has been assumed in the model, extending from end of wingwall to end of wingwall in the proposed conditions; however, the use of a three-tube railing or similar open type railing may be investigated further during detailed design. Since the existing bridge is a truss bridge and contains partially open panels which could end up partially blocked by debris during overtopping events, the truss has been modelled as a solid obstruction using 50% of the truss width to represent potential flow obstruction. Table 18 below illustrates the proposed headwater elevation compared to the existing headwater elevation.

Table 18: Headwater Comparison at Bridge – 21-WG (Cross Section 384)

Discharge Names	Flow (cms)	Existing Headwater Elevation (m)	Proposed Headwater Elevation (m)	Headwater Difference (m)	Proposed Clearance to Effective Soffit Elevation	Proposed Freeboard to Edge of Travelled Lane
					418 (m)	418.75 (m)
50% AEP / 2-year	44.72	416.87	416.85	-0.02	1.15	1.9
10% AEP / 10-year	82.54	417.42	417.36	-0.06	0.64	1.39
4% AEP / 25-year	103.28	417.64	417.55	-0.09	0.45	1.2
2% AEP / 50-year	119.10	417.8	417.68	-0.12	0.32	1.07
1% AEP / 100-year	136.73	417.97	417.81	-0.16	0.19	0.94
Regional	563.40	420.6	420.64	0.04	-2.64	-1.89

The proposed structure conveys the Regional Storm event while adhering to the design criteria outlined in Section 3.0 above.

The water surface elevation decreases by 0.01 m to 0.17 m within all upstream cross sections in the modelled river reach during 50% AEP - 1% AEP. During the Regional Storm event the upstream cross section water surface elevation has increased by approximately 0.01-0.04 m. Based on a high-level review of the surrounding topography, the increase in water surface elevations throughout the upstream cross sections does not appear to impact any adjacent dwellings and overall are seen to be negligible. This magnitude of increase is noted to be within the range of modelling tolerances generally acceptable by Conservation Authorities.

Model results show that water surface elevation in the downstream cross sections remains unchanged during all the modelled storm events.

The velocity of the channel is shown to decrease by 0.01-0.18 m/s during all the modelled storms in the upstream cross sections except during regional storm where the velocity will decrease by approximately 0.02-0.05 m/s. Downstream cross section channel velocity remains unchanged.

Water surface elevations, velocity, flow and other model results of existing and proposed Bridge 29-WG have been provided in Appendix D. Preliminary Plan and Profile Drawings have been provided in Appendix E.

8.0 Recommendations and Conclusions

Burnside has completed hydrologic and hydraulic analysis of the three existing bridge crossings and provided recommendations for replacement structure sizes for consideration when evaluating the potential replacement as the bridges as part of this study.

All options provide an overall improvement by reducing or maintaining the headwater elevations under proposed conditions during design storm event outlined in Section 3.0. The required clearances for the 4% AEP design storm are met for all bridges.

Further refinement of the bridge design and associated road profiles and guide rail can be completed during the detailed design phase to further optimize designs.

R.J. Burnside & Associates Limited

D. Kankanamge

Dil Kankanamge, MASc., EIT
Engineering Assistant
DK:jm

Rachel Walton

Rachel Walton, P.Eng., MASc.
Project Engineer

Enclosure(s) Appendix A Site Photos
Appendix B Hydrology Calculations
Appendix C VO & The Unified Ontario Flood Method
Appendix D Hydraulic Modelling Outputs
Appendix E Drawings

30-WG


76°E (T) 43°47'42"N, 80°21'37"W ±16ft
Bridge 30-WG
Centre Wellington
23 May 2025, 15:39:43

Project No.: 300059832.0000
Date: January 2026

29-WG

Project No.: 300059832.0000
Date: January 2026

Project No.: 300059832.0000
Date: January 2026

21-WG


312°NW (T) 43°45'13"N, 80°24'31"W ±13ft
Bridge 21-WG
Centre Wellington
23 May 2025, 15:18:35

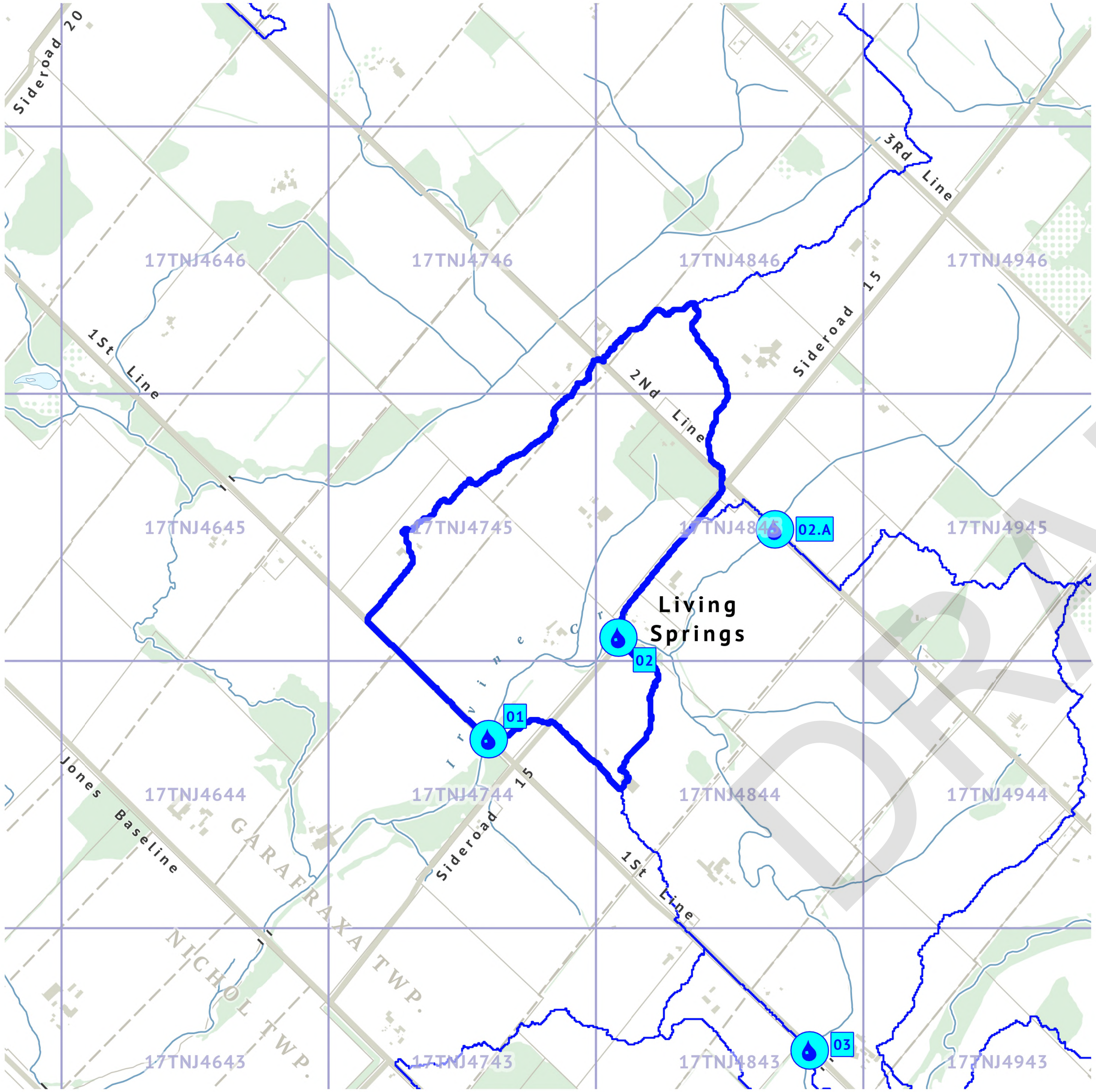
Project No.: 300059832.0000
Date: January 2026

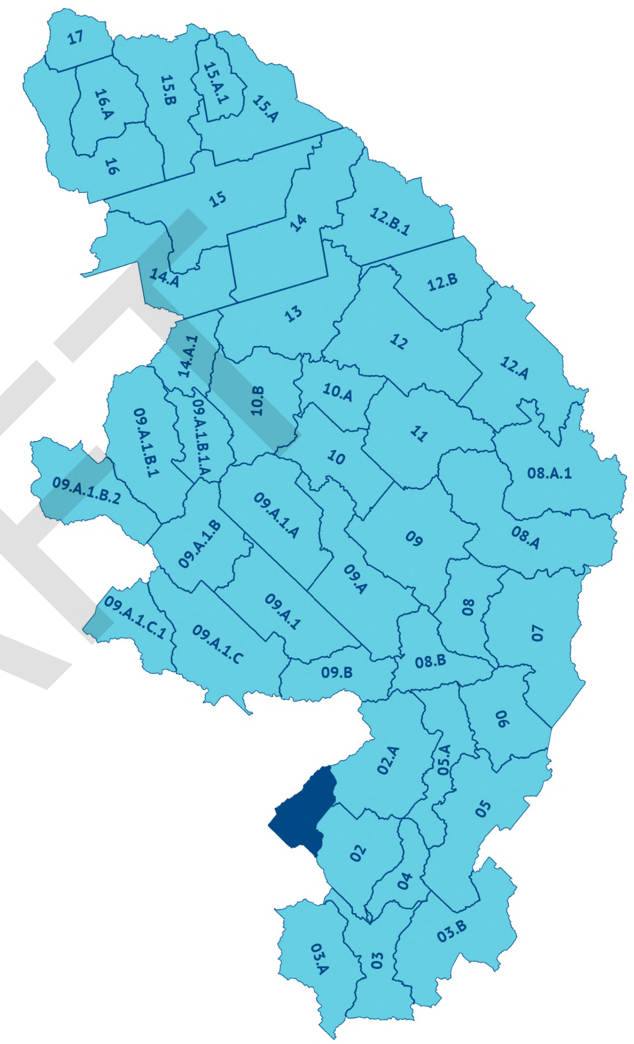

126°SE (T) 43°45'14"N, 80°24'32"W ±39ft
Bridge 21-WG
Centre Wellington
23 May 2025, 15:22:06

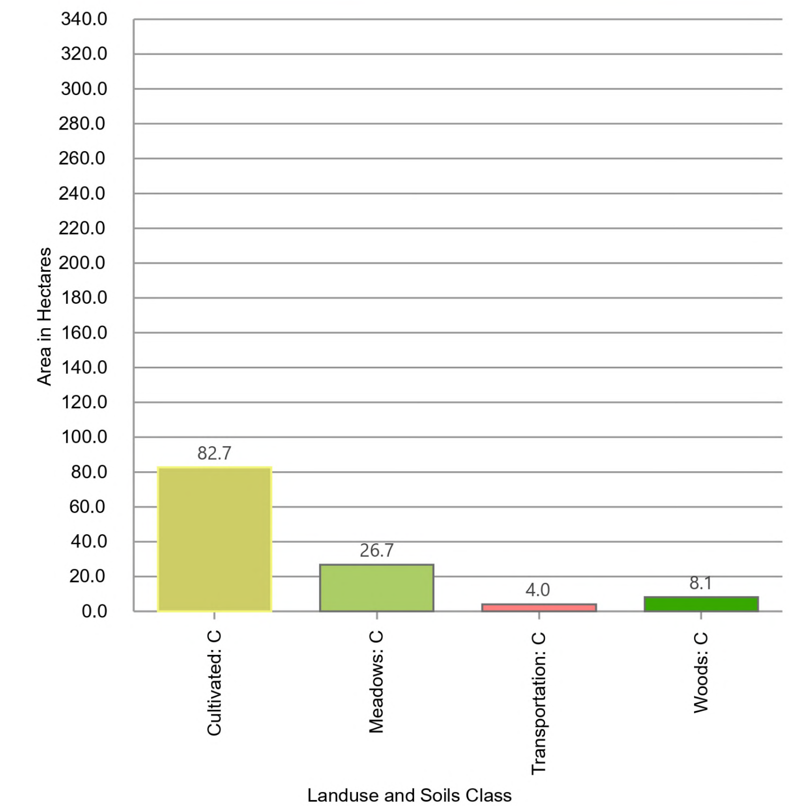
Project No.: 300059832.0000
Date: January 2026

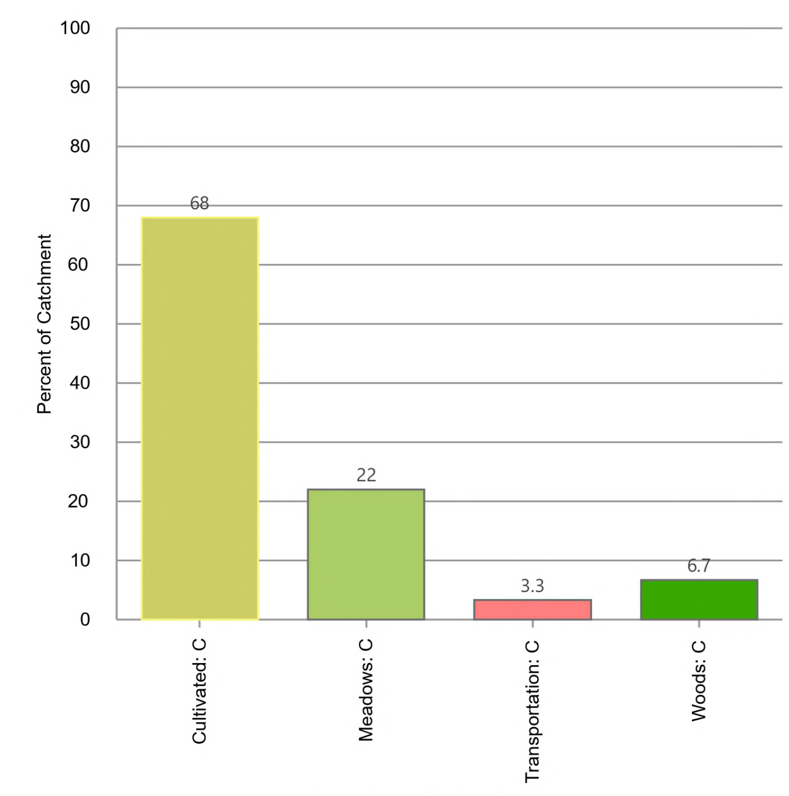

314°NW (T) 43°45'13"N, 80°24'31"W ±22ft
4m
Centre Wellington
23 May 2025, 15:23:37
Bridge 21-WG


120°SE (T) 43°45'14"N, 80°24'31"W ±22ft
Bridge 21-WG
Centre Wellington
23 May 2025, 15:22:55









Model Outlet Desc.: Structure B109141 (Sideroad 15)
Catchment Area: 316.3 ha
Longest Flow Path: 4,520 m
Longest Flow Path Min. Elev: 466.7 m
Longest Flow Path Max. Elev: 481.7 m

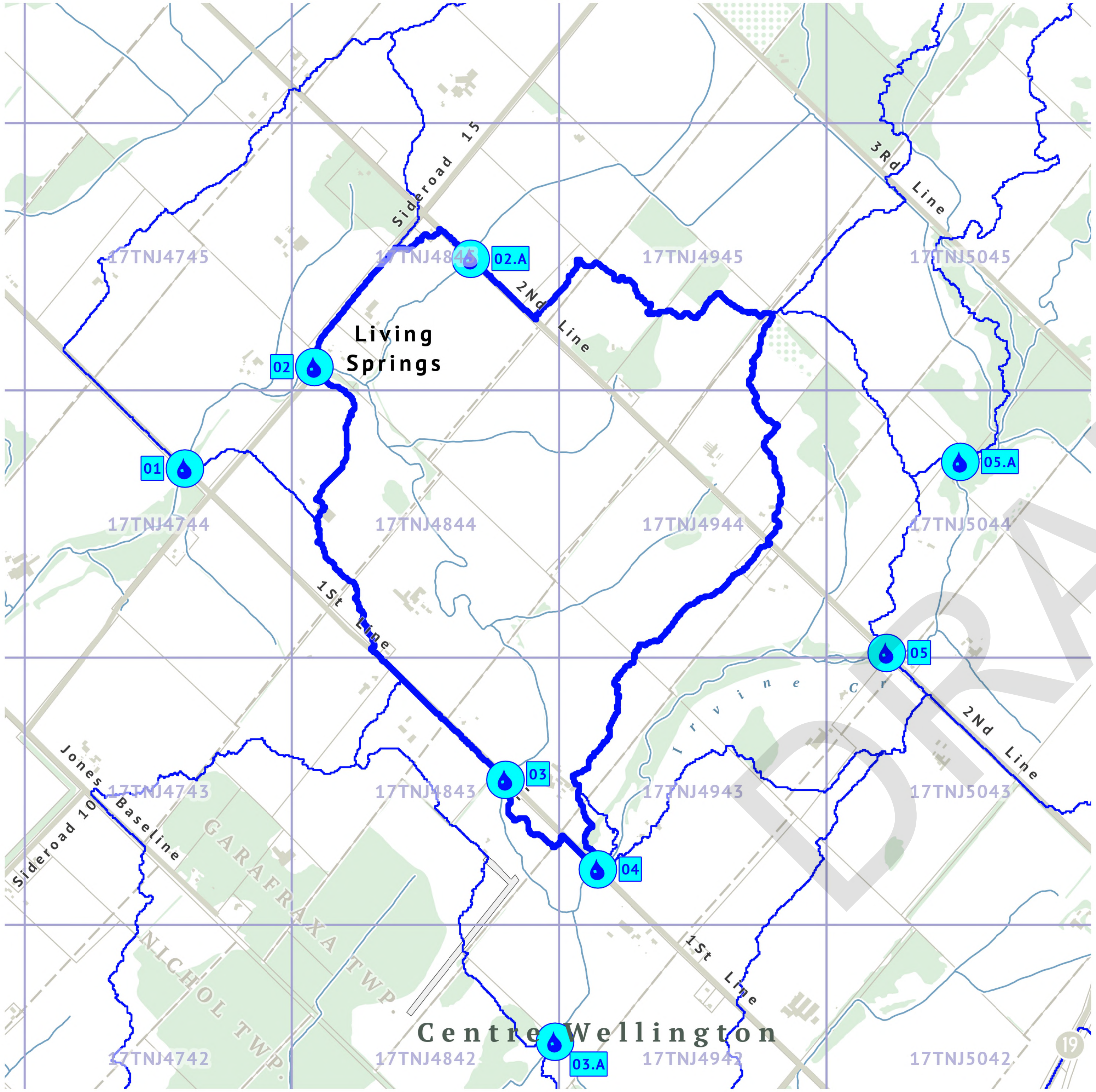
0°

0 500 1,000
Metres
1:20,000

Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 01



0°

0 500 1,000
Metres
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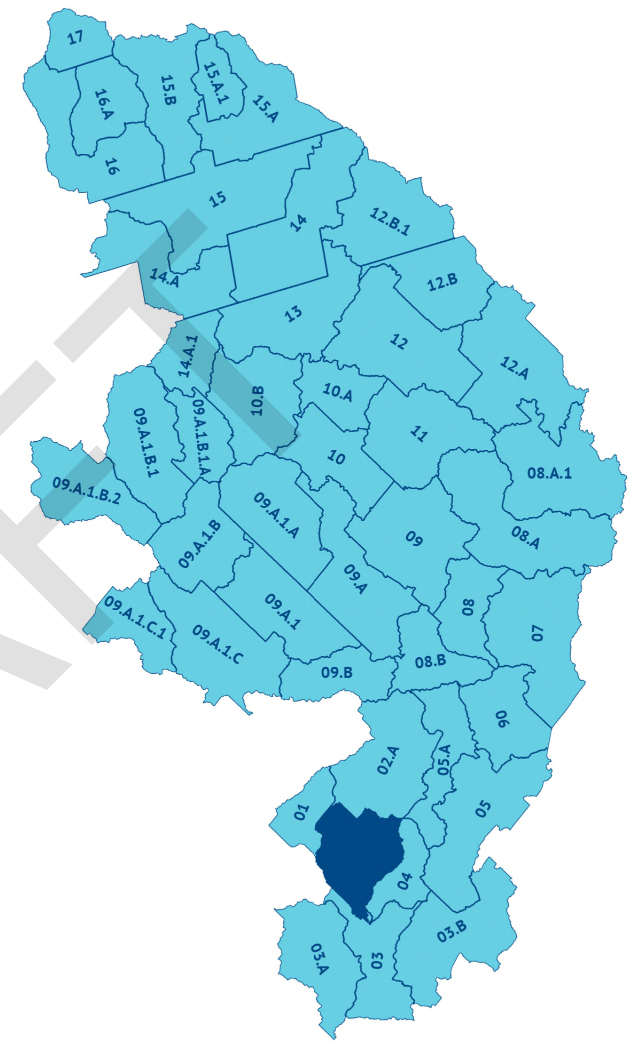
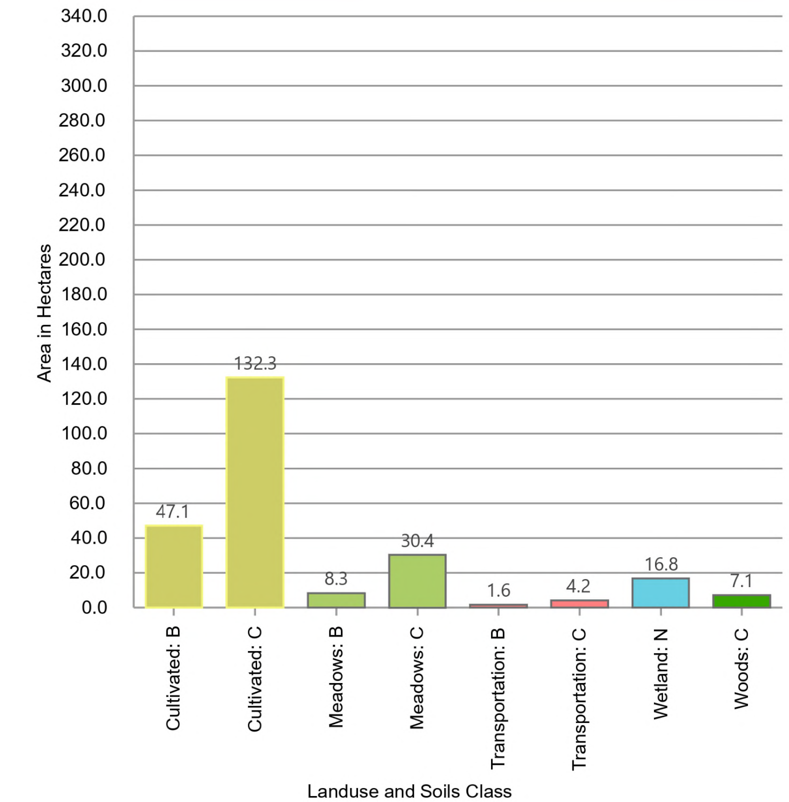
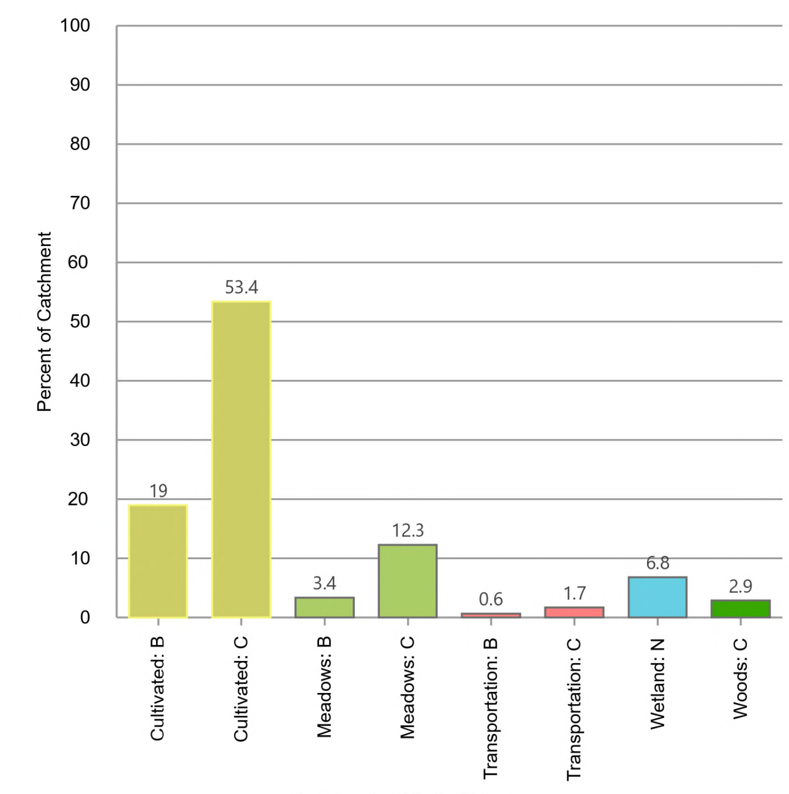




Model Outlet Desc.: Structure 29-WG (Sideroad 15)
Catchment Area: 247.9 ha
Longest Flow Path: 3,972 m
Longest Flow Path Min. Elev: 416.4 m
Longest Flow Path Max. Elev: 436.3 m

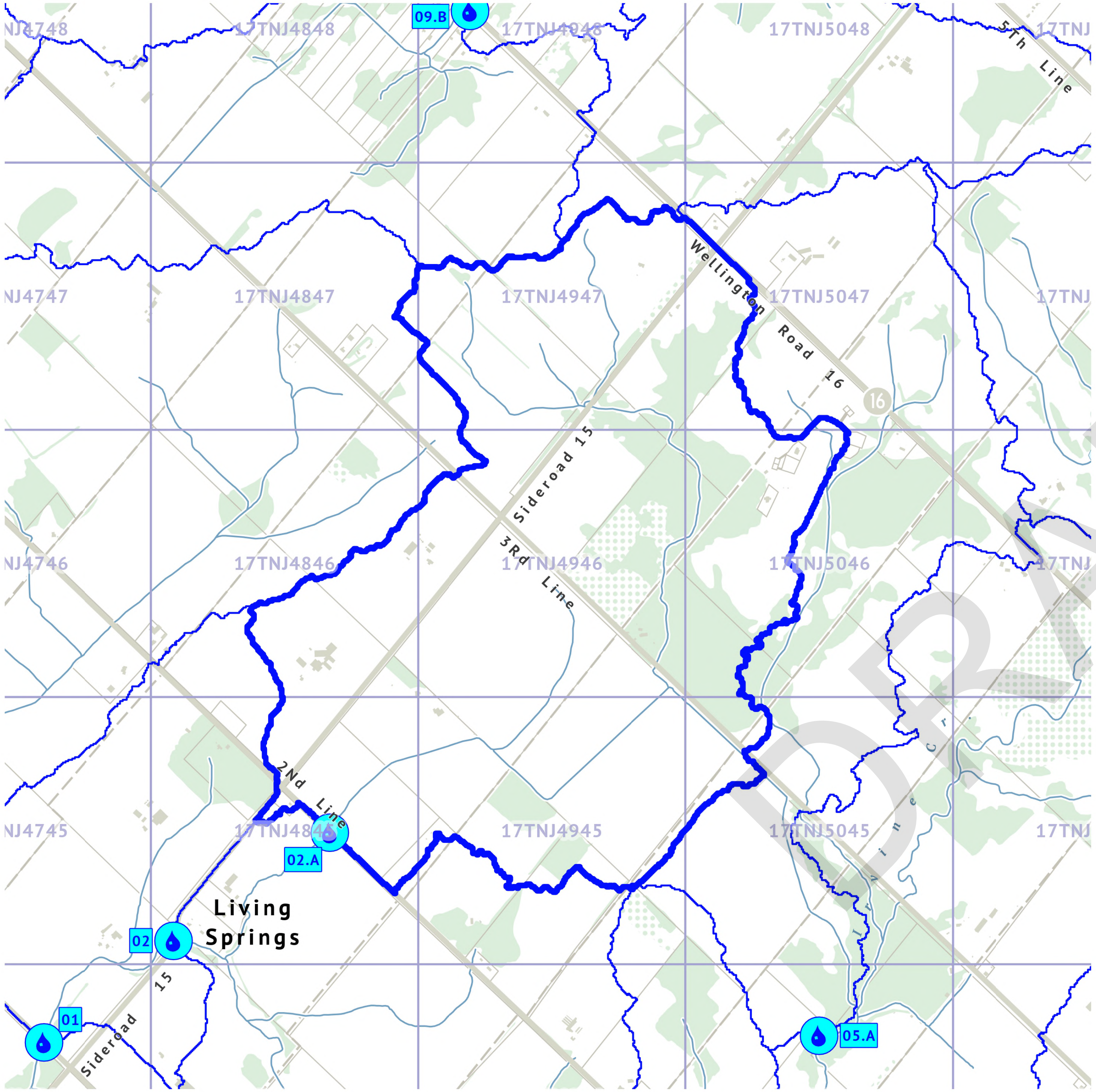


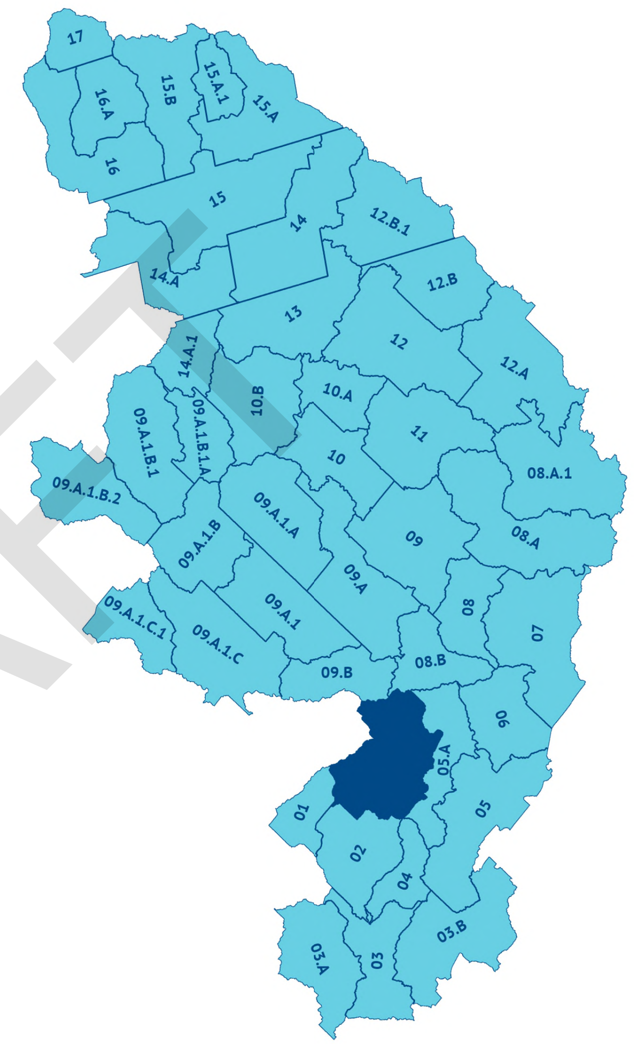
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

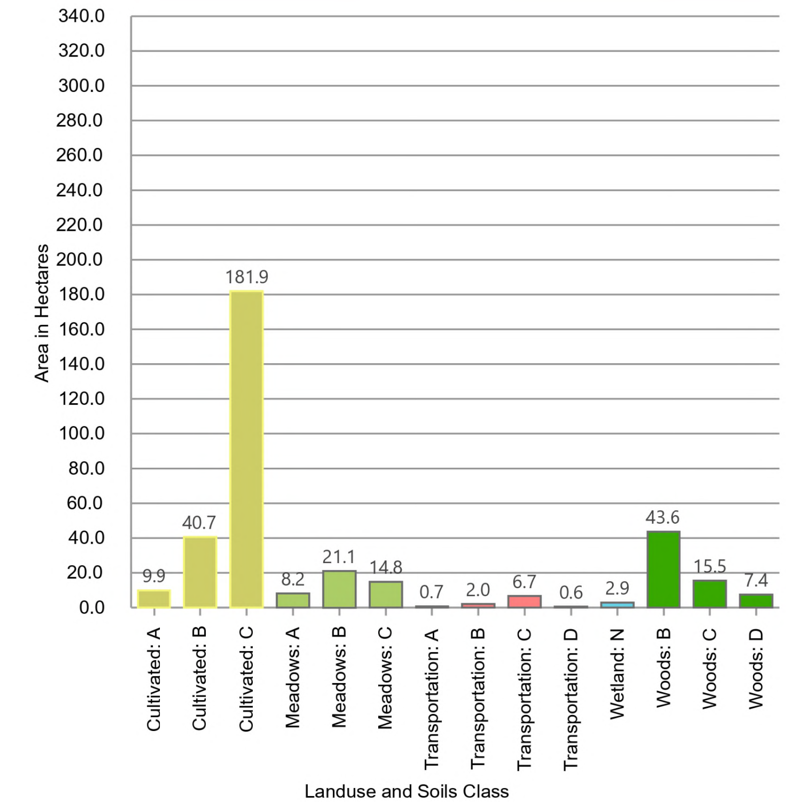
DRAFT

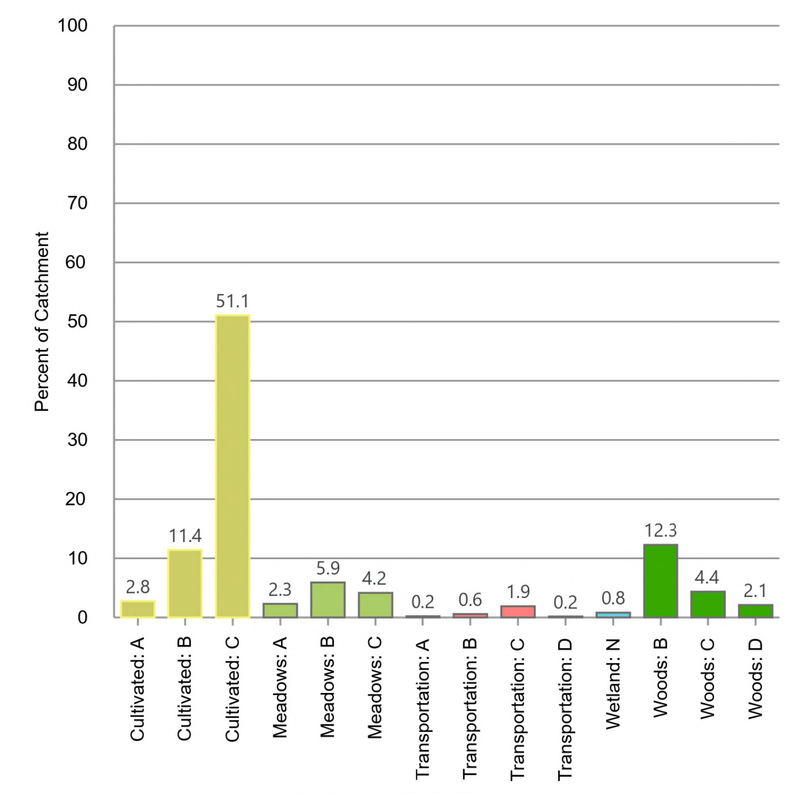
BURNSIDE

Catchment: 02

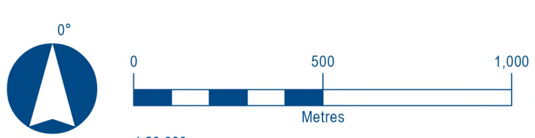








Model Outlet Desc.: Structure 33-WG (2nd Line)
Catchment Area: 356.1 ha
Longest Flow Path: 4,867 m
Longest Flow Path Min. Elev: 422.4 m
Longest Flow Path Max. Elev: 466.8 m

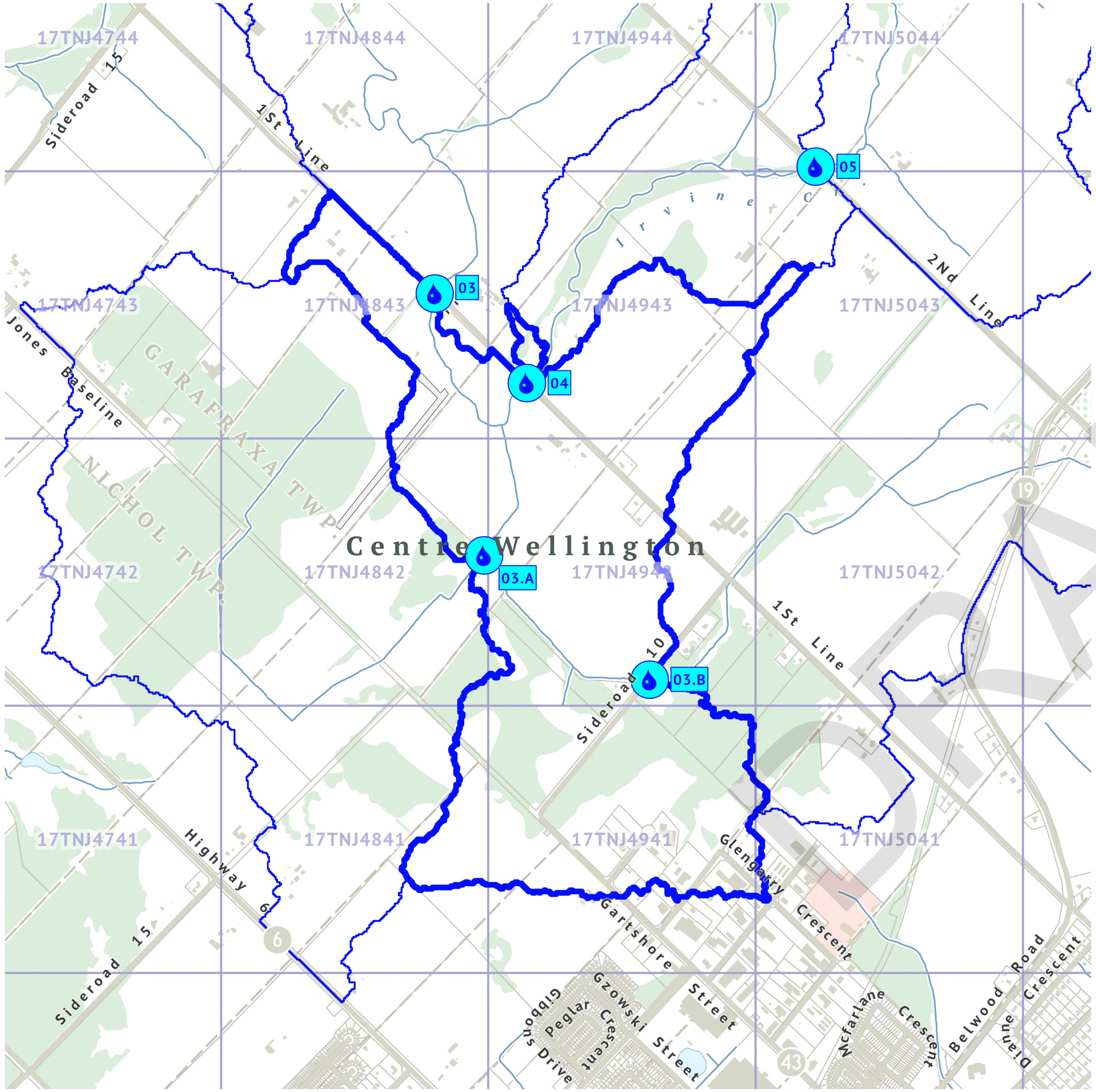


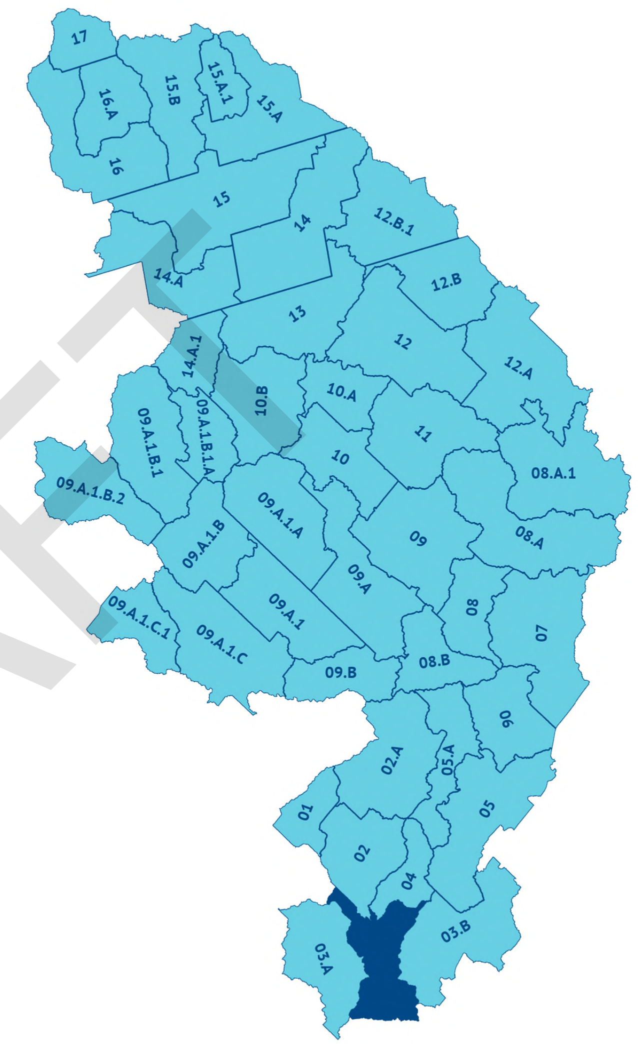
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

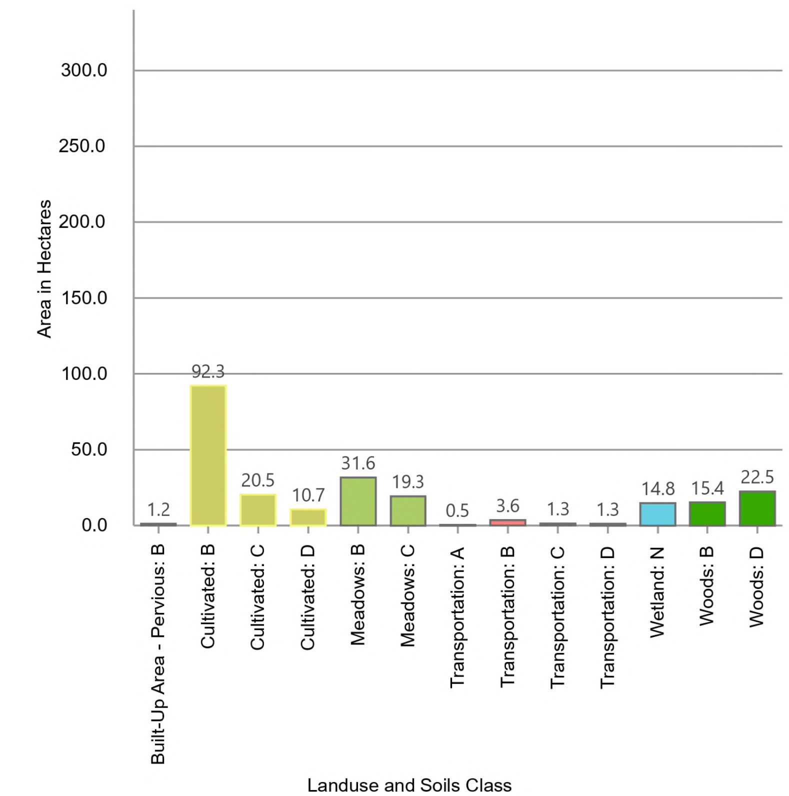
BURNSIDE

Catchment: 02.A

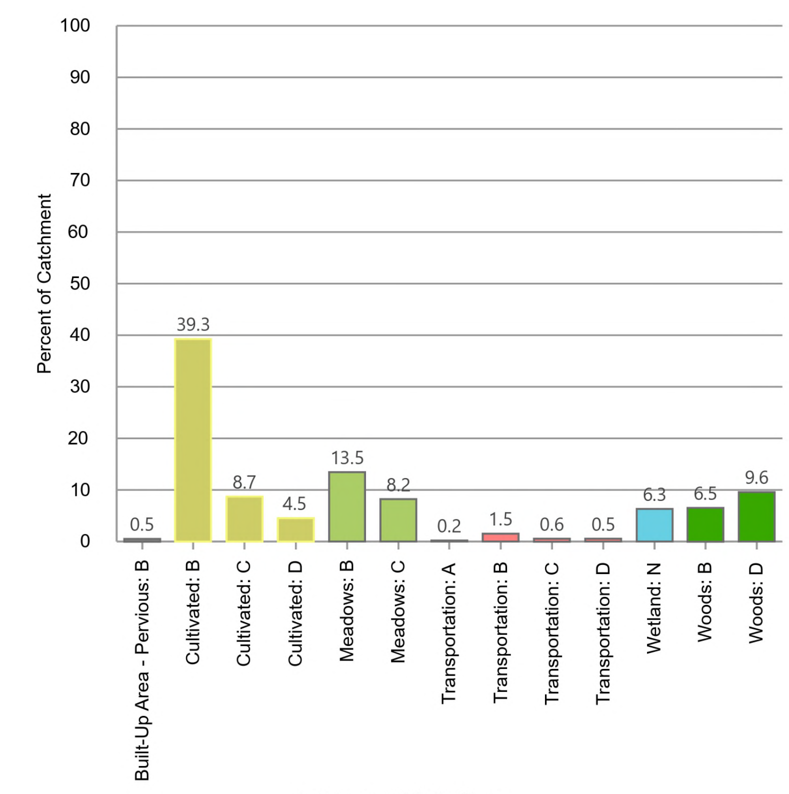
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

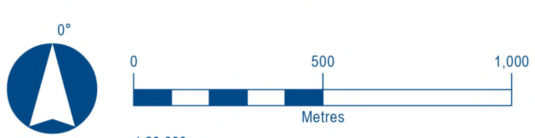






Model Outlet Desc.: Structure 22-WG (1st Line)
Catchment Area: 235.1 ha
Longest Flow Path: 3,780 m
Longest Flow Path Min. Elev: 418.3 m
Longest Flow Path Max. Elev: 430.3 m



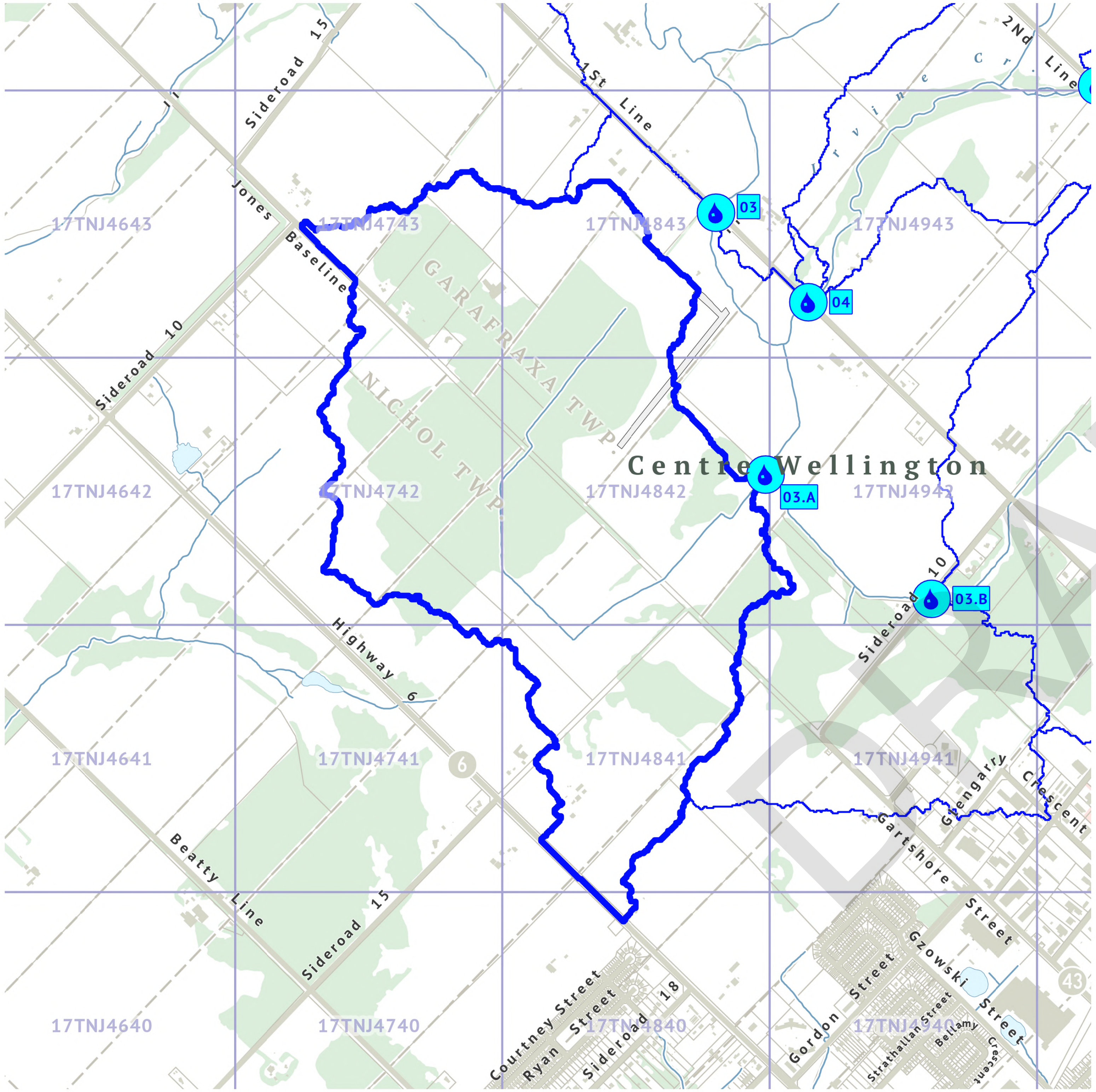


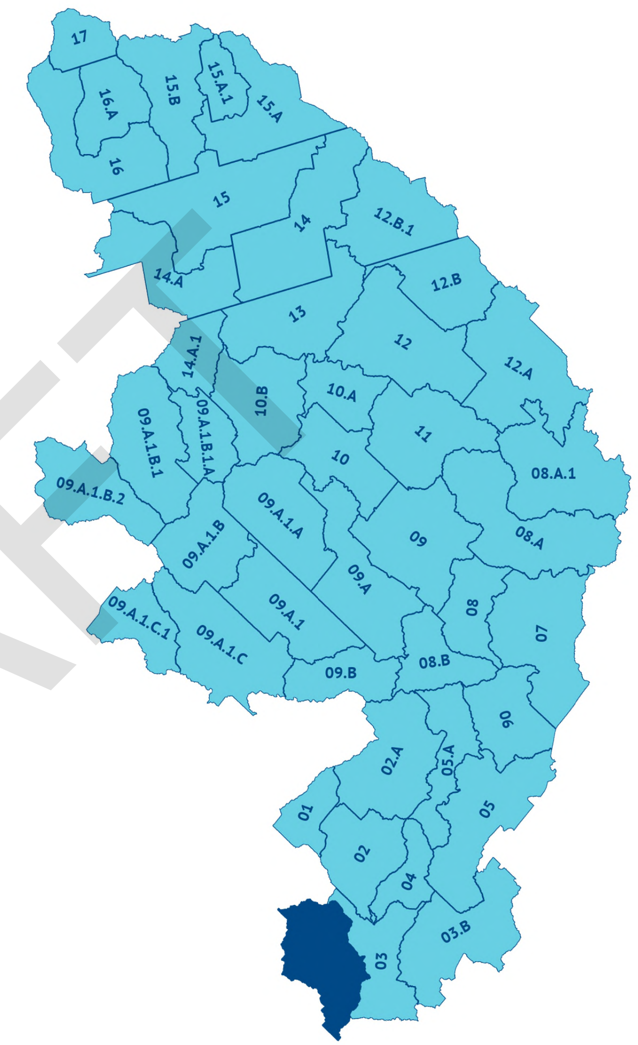
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

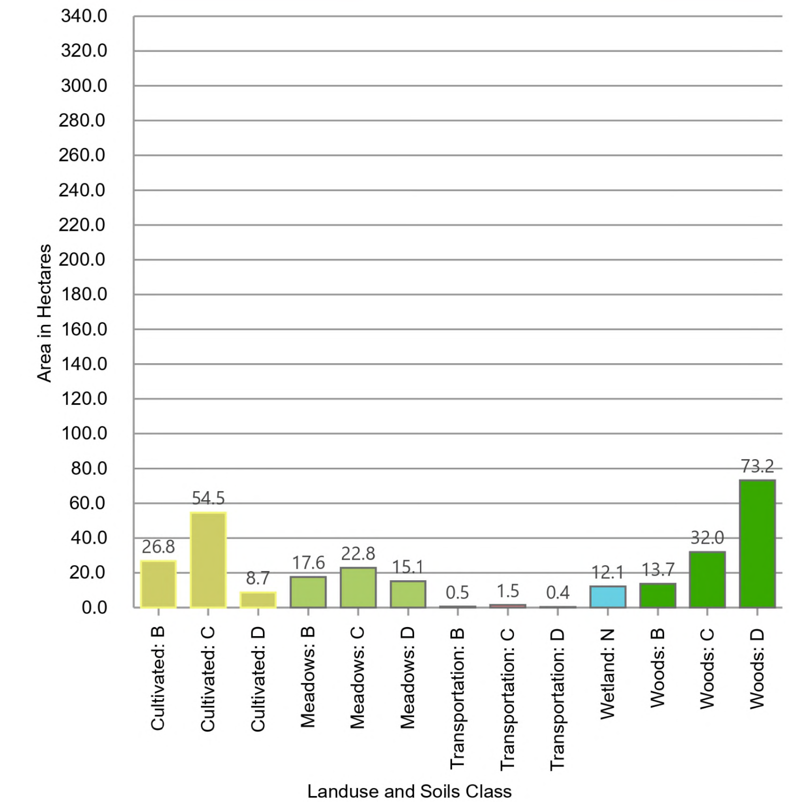
BURNSIDE

Catchment: 03

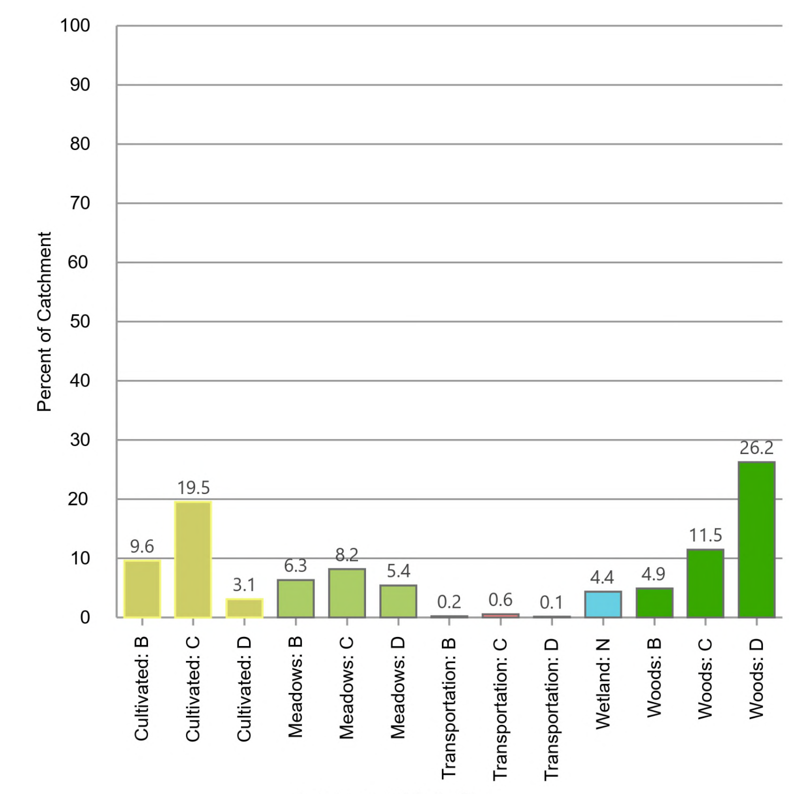
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Lot 12 Con 1
Catchment Area: 279.0 ha
Longest Flow Path: 3,633 m
Longest Flow Path Min. Elev: 420.0 m
Longest Flow Path Max. Elev: 433.5 m



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Metres
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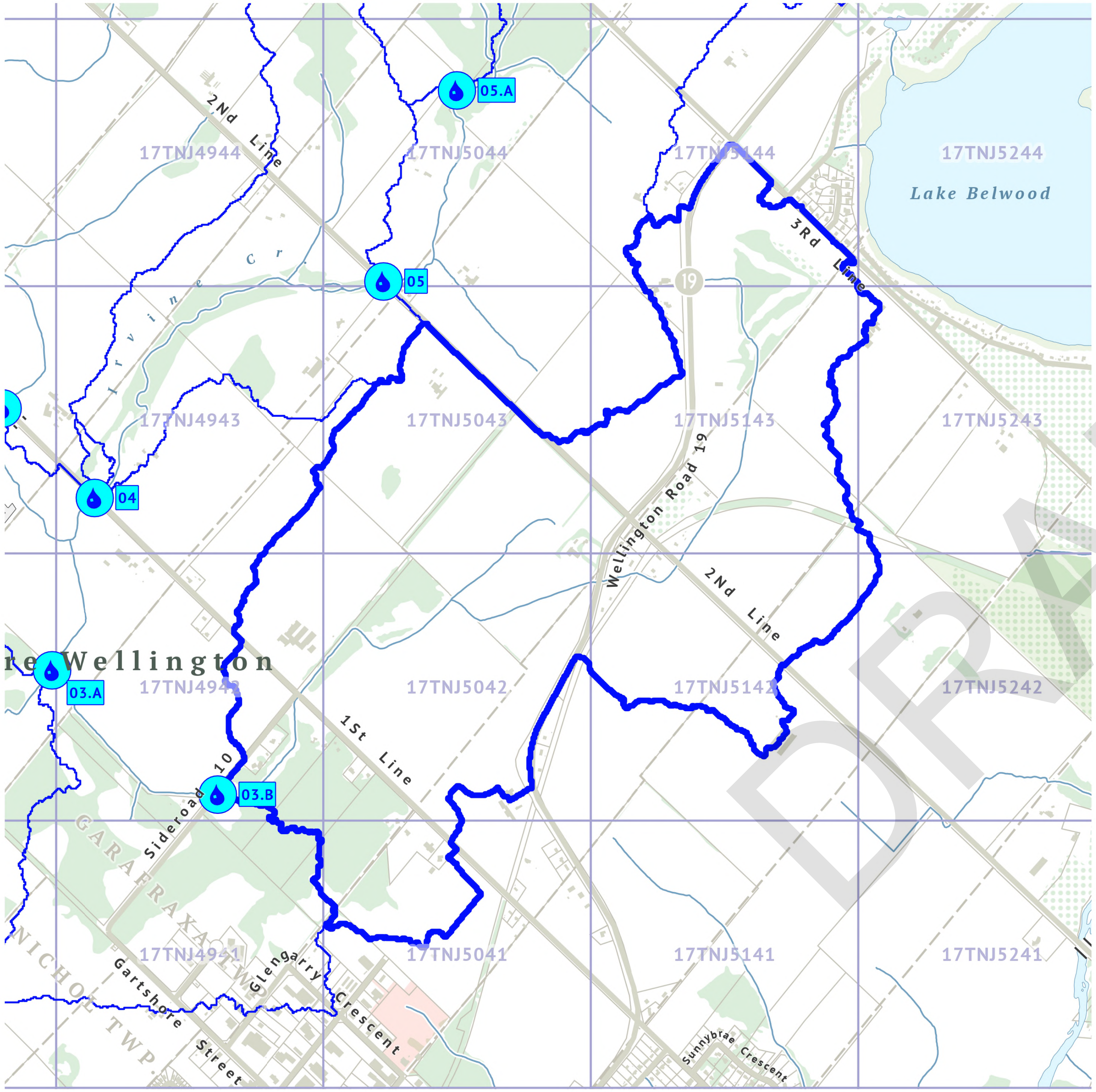
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 03.A



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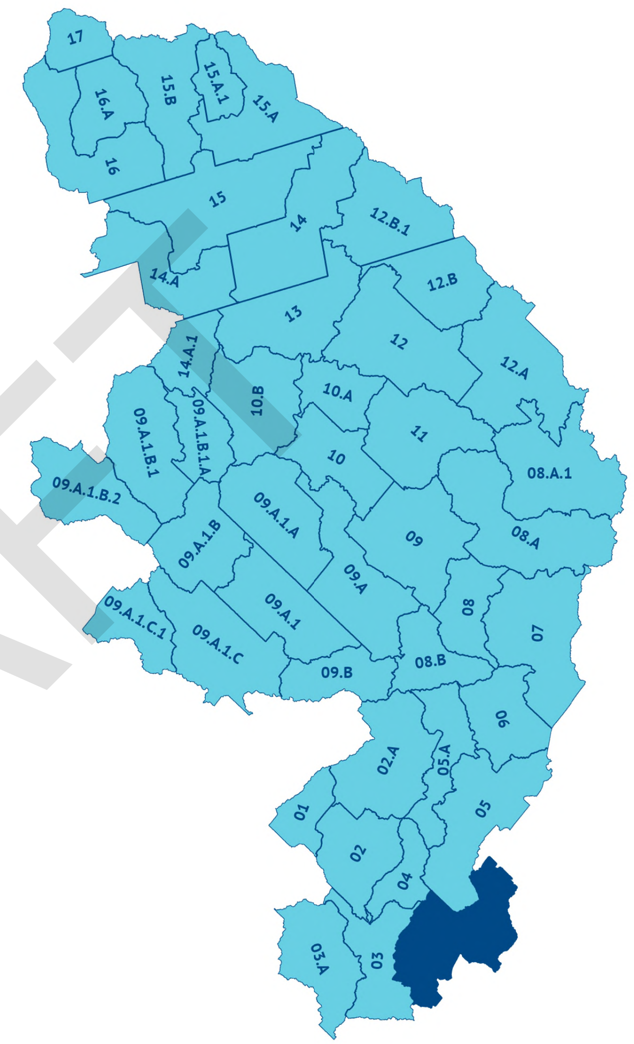
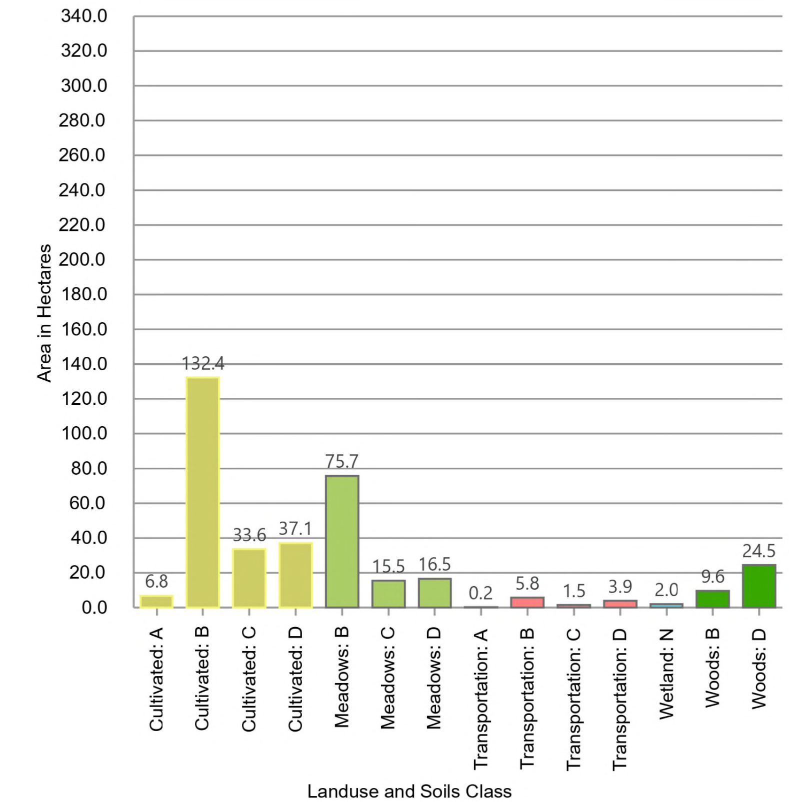
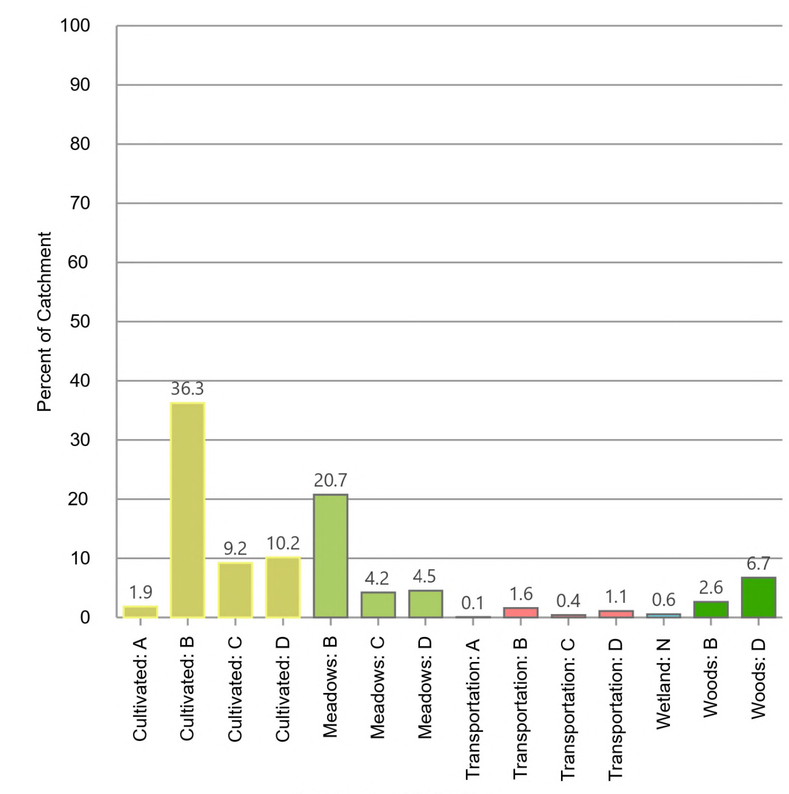






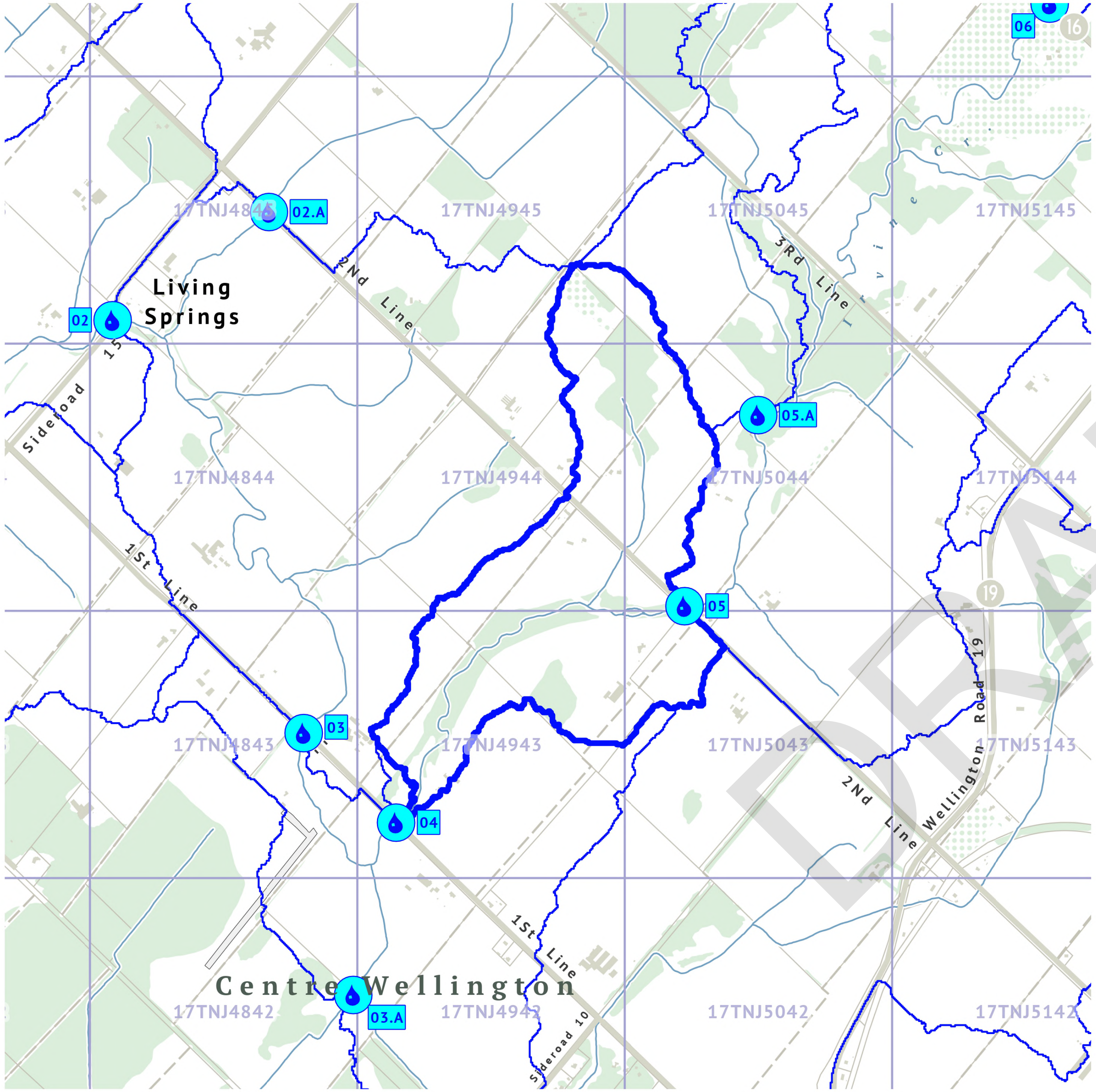
Model Outlet Desc.: Structure 34-WG (Sideroad 10)
Catchment Area: 365.0 ha
Longest Flow Path: 4,671 m
Longest Flow Path Min. Elev: 421.6 m
Longest Flow Path Max. Elev: 437.4 m

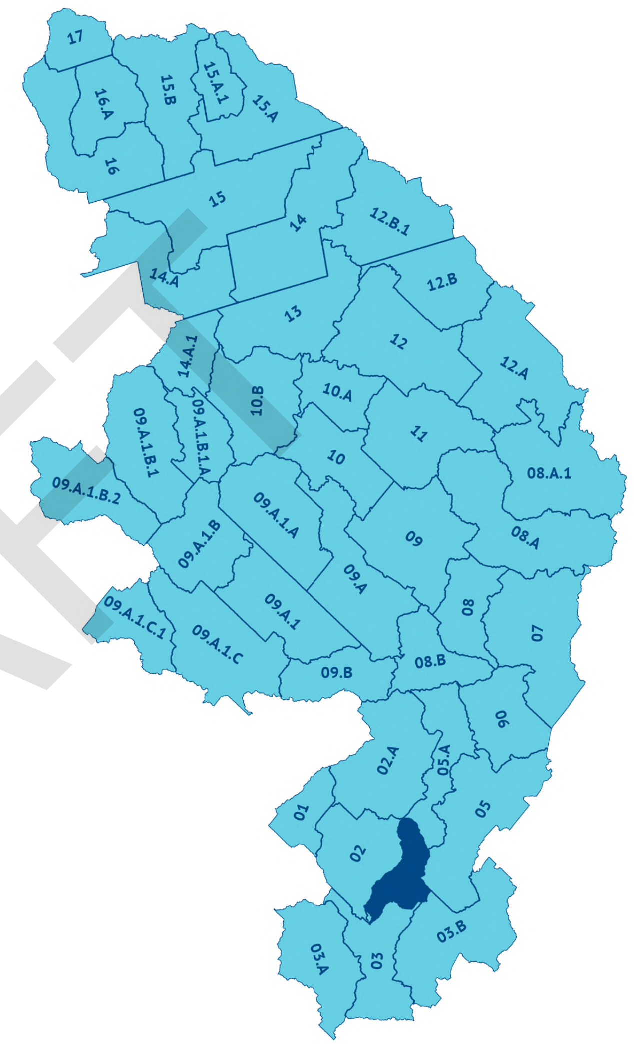
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

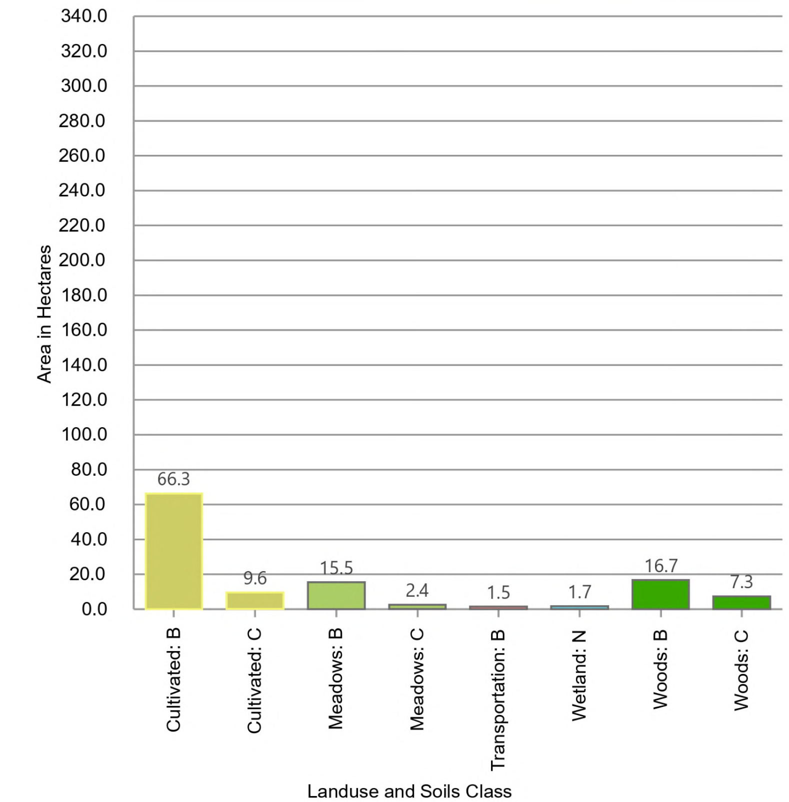
BURNSIDE

Catchment: 03.B

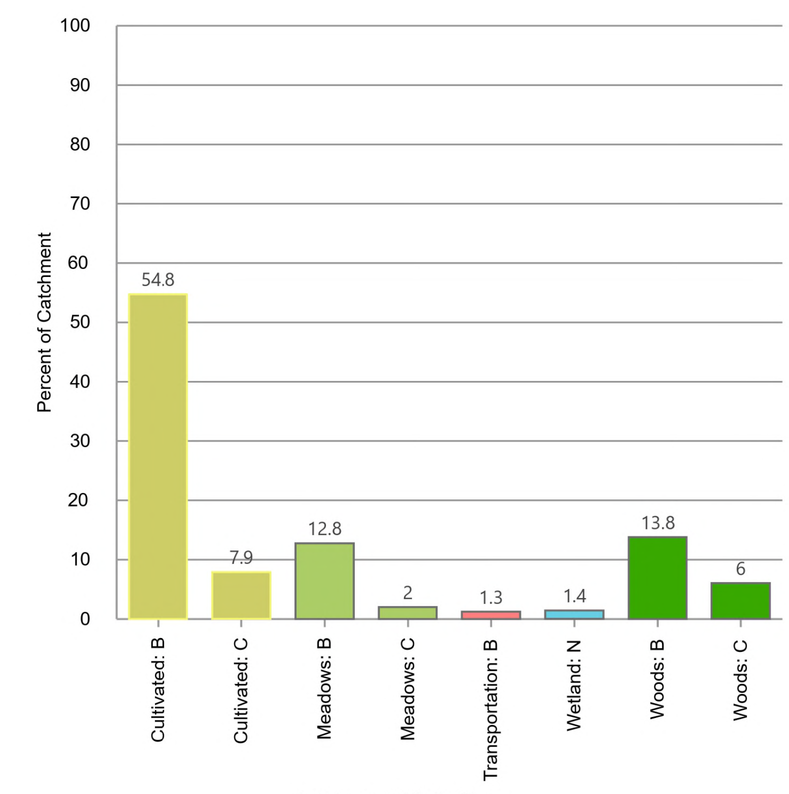
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

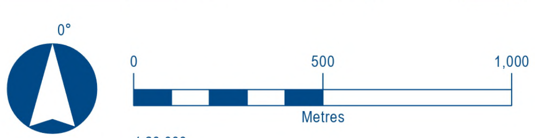






Model Outlet Desc.: Structure 24-WG (1st Line)
Catchment Area: 121.1 ha
Longest Flow Path: 3,212 m
Longest Flow Path Min. Elev: 419.0 m
Longest Flow Path Max. Elev: 435.7 m

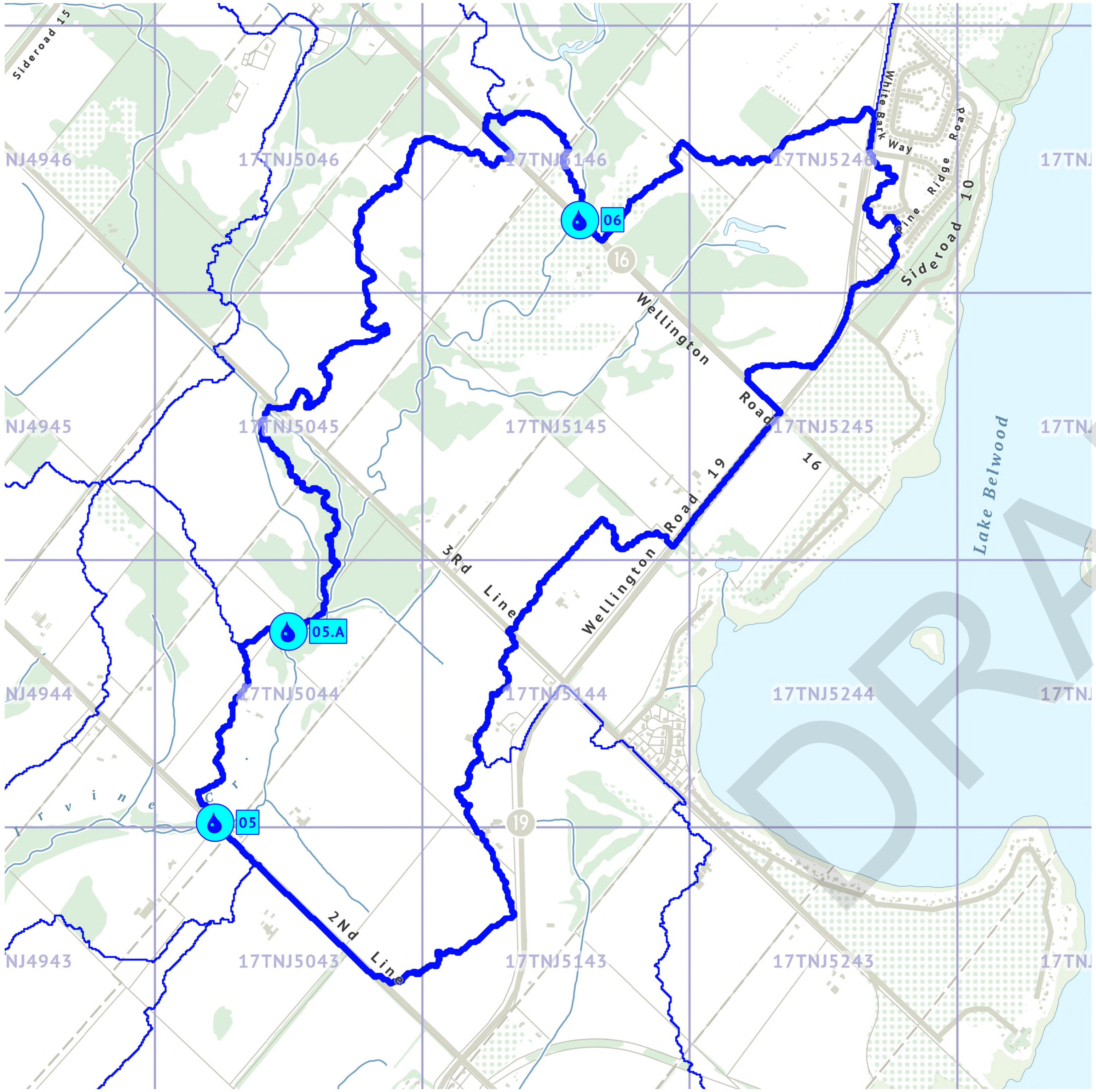


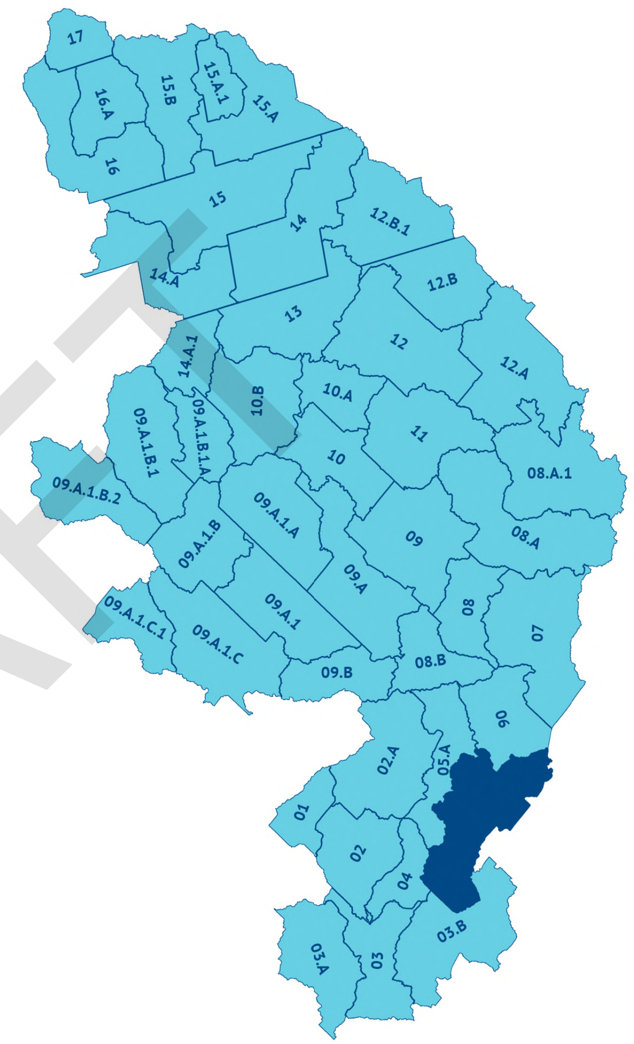


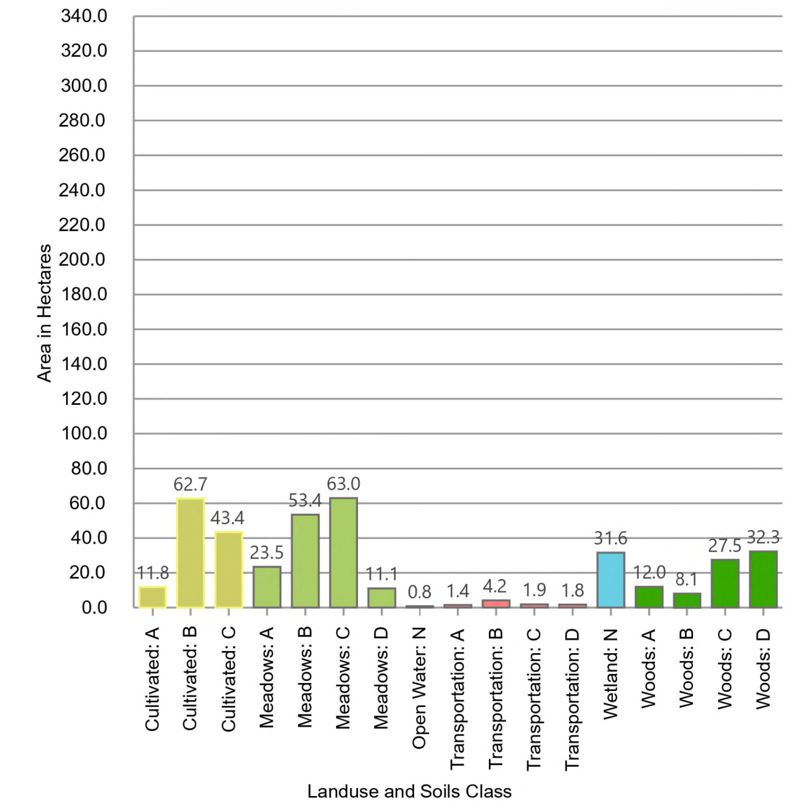
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

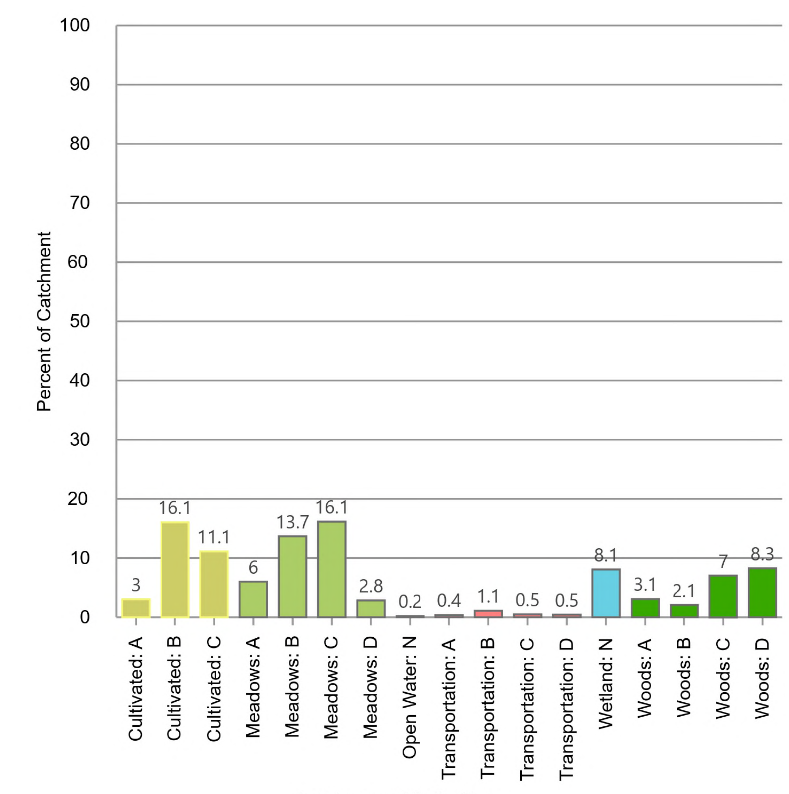
BURNSIDE

Catchment: 04









Model Outlet Desc.: Structure 20-WG (2nd Line)
Catchment Area: 390.3 ha
Longest Flow Path: 5,631 m
Longest Flow Path Min. Elev: 421.2 m
Longest Flow Path Max. Elev: 445.8 m

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Metres
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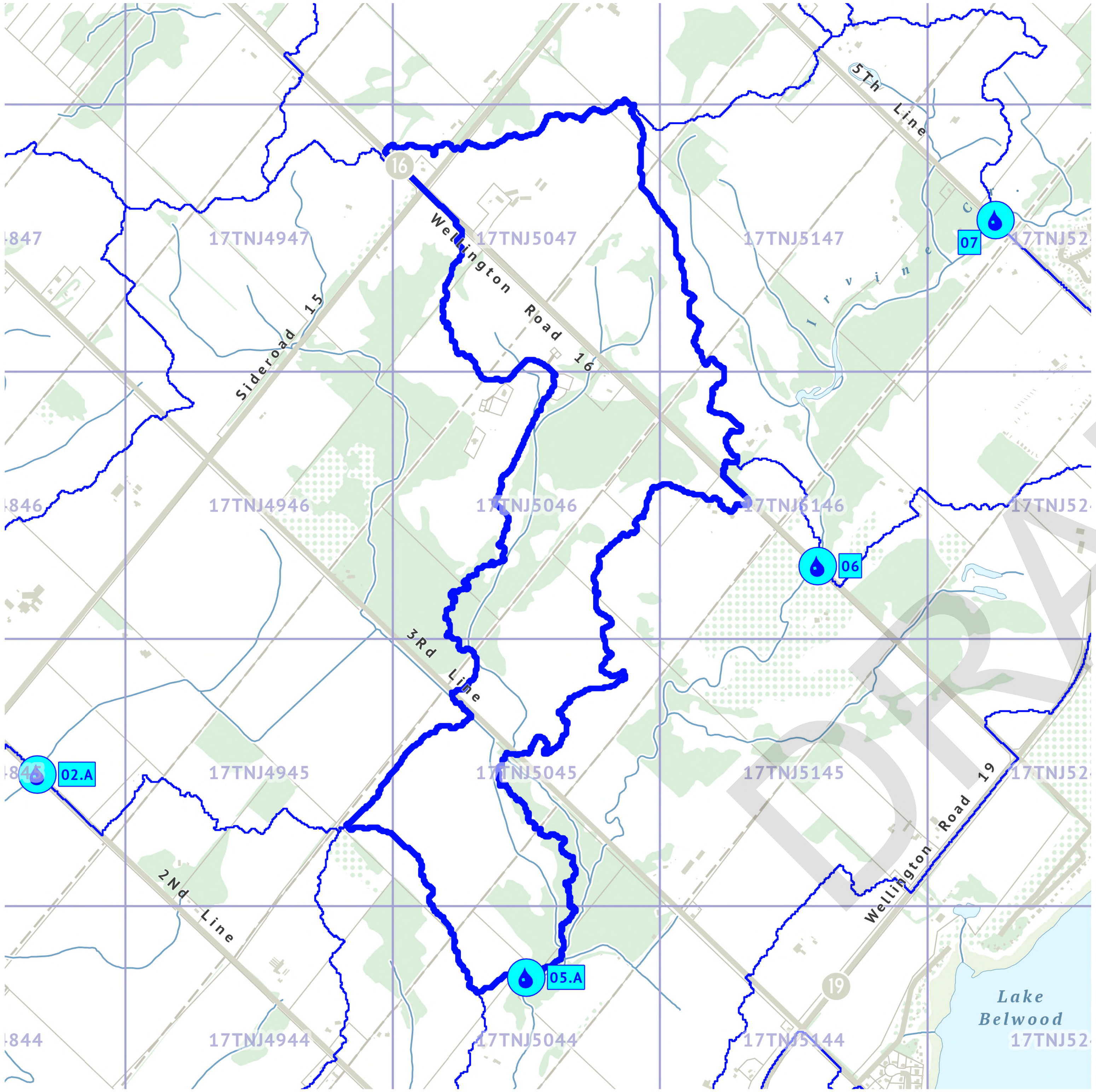
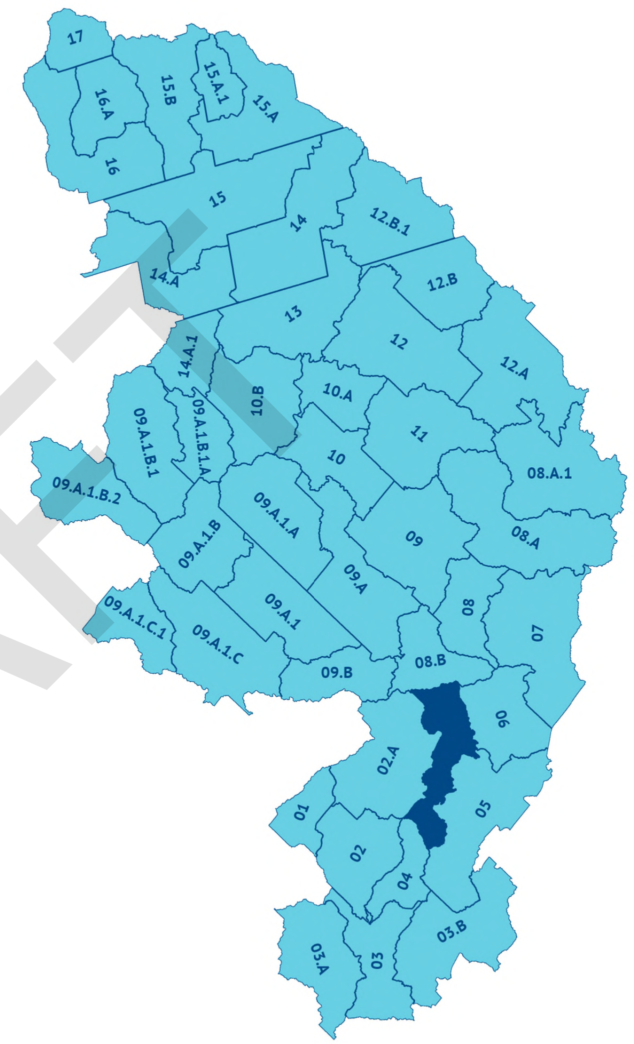
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

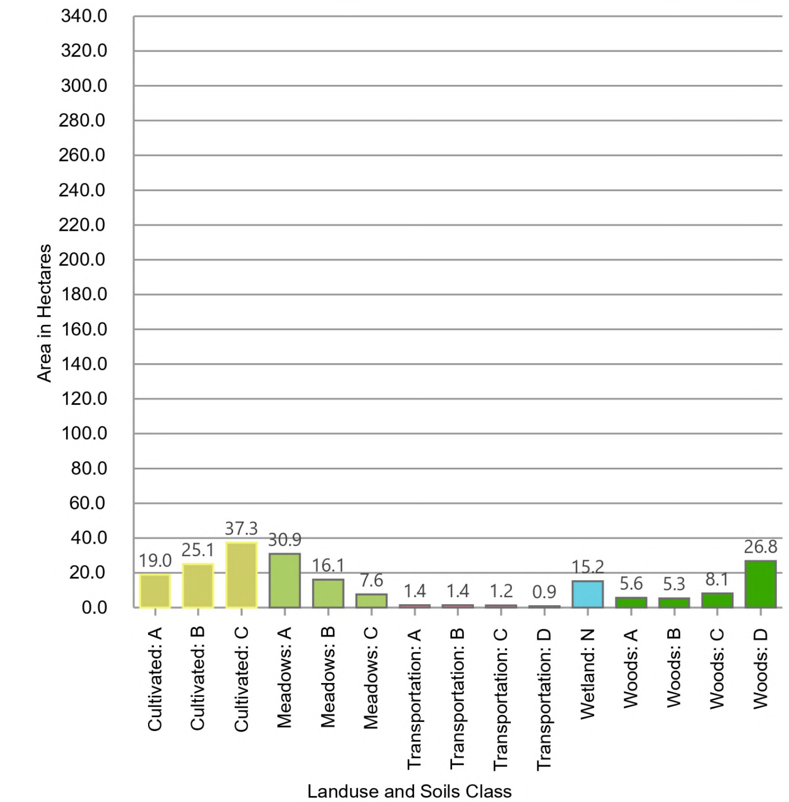
BURNSIDE

Catchment: 05

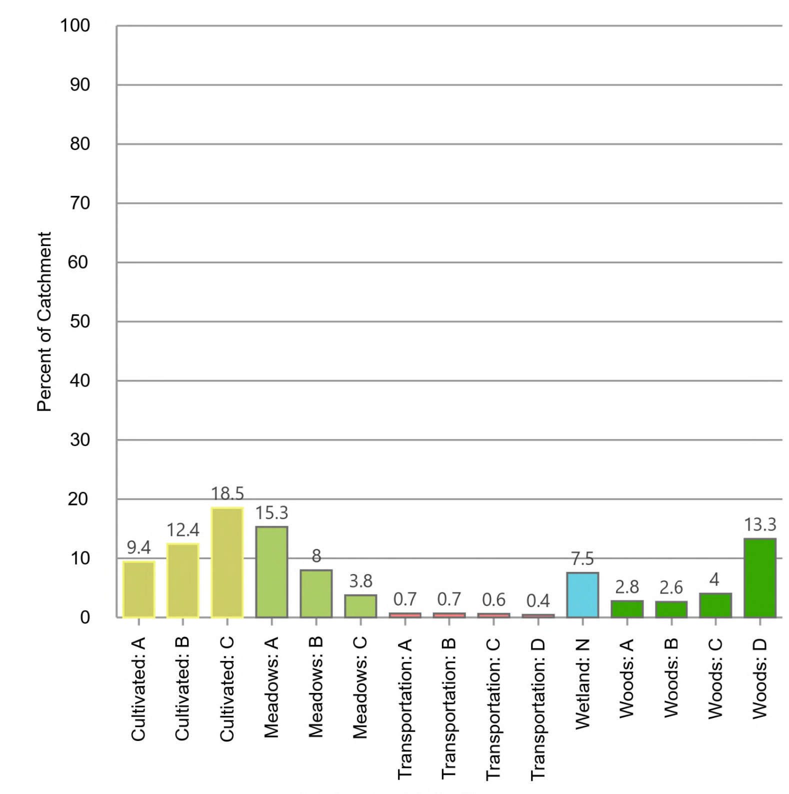
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

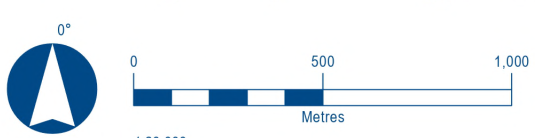






Model Outlet Desc.: Lot 12 Con 3
Catchment Area: 201.8 ha
Longest Flow Path: 4,674 m
Longest Flow Path Min. Elev: 422.9 m
Longest Flow Path Max. Elev: 469.1 m

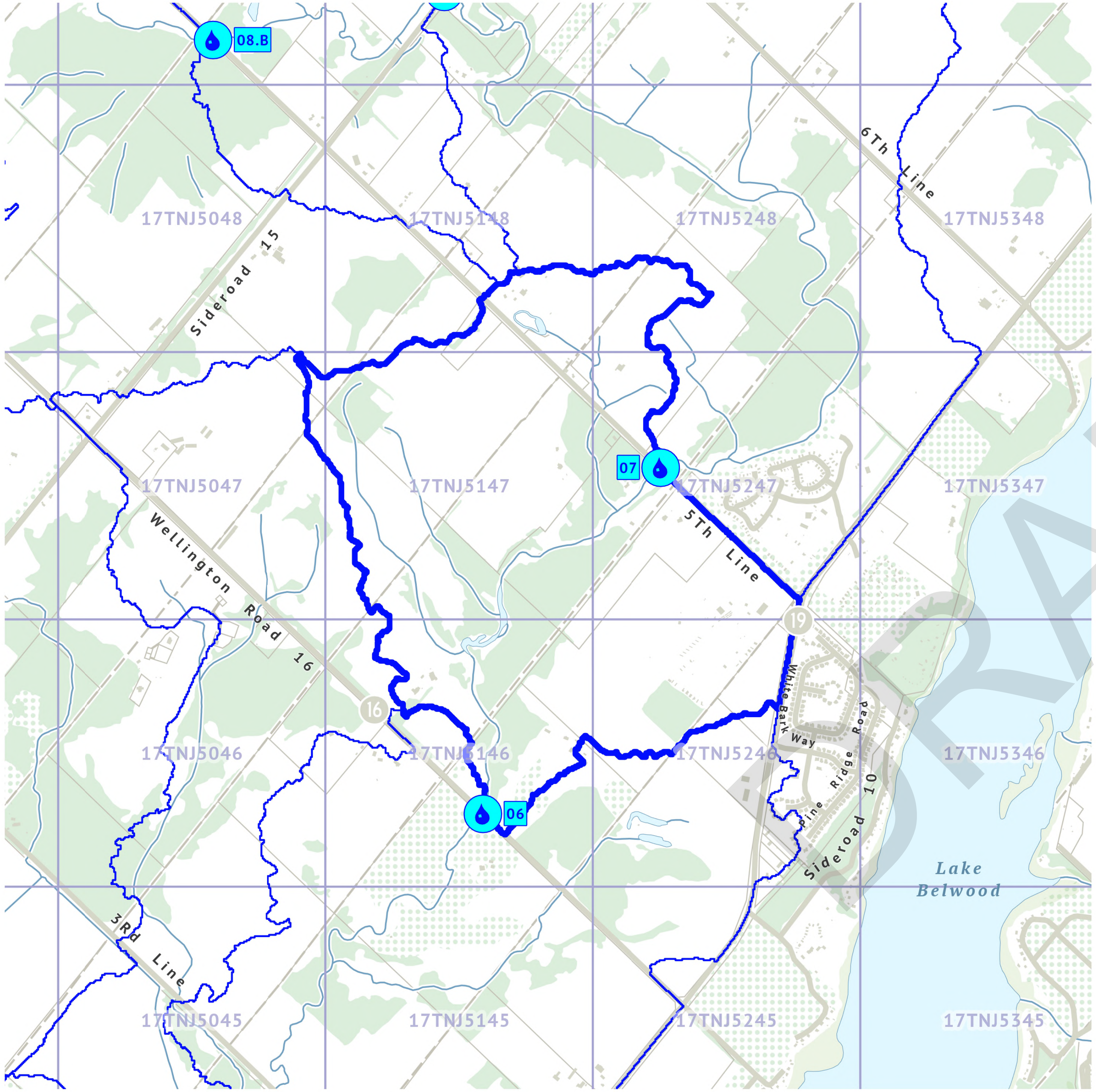


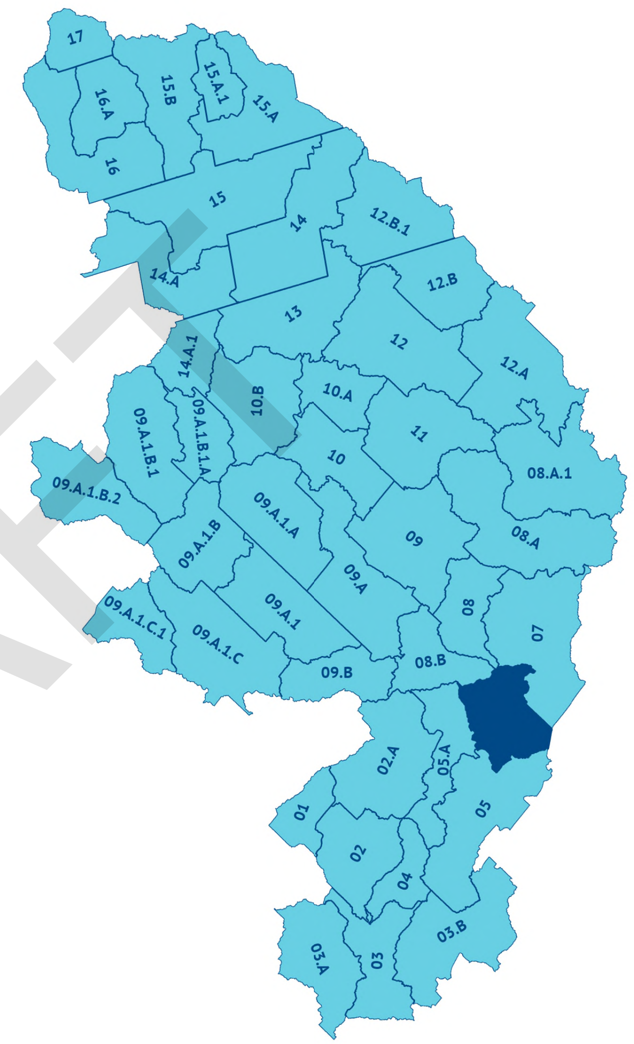


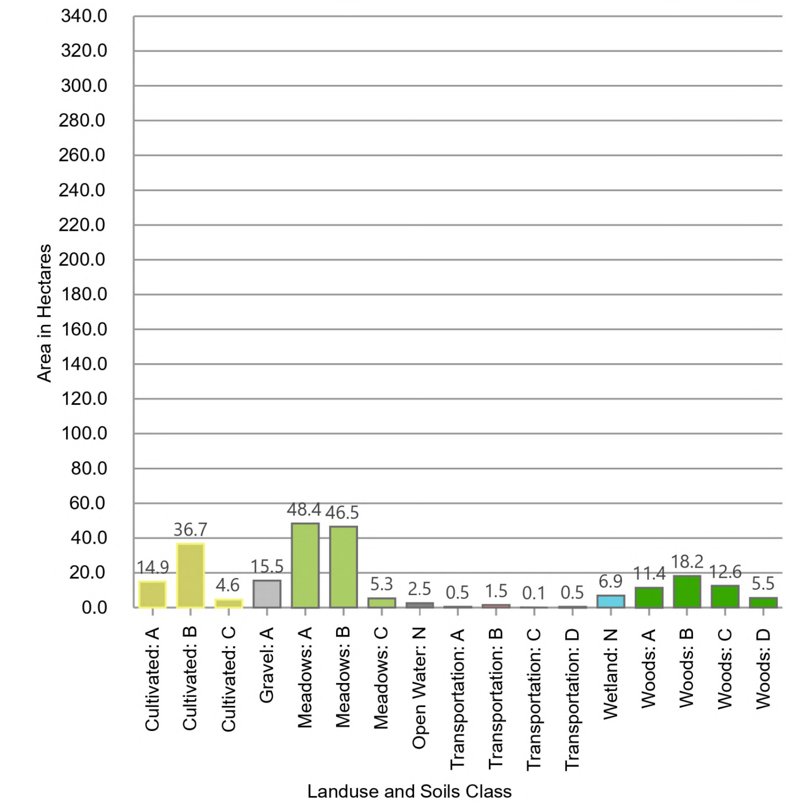
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

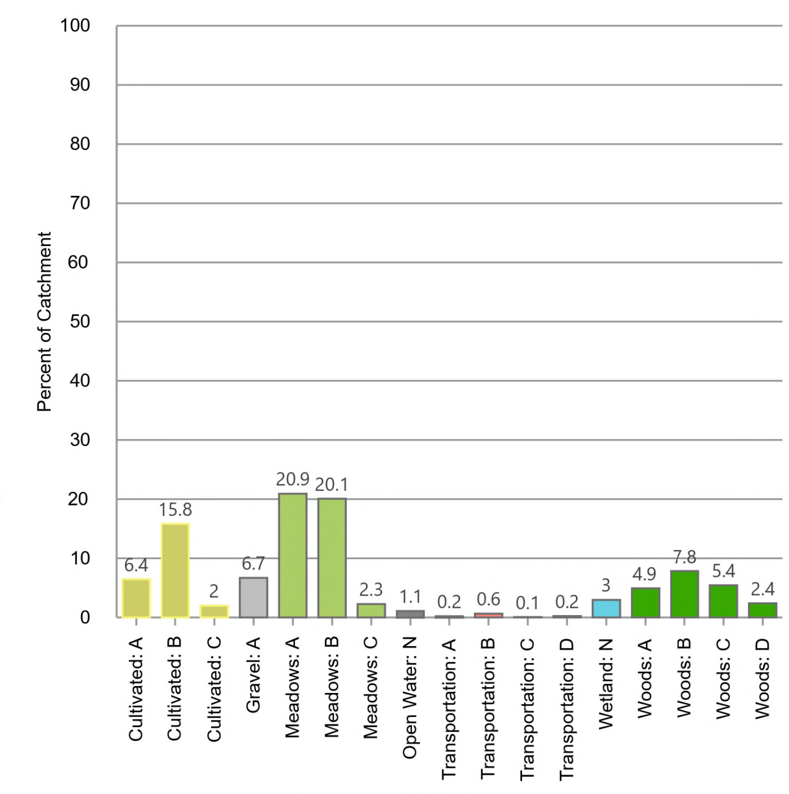
Catchment: 05.A







Model Outlet Desc.: Structure B016049 (Wellington Road 16)
Catchment Area: 231.7 ha
Longest Flow Path: 3,103 m
Longest Flow Path Min. Elev: 427.4 m
Longest Flow Path Max. Elev: 464.2 m

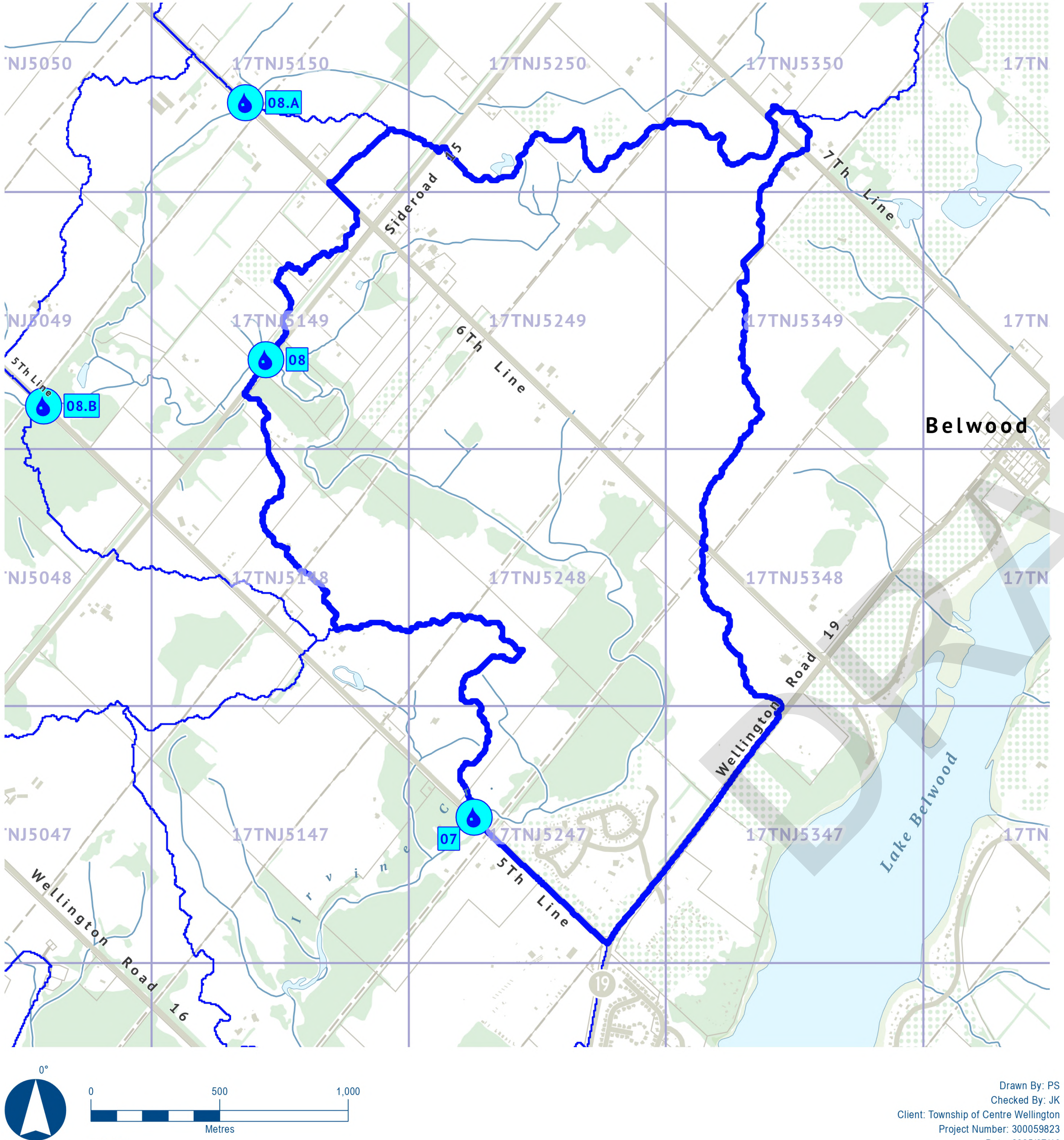


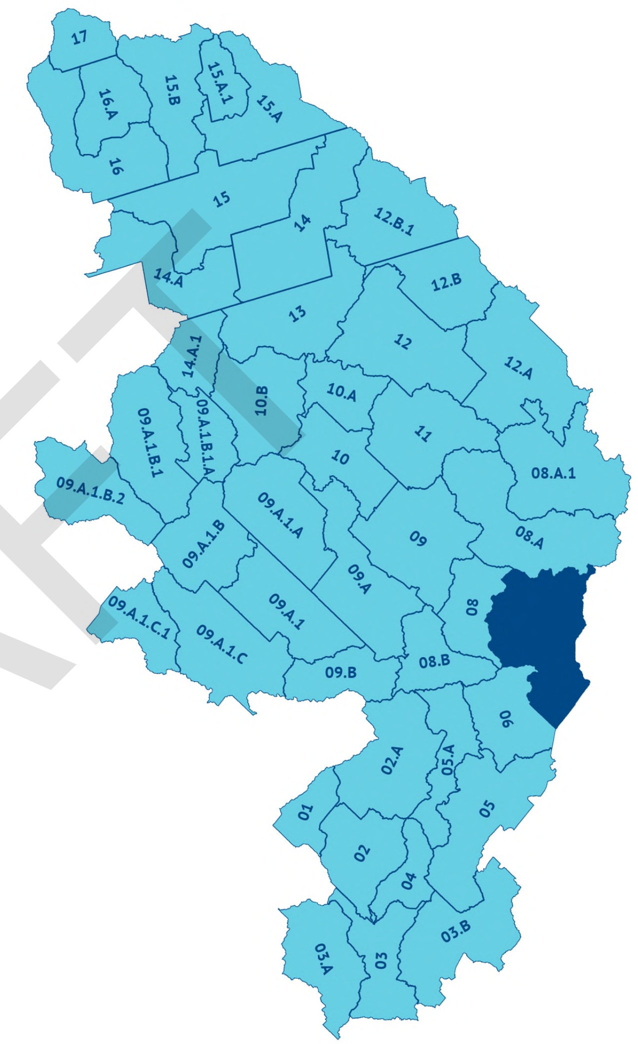
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

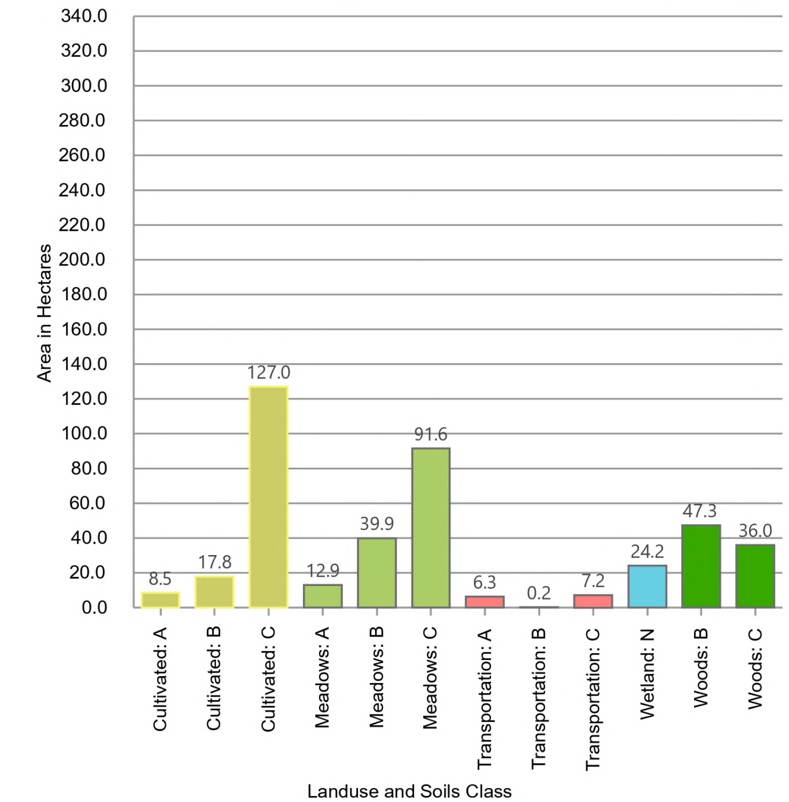
BURNSIDE

Catchment: 06

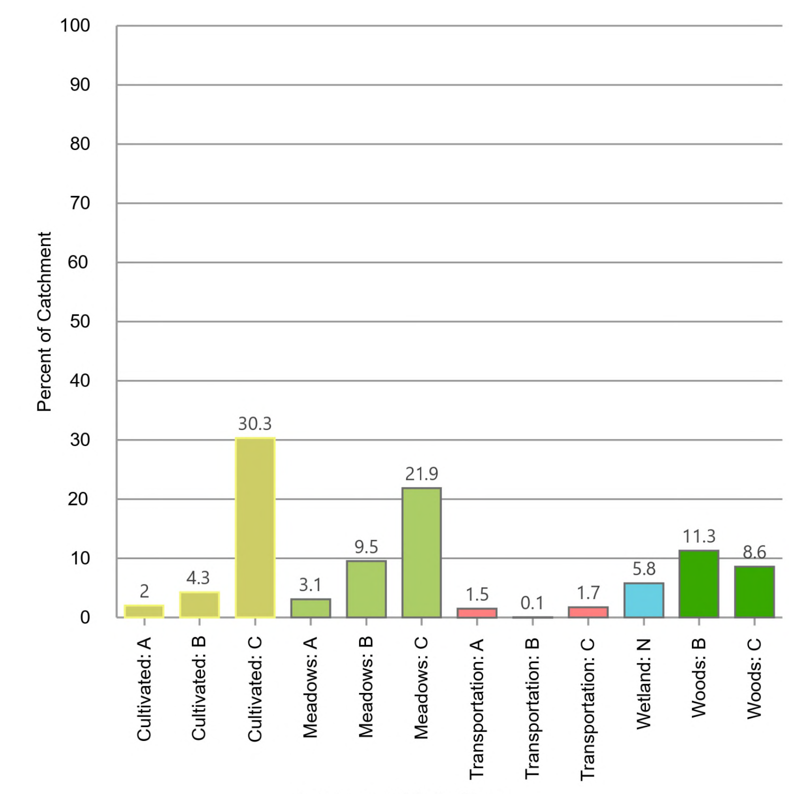
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG





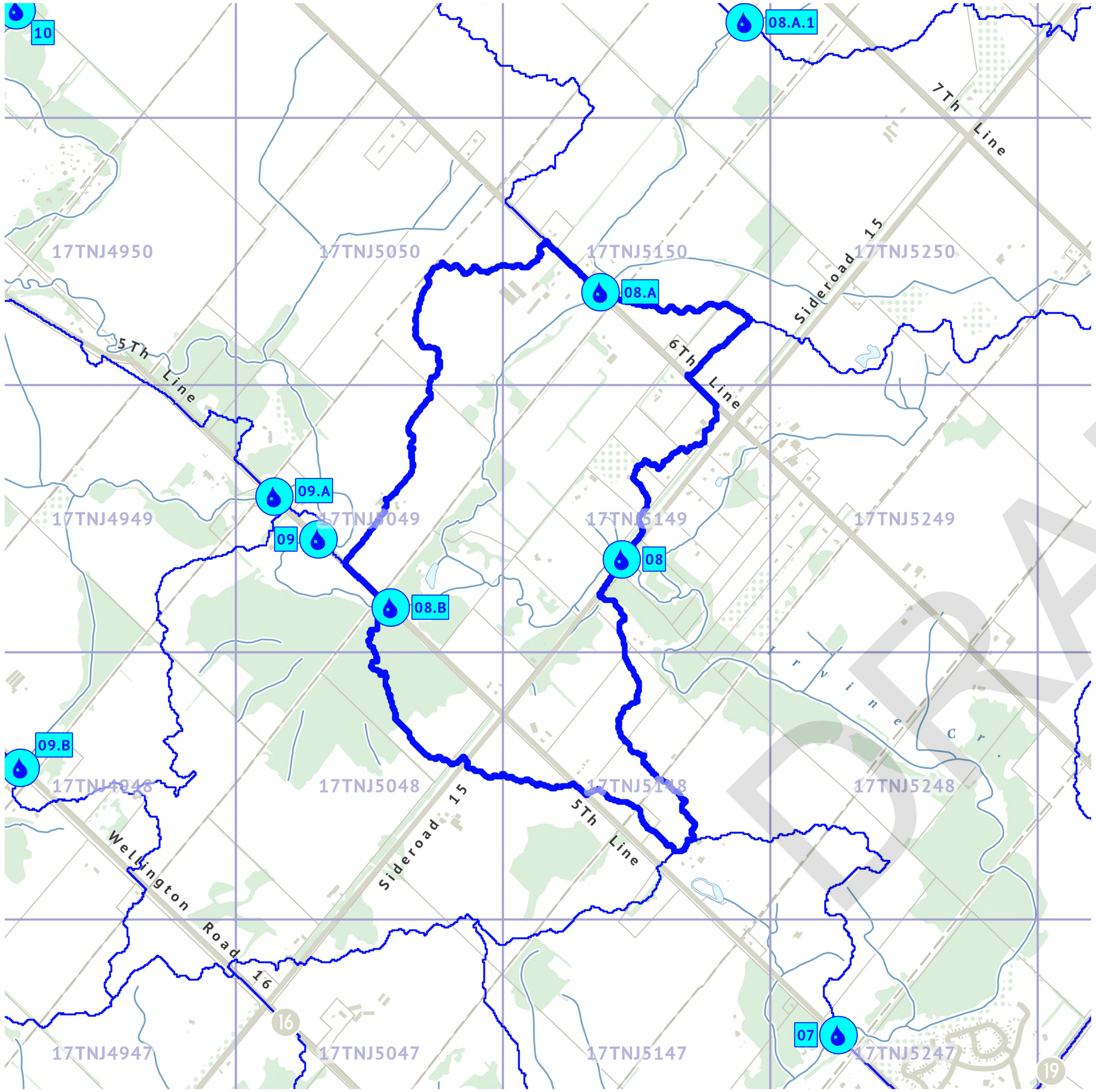


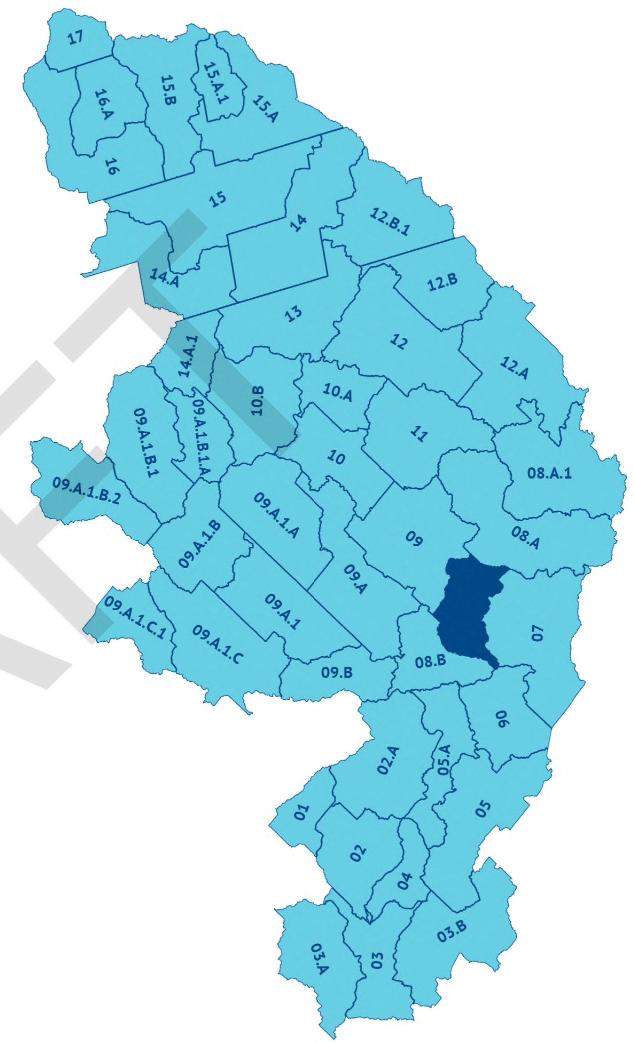
Model Outlet Desc.: Structure 16-WG (5th Line)
Catchment Area: 418.9 ha
Longest Flow Path: 6,589 m
Longest Flow Path Min. Elev: 431.6 m
Longest Flow Path Max. Elev: 464.9 m

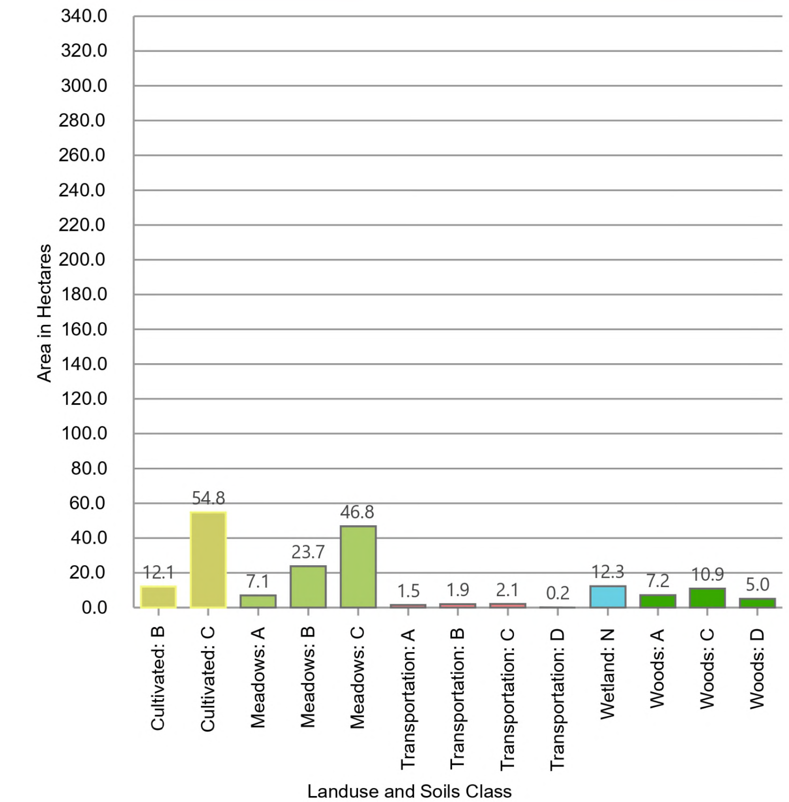


BURNSIDE

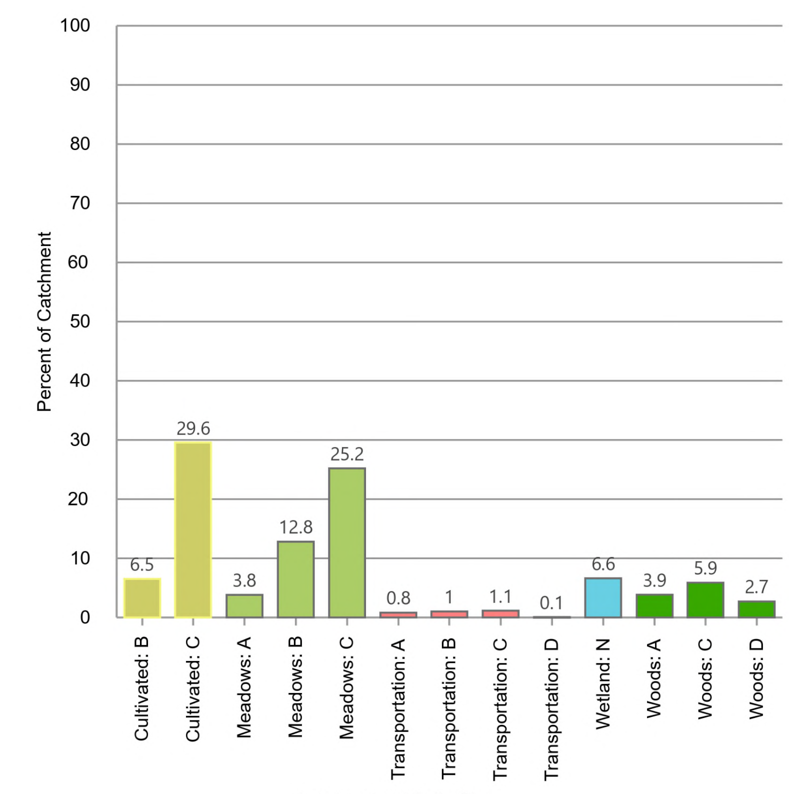
Catchment: 07







Model Outlet Desc.: Structure 30-WG (Sideroad 15)
Catchment Area: 185.4 ha
Longest Flow Path: 3,503 m
Longest Flow Path Min. Elev: 437.6 m
Longest Flow Path Max. Elev: 462.6 m



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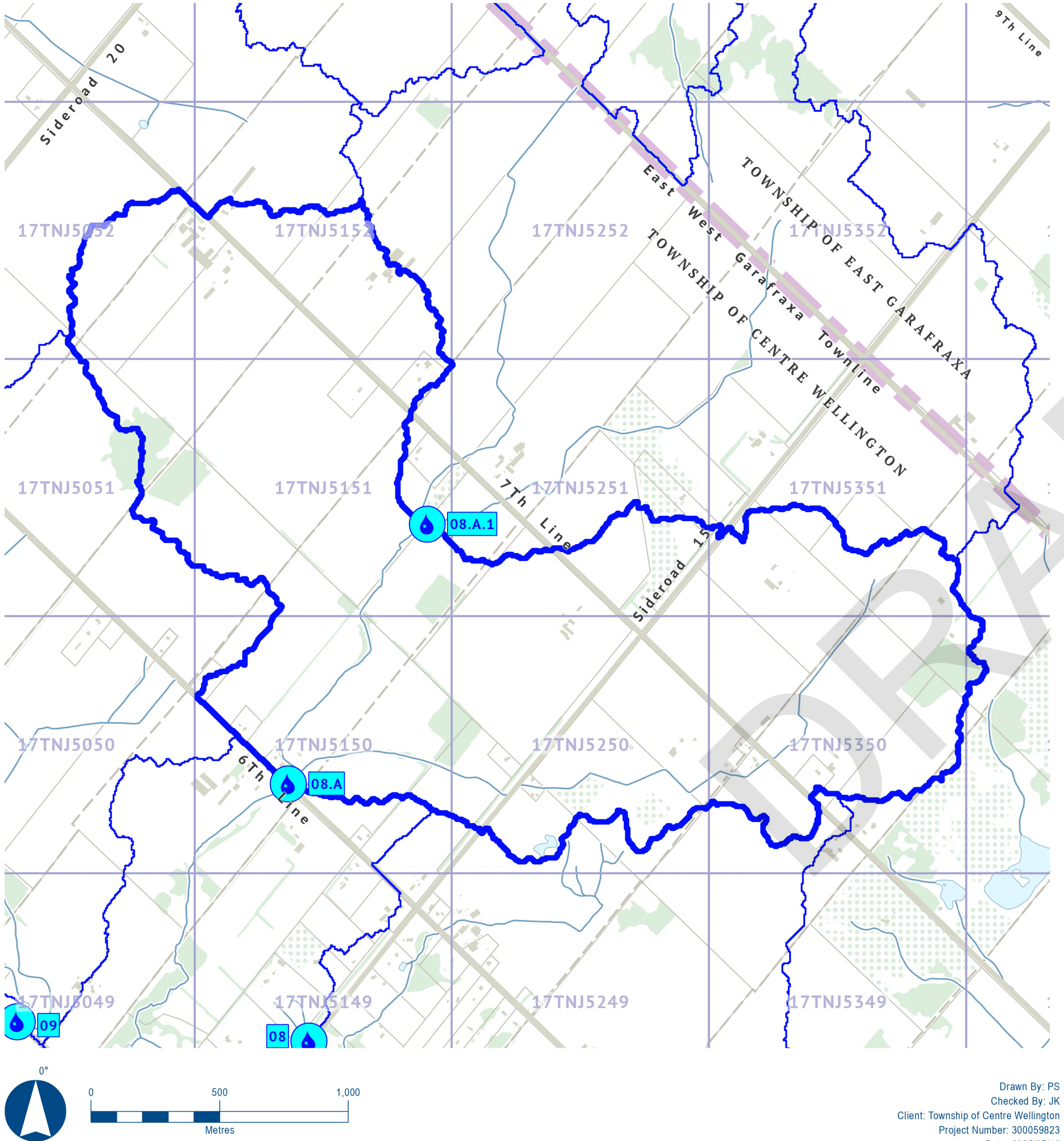
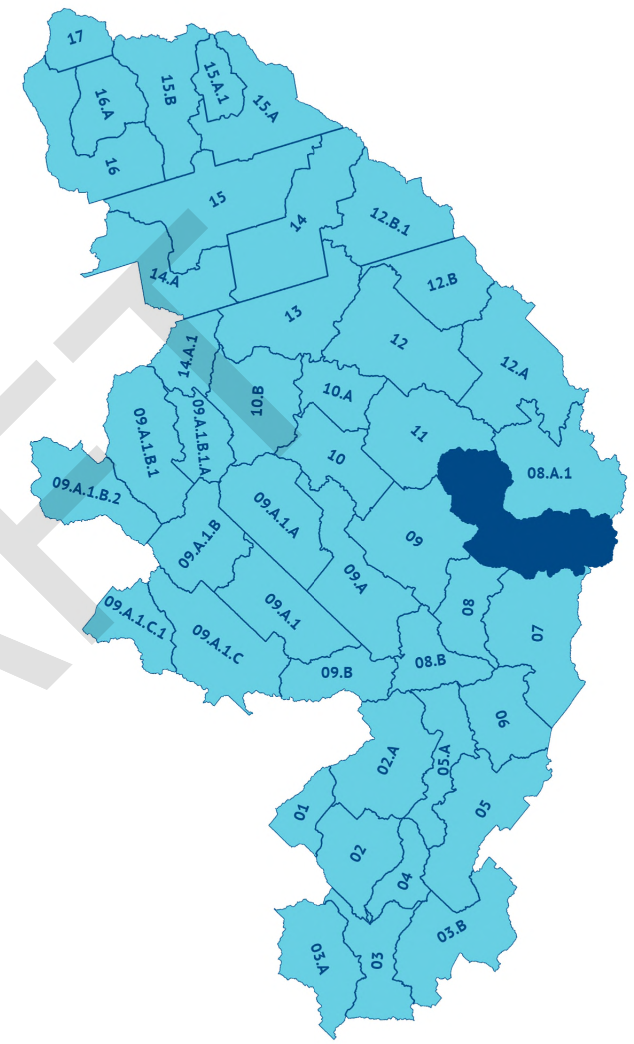
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

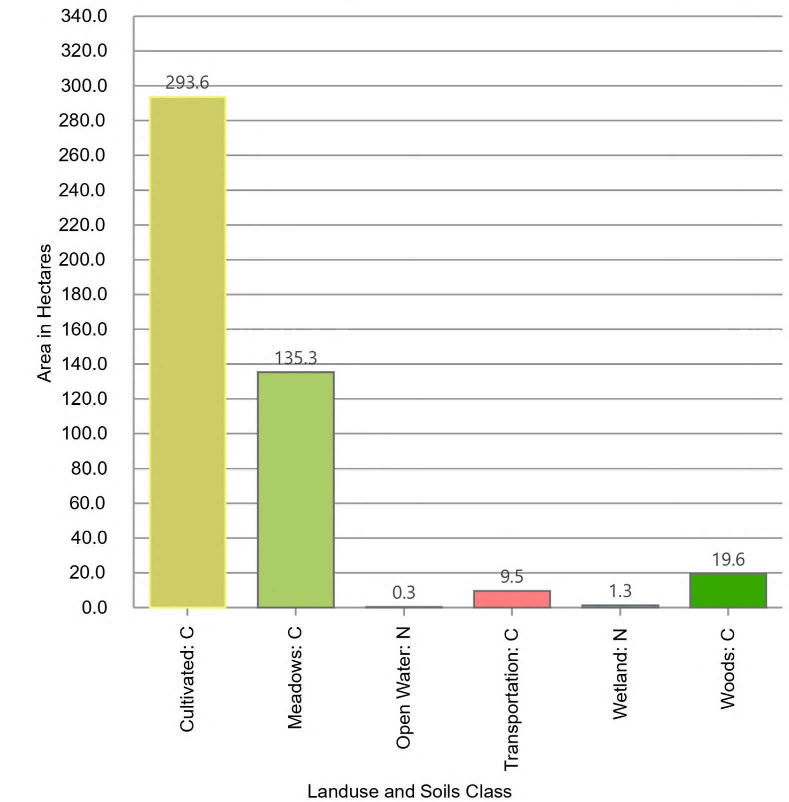
BURNSIDE

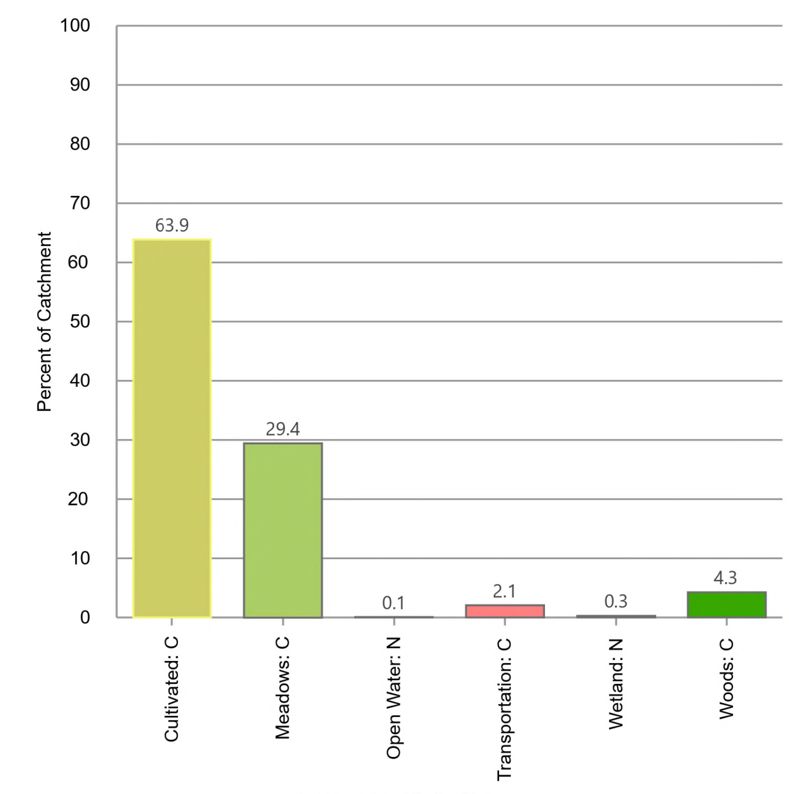
Catchment: 08

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG









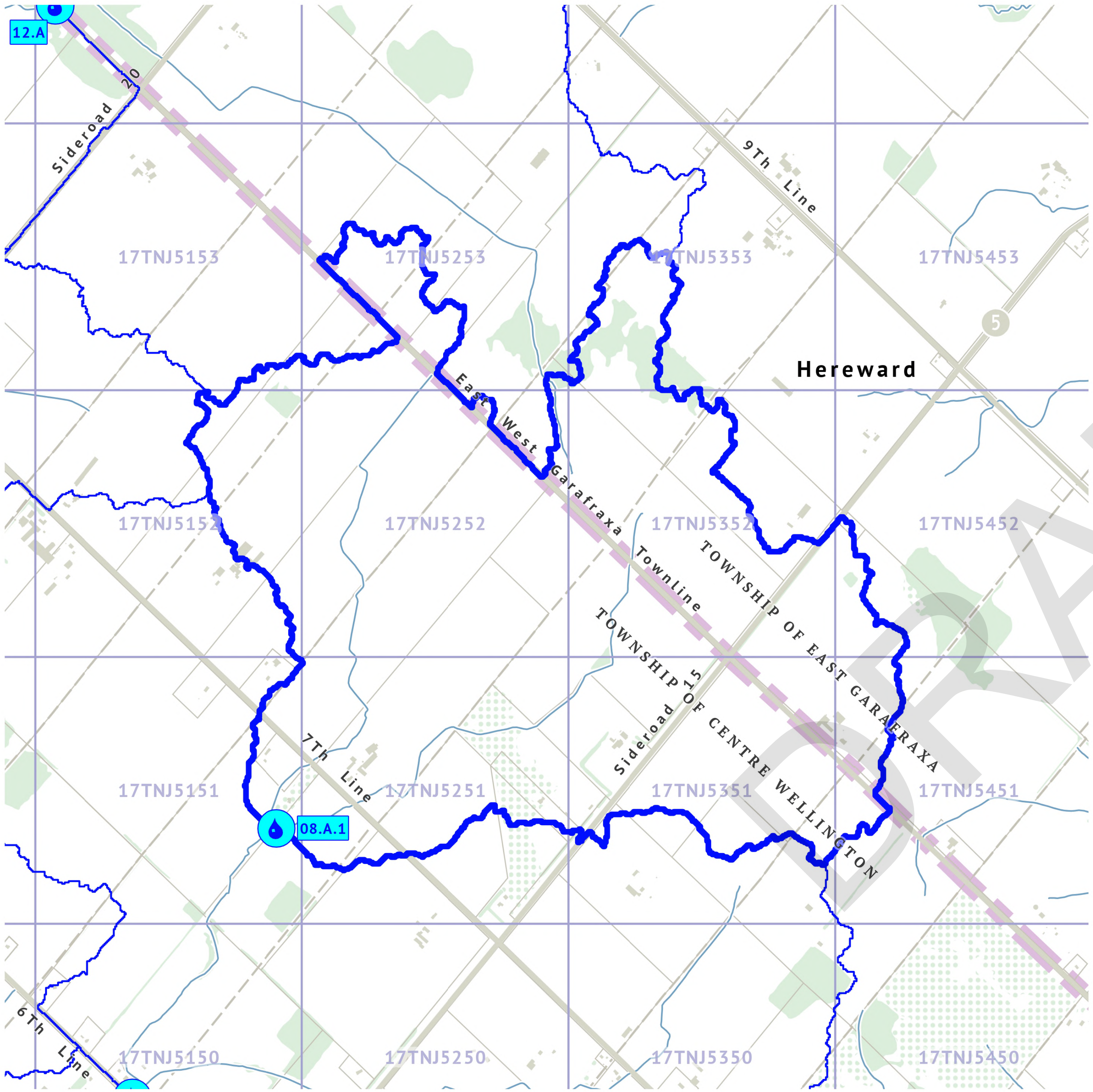
Model Outlet Desc.: Structure 14-WG (6th Line)
Catchment Area: 459.6 ha
Longest Flow Path: 3,877 m
Longest Flow Path Min. Elev: 449.5 m
Longest Flow Path Max. Elev: 475.8 m

Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 08.A

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG



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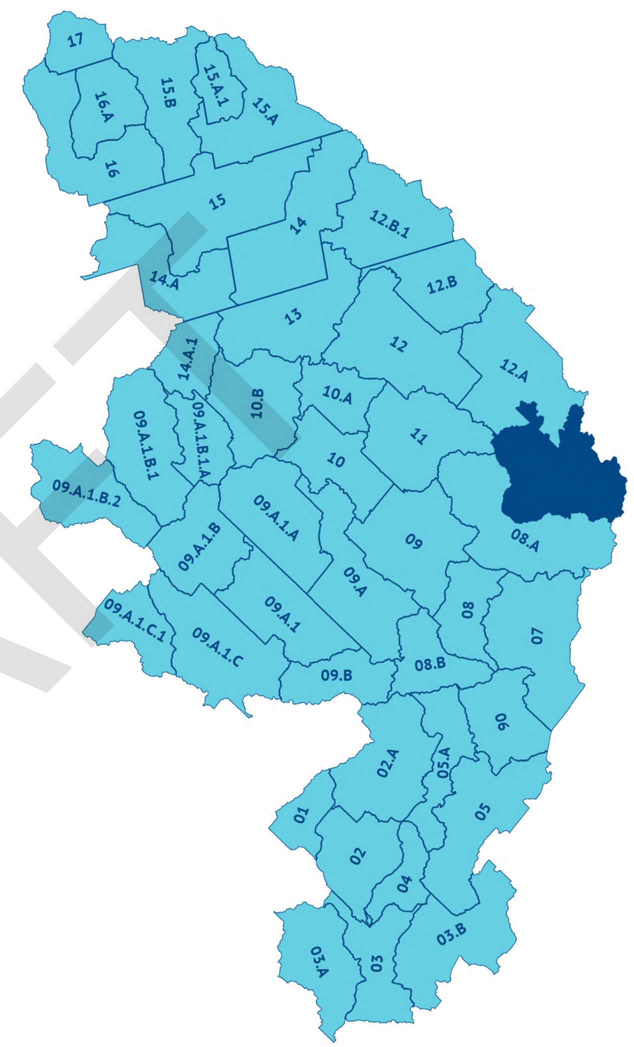
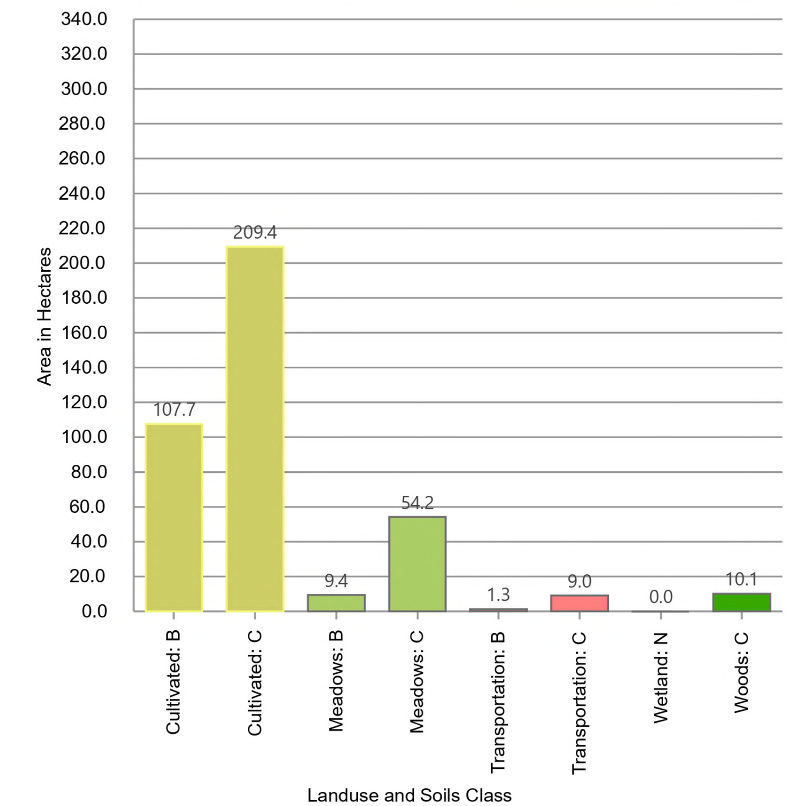
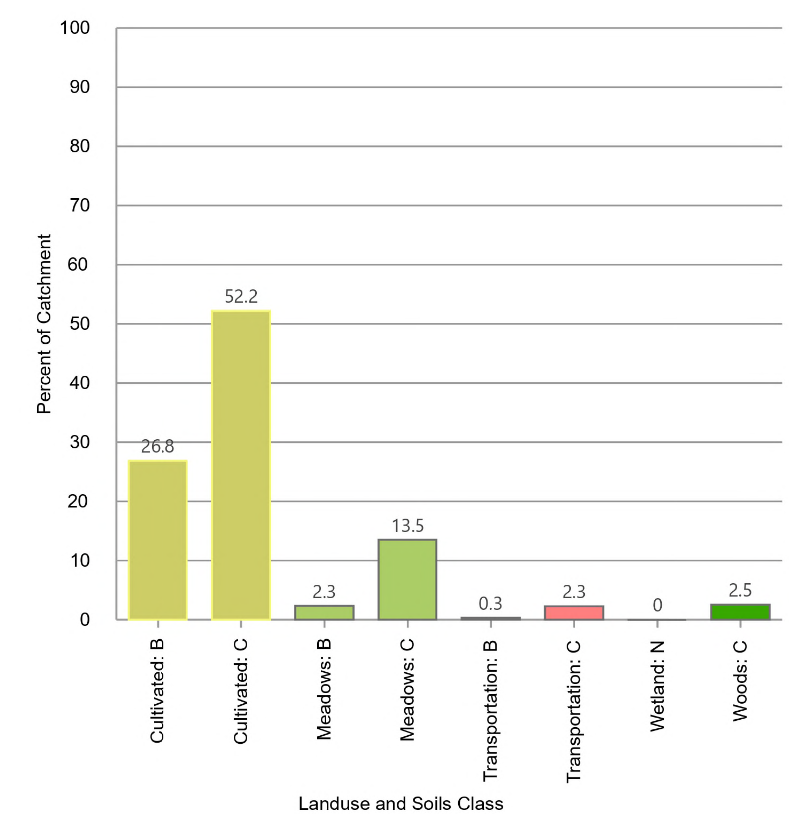
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10



Model Outlet Desc.: Lot 17 Con 7
Catchment Area: 401.1 ha
Longest Flow Path: 3,718 m
Longest Flow Path Min. Elev: 457.2 m
Longest Flow Path Max. Elev: 474.8 m

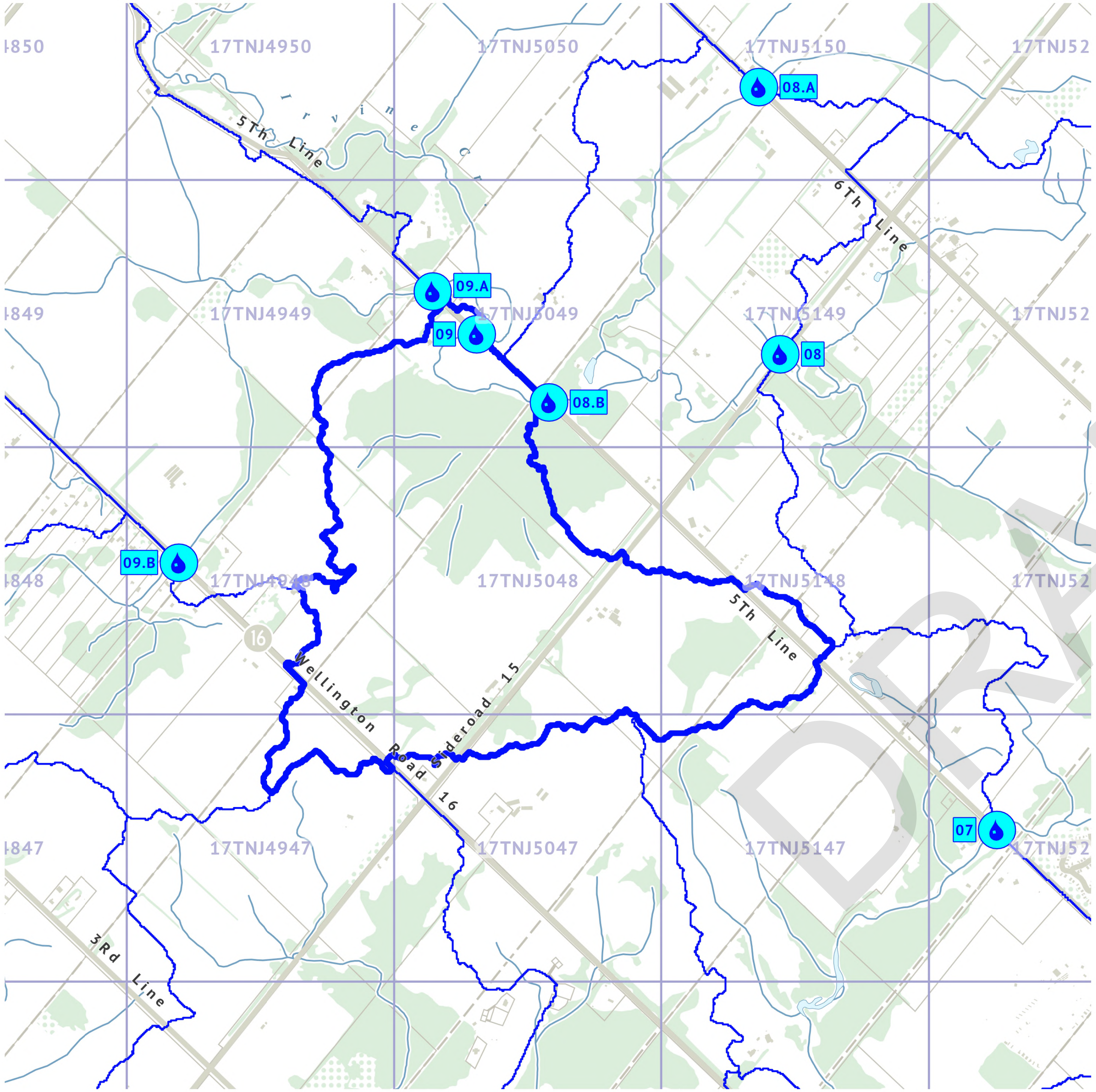


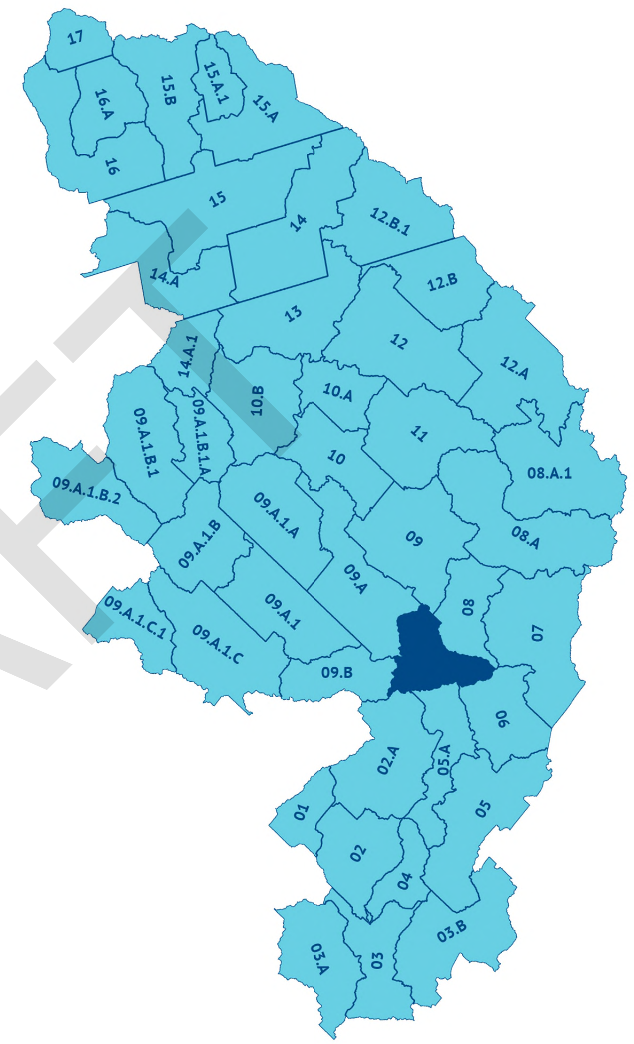


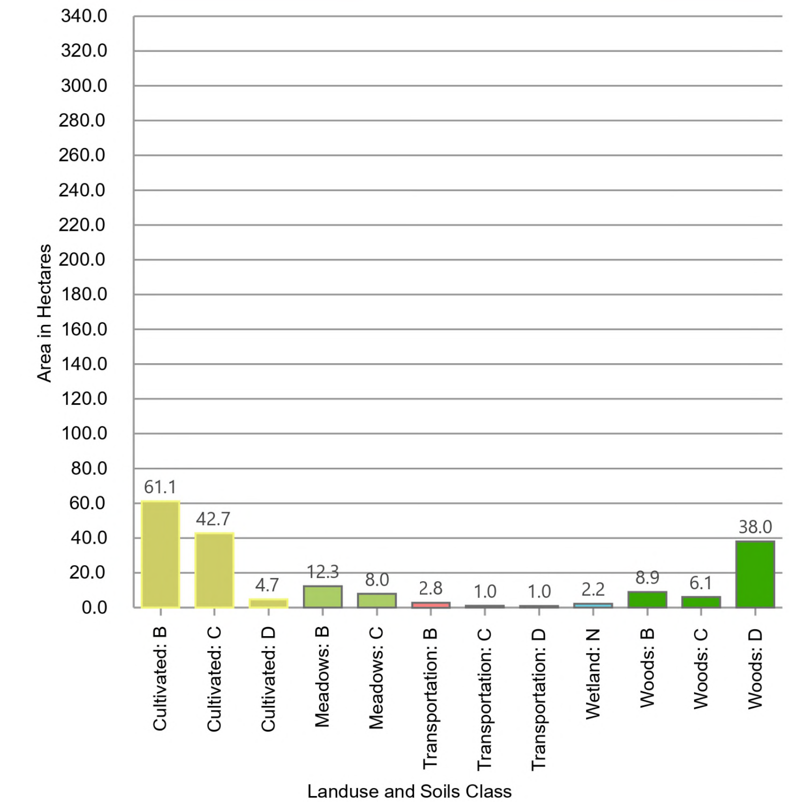
BURNSIDE

Catchment: 08.A.1

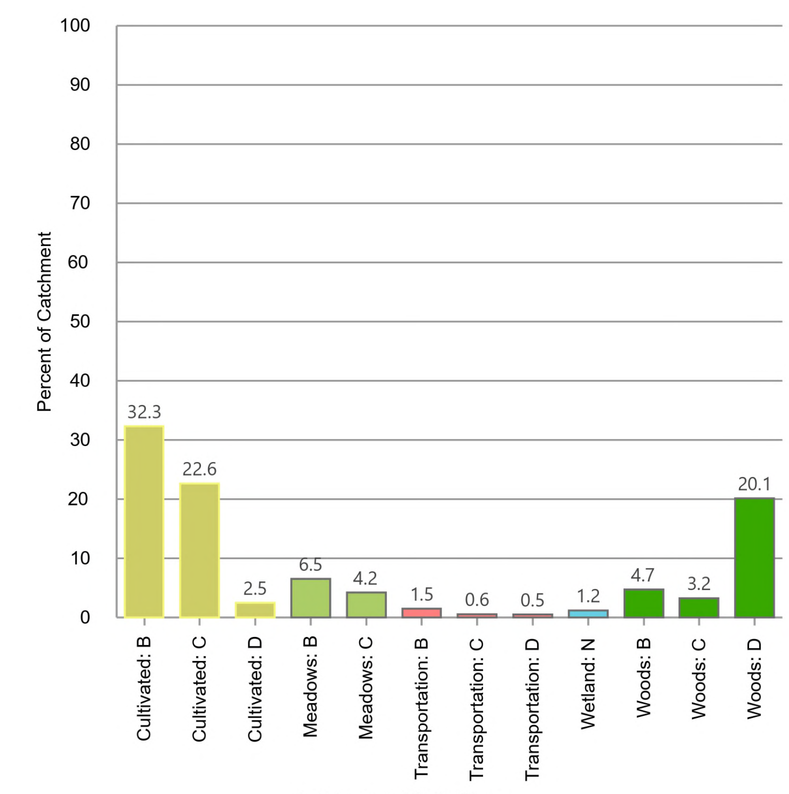
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

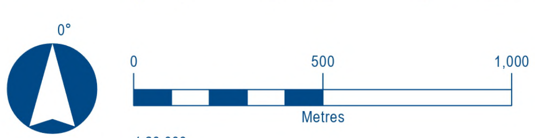






Model Outlet Desc.: Structure 17-WG (5th Line)
Catchment Area: 188.9 ha
Longest Flow Path: 2,412 m
Longest Flow Path Min. Elev: 439.6 m
Longest Flow Path Max. Elev: 469.4 m



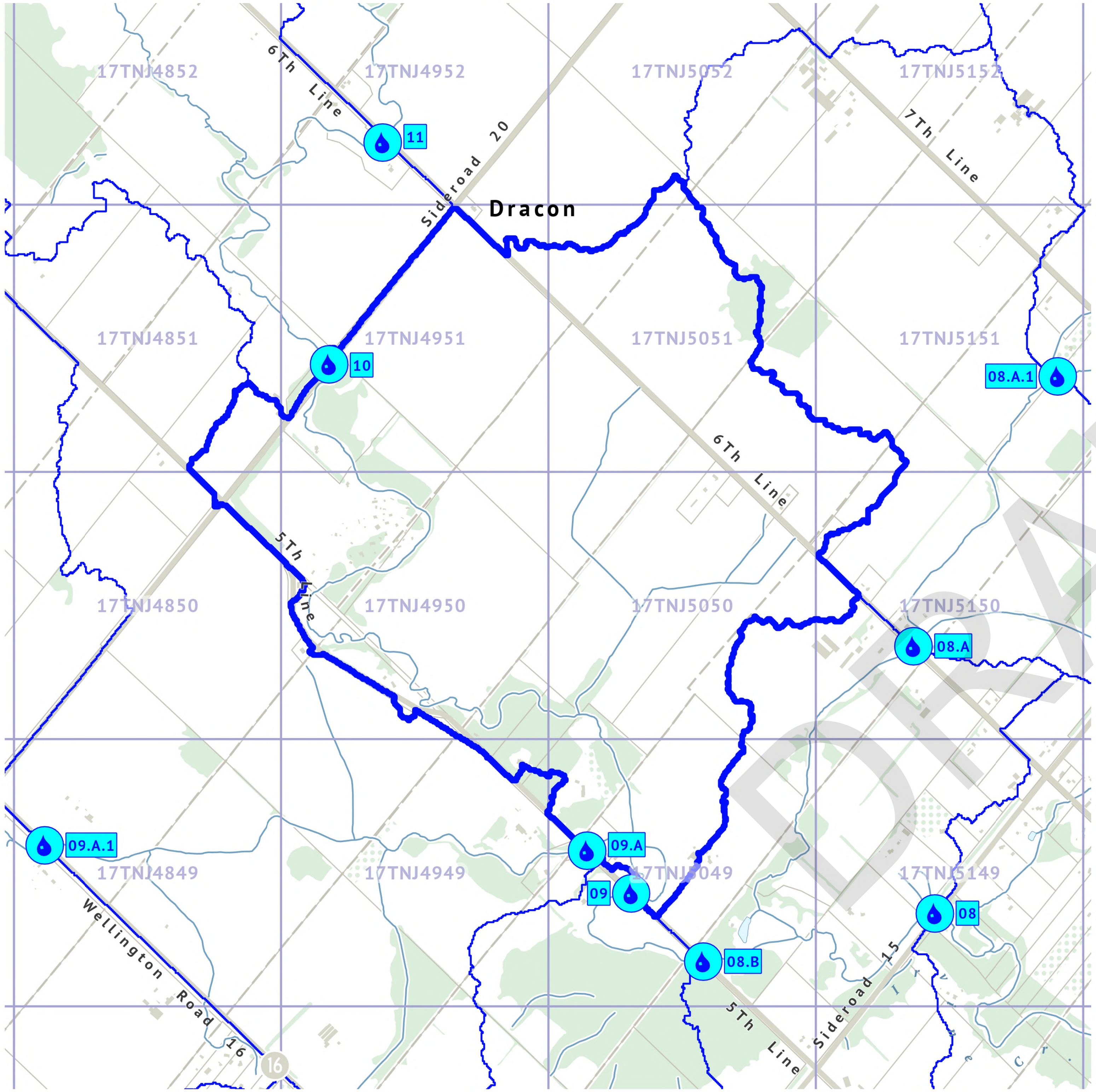


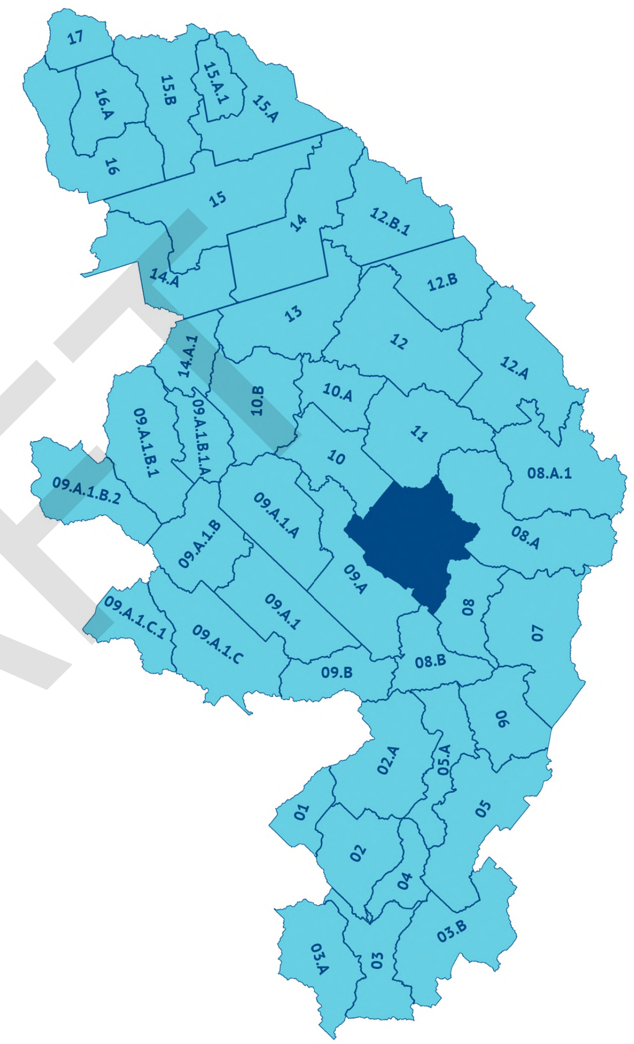
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

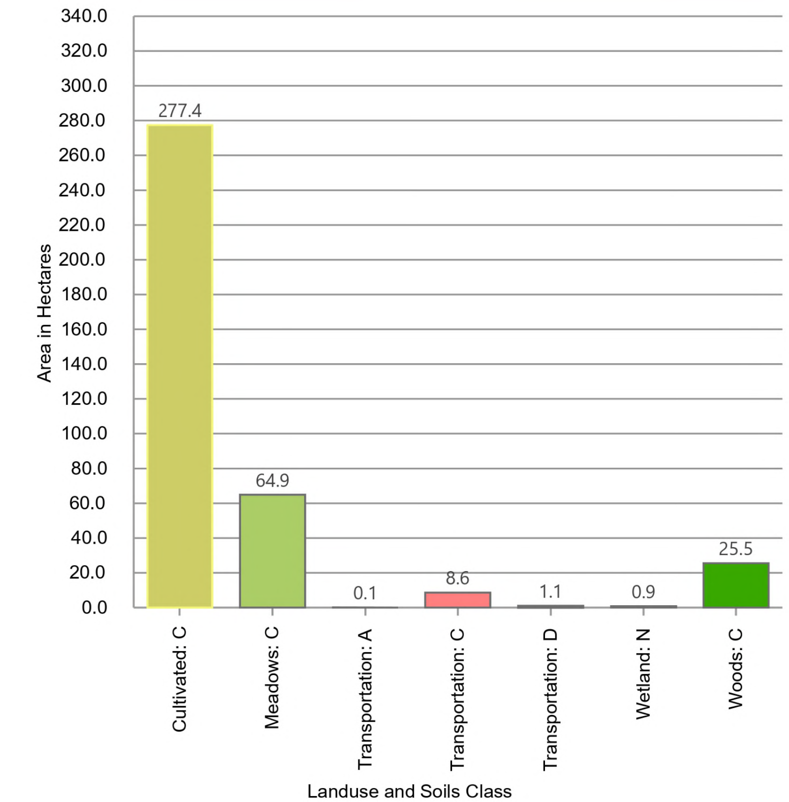
BURNSIDE

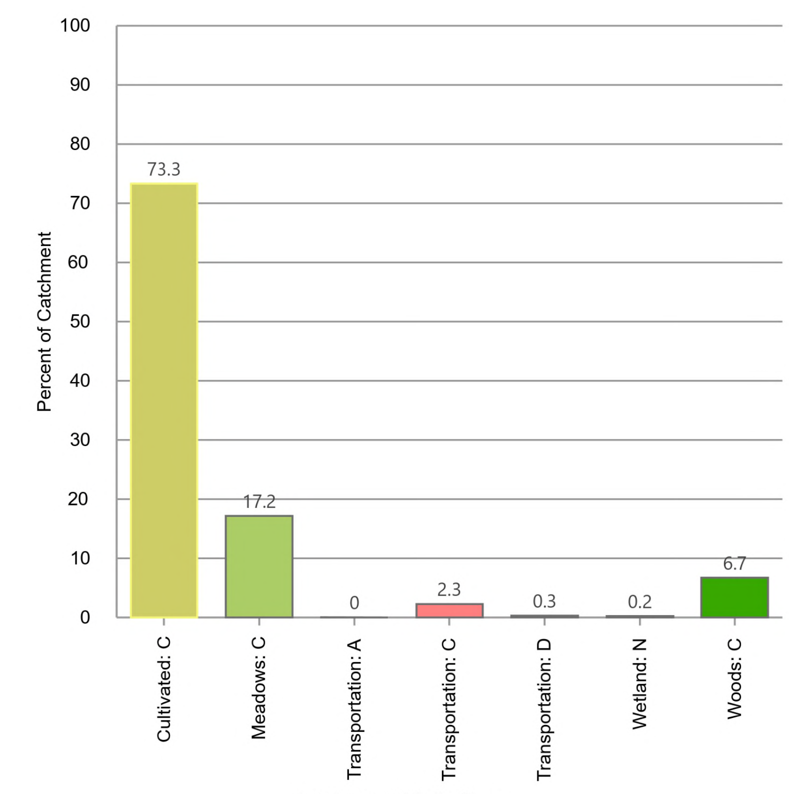
Catchment: 08.B

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG









Model Outlet Desc.: Structure 18-WG (5th Line)
Catchment Area: 378.4 ha
Longest Flow Path: 6,491 m
Longest Flow Path Min. Elev: 440.6 m
Longest Flow Path Max. Elev: 471.0 m

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Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 09

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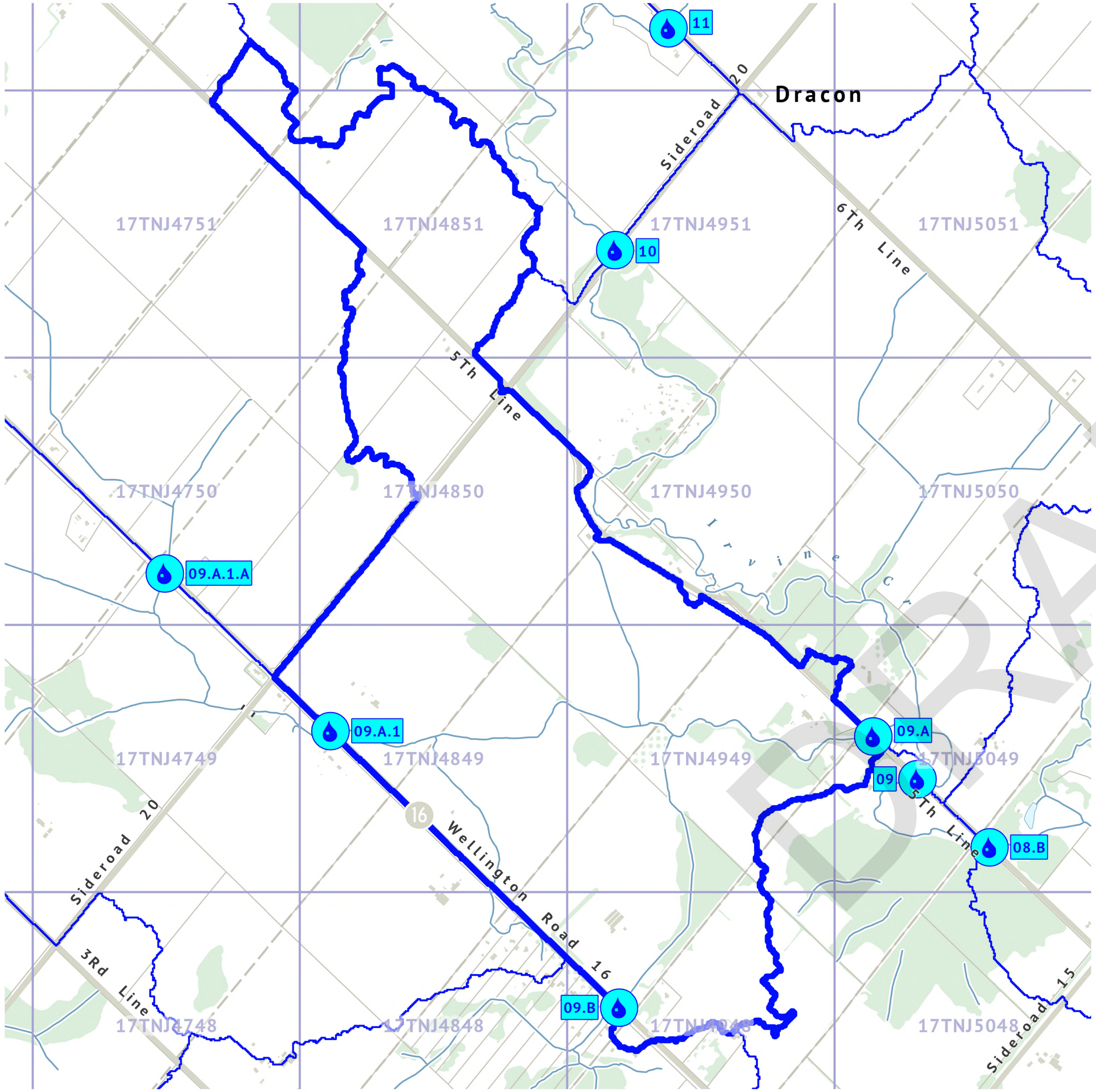
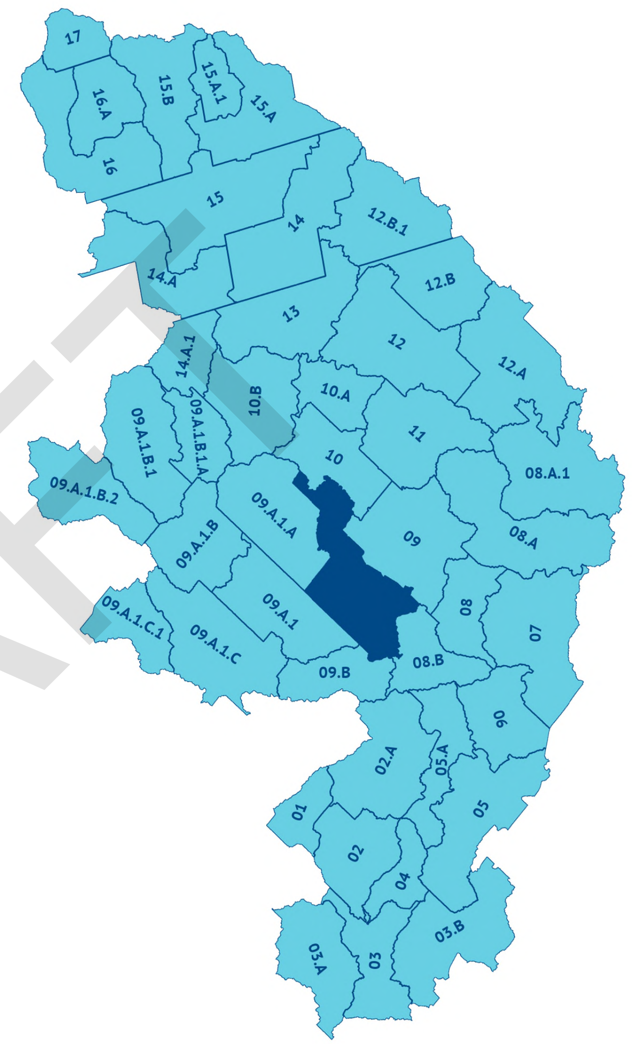
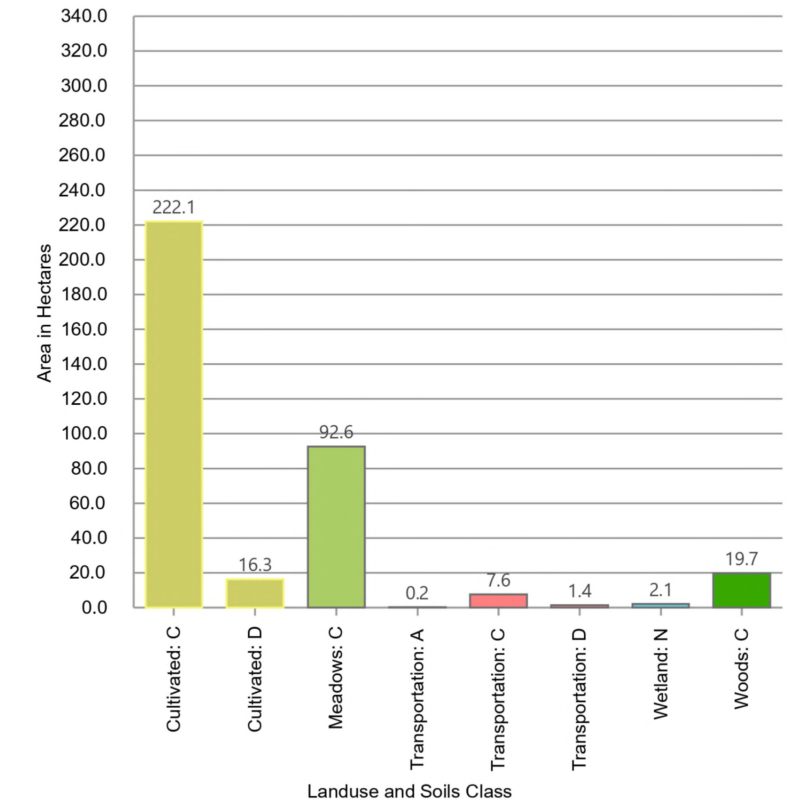
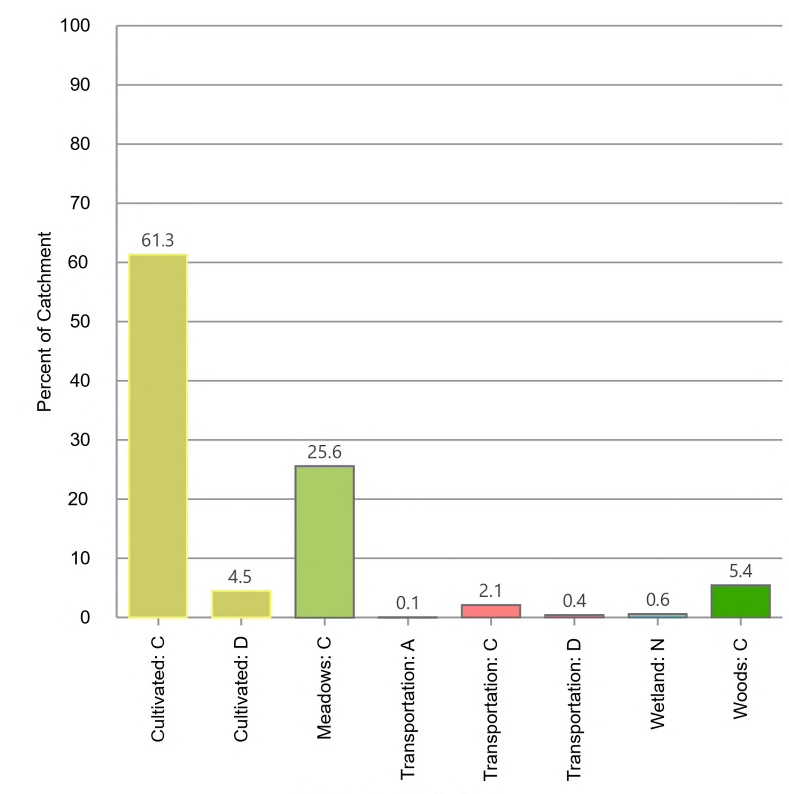
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Structure 19-WG (5th Line)
Catchment Area: 362.0 ha
Longest Flow Path: 4,909 m
Longest Flow Path Min. Elev: 442.0 m
Longest Flow Path Max. Elev: 474.7 m



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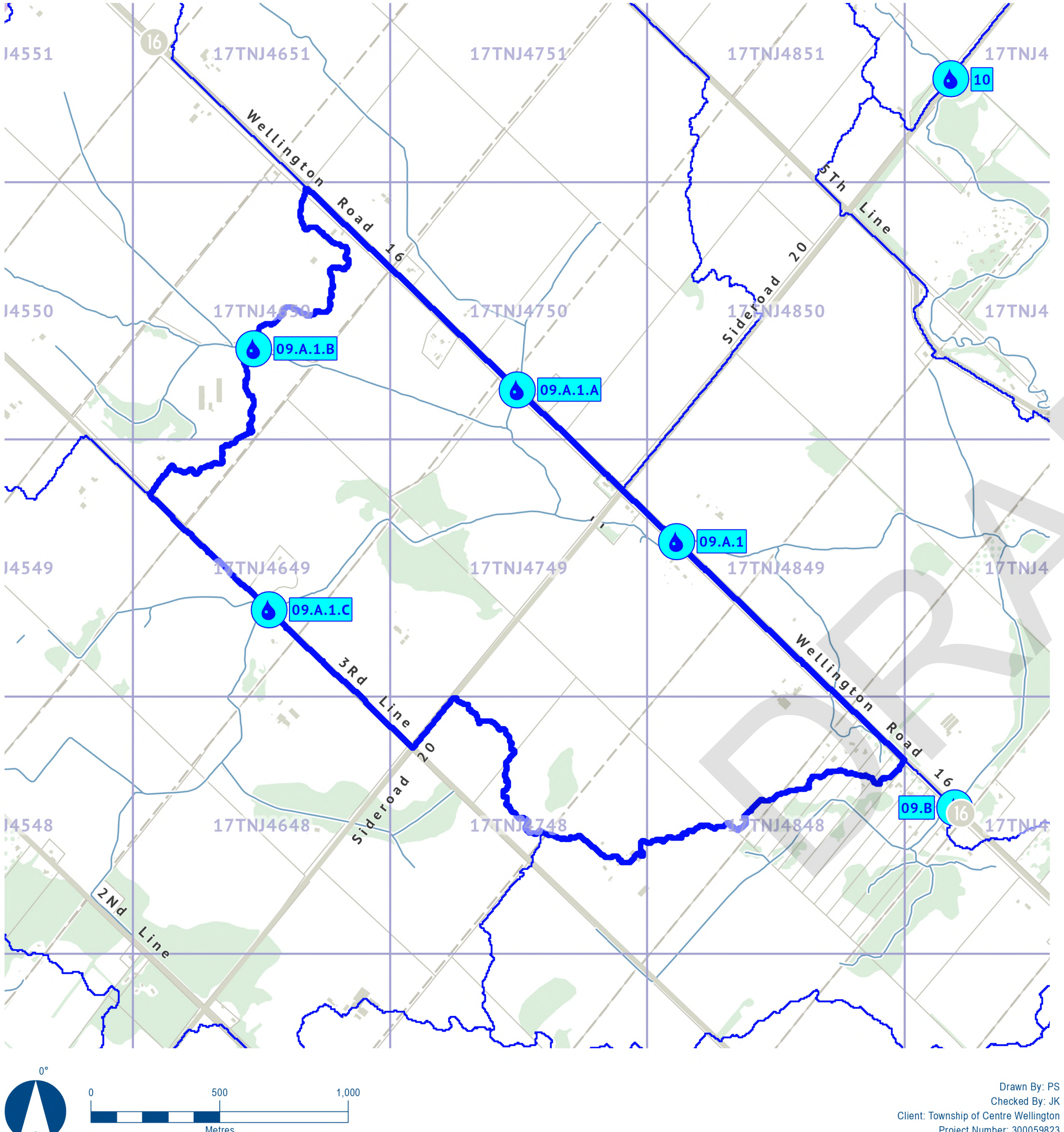
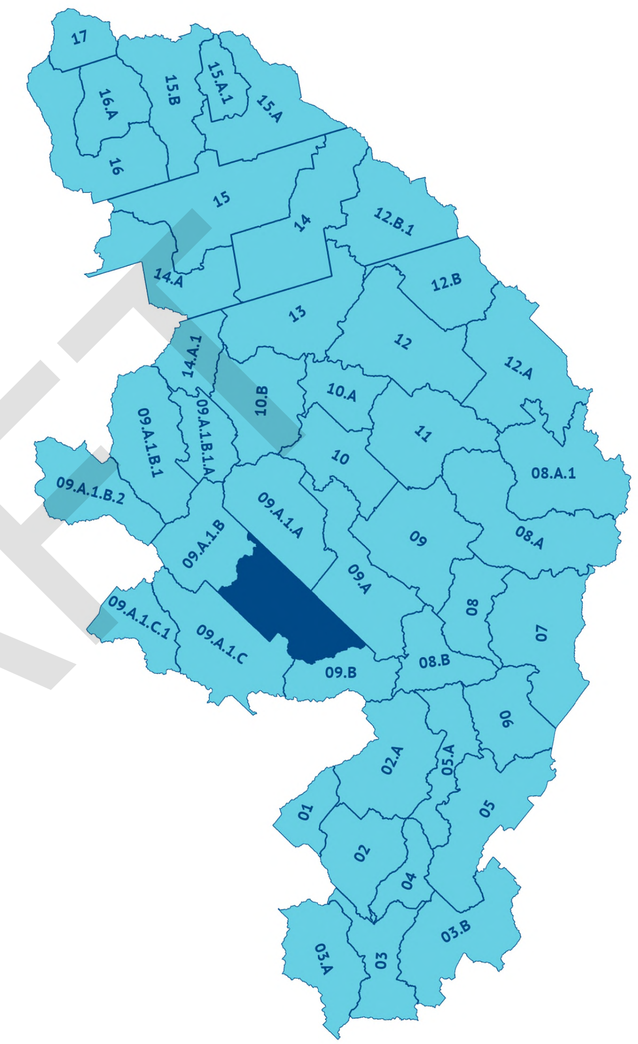
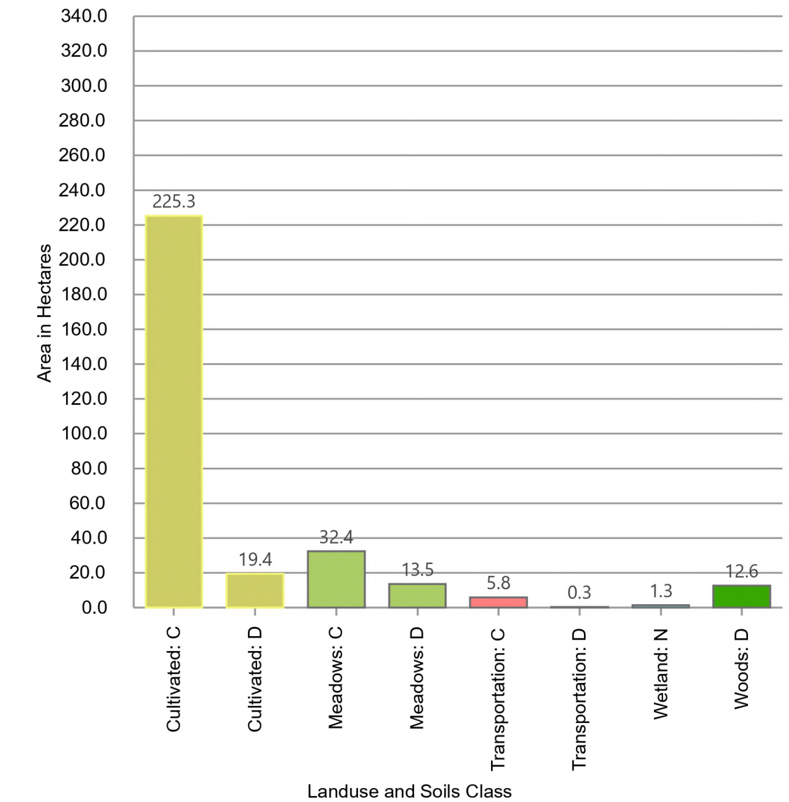
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

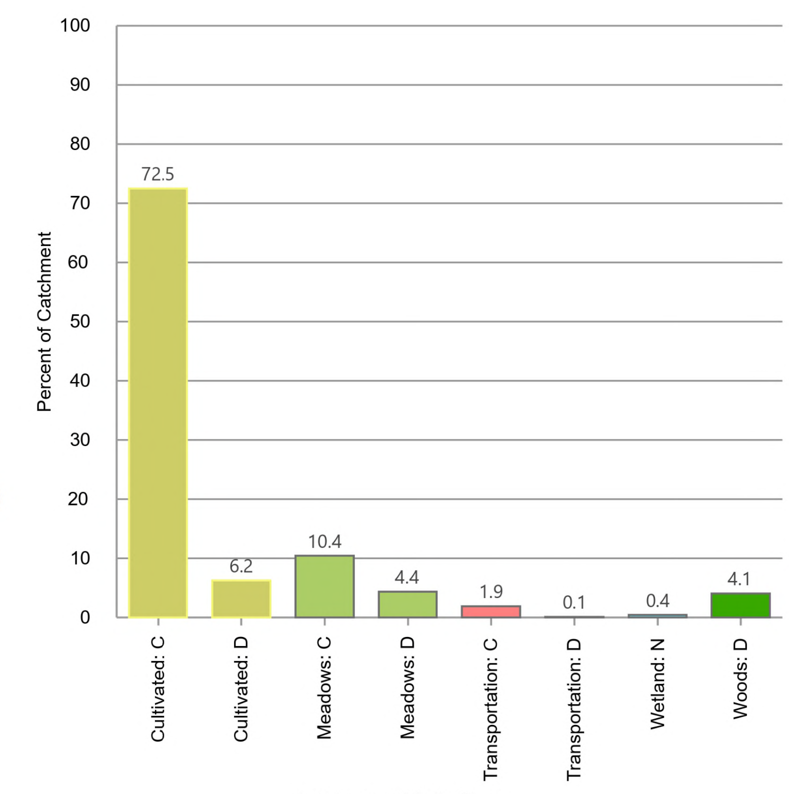
Catchment: 09.A







Model Outlet Desc.: Structure B016038 (Wellington Road 16)
Catchment Area: 310.7 ha
Longest Flow Path: 2,758 m
Longest Flow Path Min. Elev: 446.4 m
Longest Flow Path Max. Elev: 458.1 m

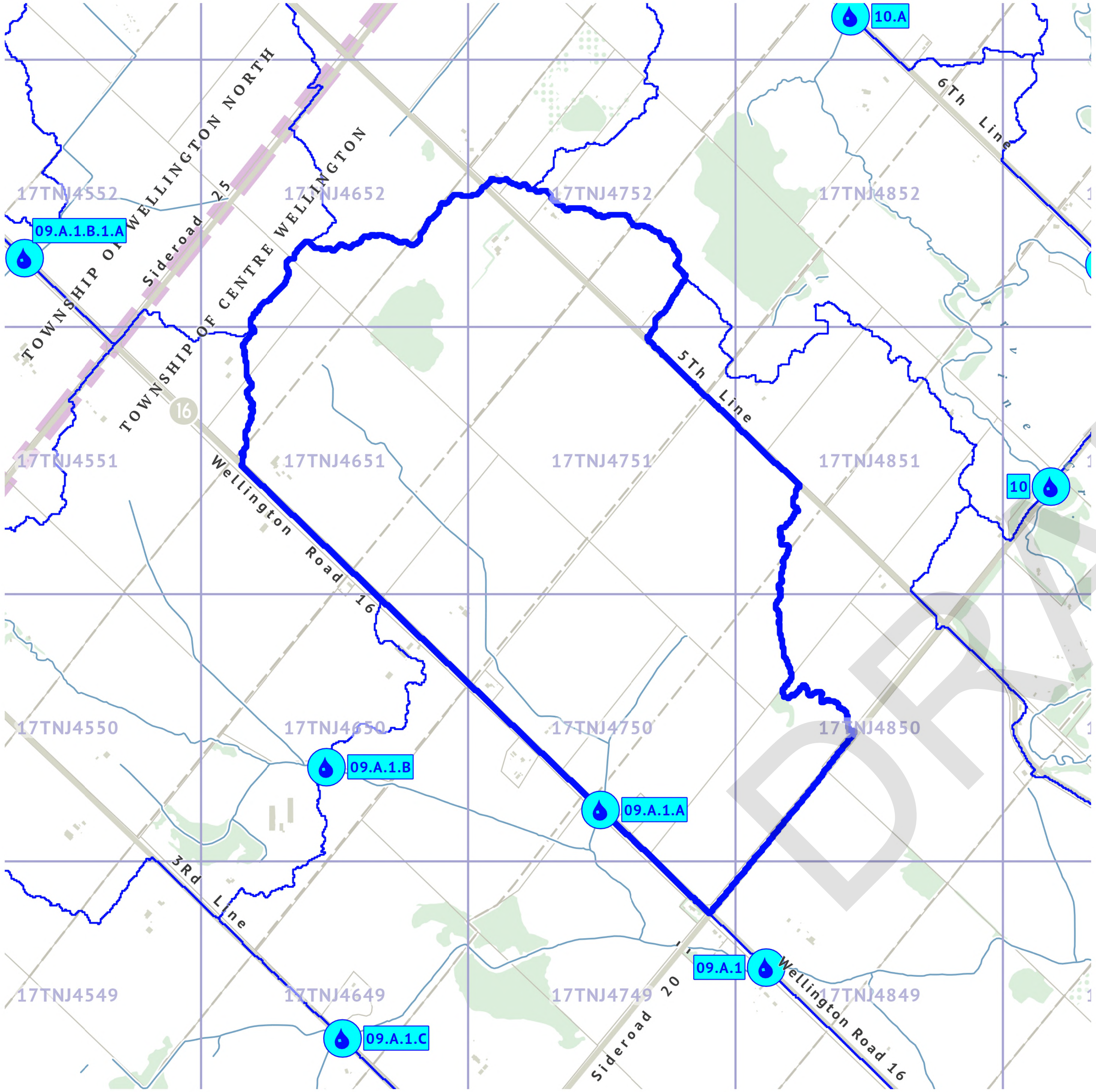


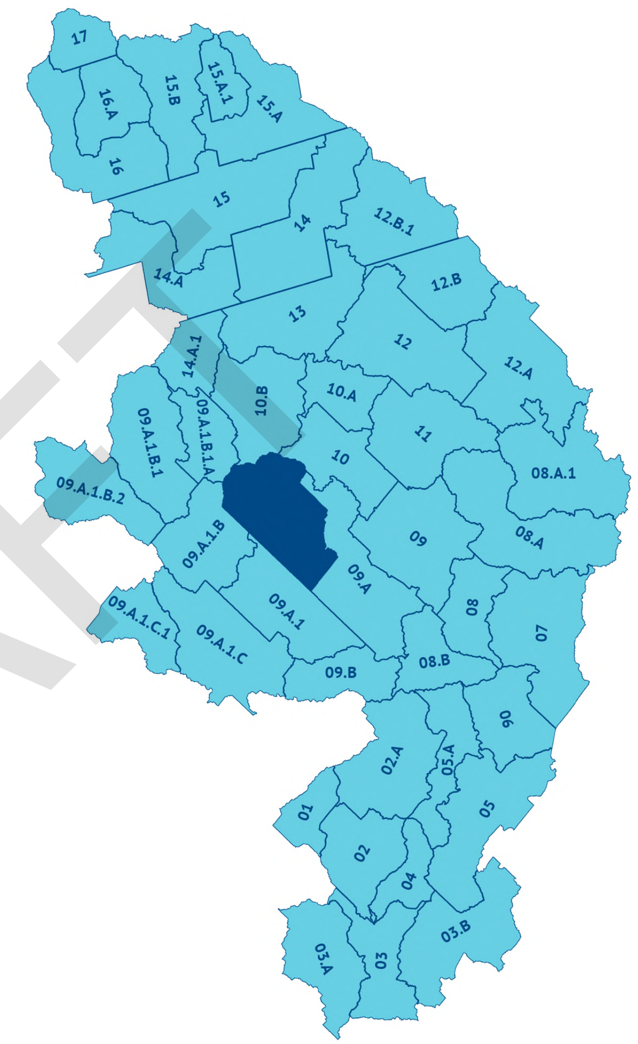
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

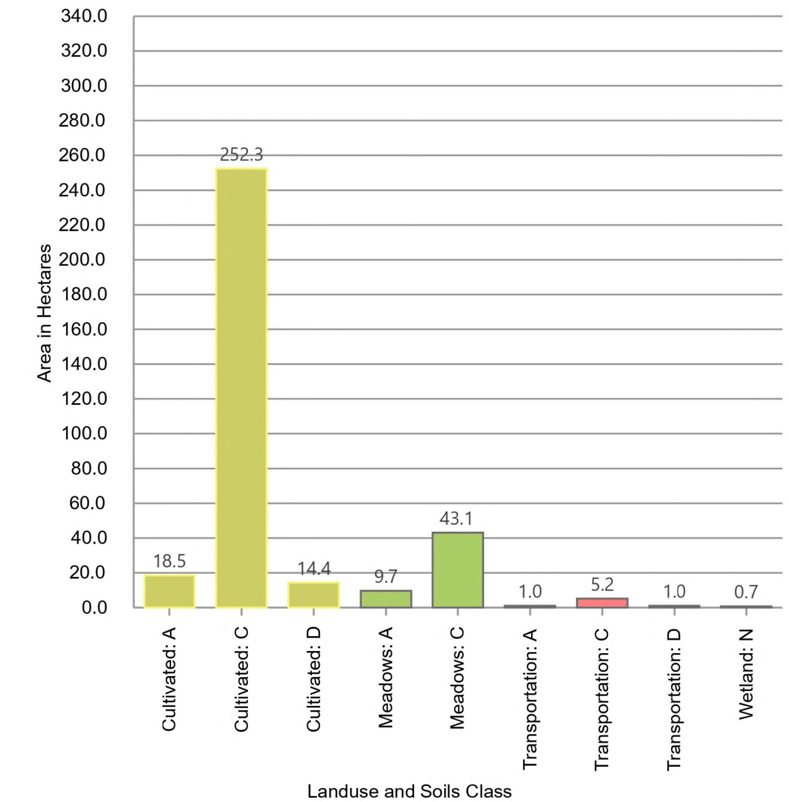
BURNSIDE

Catchment: 09.A.1

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







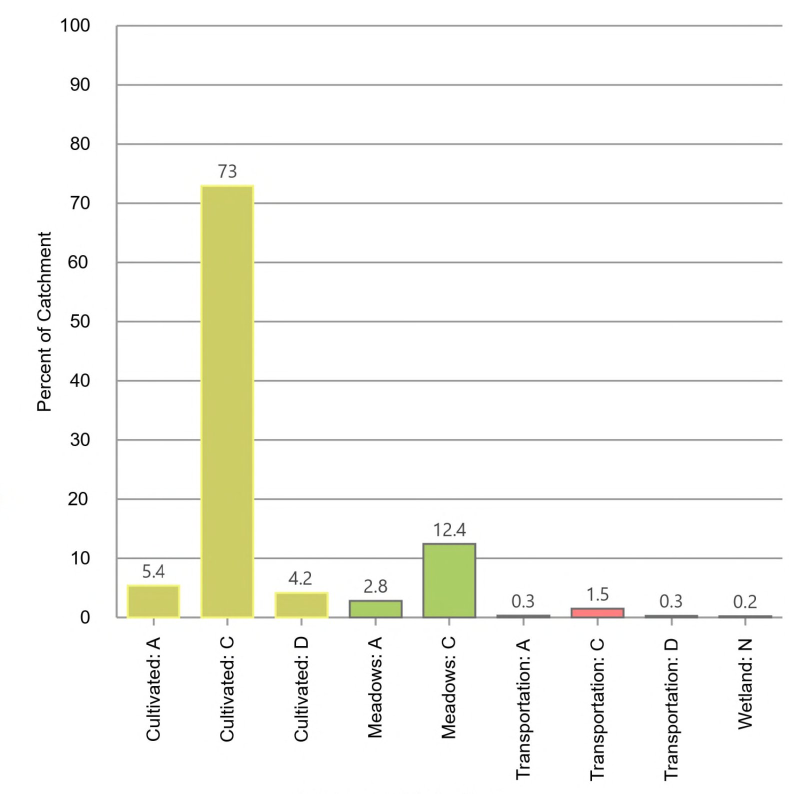
Model Outlet Desc.: Structure B016104 (Wellington Road 16)

Catchment Area: 345.9 ha

Longest Flow Path: 3,149 m

Longest Flow Path Min. Elev: 450.3 m

Longest Flow Path Max. Elev: 485.9 m



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Metres

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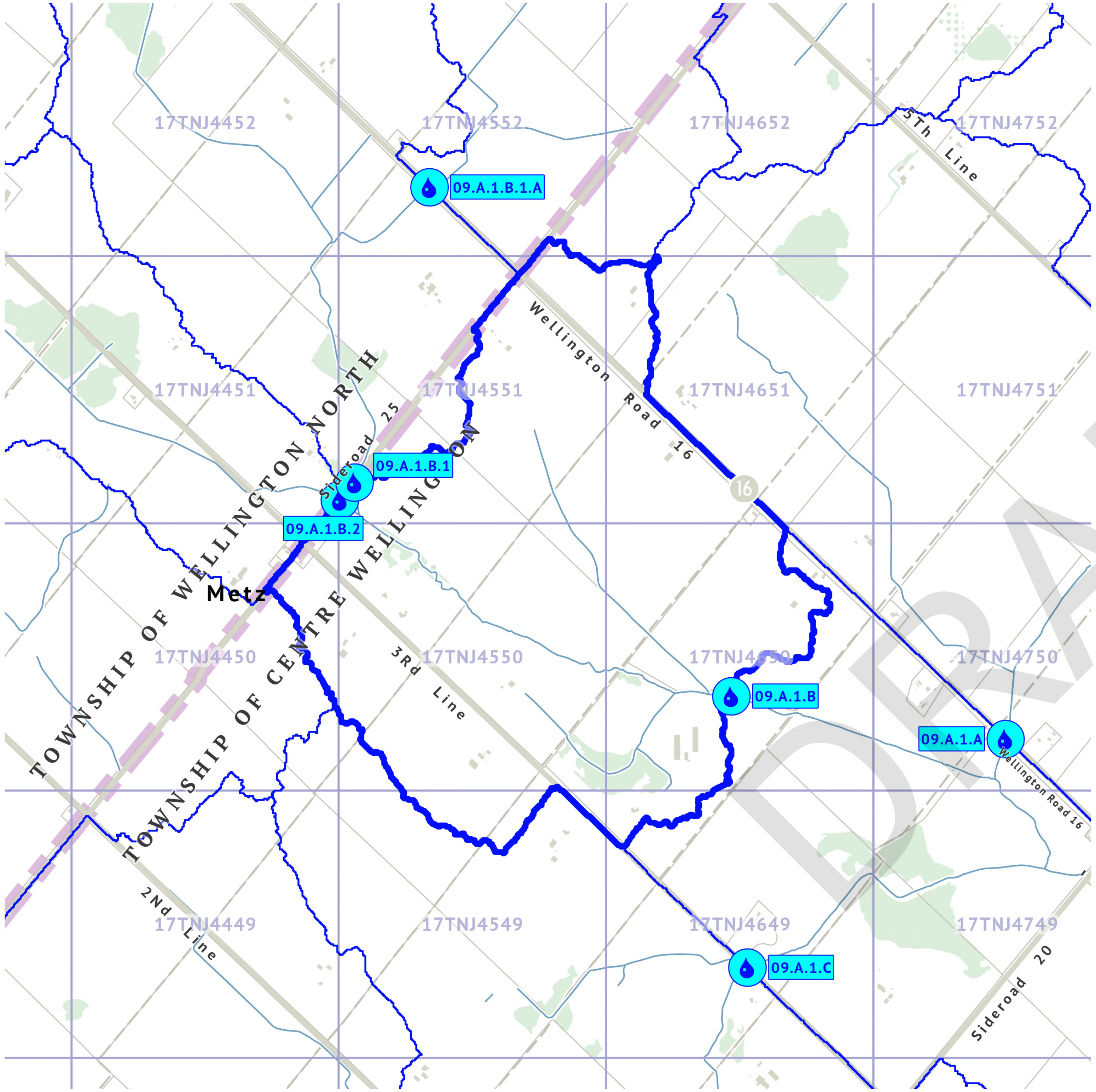
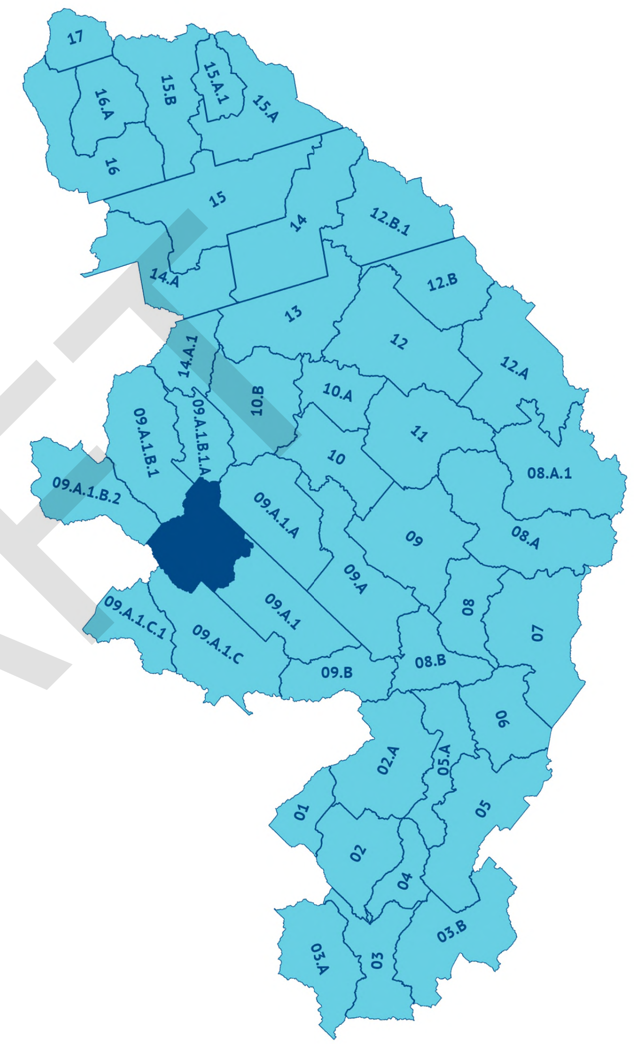
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

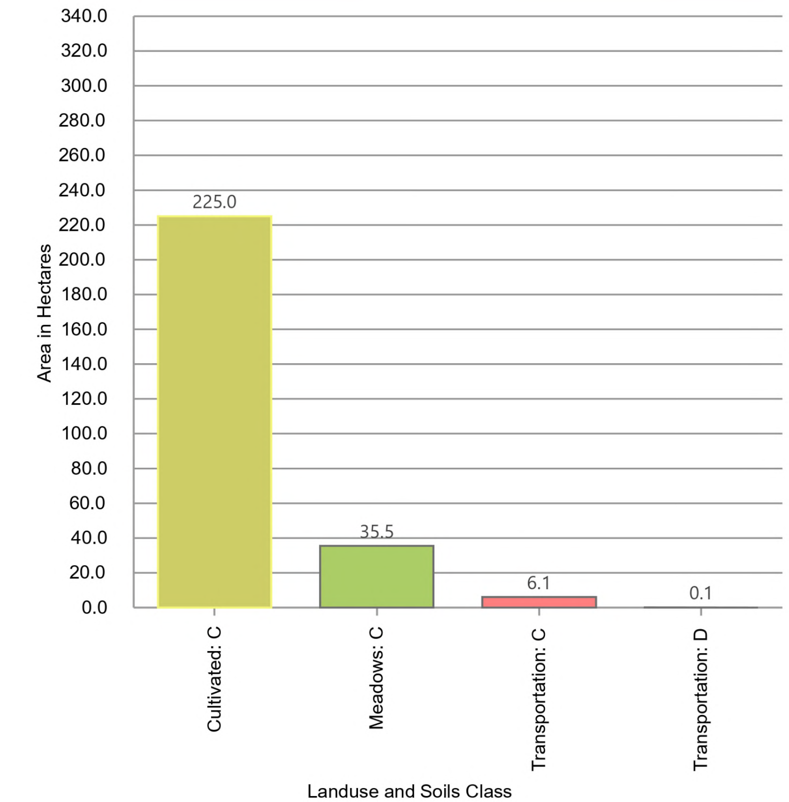
BURNSIDE

Catchment: 09.A.1.A

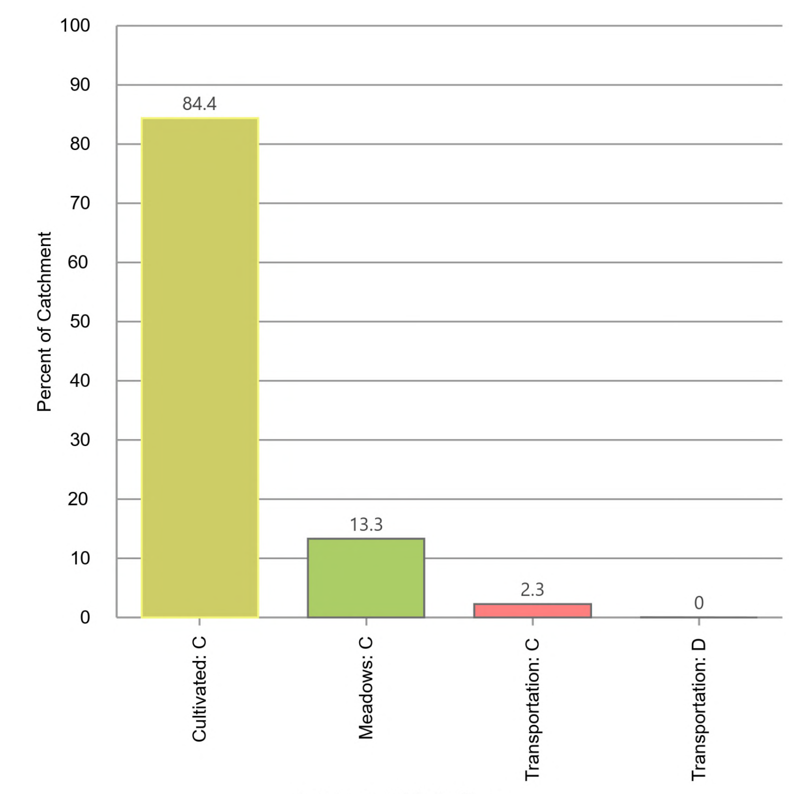
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Lot 23 Con 4
Catchment Area: 266.7 ha
Longest Flow Path: 2,521 m
Longest Flow Path Min. Elev: 452.4 m
Longest Flow Path Max. Elev: 469.3 m



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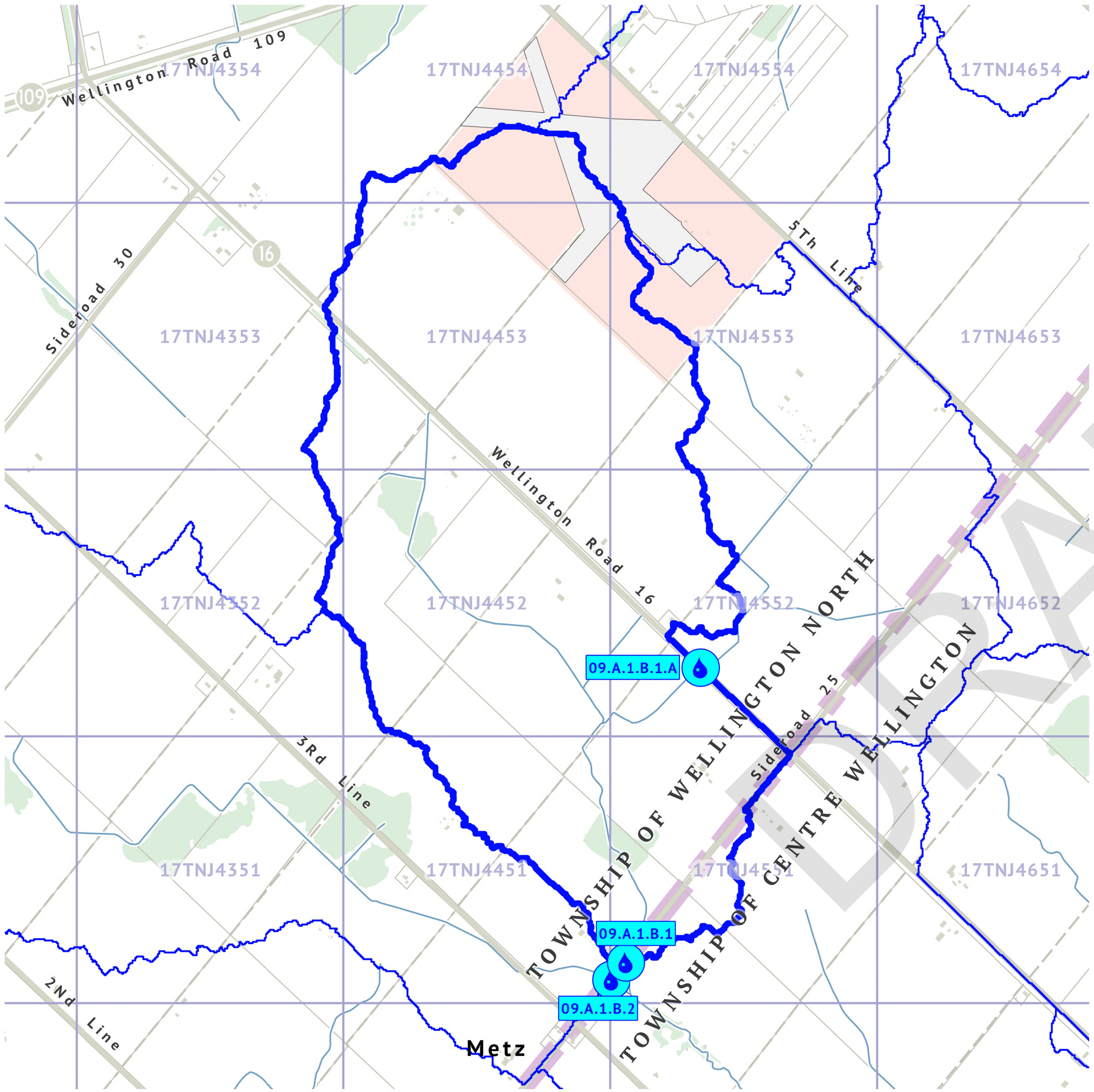
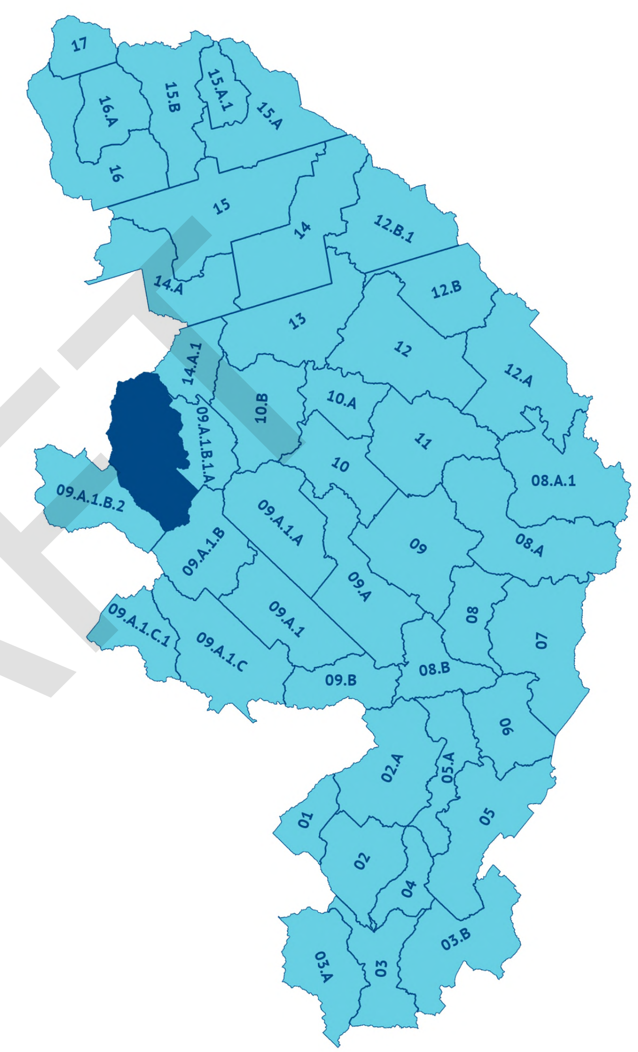
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

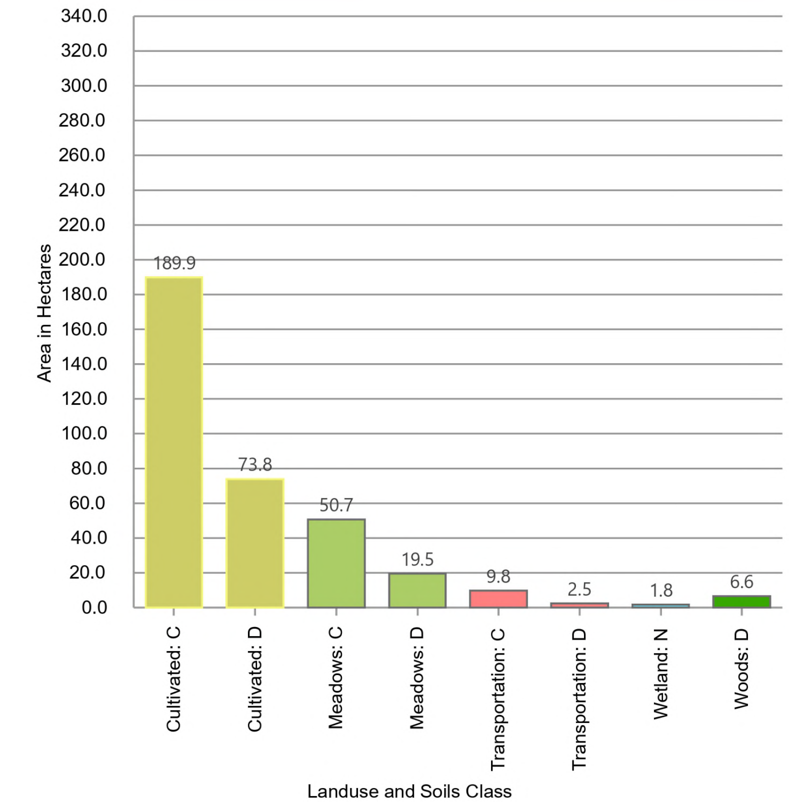
BURNSIDE

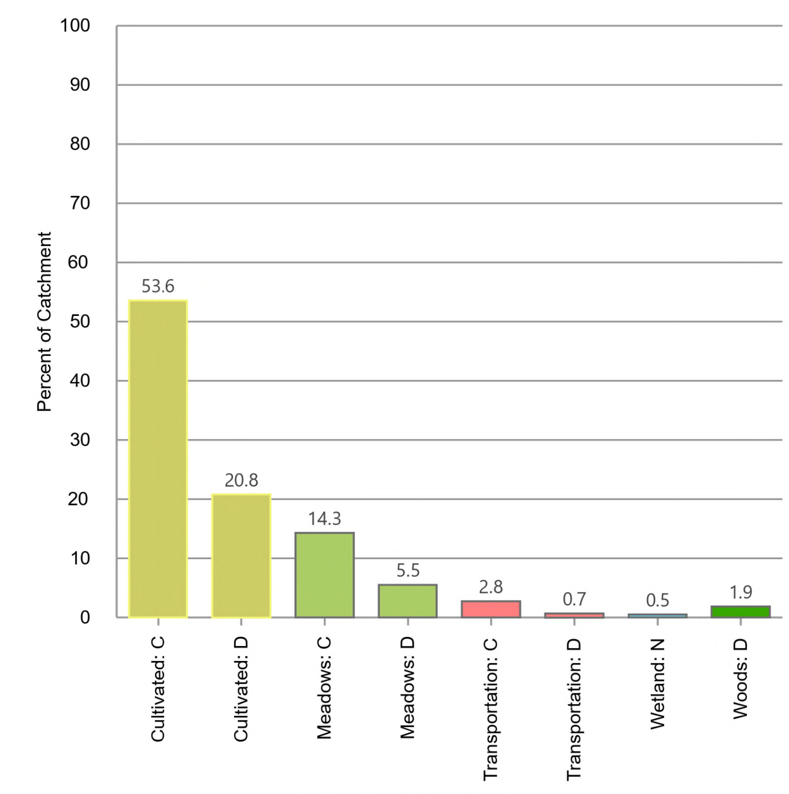
Catchment: 09.A.1.B

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







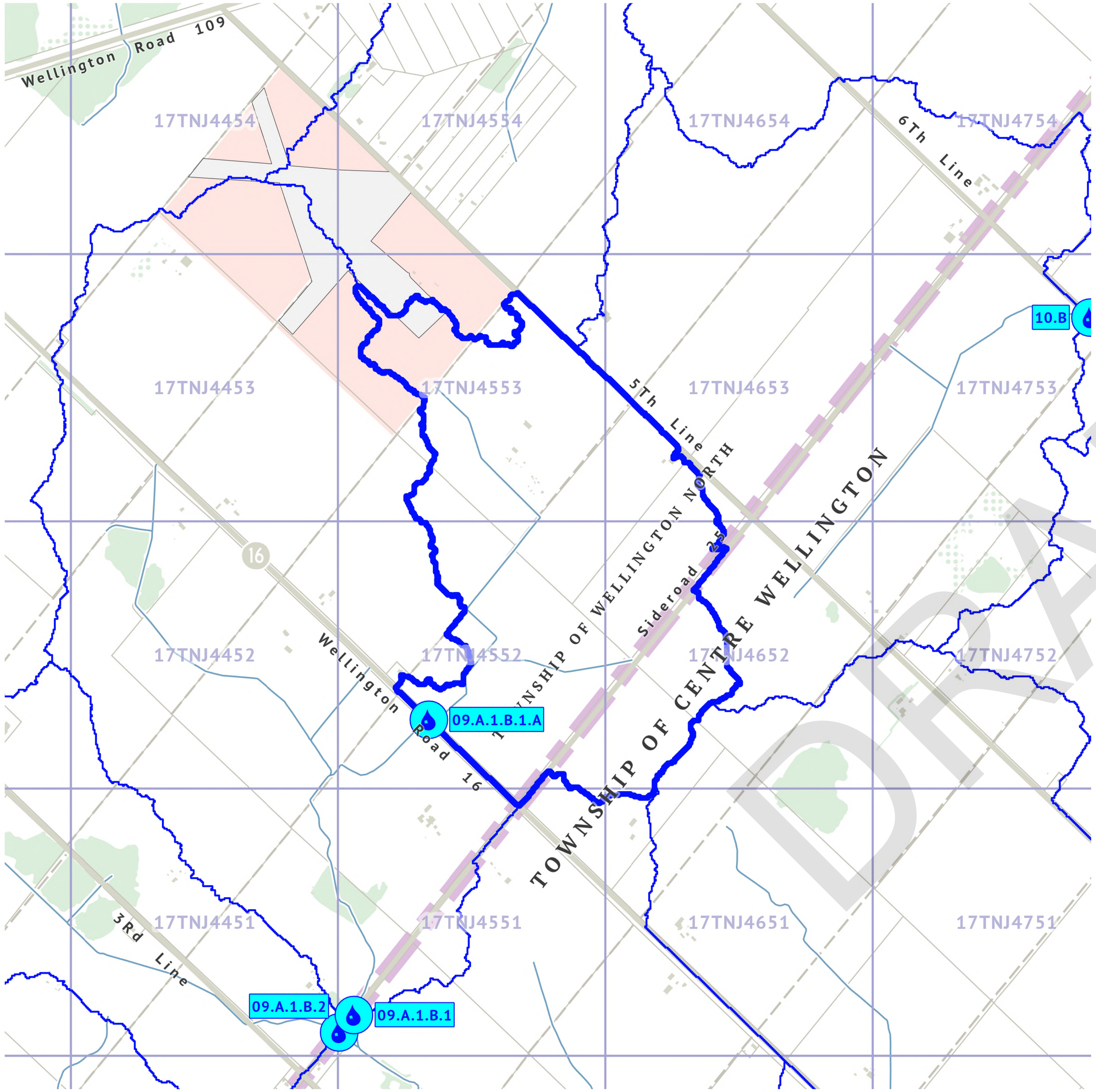


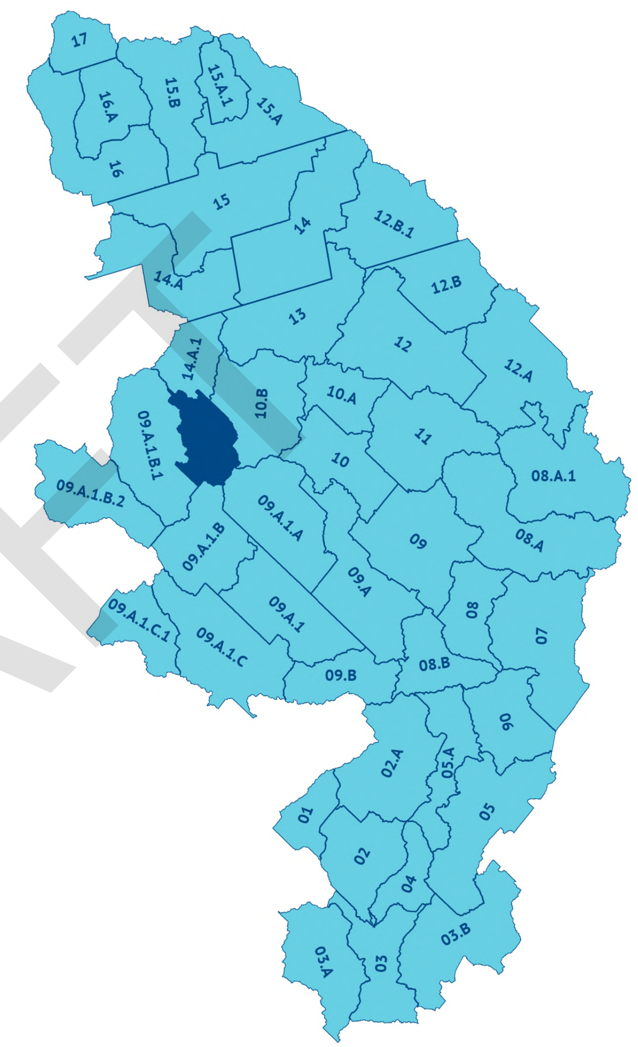
Model Outlet Desc.: Structure 2059 (Sideroad 25)
Catchment Area: 354.5 ha
Longest Flow Path: 4,226 m
Longest Flow Path Min. Elev: 460.3 m
Longest Flow Path Max. Elev: 477.9 m

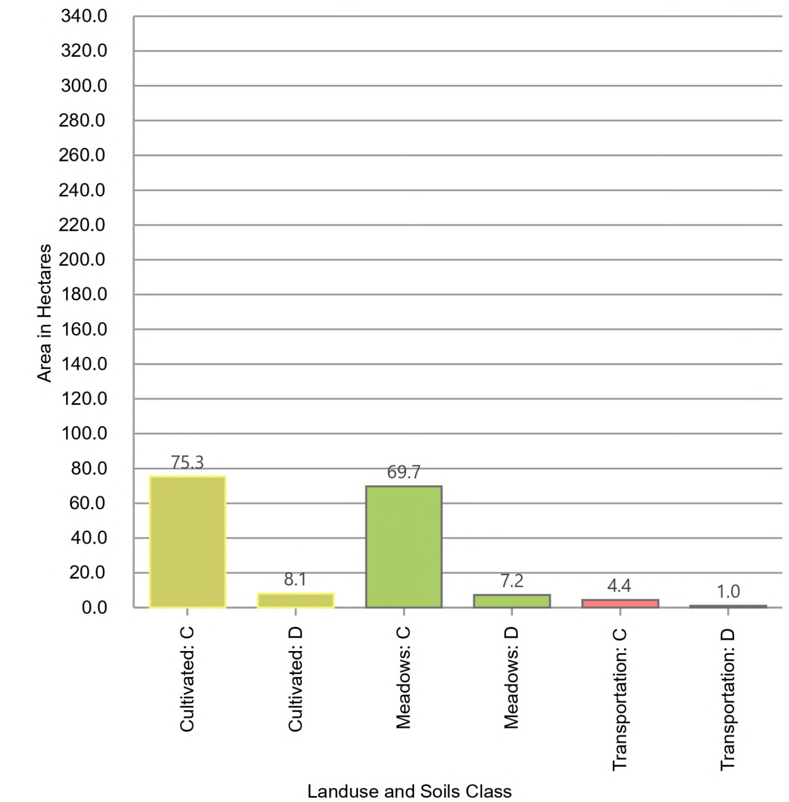
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

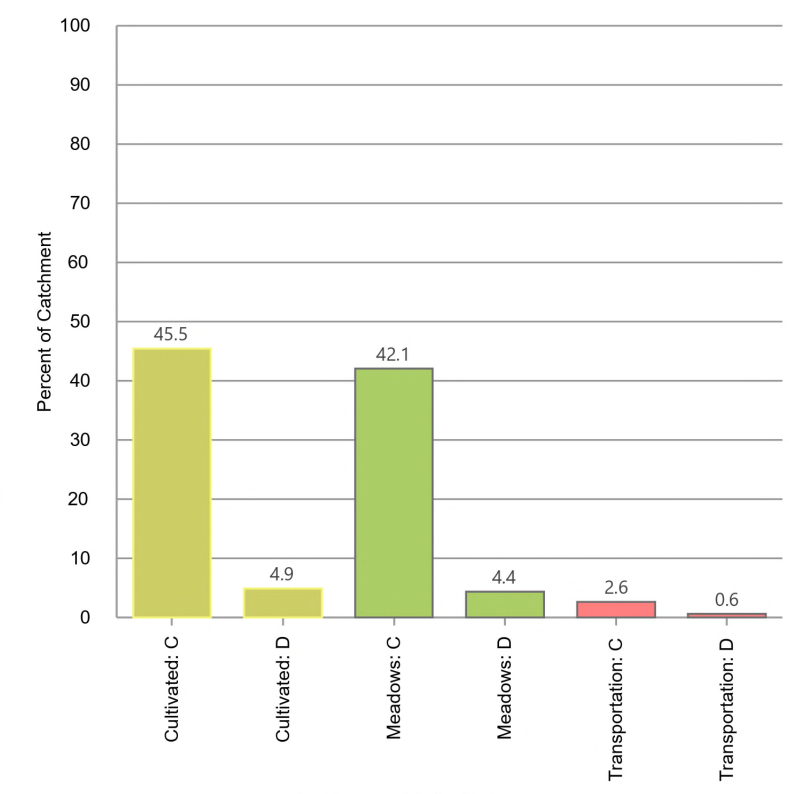
Catchment: 09.A.1.B.1







Model Outlet Desc.: Structure B016103 (Wellington Road 16)
Catchment Area: 165.7 ha
Longest Flow Path: 2,682 m
Longest Flow Path Min. Elev: 465.4 m
Longest Flow Path Max. Elev: 471.8 m



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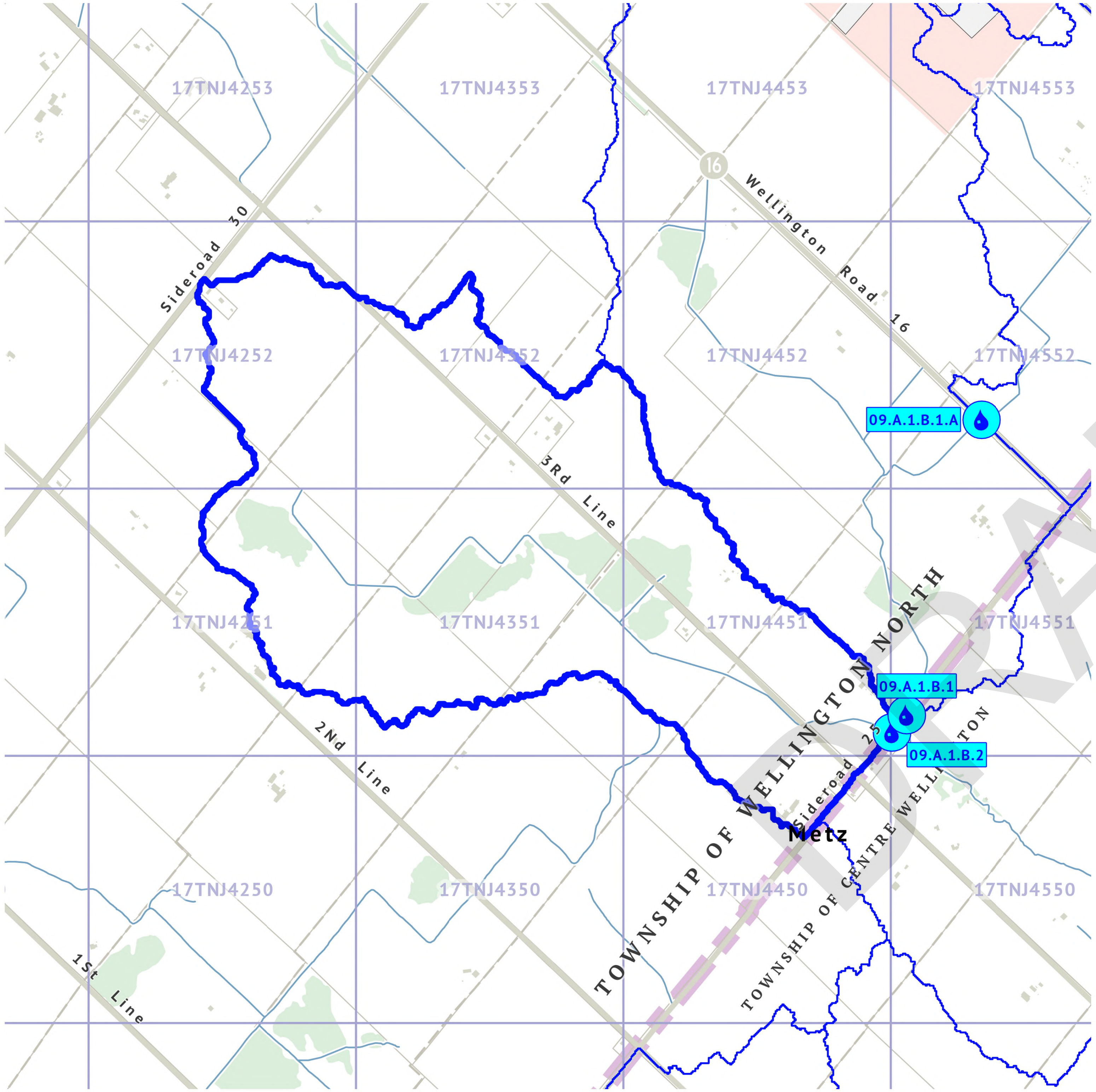
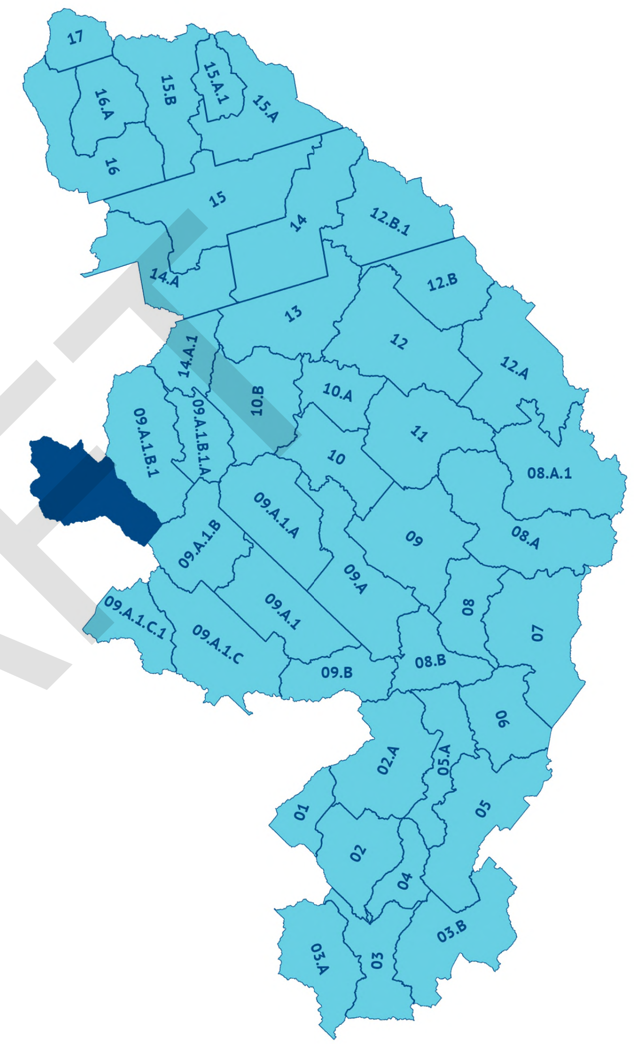
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

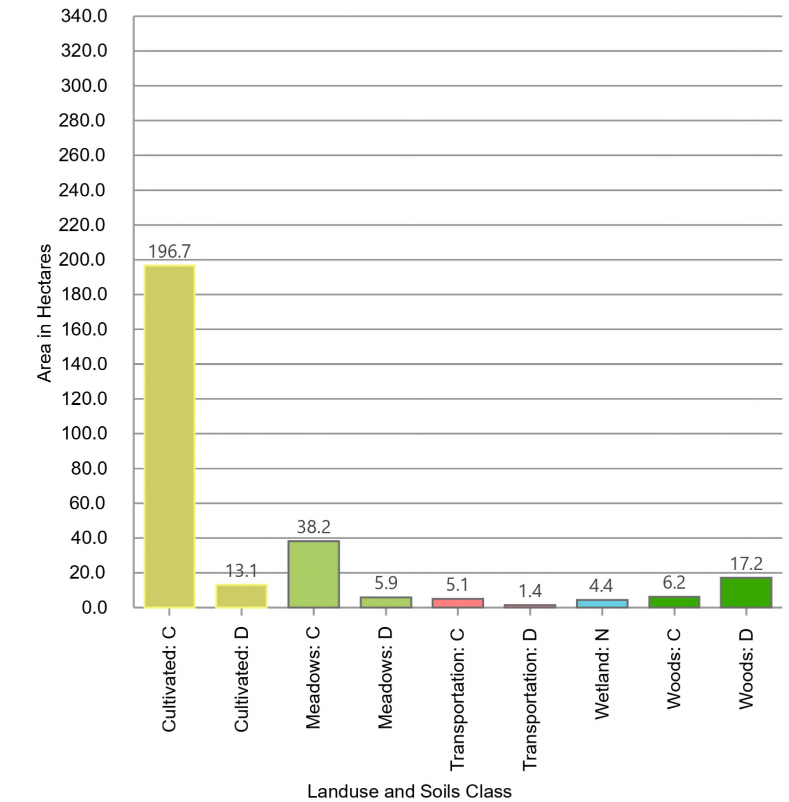
BURNSIDE

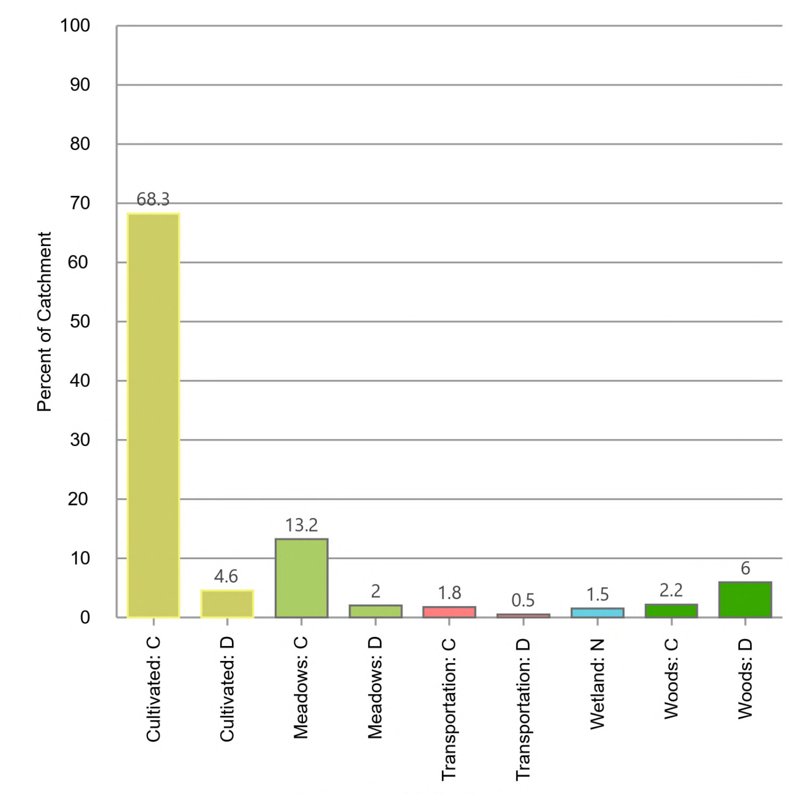
Catchment: 09.A.1.B.1.A

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG









Model Outlet Desc.: Structure 26-WG (Sideroad 25)
Catchment Area: 288.1 ha
Longest Flow Path: 4,404 m
Longest Flow Path Min. Elev: 460.1 m
Longest Flow Path Max. Elev: 477.8 m

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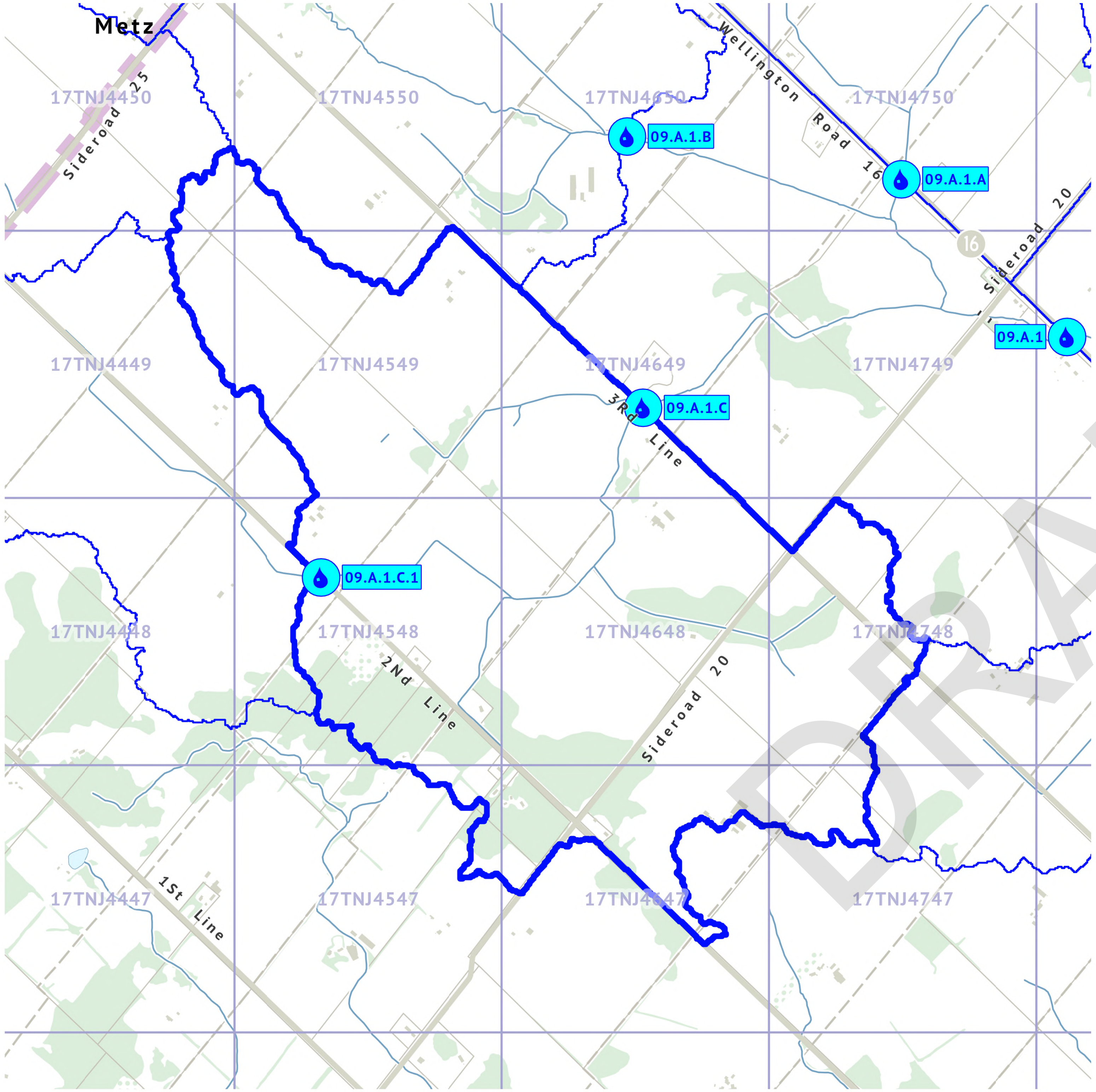
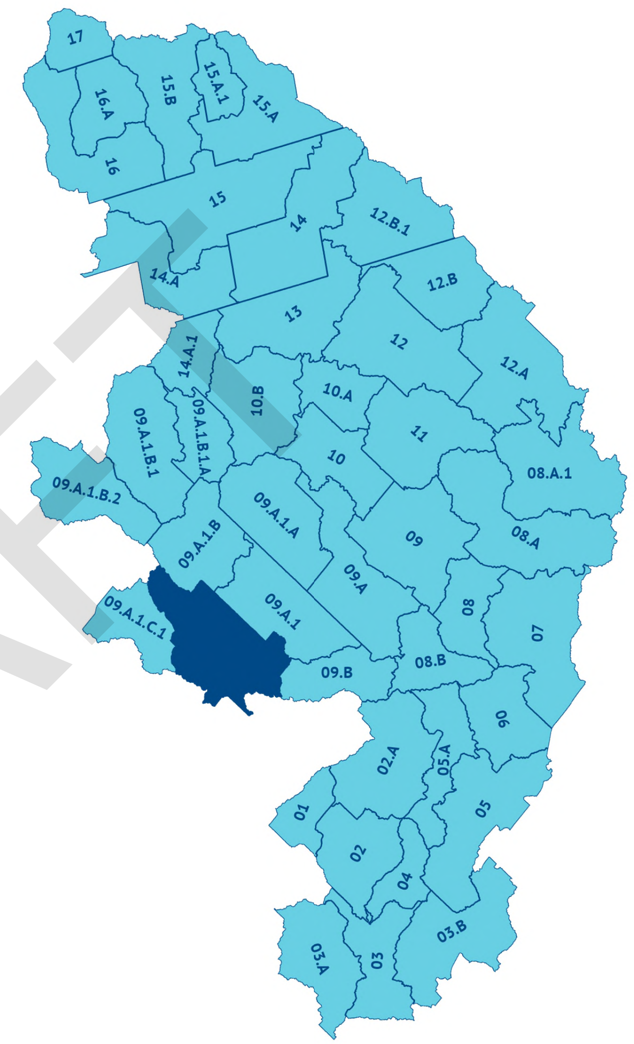
Metres
1:20,000

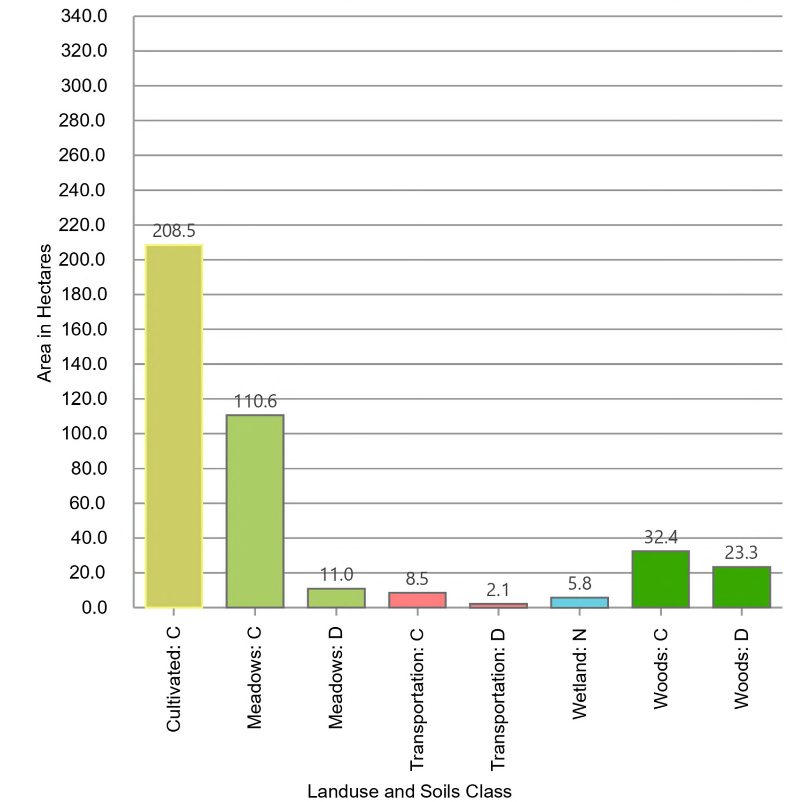
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

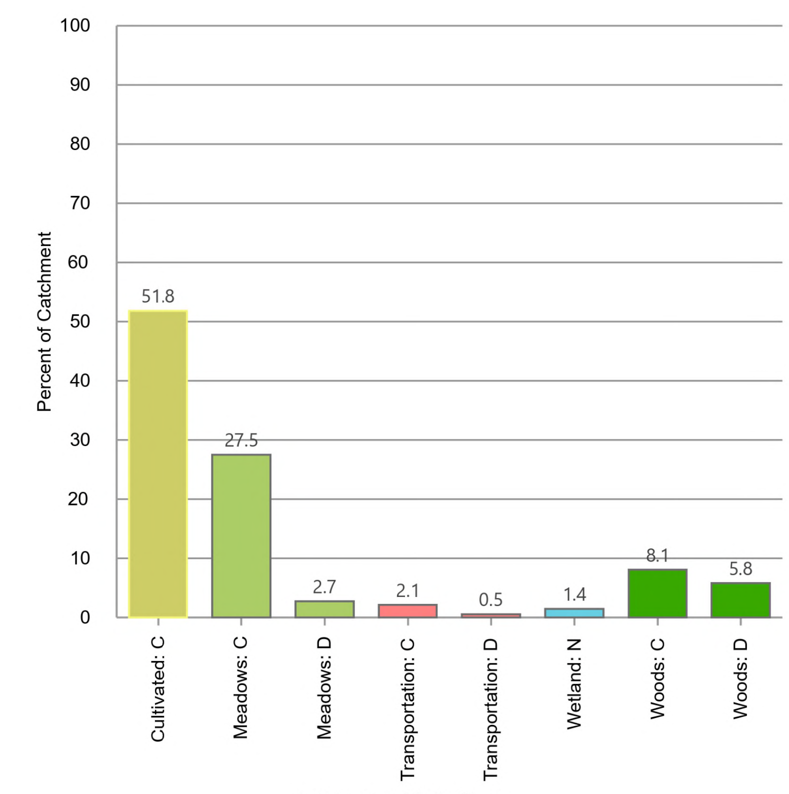
Catchment: 09.A.1.B.2







Model Outlet Desc.: Structure 32-WG (3rd Line)
Catchment Area: 402.3 ha
Longest Flow Path: 3,065 m
Longest Flow Path Min. Elev: 450.4 m
Longest Flow Path Max. Elev: 461.3 m



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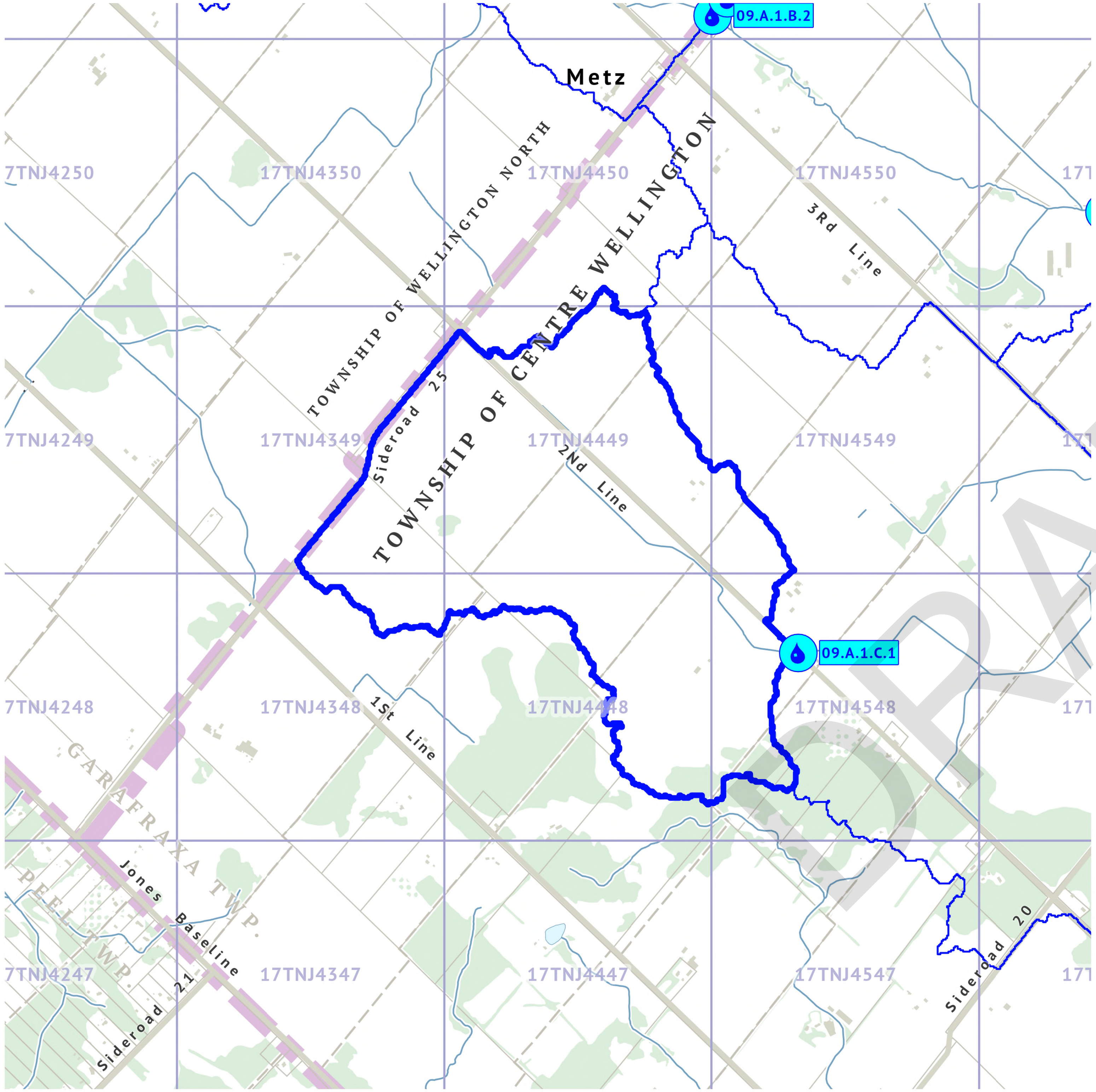
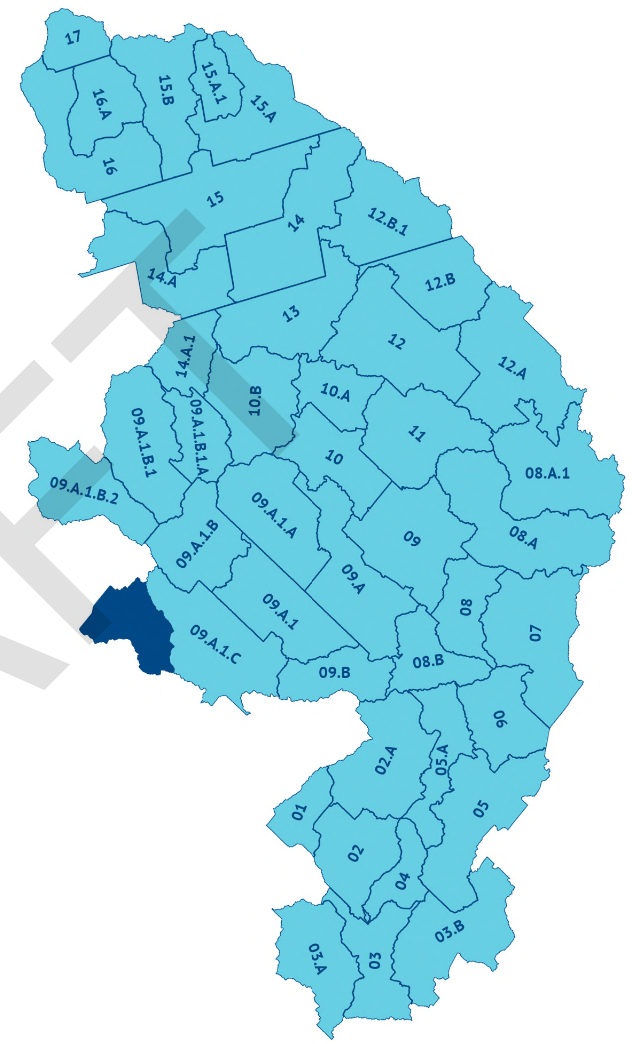
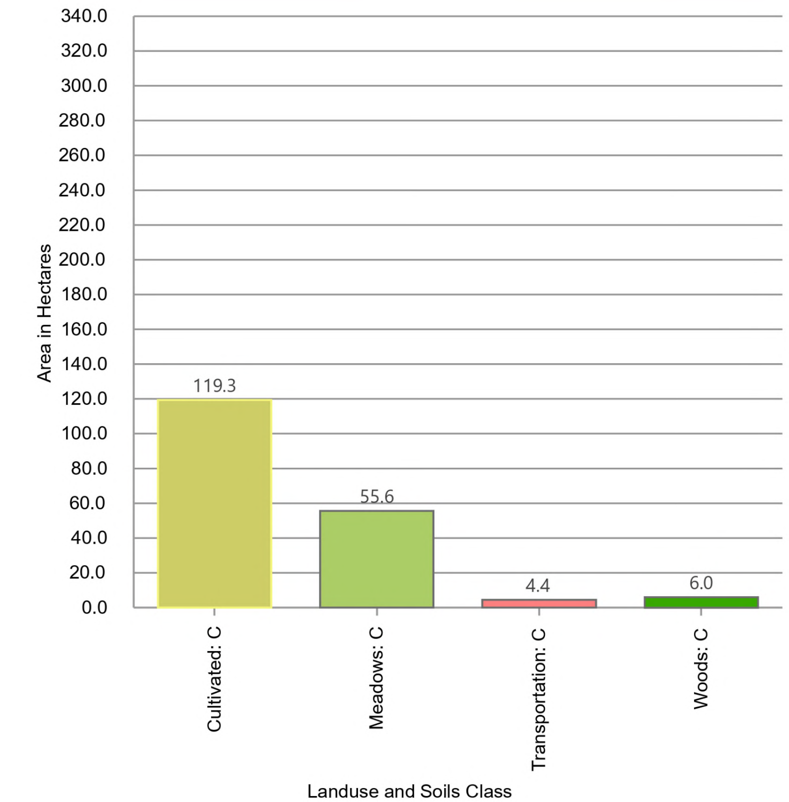
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

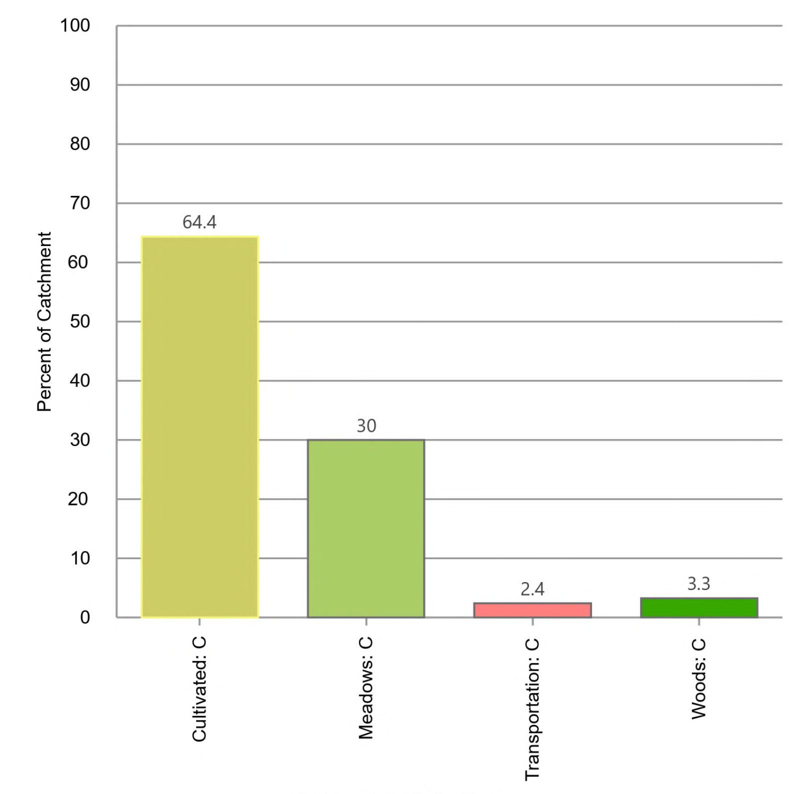
Catchment: 09.A.1.C







Model Outlet Desc.: Structure Unidentified (2nd Line)
Catchment Area: 185.4 ha
Longest Flow Path: 3,043 m
Longest Flow Path Min. Elev: 459.4 m
Longest Flow Path Max. Elev: 469.0 m



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0 500 1,000

Metres

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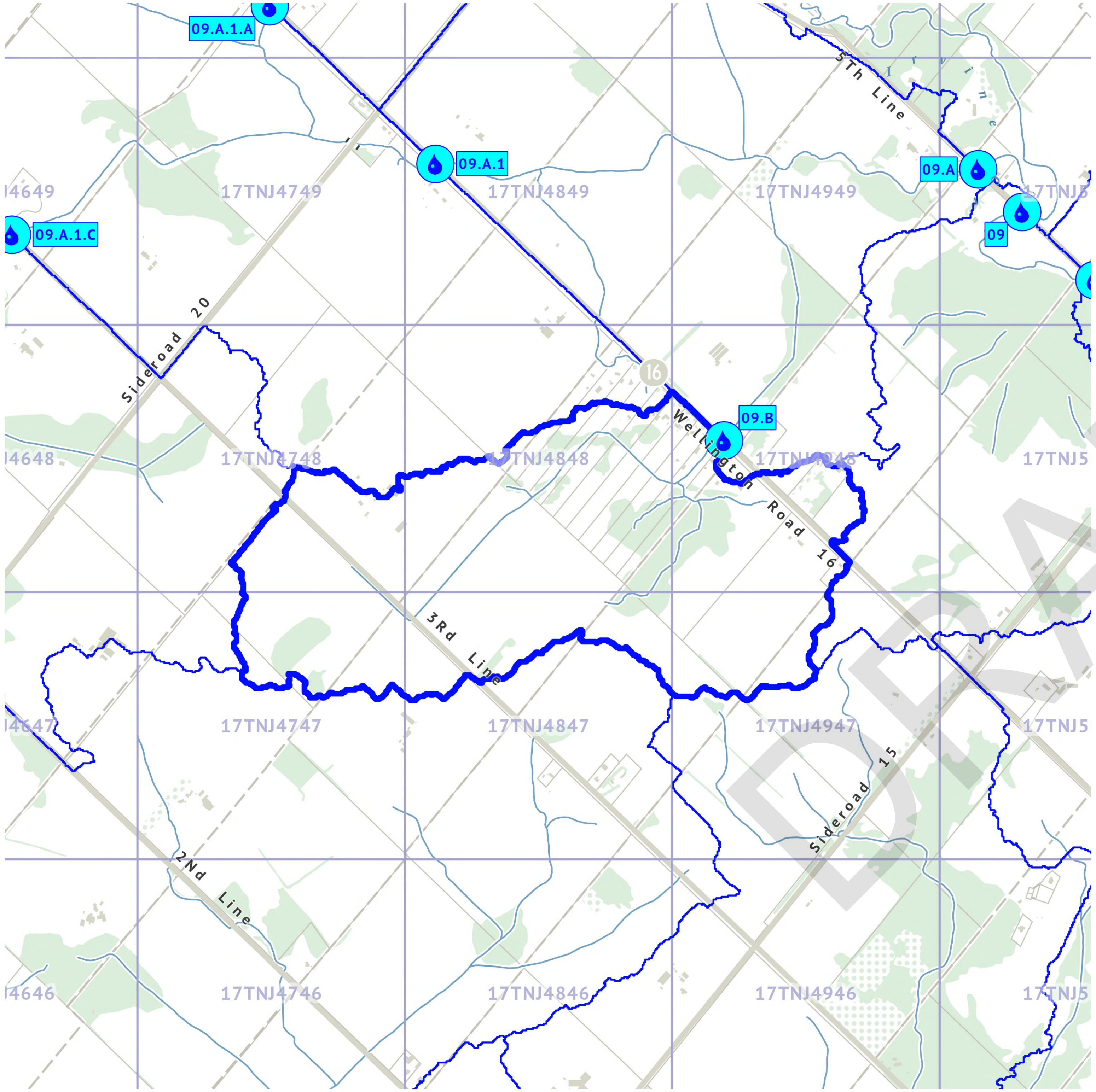
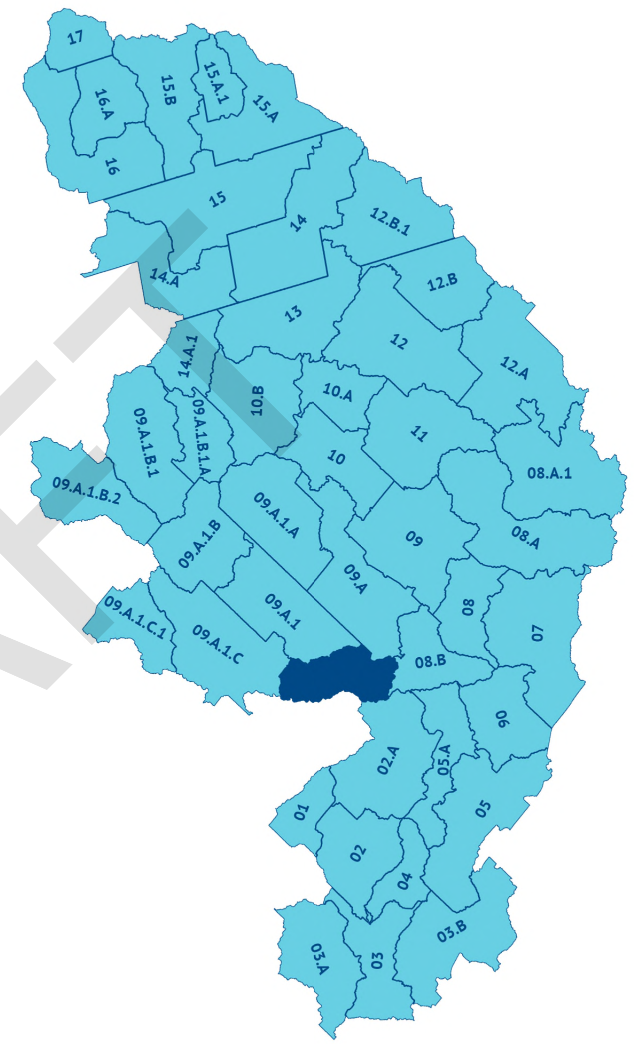
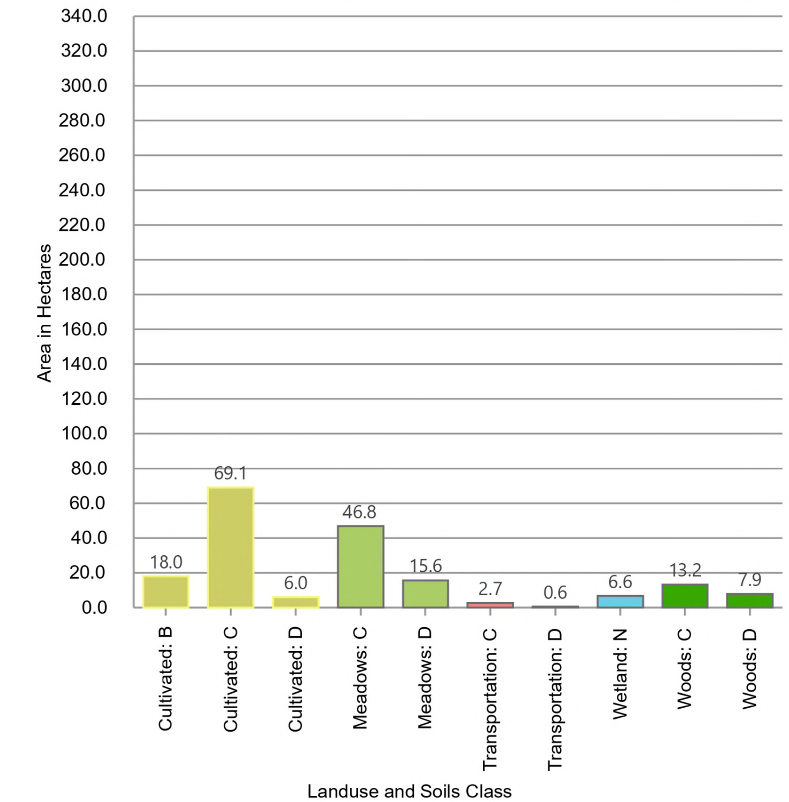
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

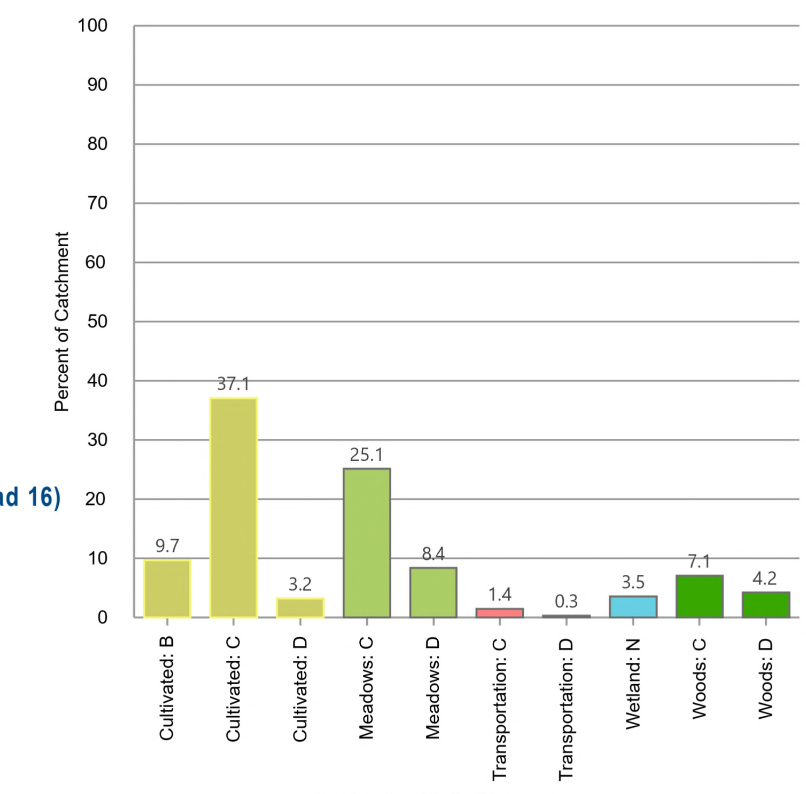
Catchment: 09.A.1.C.1

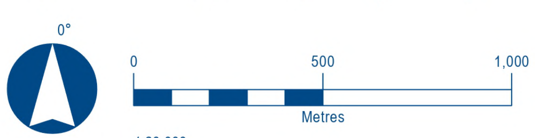






Model Outlet Desc.: Structure Unidentified (Wellington Road 16)
Catchment Area: 186.4 ha
Longest Flow Path: 2,882 m
Longest Flow Path Min. Elev: 452.3 m
Longest Flow Path Max. Elev: 464.5 m

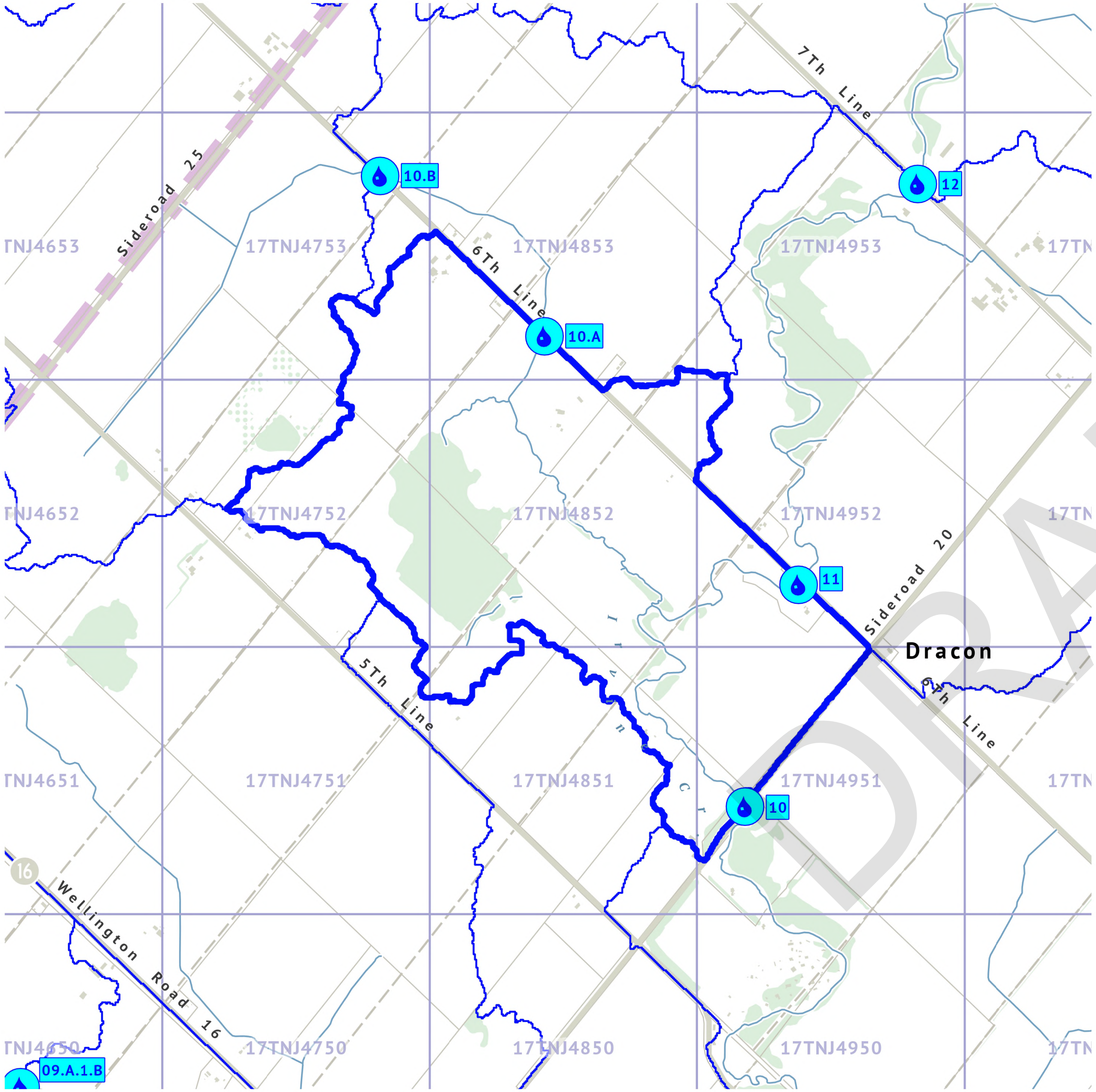




Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 09.B



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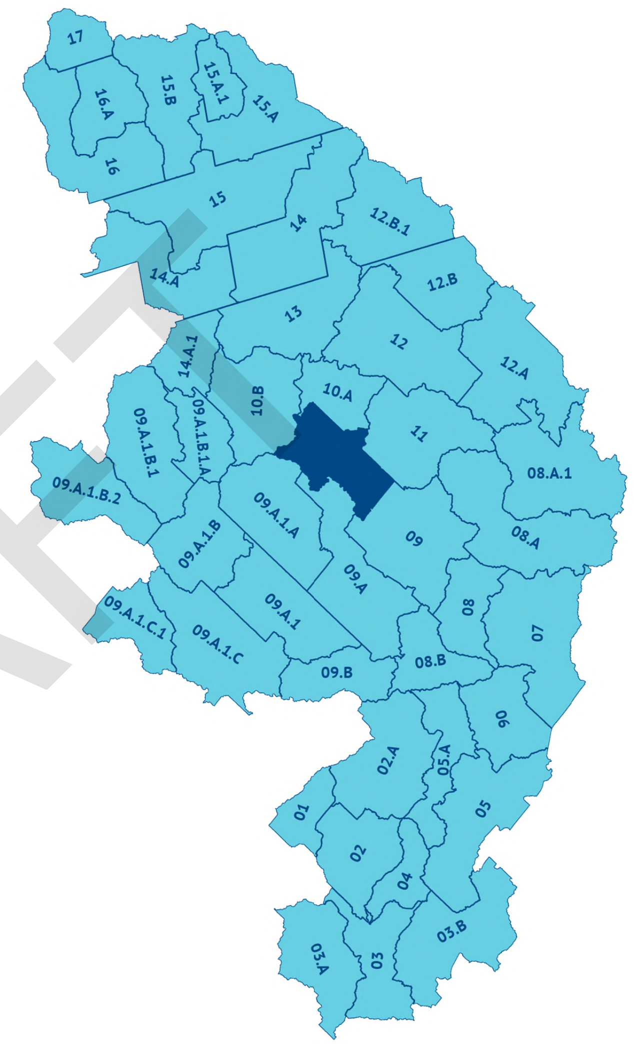
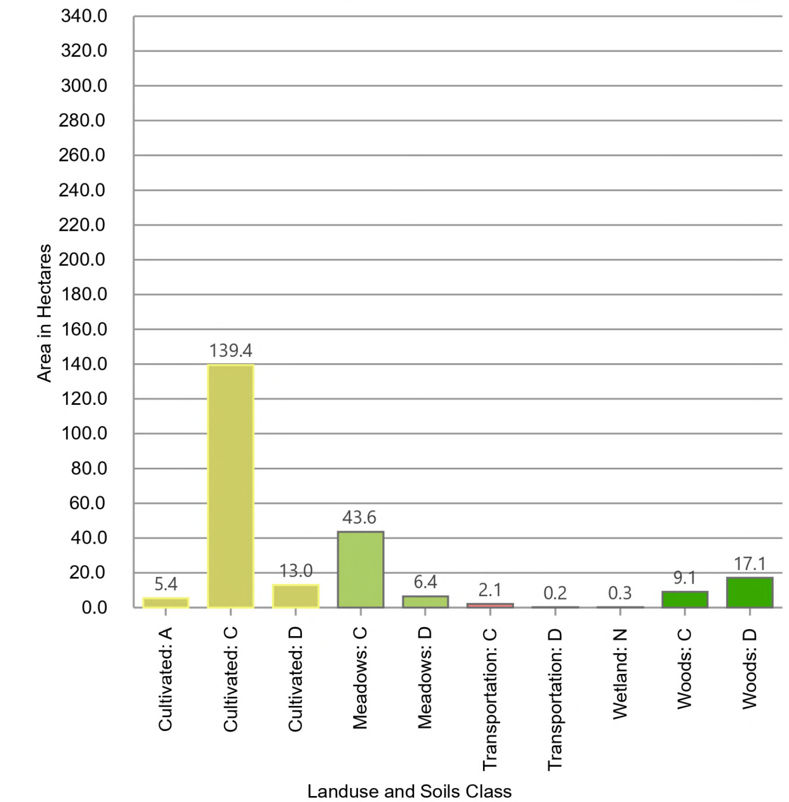
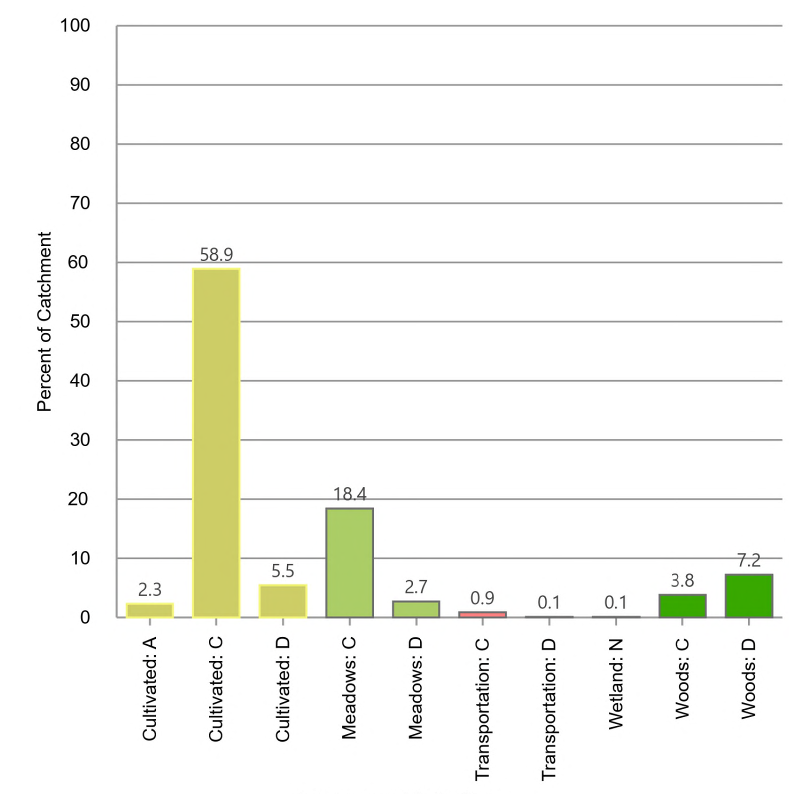
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10





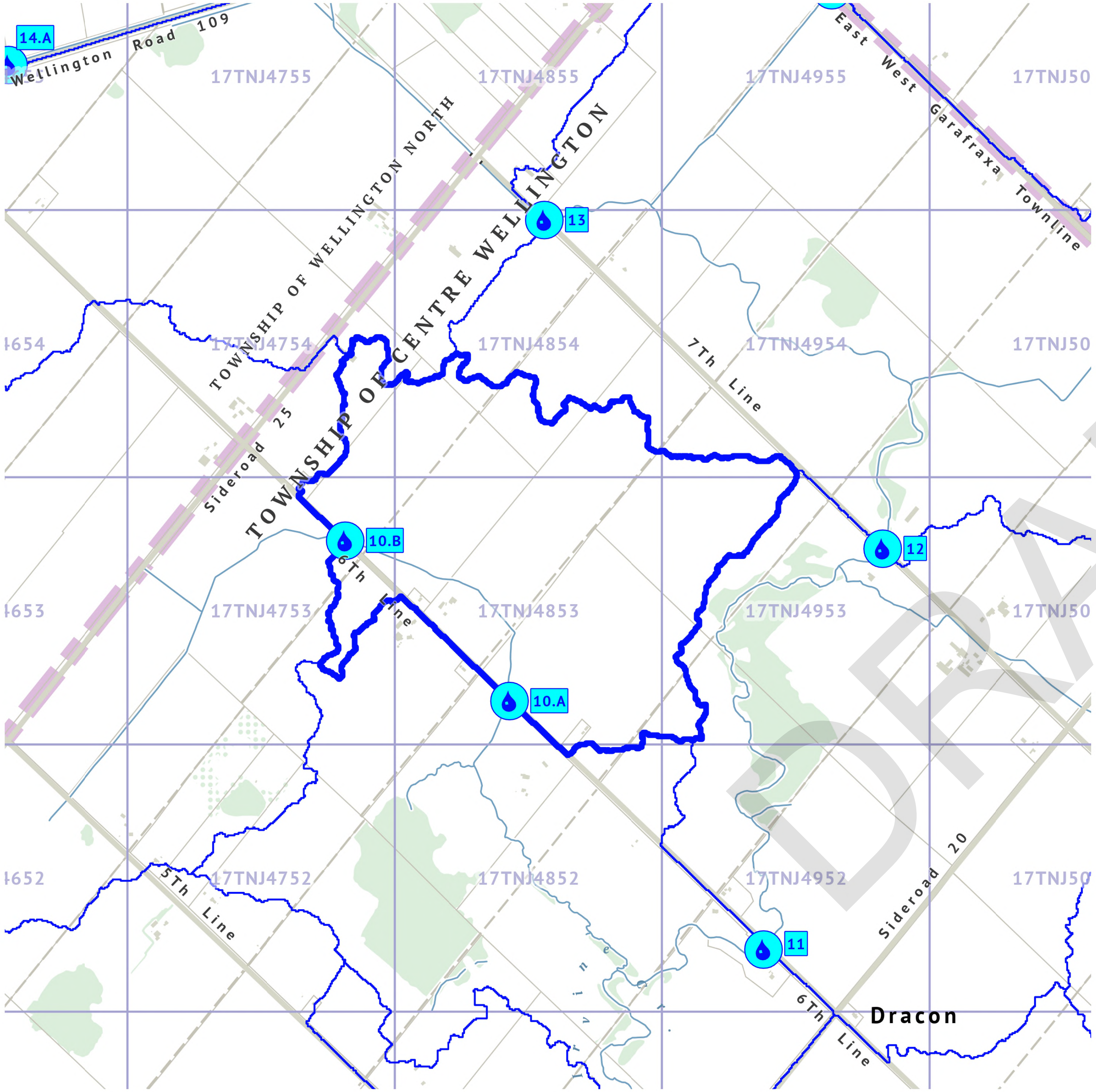


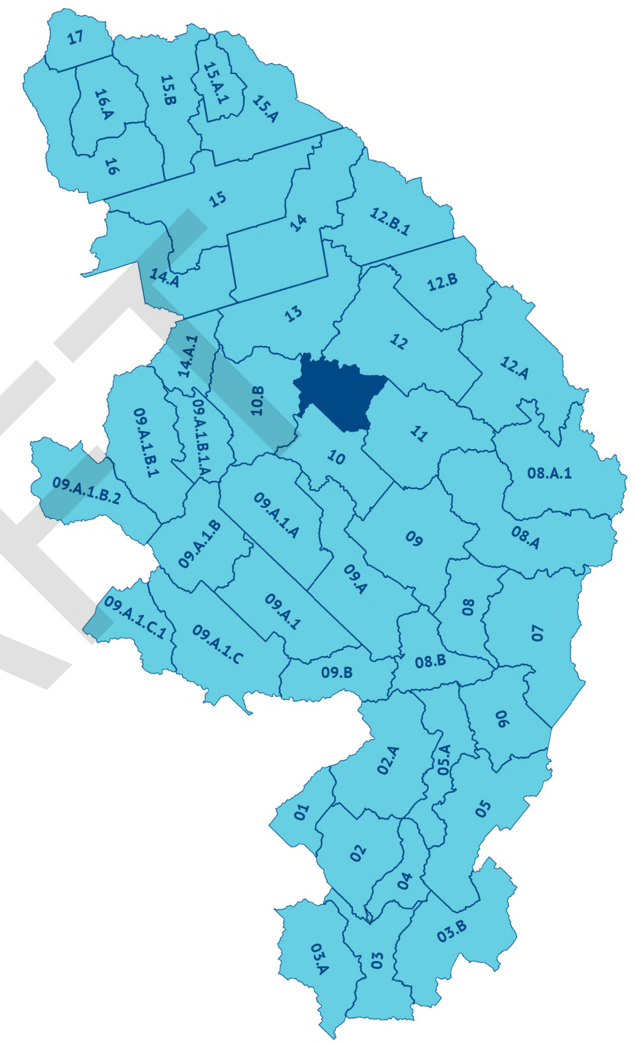
Model Outlet Desc.: Structure 27-WG (Sideroad 20)
Catchment Area: 236.6 ha
Longest Flow Path: 3,966 m
Longest Flow Path Min. Elev: 449.4 m
Longest Flow Path Max. Elev: 482.0 m

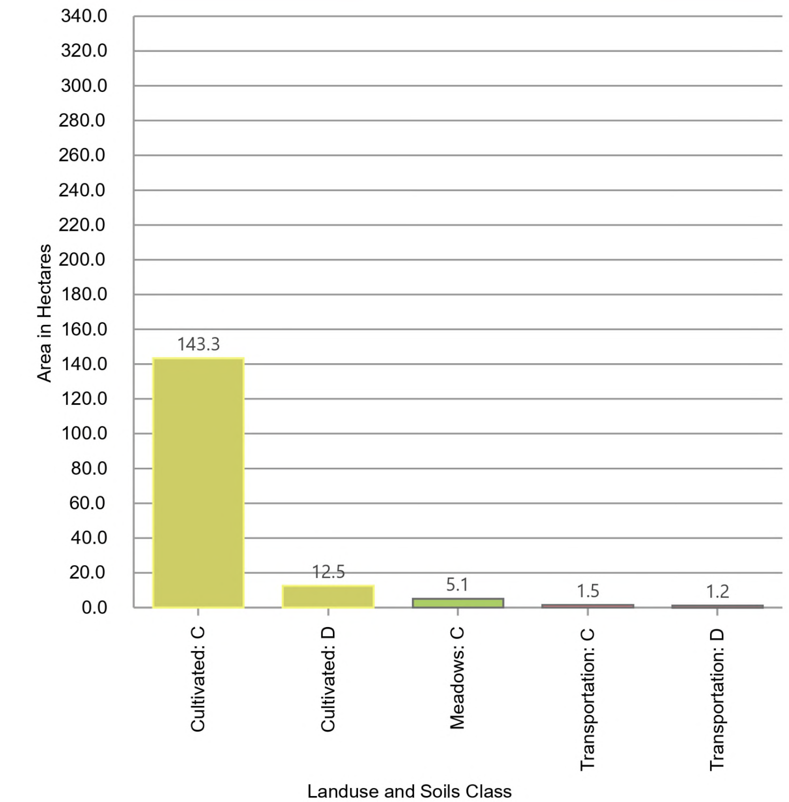
BURNSIDE

Catchment: 10

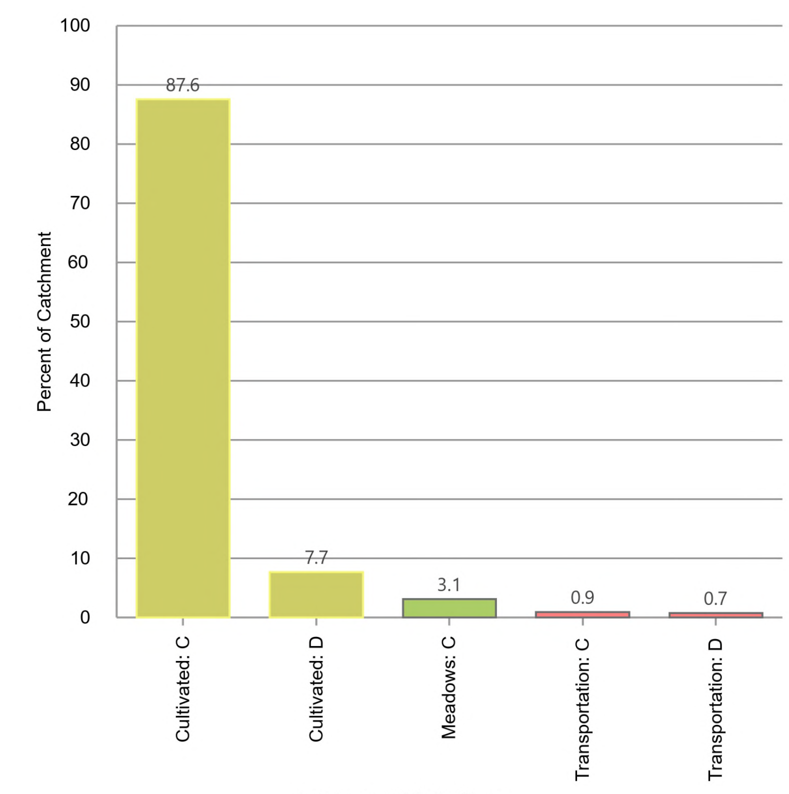
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

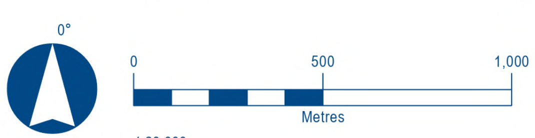






Model Outlet Desc.: Structure 15-WG (6th Line)
Catchment Area: 163.7 ha
Longest Flow Path: 2,166 m
Longest Flow Path Min. Elev: 459.0 m
Longest Flow Path Max. Elev: 473.9 m

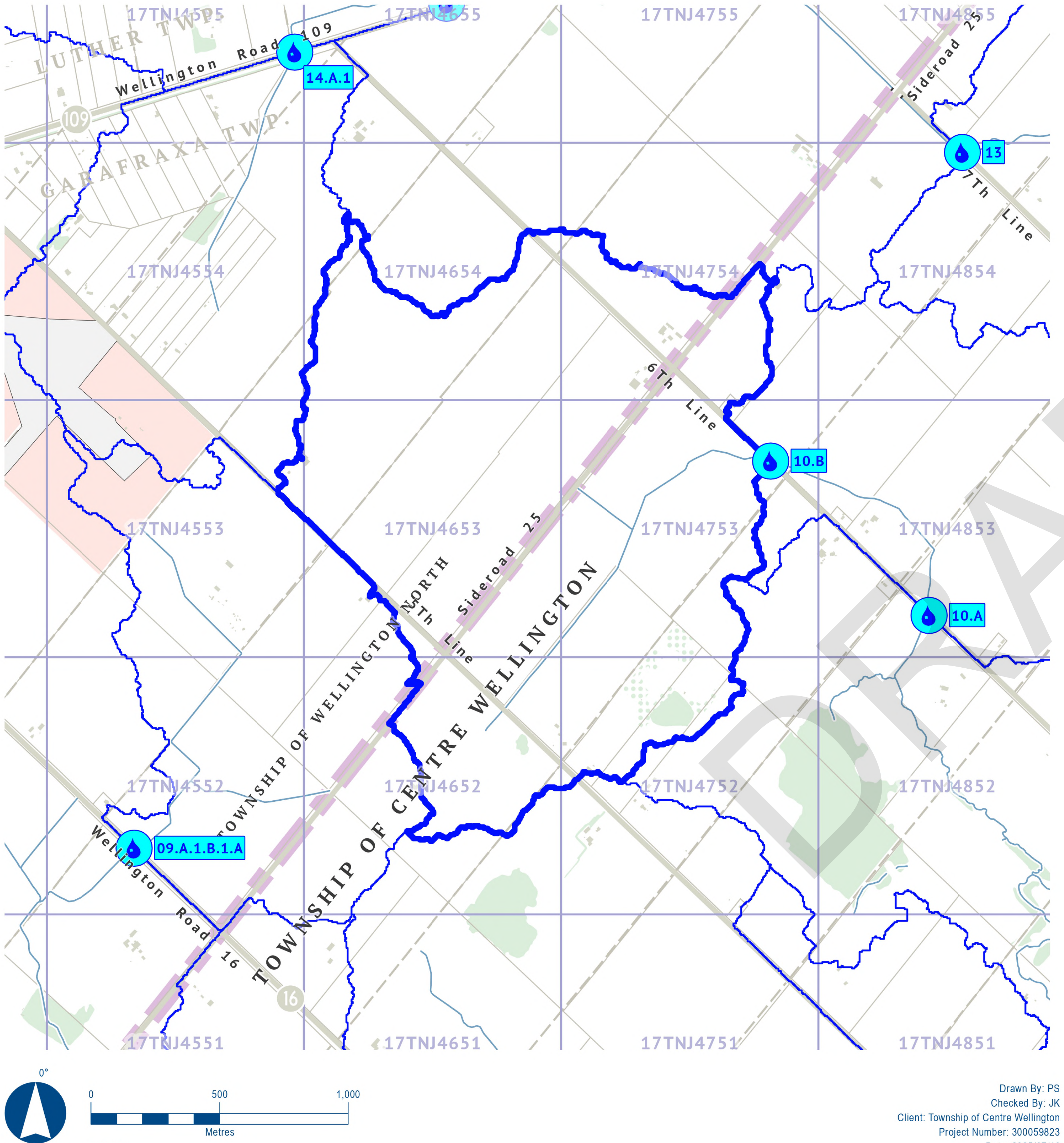


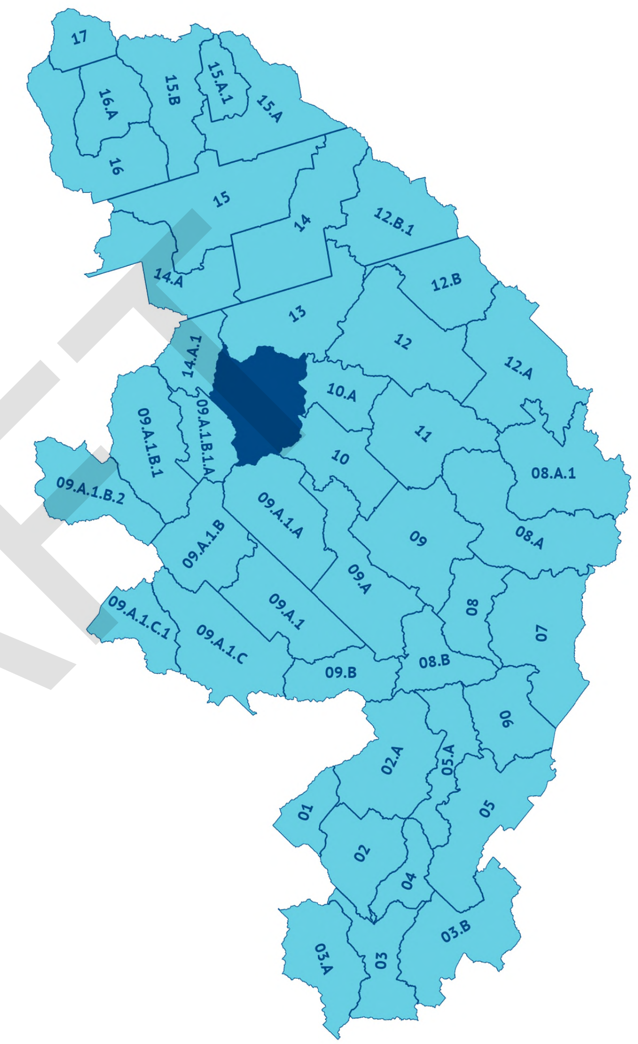


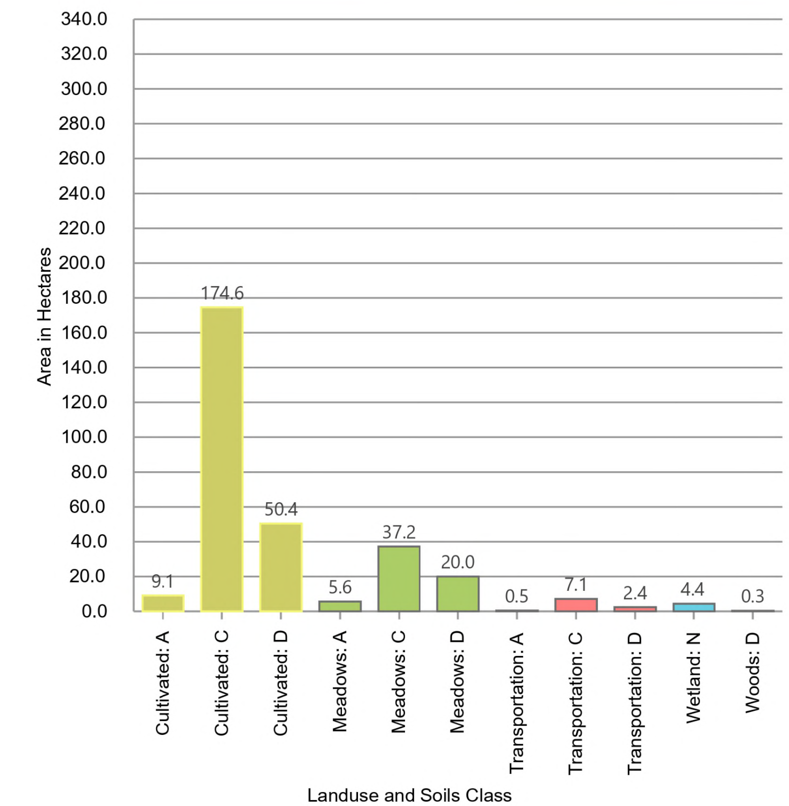
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

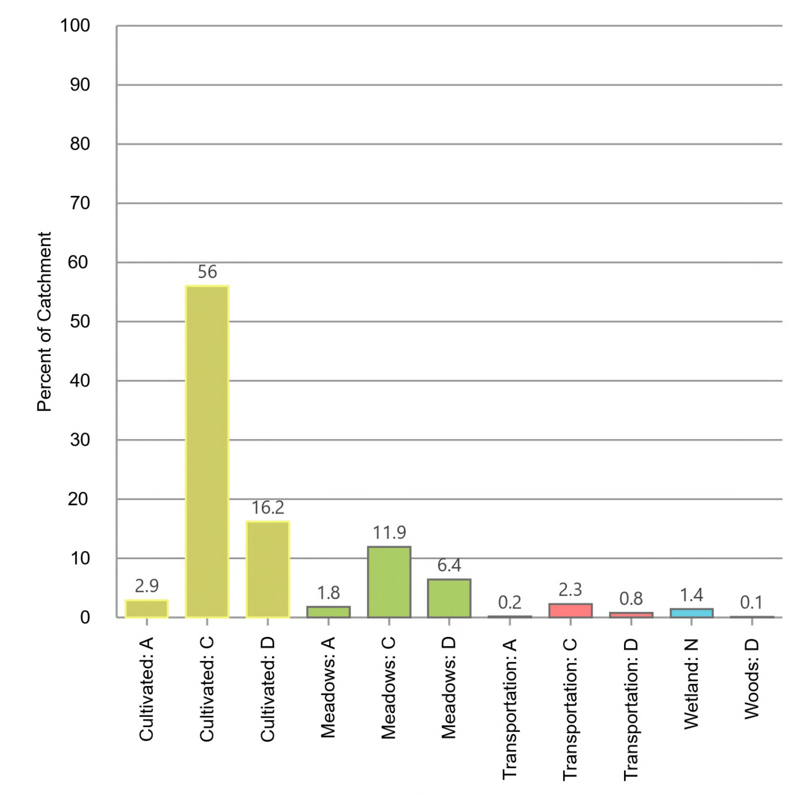
BURNSIDE

Catchment: 10.A









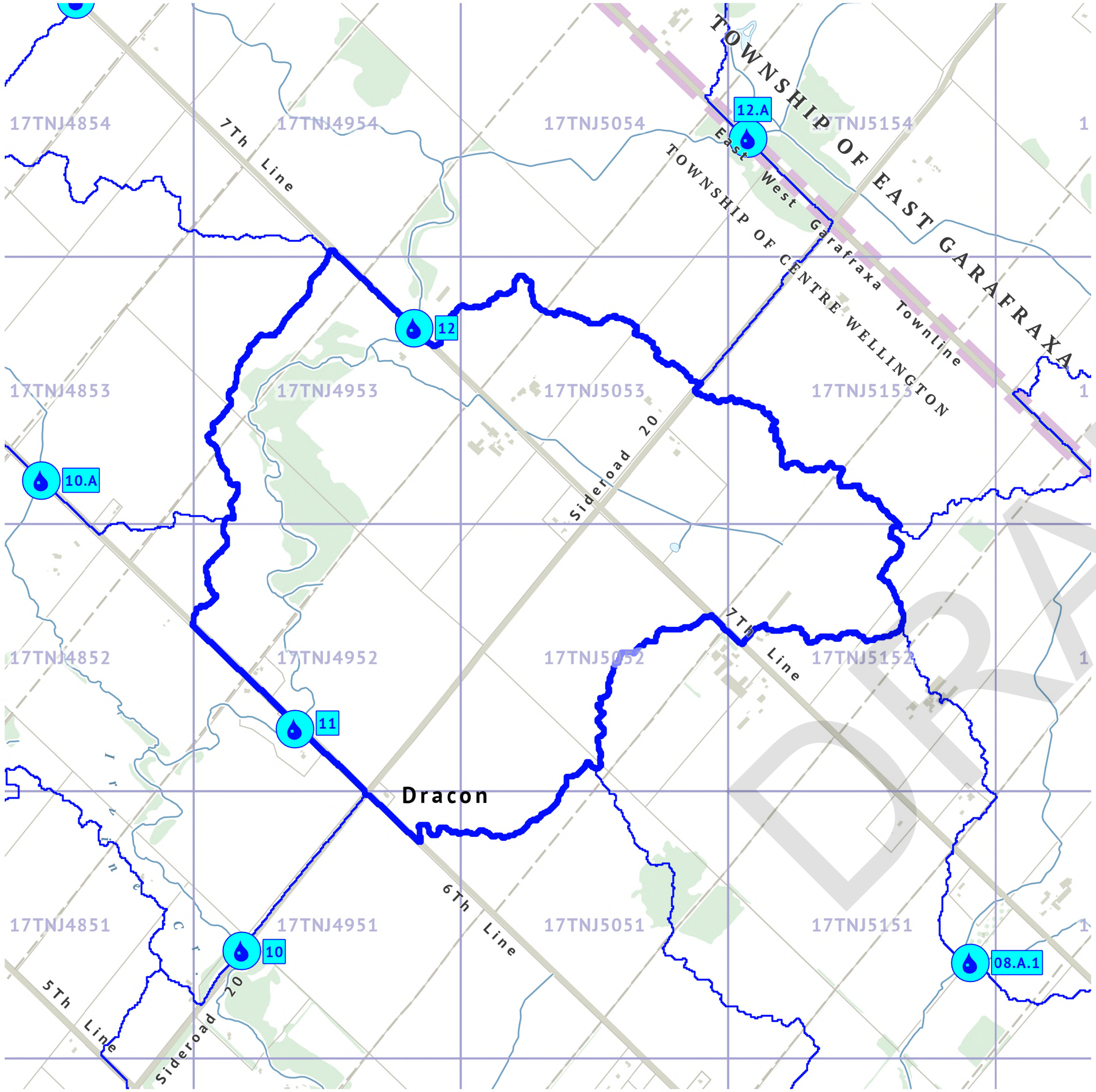
Model Outlet Desc.: Structure 12-WG (6th Line)
Catchment Area: 311.6 ha
Longest Flow Path: 3,169 m
Longest Flow Path Min. Elev: 462.8 m
Longest Flow Path Max. Elev: 471.5 m

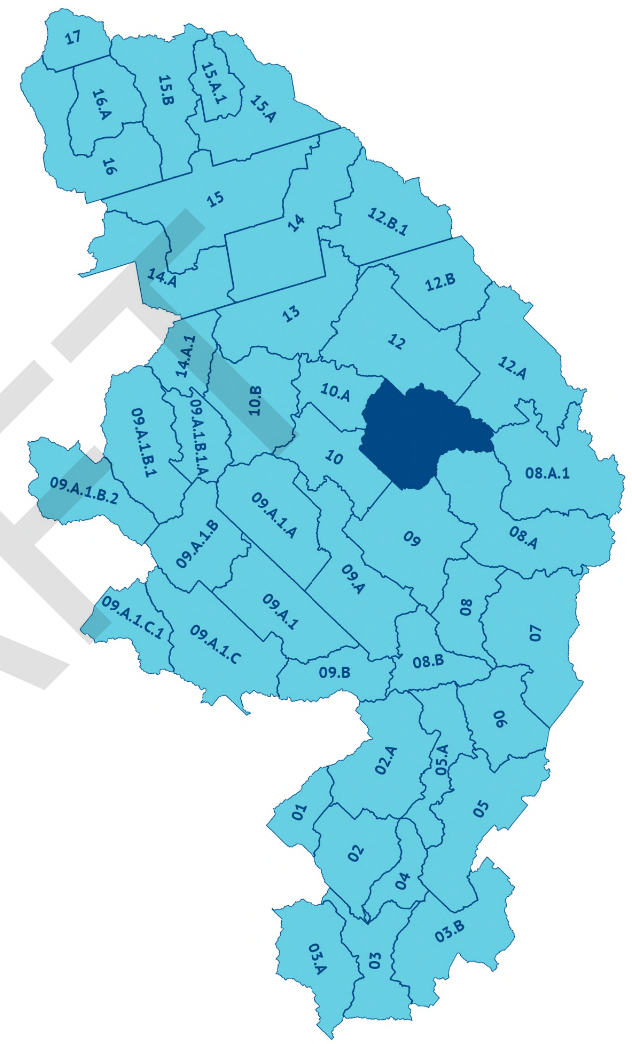
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

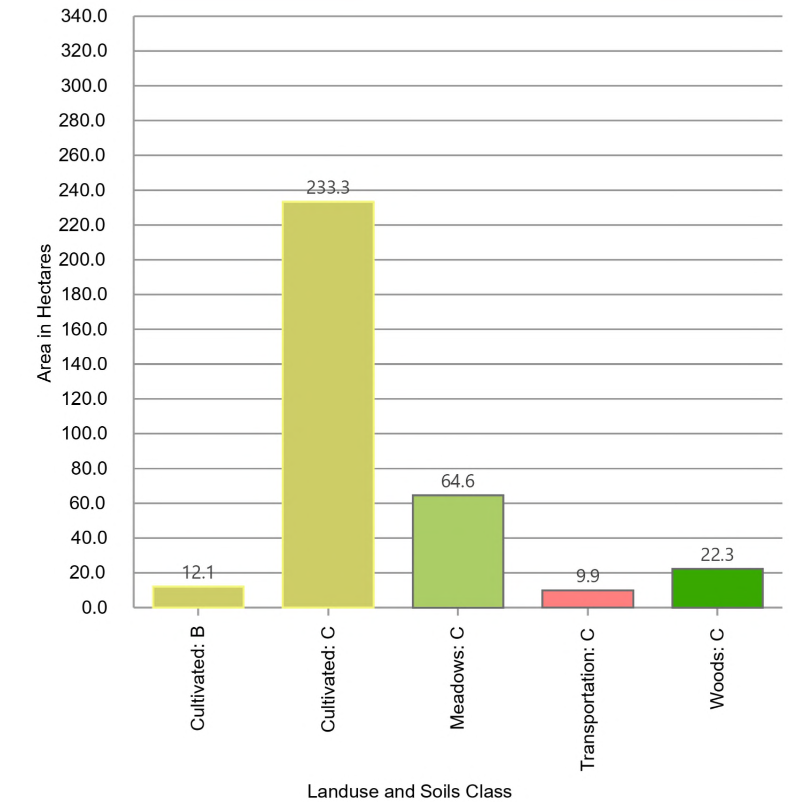
BURNSIDE

Catchment: 10.B

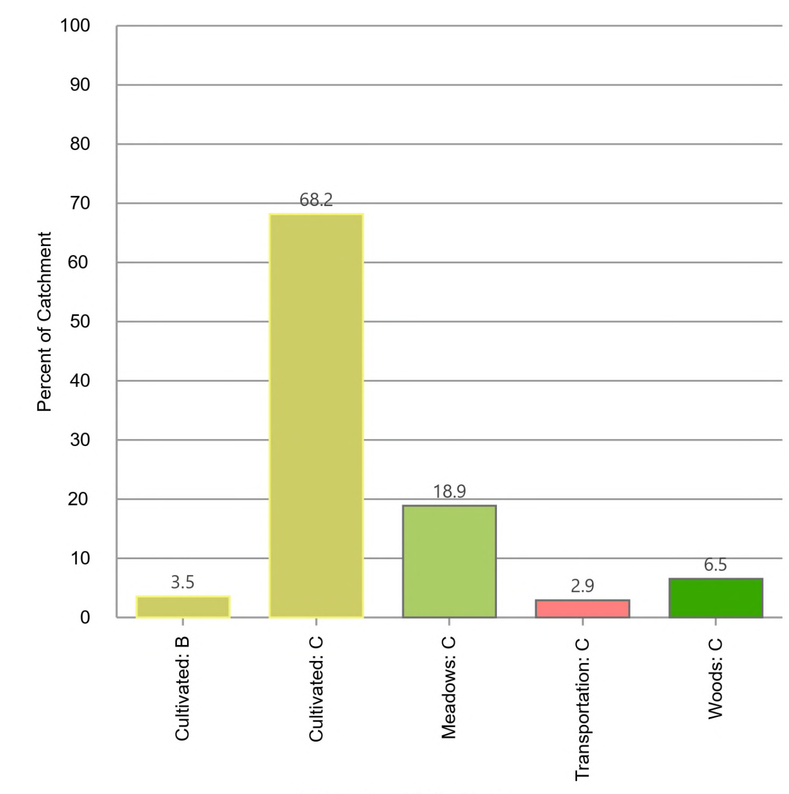
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Structure 13-WG (6th Line)
Catchment Area: 342.2 ha
Longest Flow Path: 5,303 m
Longest Flow Path Min. Elev: 453.8 m
Longest Flow Path Max. Elev: 479.8 m



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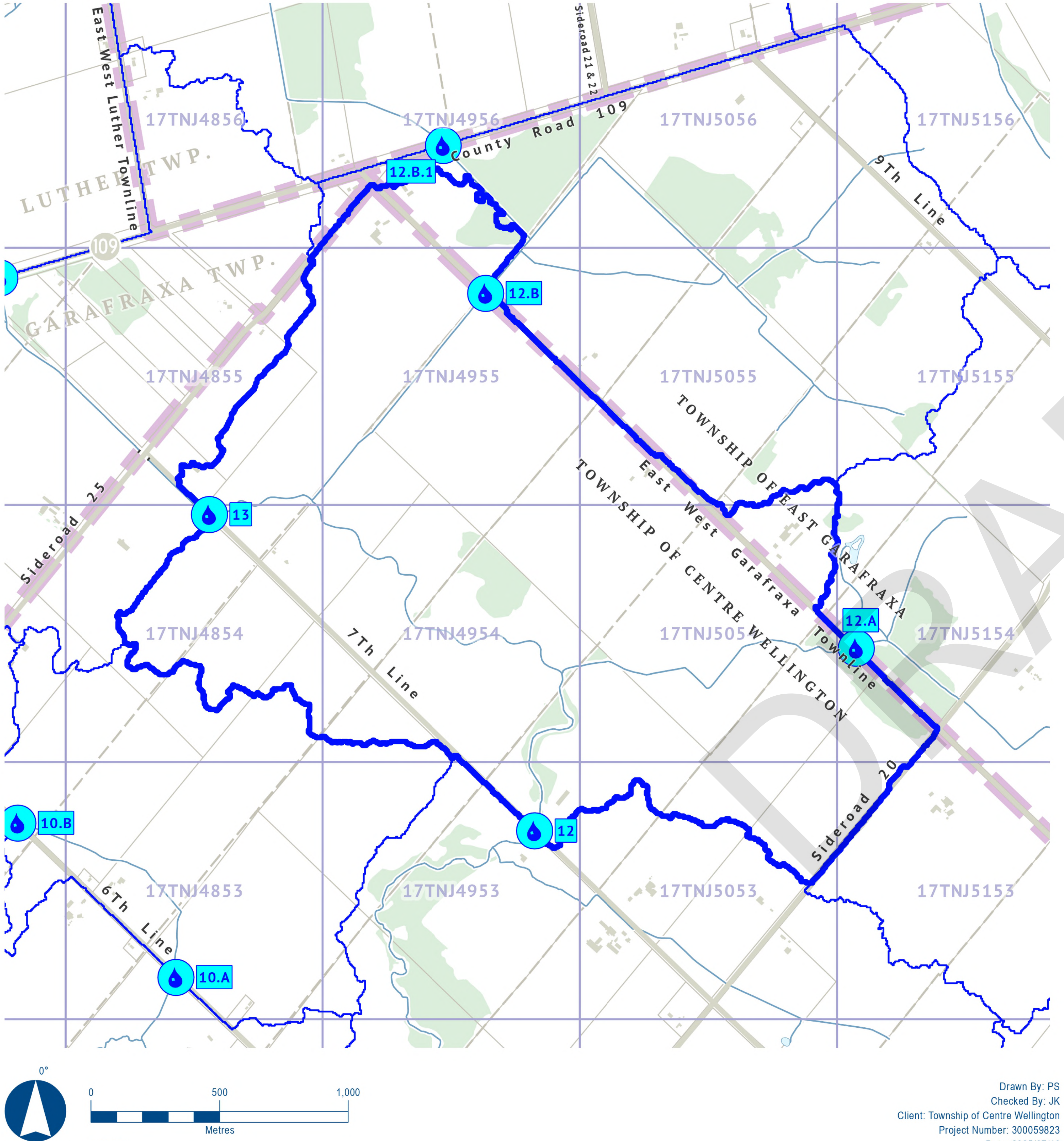
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

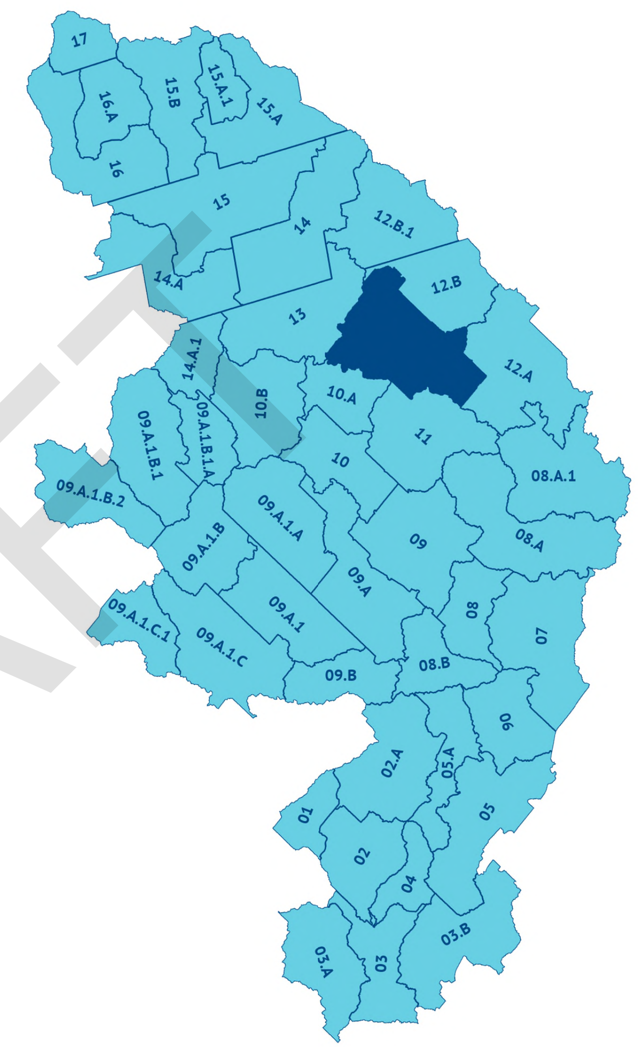
BURNSIDE

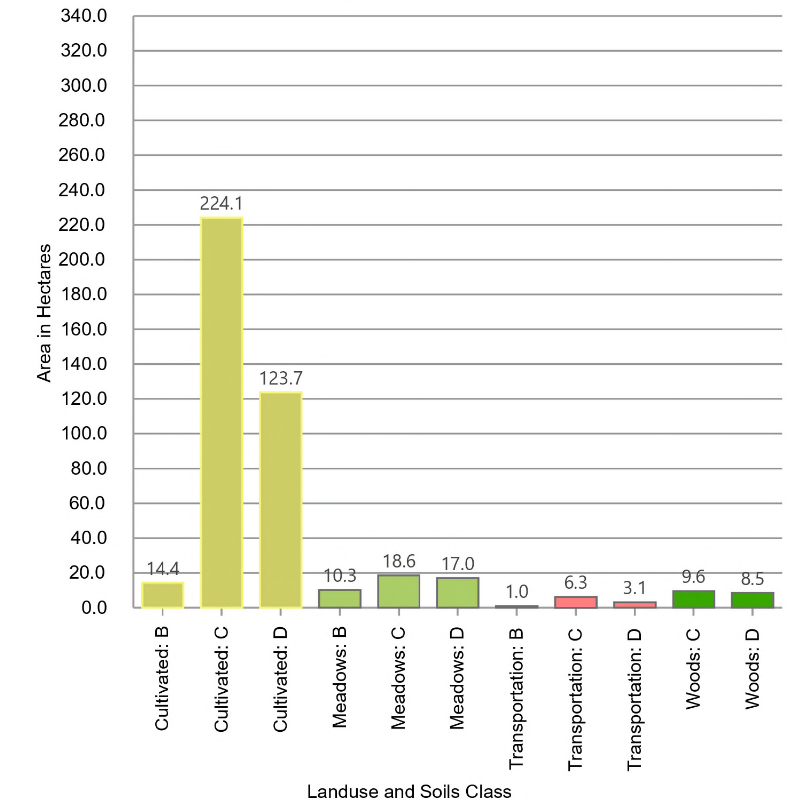
Catchment: 11

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

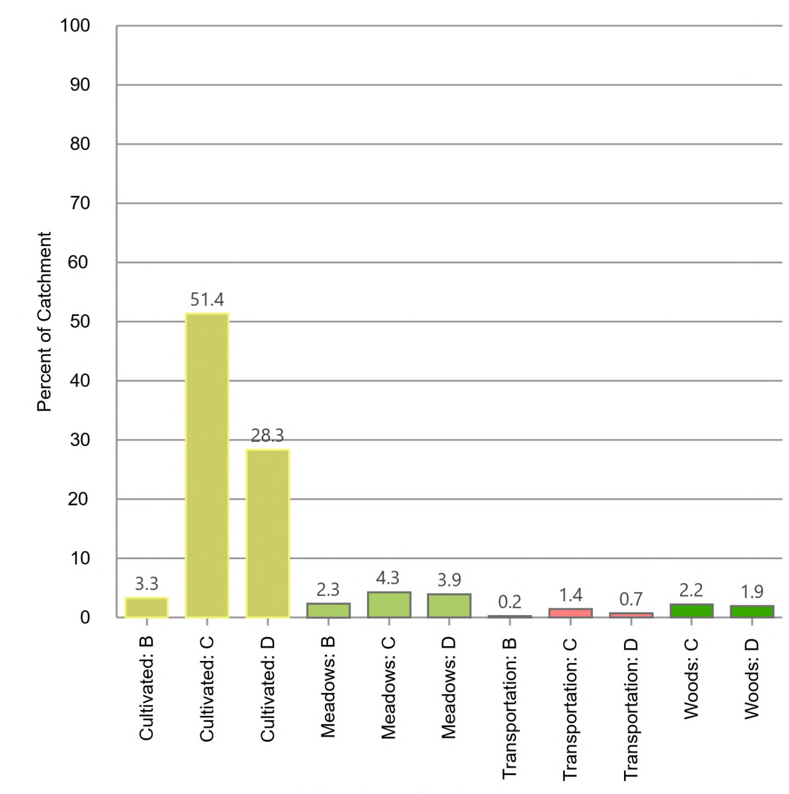


Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10





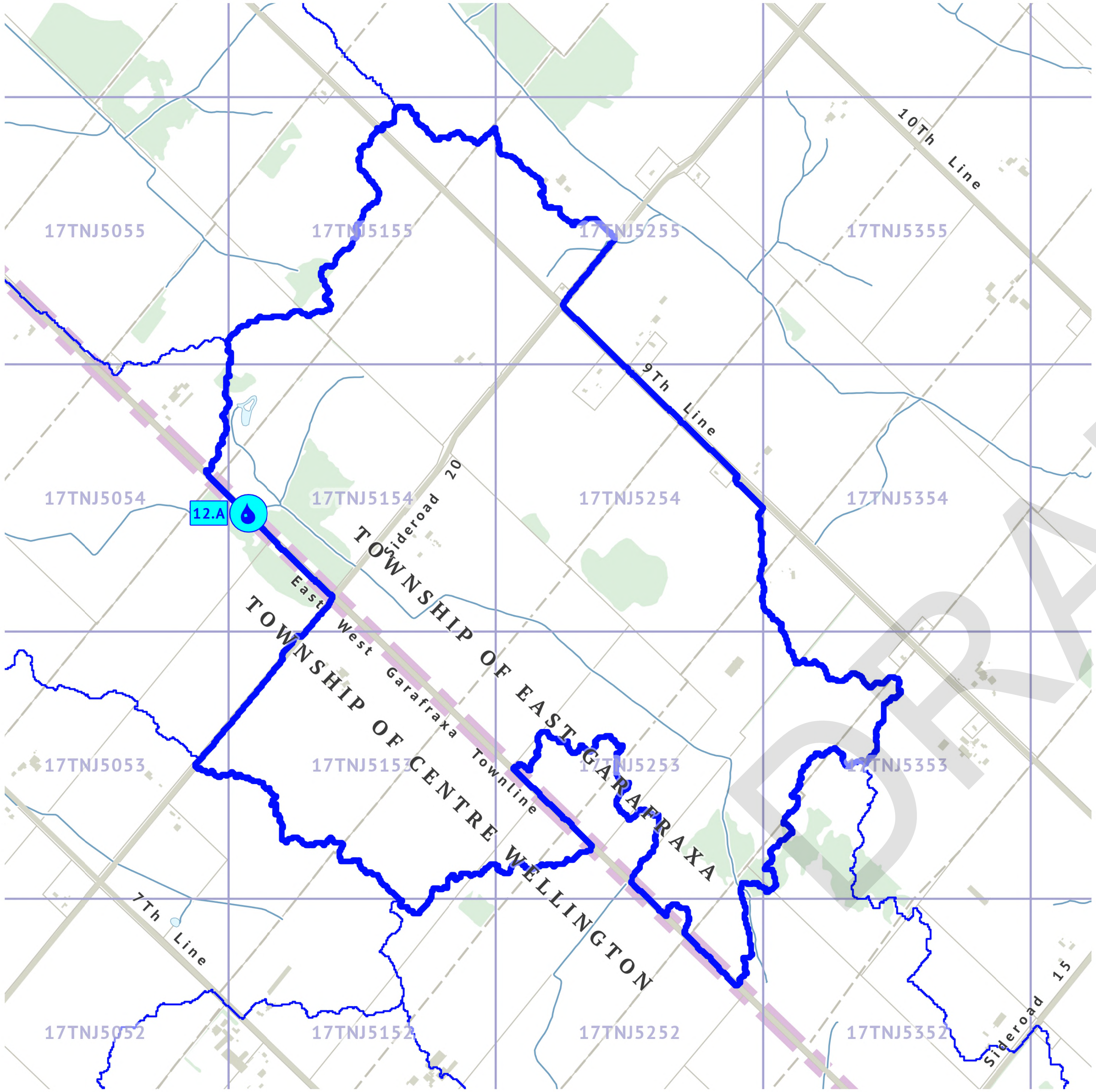
Model Outlet Desc.: Structure 9-WG (7th Line)
Catchment Area: 436.5 ha
Longest Flow Path: 4,283 m
Longest Flow Path Min. Elev: 460.7 m
Longest Flow Path Max. Elev: 471.8 m

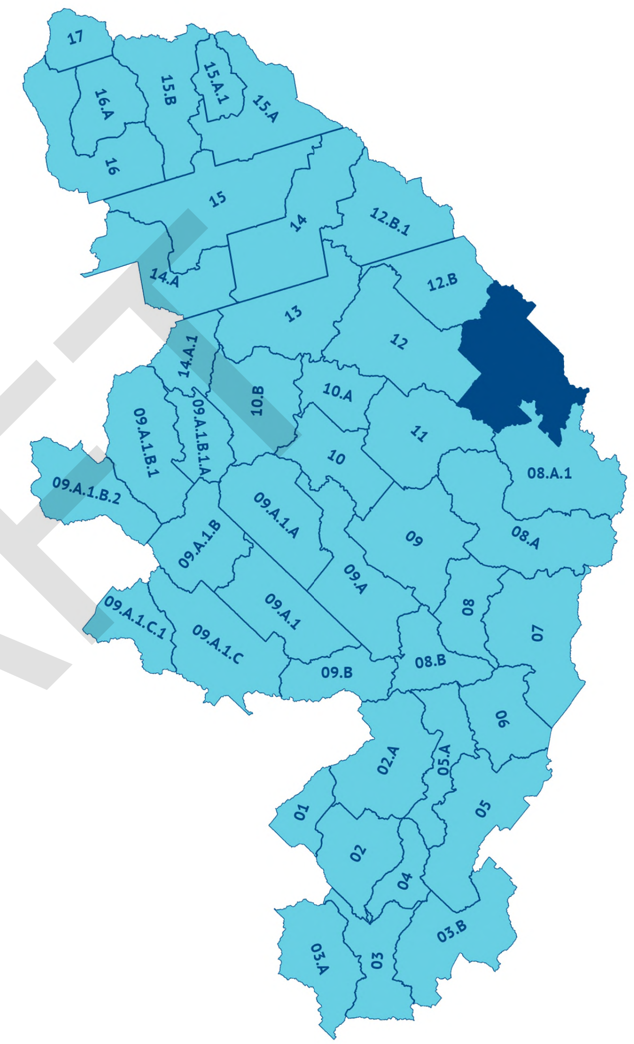


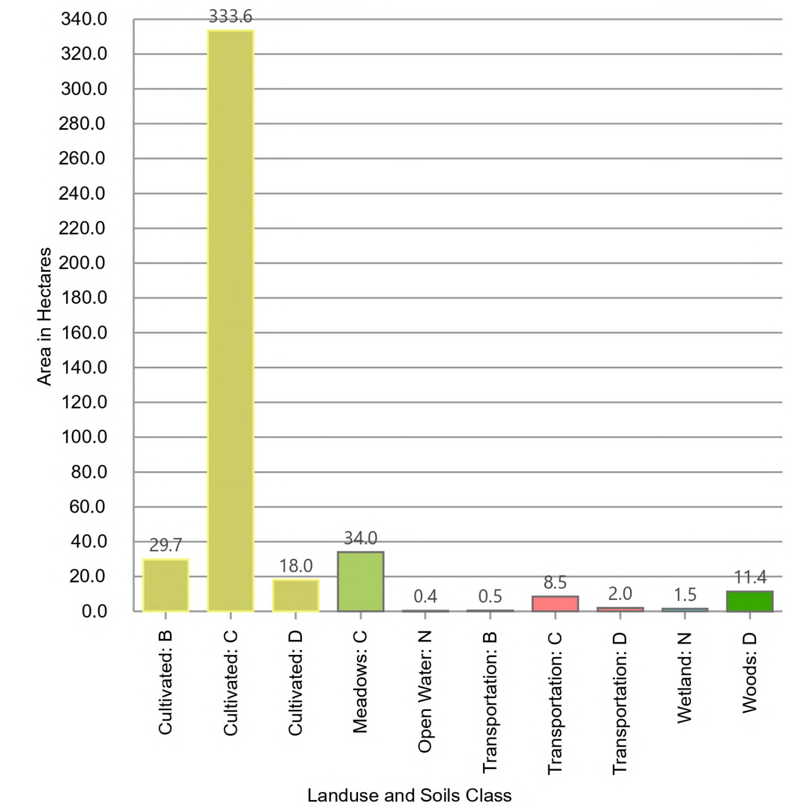
BURNSIDE

Catchment: 12

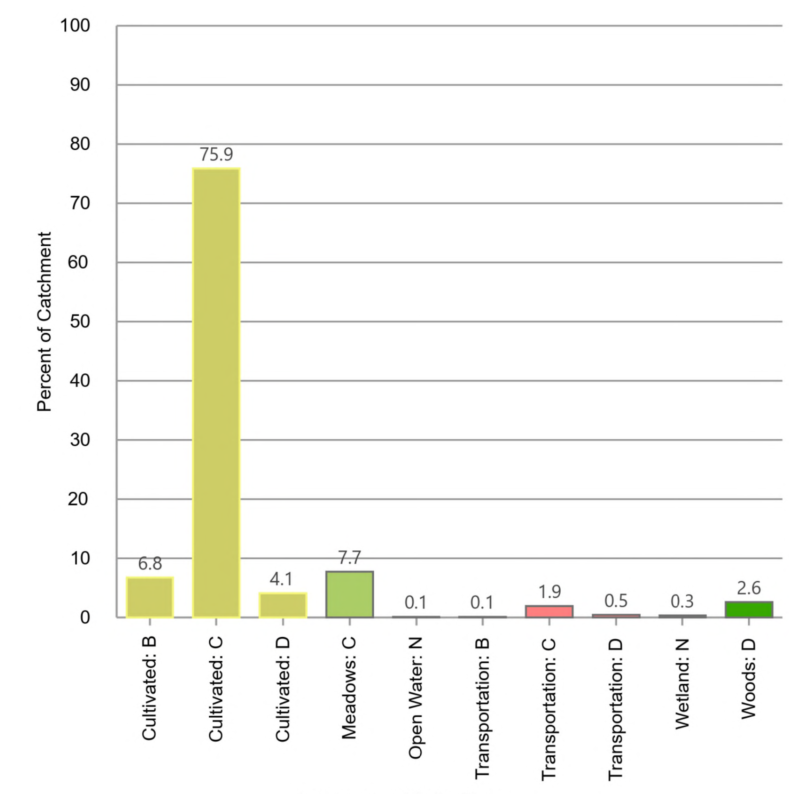
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Structure 10-WG (East West Garafraxa Townline)
Catchment Area: 439.6 ha
Longest Flow Path: 3,587 m
Longest Flow Path Min. Elev: 466.6 m
Longest Flow Path Max. Elev: 474.8 m



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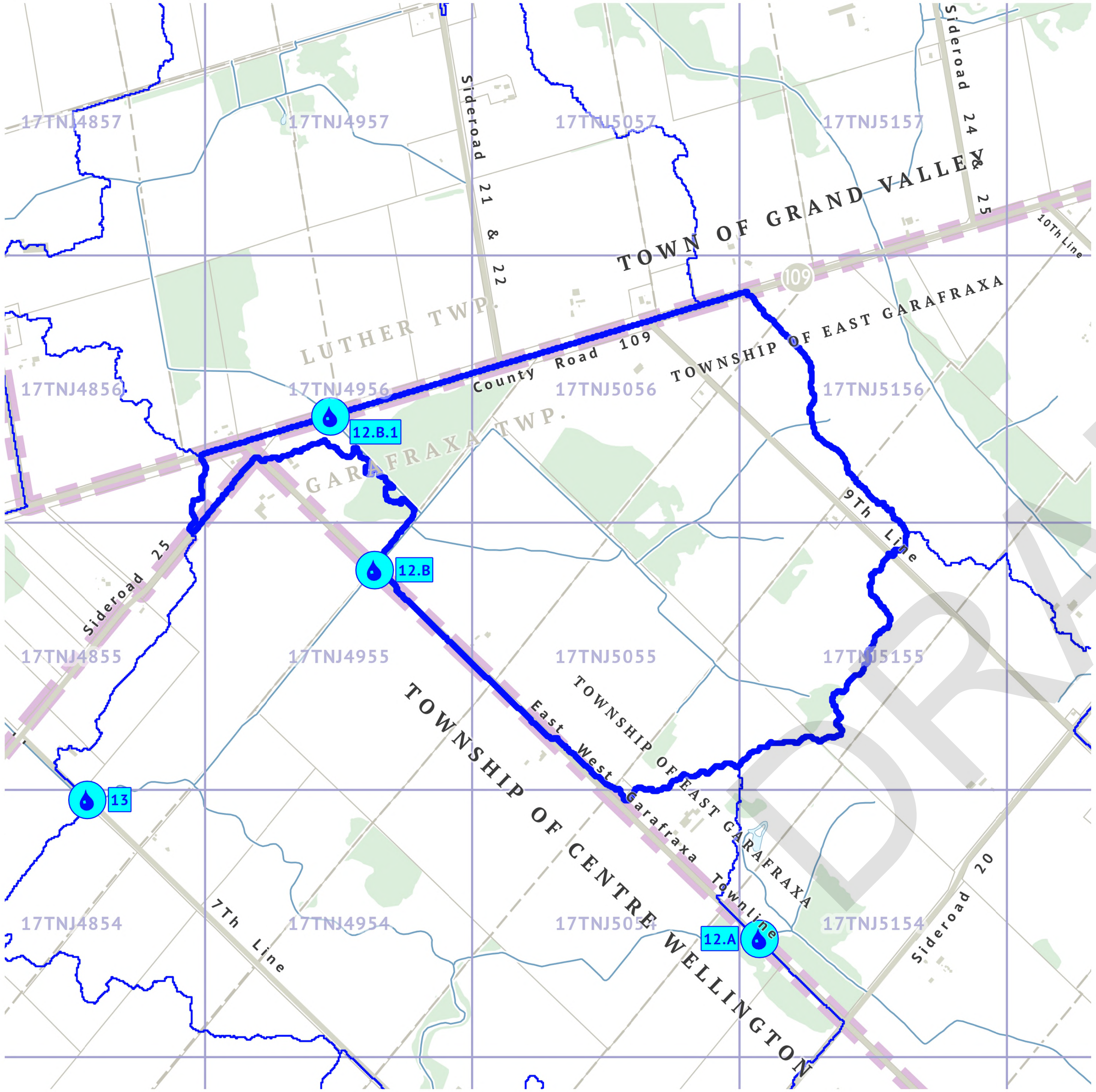
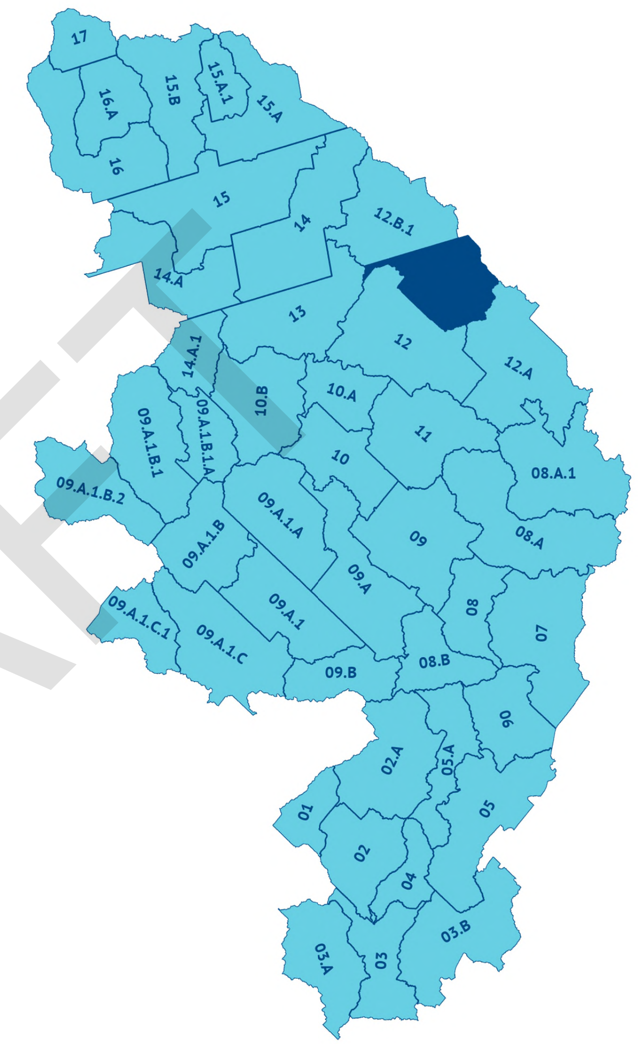
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

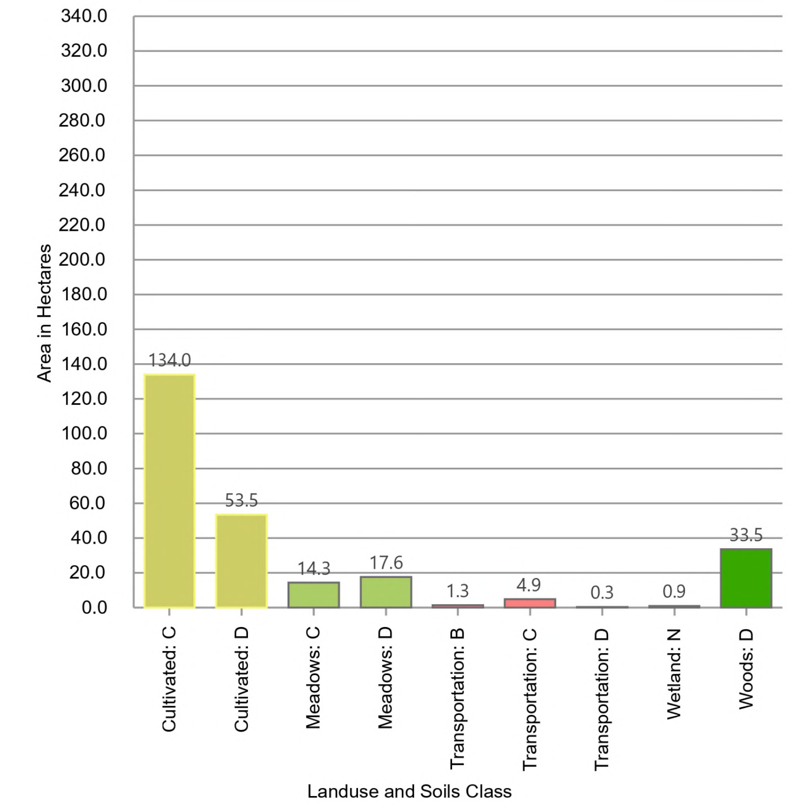
BURNSIDE

Catchment: 12.A

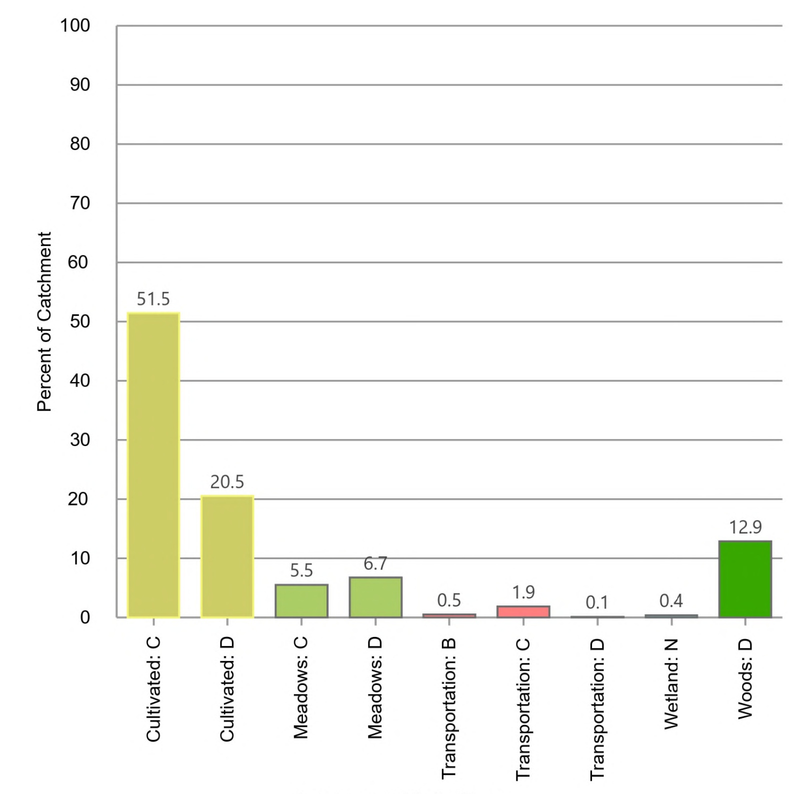
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Structure 7-WG (East West Garafraxa Townline)
Catchment Area: 260.3 ha
Longest Flow Path: 3,151 m
Longest Flow Path Min. Elev: 467.9 m
Longest Flow Path Max. Elev: 476.2 m



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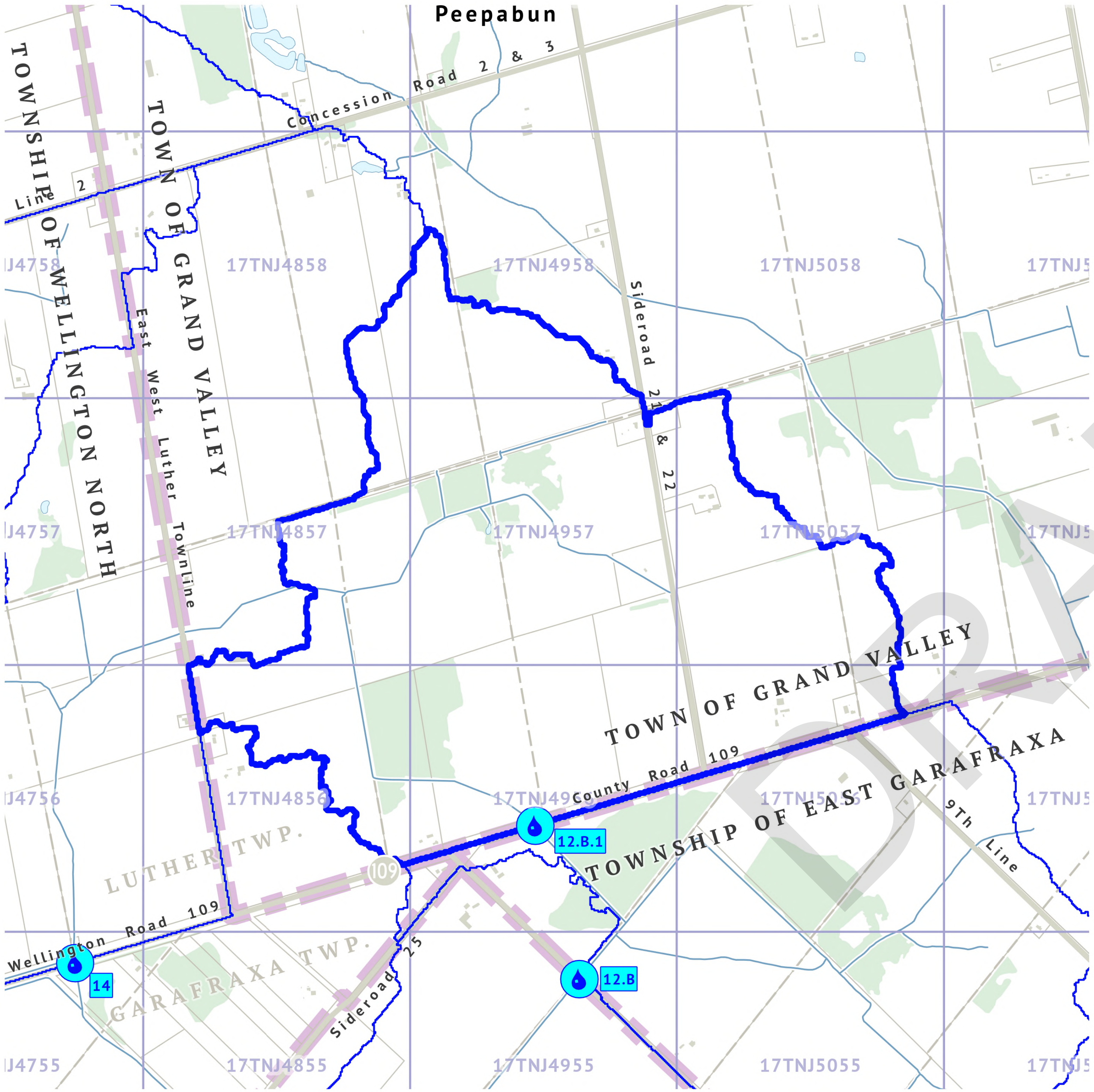
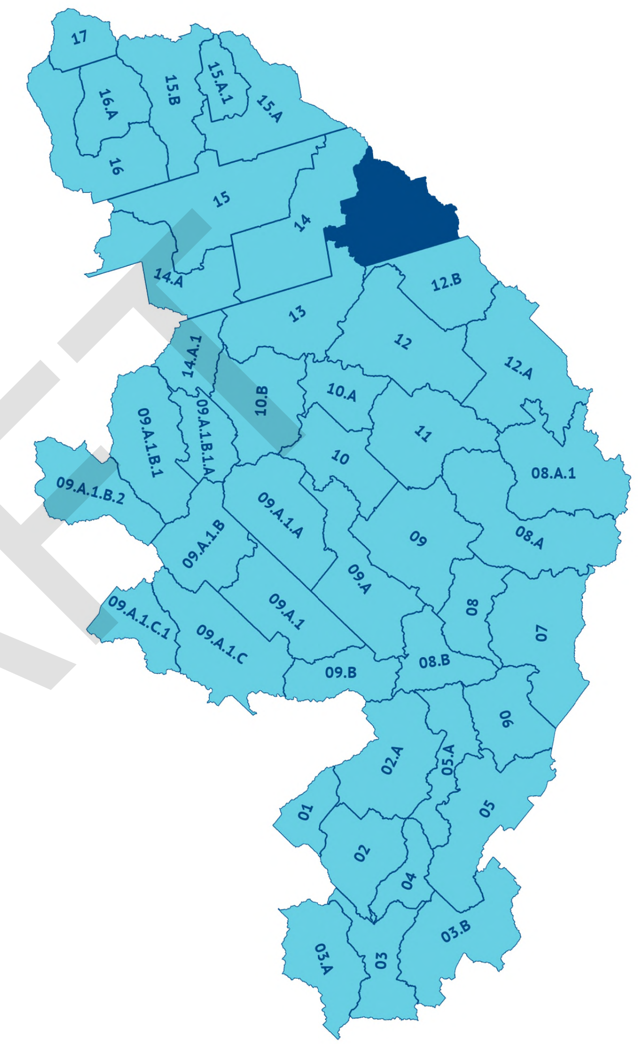
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 12.B

File Path: C:\Users\pstubbert\RJB\059832 Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG - 06_ArcHydro\059832.aprx Print Date: 2025/07/10 Time: 09:51 AM





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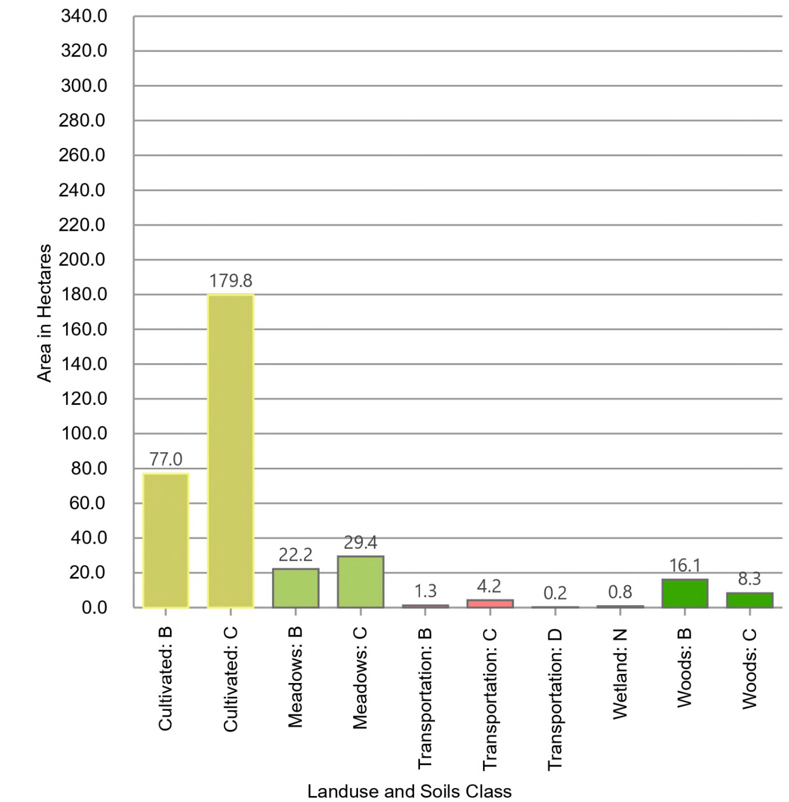
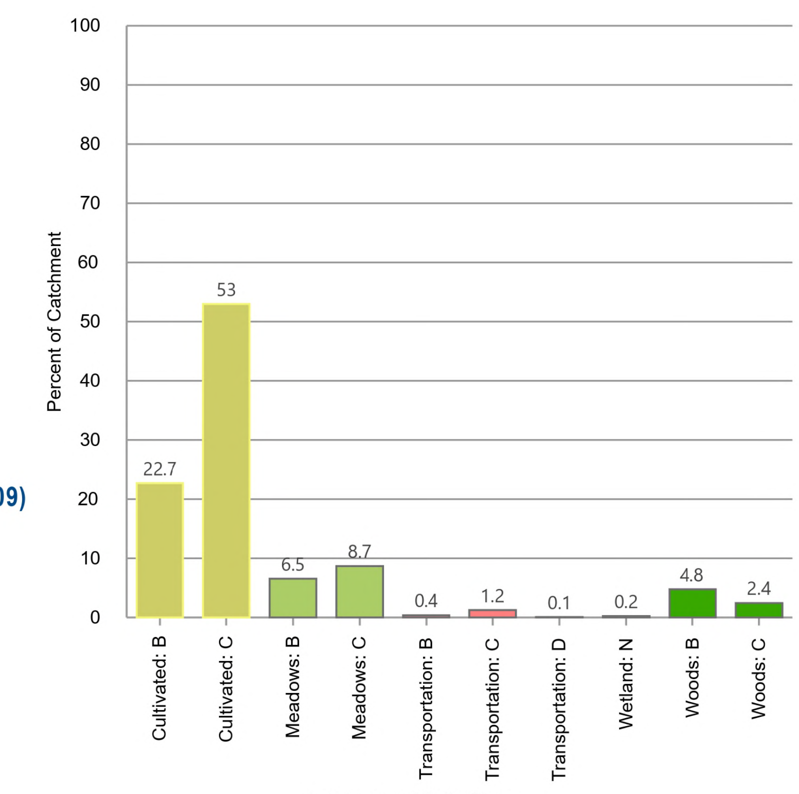
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10



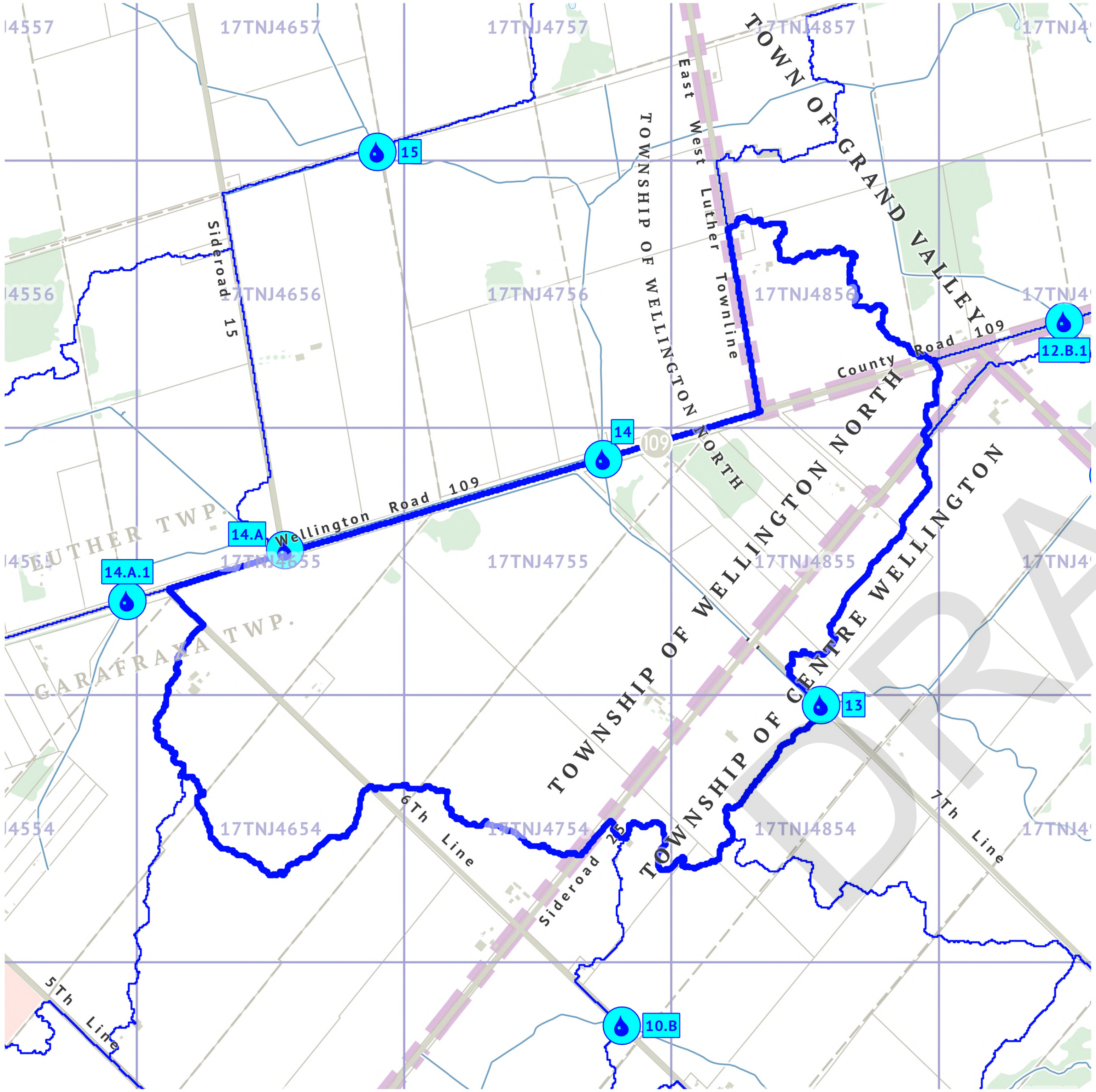
Model Outlet Desc.: Structure Unidentified (County Road 109)
Catchment Area: 339.2 ha
Longest Flow Path: 4,660 m
Longest Flow Path Min. Elev: 469.2 m
Longest Flow Path Max. Elev: 482.0 m

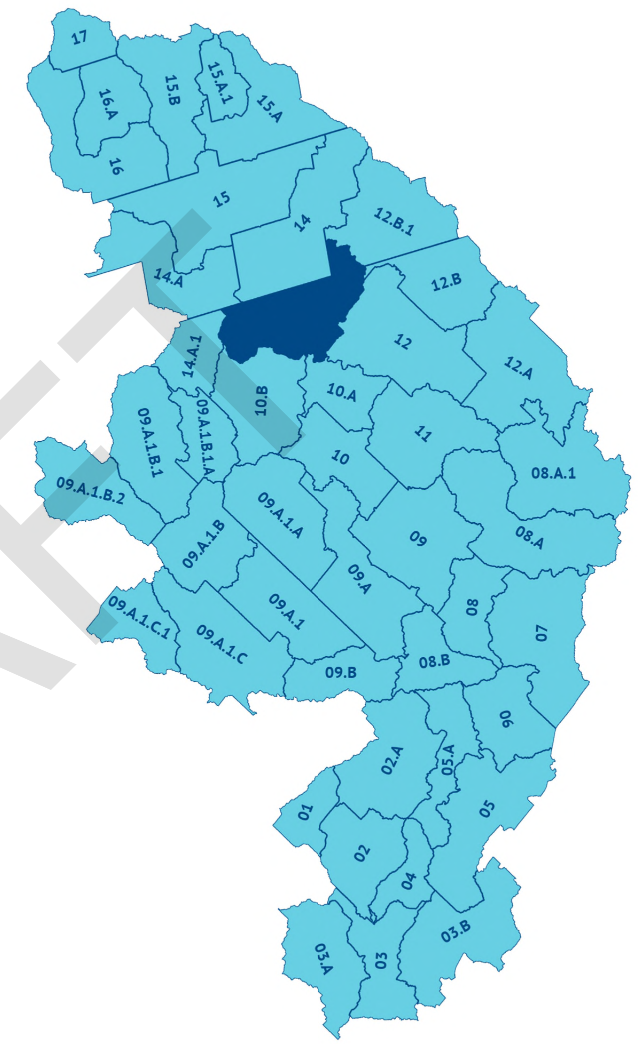


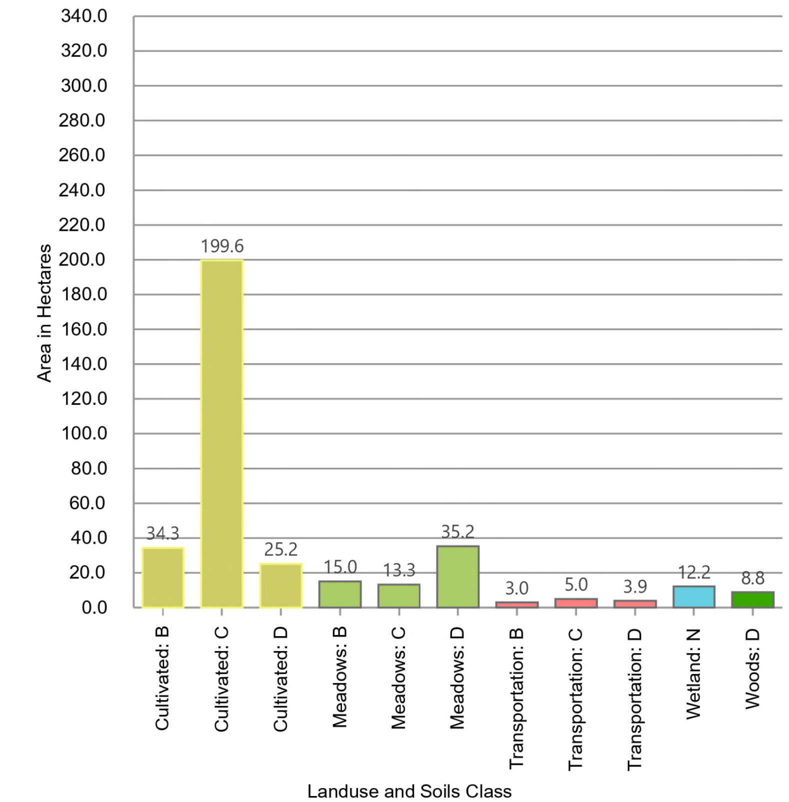
BURNSIDE

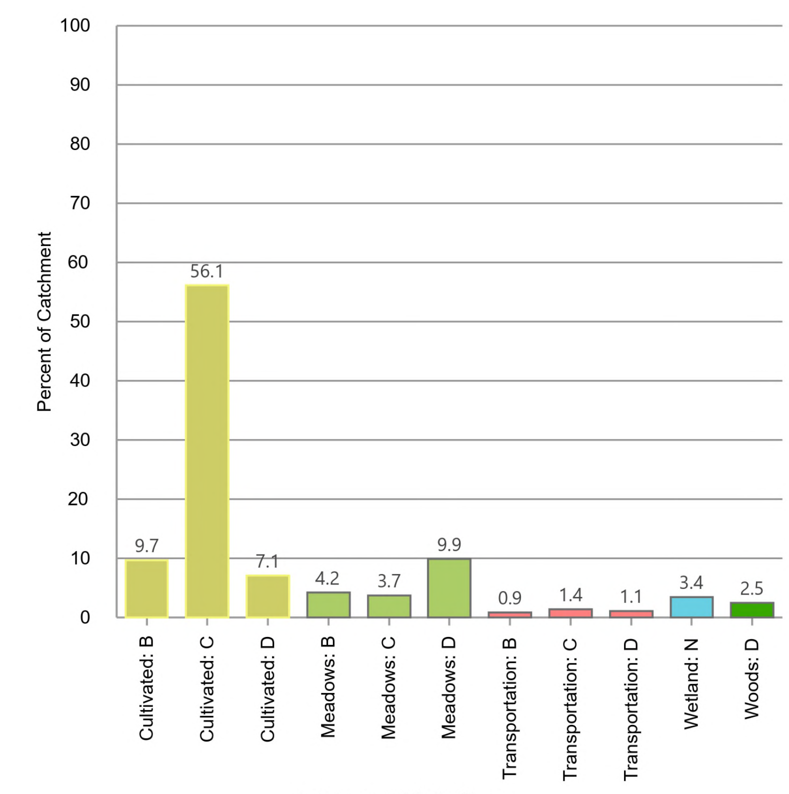
Catchment: 12.B.1

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG









Model Outlet Desc.: Structure 8-WG (7th Line)
Catchment Area: 355.5 ha
Longest Flow Path: 3,688 m
Longest Flow Path Min. Elev: 464.0 m
Longest Flow Path Max. Elev: 473.4 m

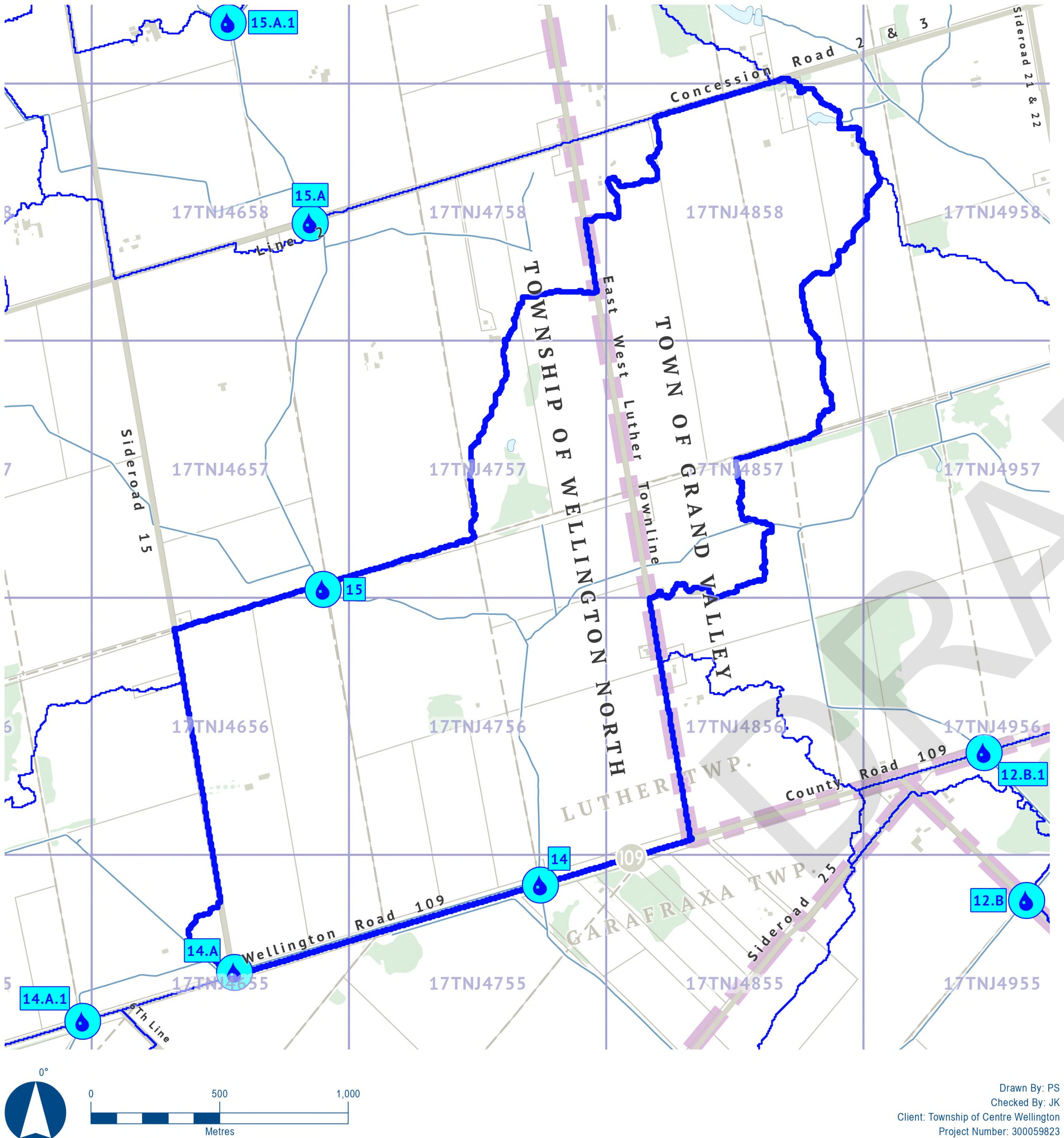
0 500 1,000 Metres
1:20,000

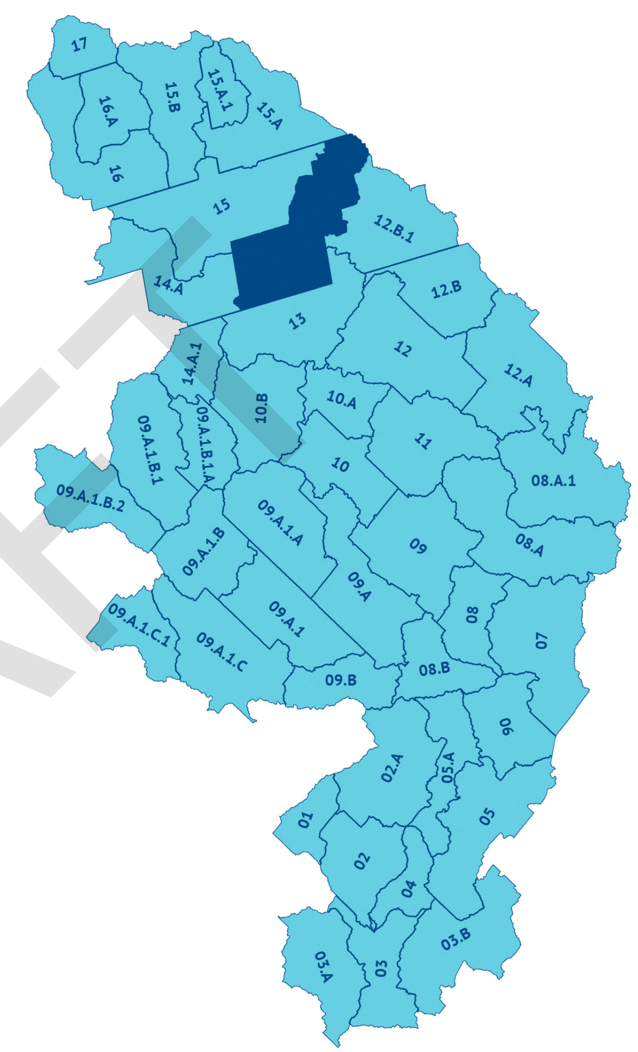
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

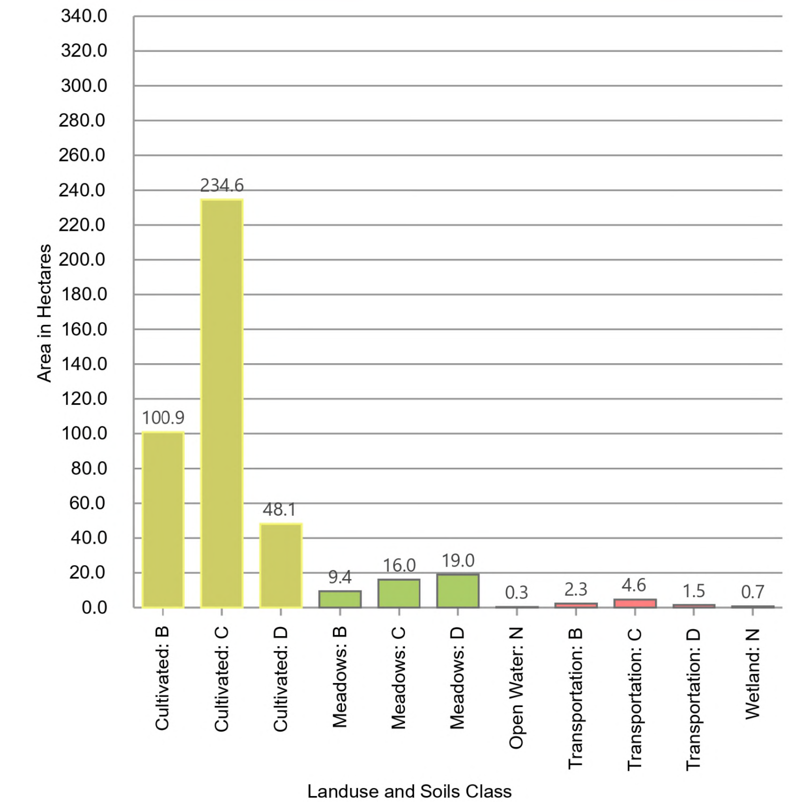
BURNSIDE

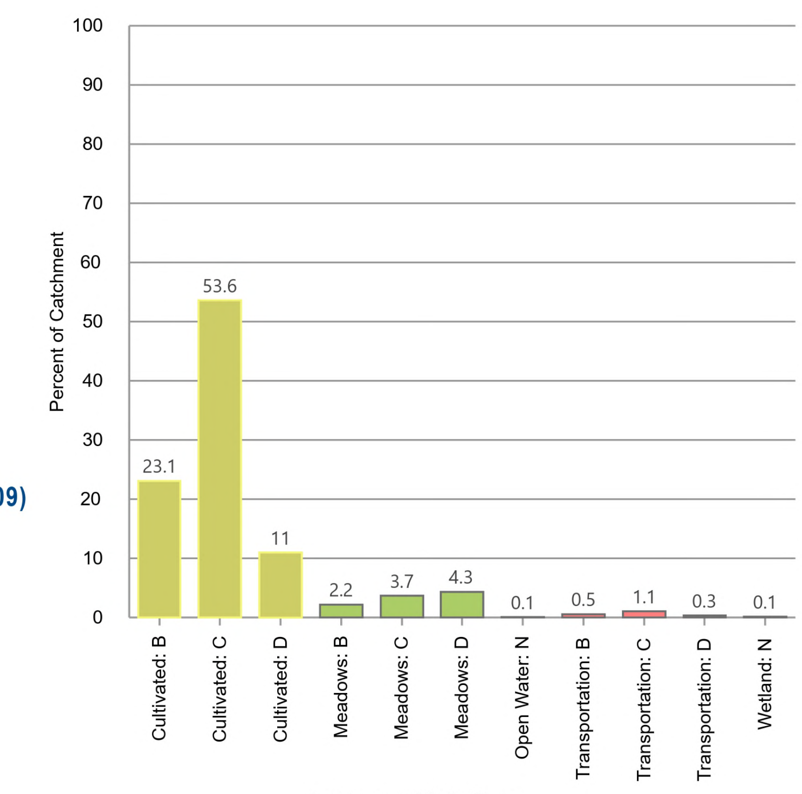
Catchment: 13

File Path: C:\Users\pstubbert\RJB\059832 Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG - 06_ArcHydro\059832.aprx Print Date: 2025/07/10 Time: 09:52 AM









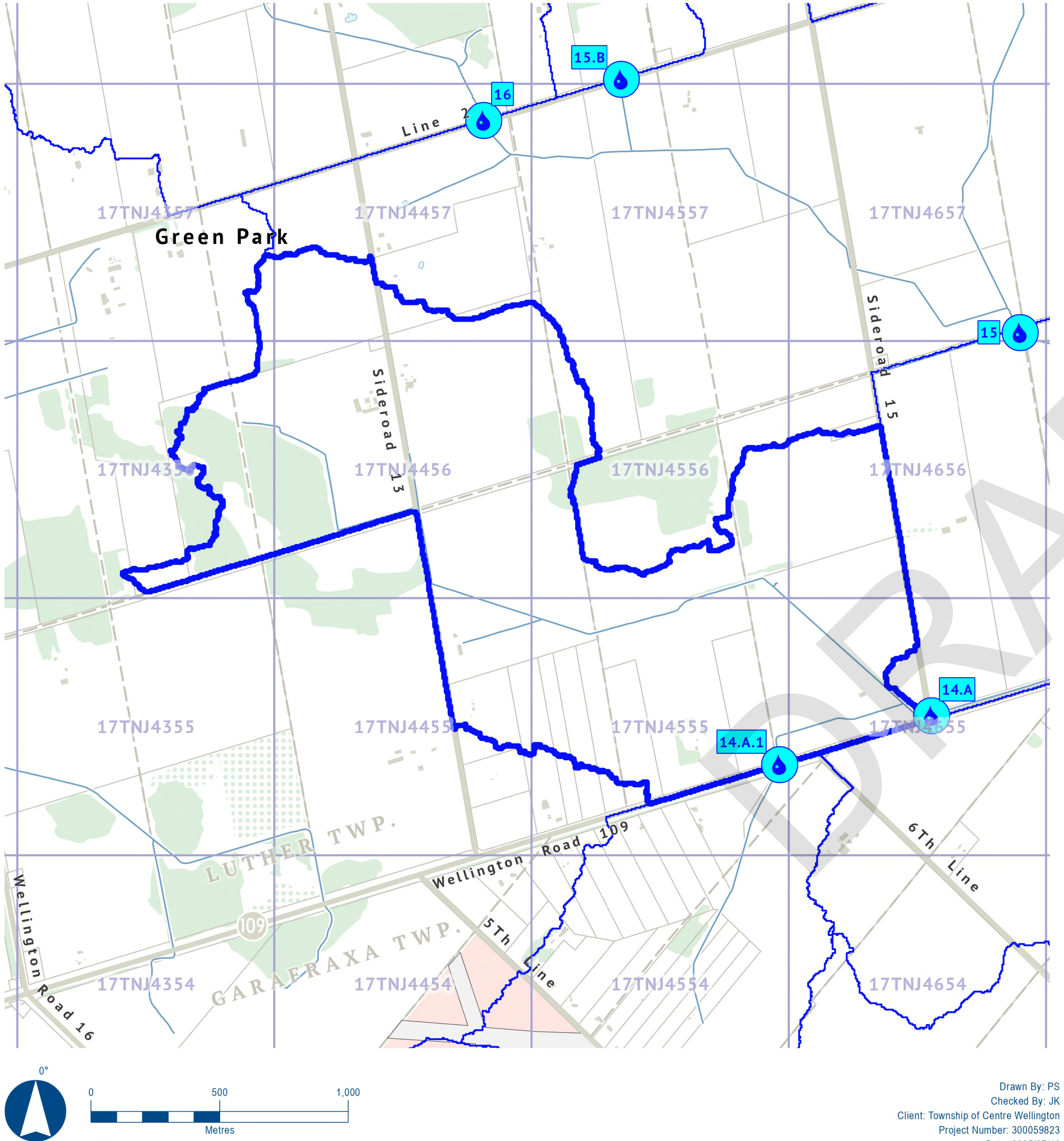
Model Outlet Desc.: Structure C109142 (Wellington Road 109)
Catchment Area: 437.4 ha
Longest Flow Path: 4,920 m
Longest Flow Path Min. Elev: 464.8 m
Longest Flow Path Max. Elev: 486.8 m

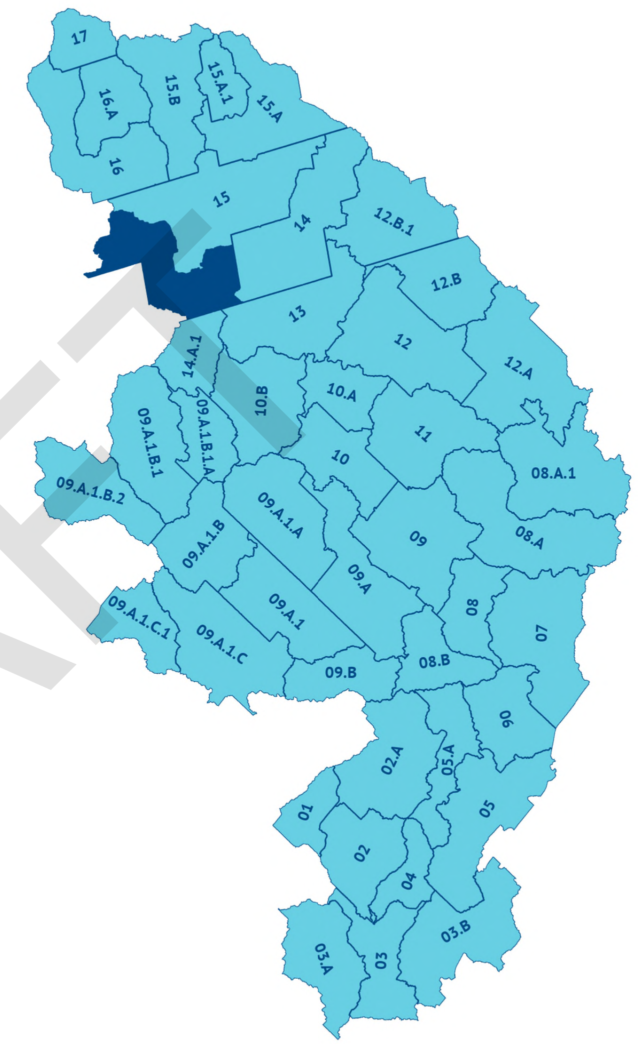
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

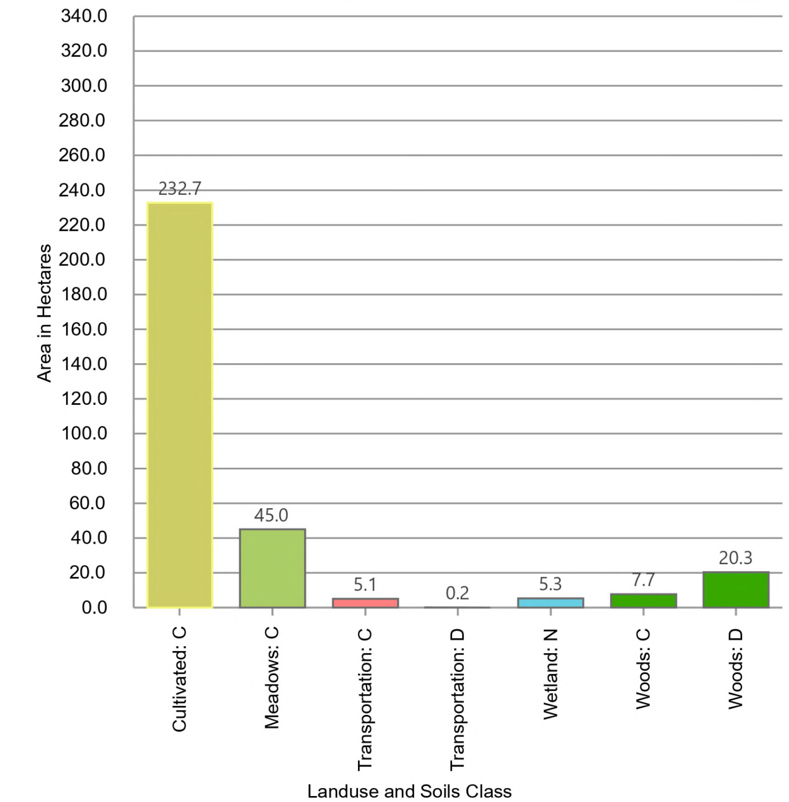
BURNSIDE

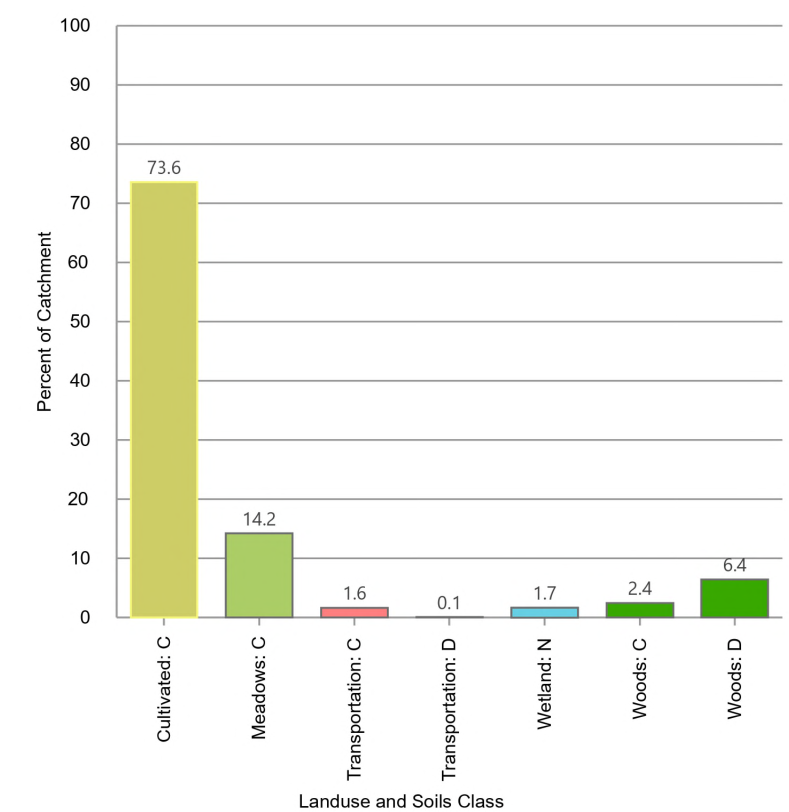
Catchment: 14

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG









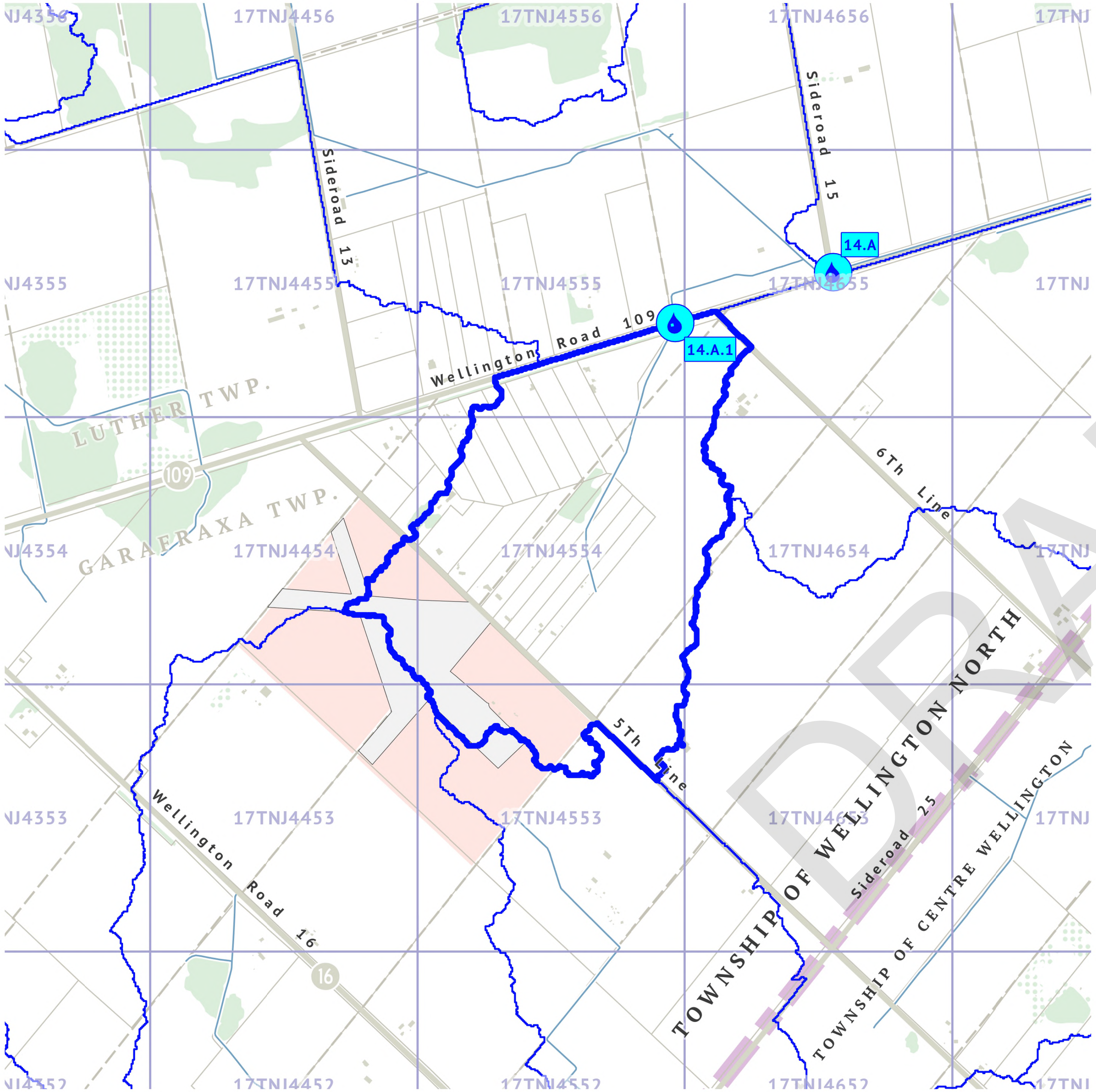
Model Outlet Desc.: Structure B109141 (Sideroad 15)
Catchment Area: 316.3 ha
Longest Flow Path: 4,520 m
Longest Flow Path Min. Elev: 466.7 m
Longest Flow Path Max. Elev: 481.7 m

Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 14.A

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG



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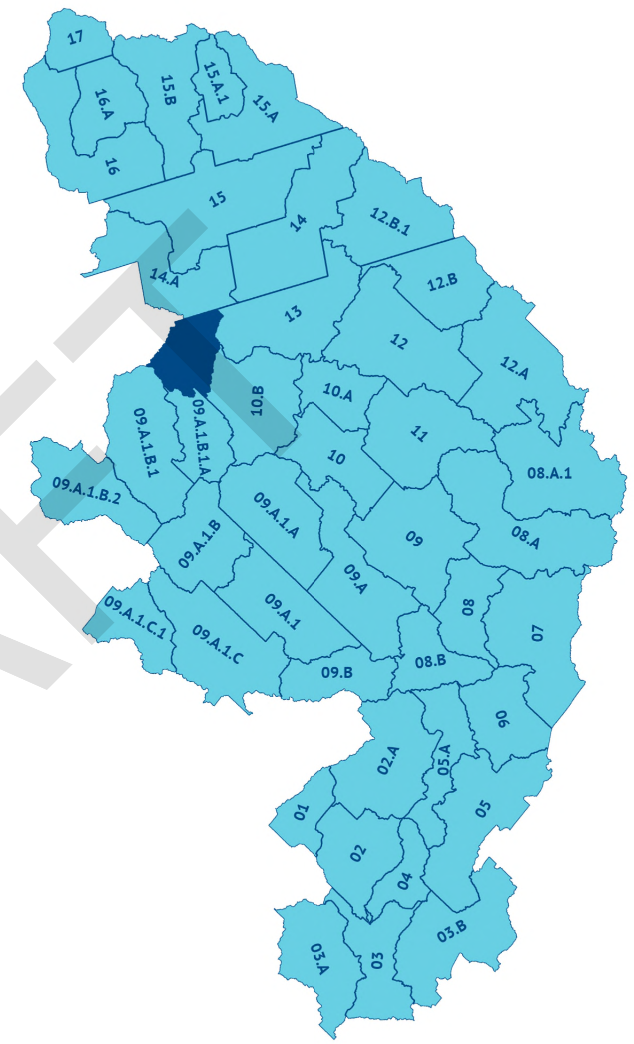
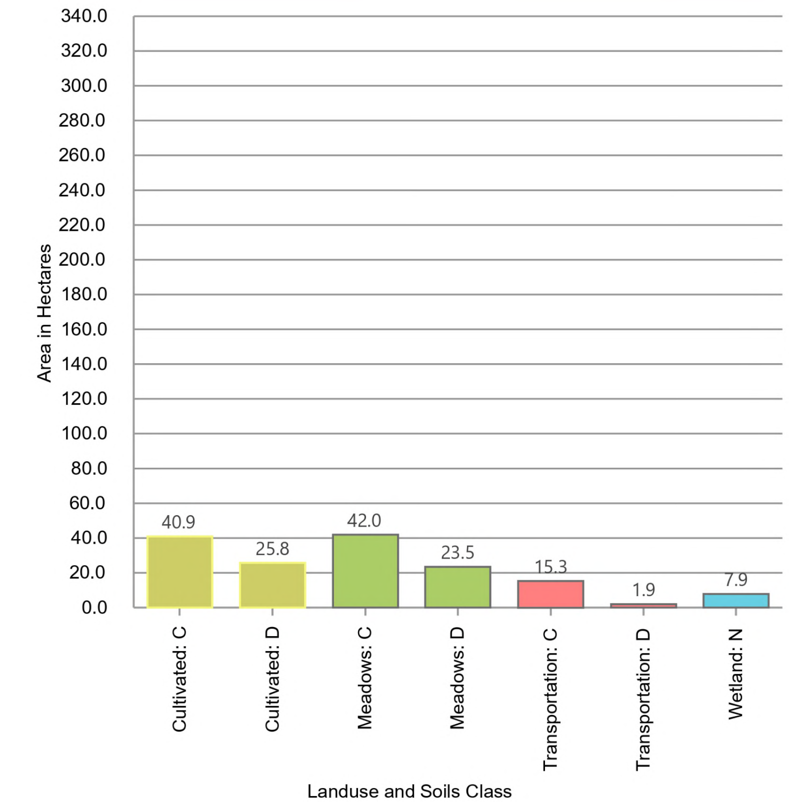
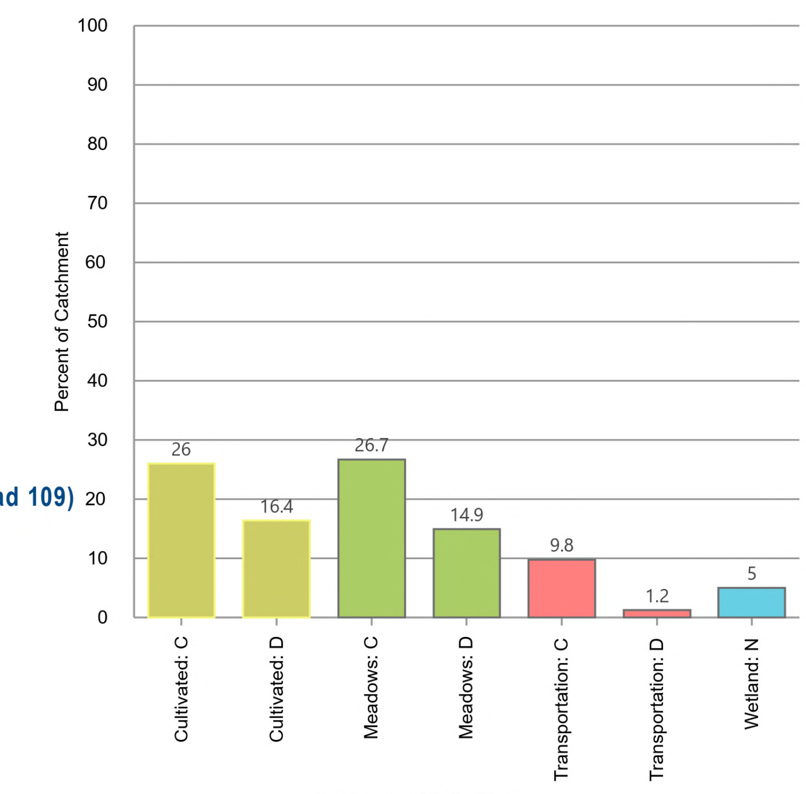
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10



Model Outlet Desc.: Structure Unidentified (Wellington Road 109)
Catchment Area: 157.2 ha
Longest Flow Path: 2,429 m
Longest Flow Path Min. Elev: 468.2 m
Longest Flow Path Max. Elev: 472.9 m

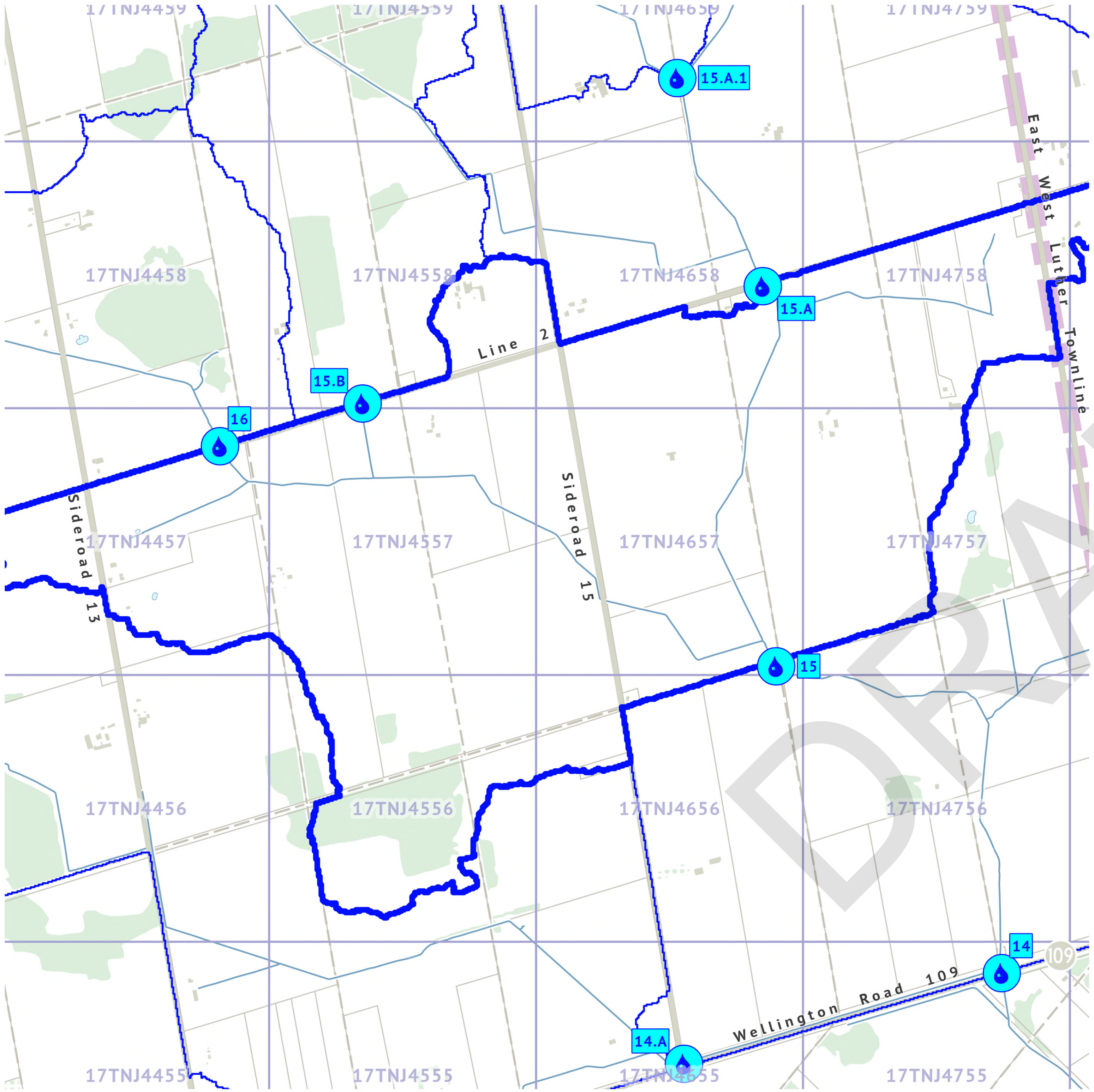


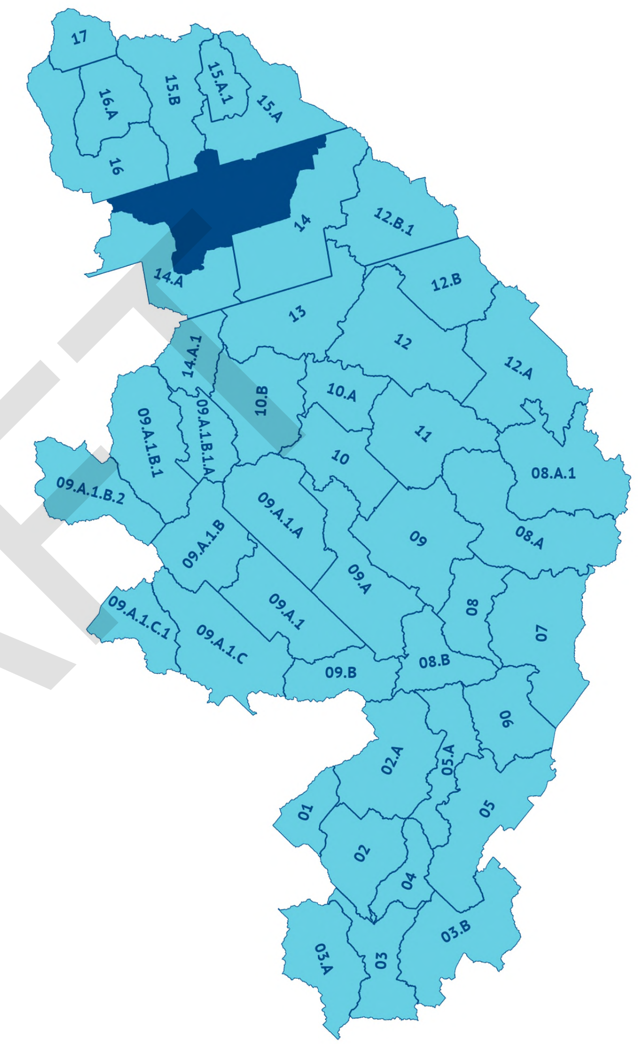


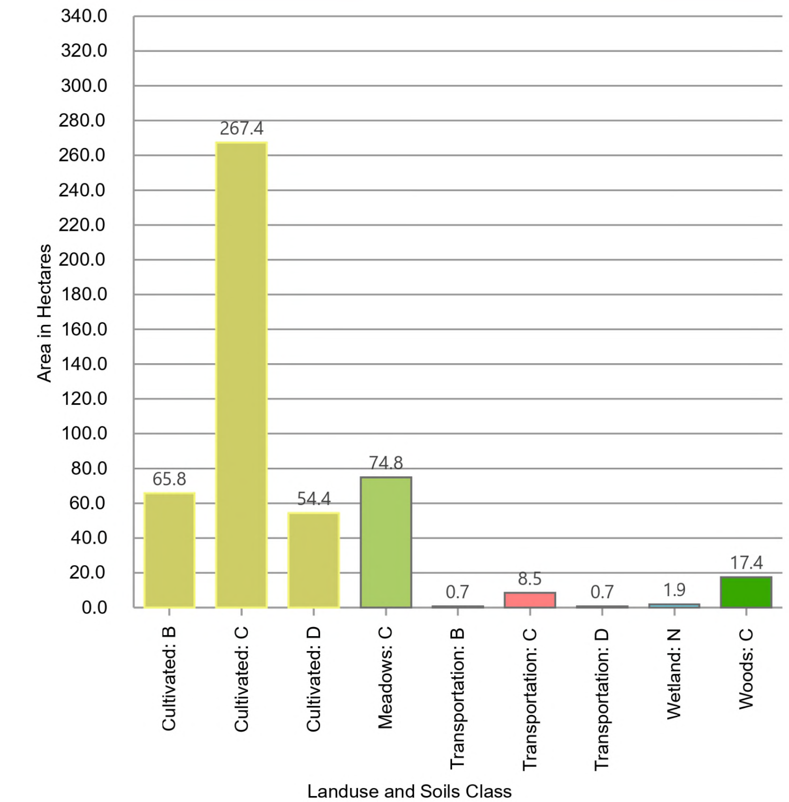
BURNSIDE

Catchment: 14.A.1

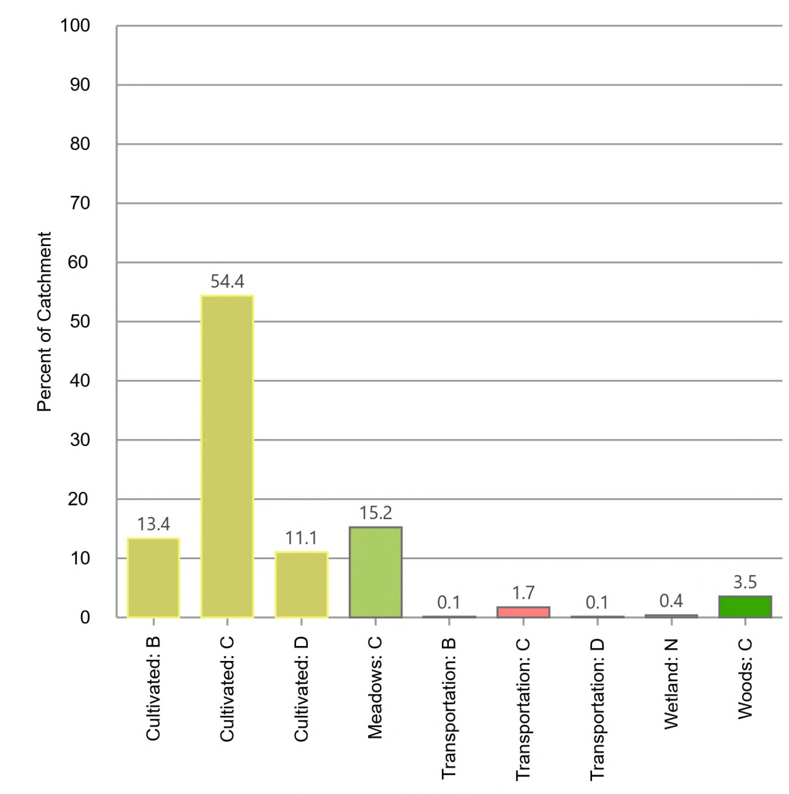
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Lot 16 Con 1
Catchment Area: 491.6 ha
Longest Flow Path: 3,814 m
Longest Flow Path Min. Elev: 467.6 m
Longest Flow Path Max. Elev: 481.3 m



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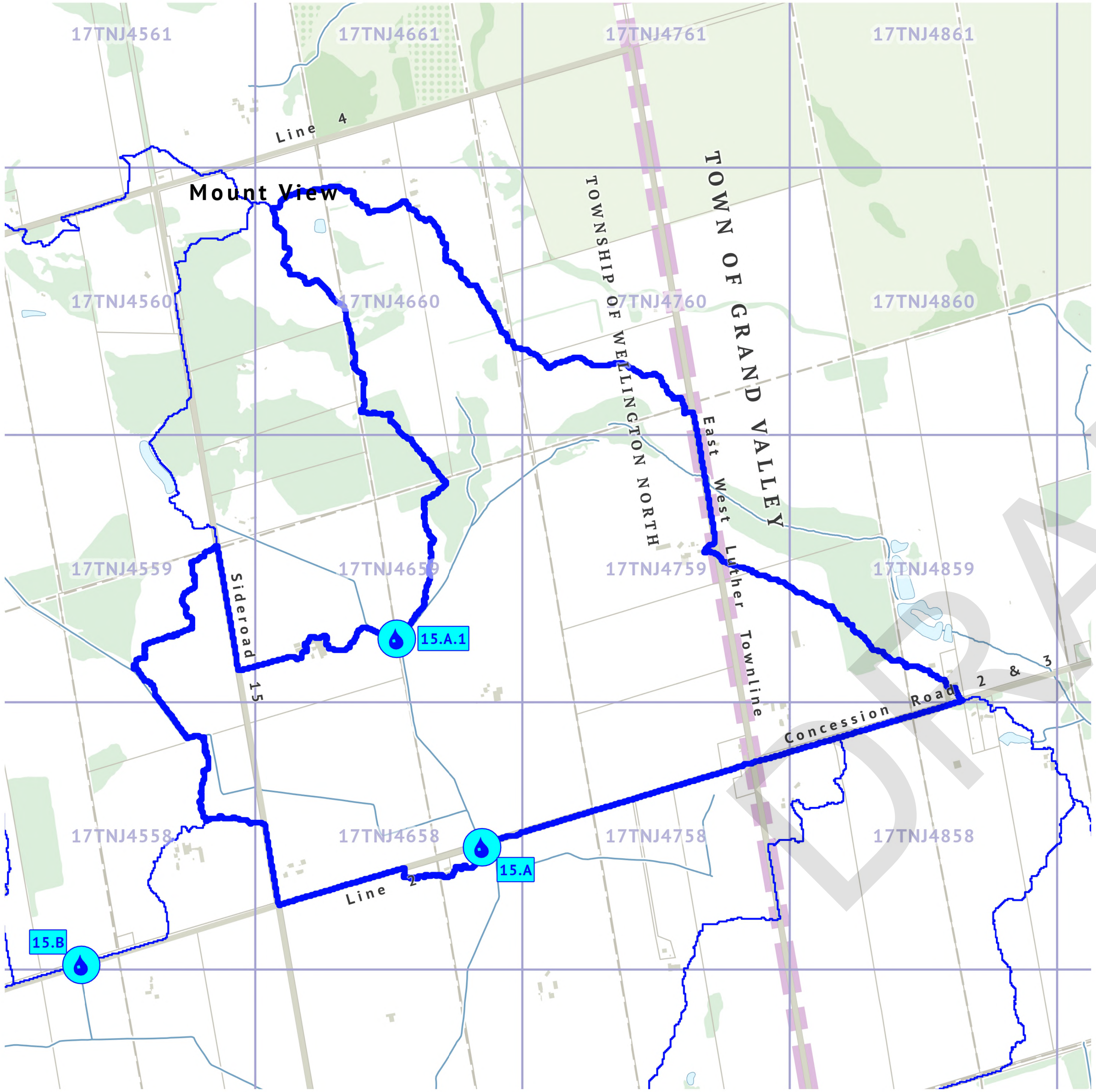
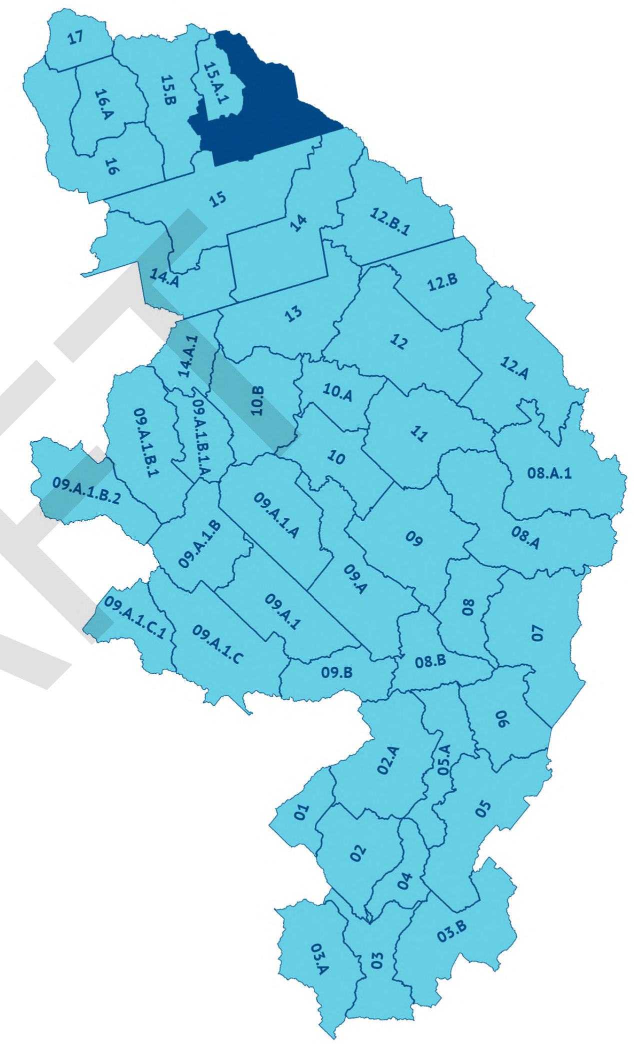
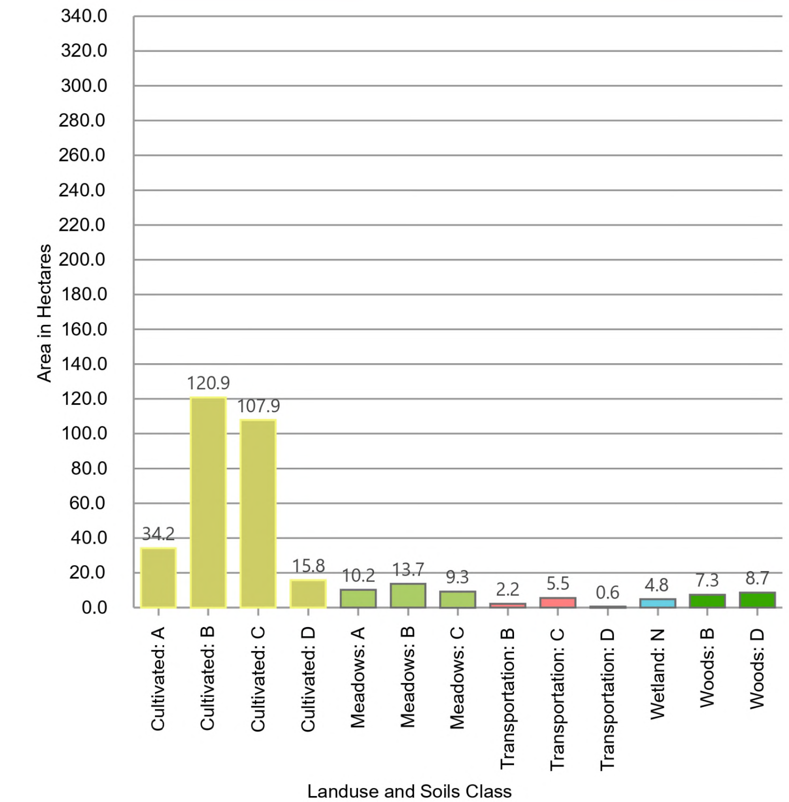
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

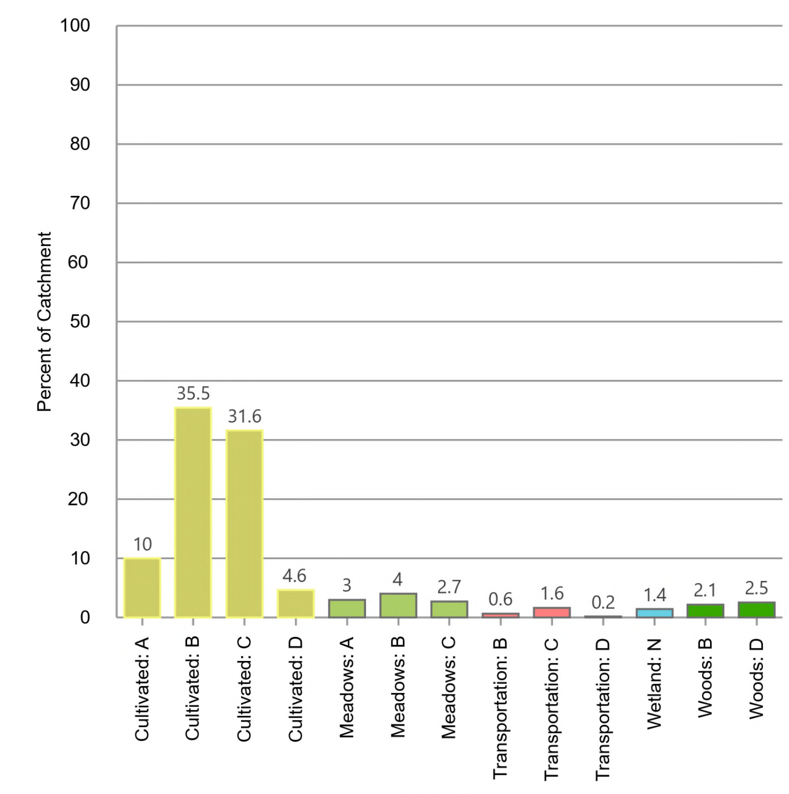
Catchment: 15

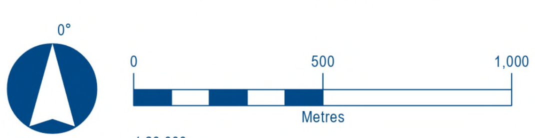






Model Outlet Desc.: Structure Unidentified (2 Line)
Catchment Area: 341.0 ha
Longest Flow Path: 3,600 m
Longest Flow Path Min. Elev: 472.5 m
Longest Flow Path Max. Elev: 501.6 m



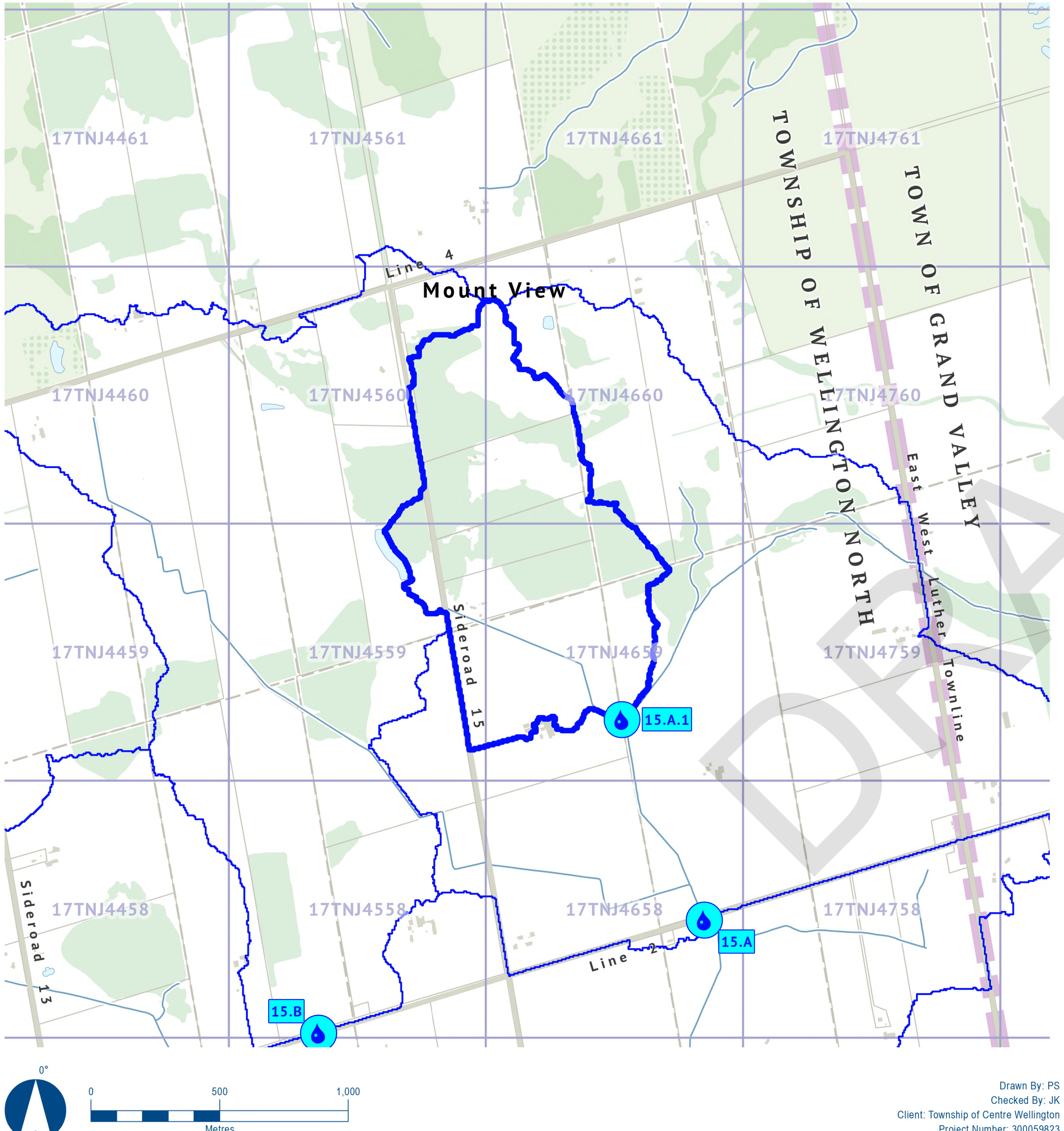


Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

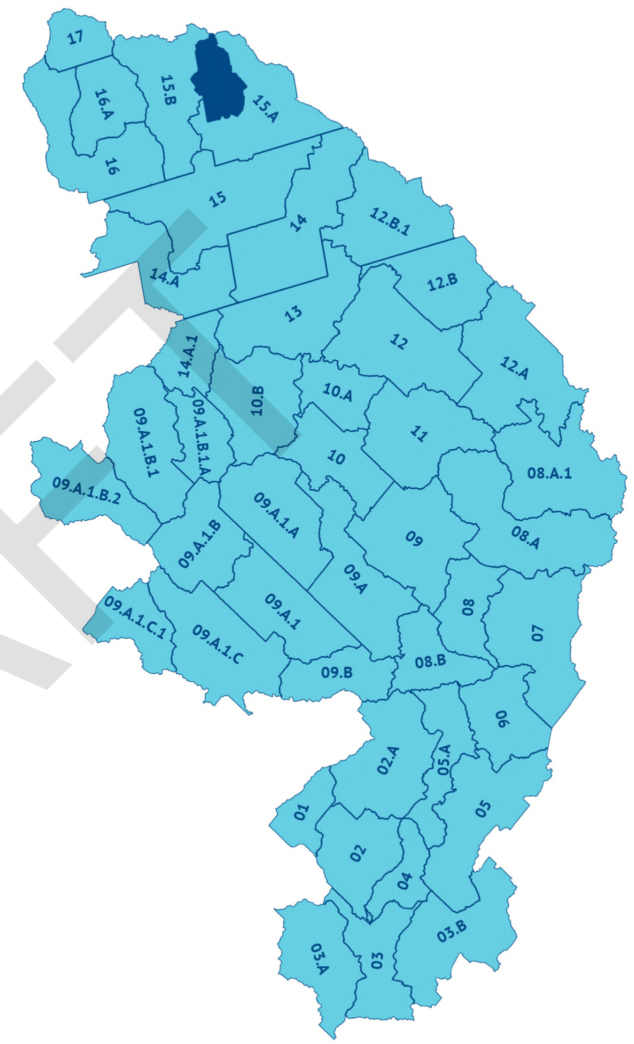
BURNSIDE

Catchment: 15.A

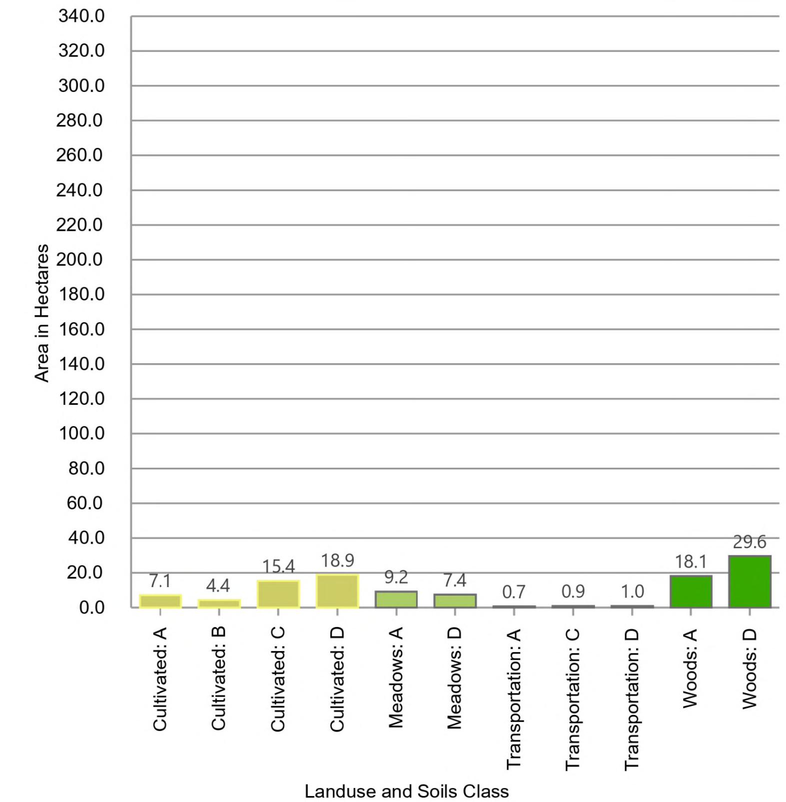
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG

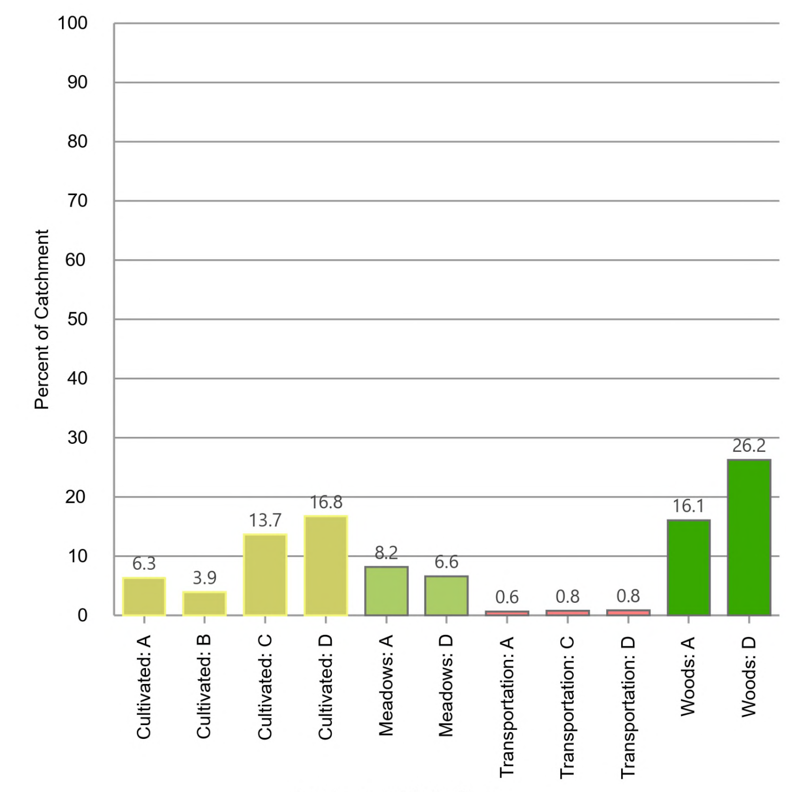


Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10



Model Outlet Desc.: Lots 16 & 17 Con 3
Catchment Area: 112.7 ha
Longest Flow Path: 2,721 m
Longest Flow Path Min. Elev: 475.4 m
Longest Flow Path Max. Elev: 494.3 m

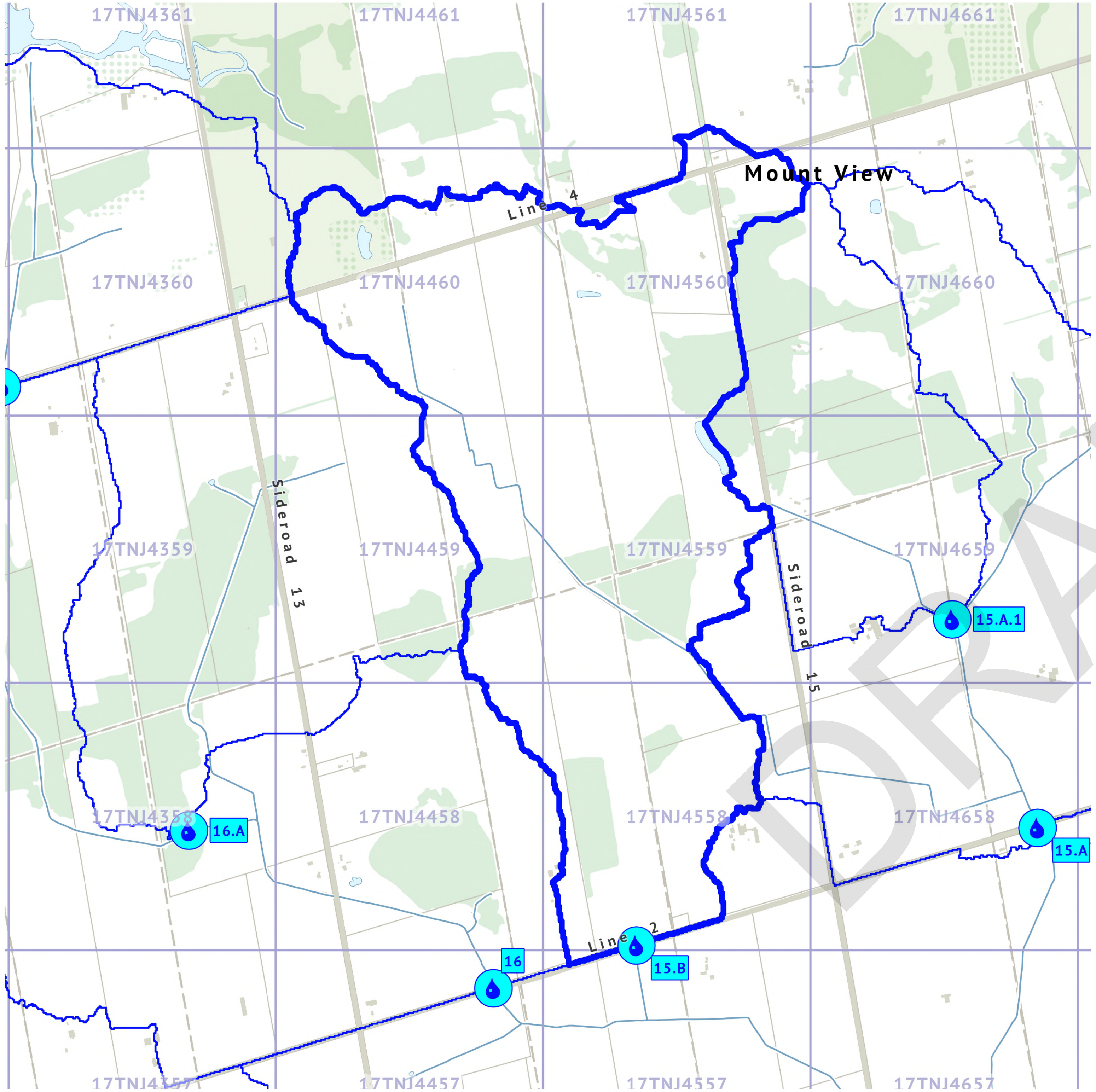


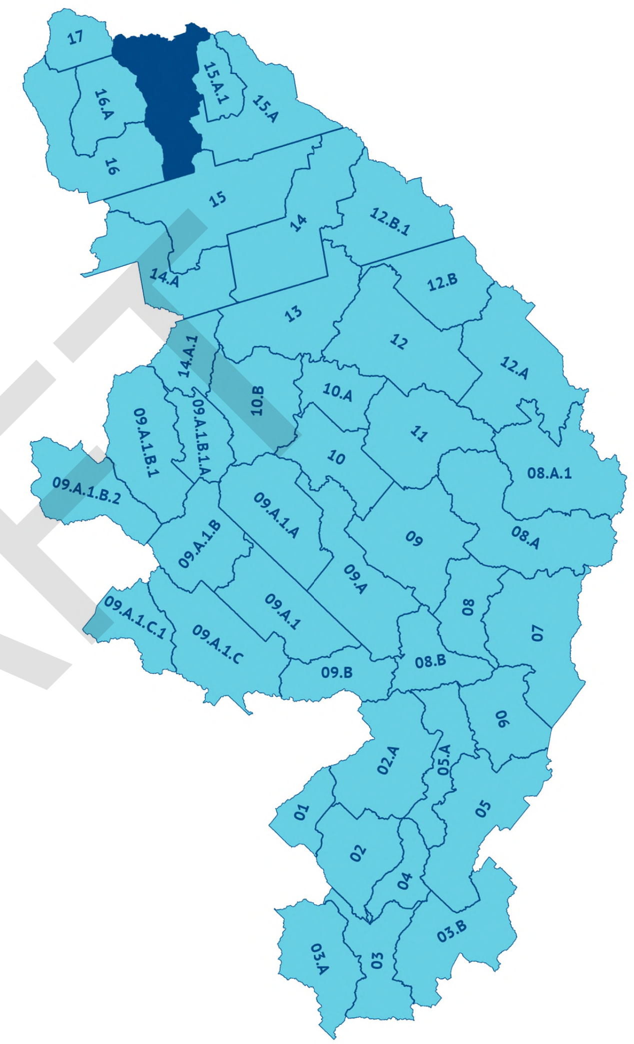


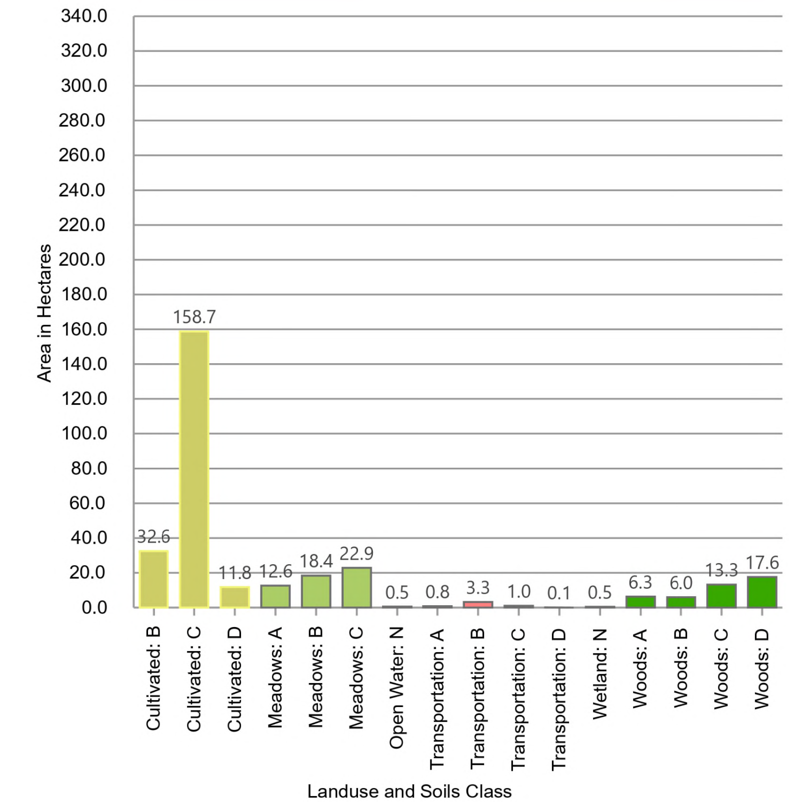
BURNSIDE

Catchment: 15.A.1

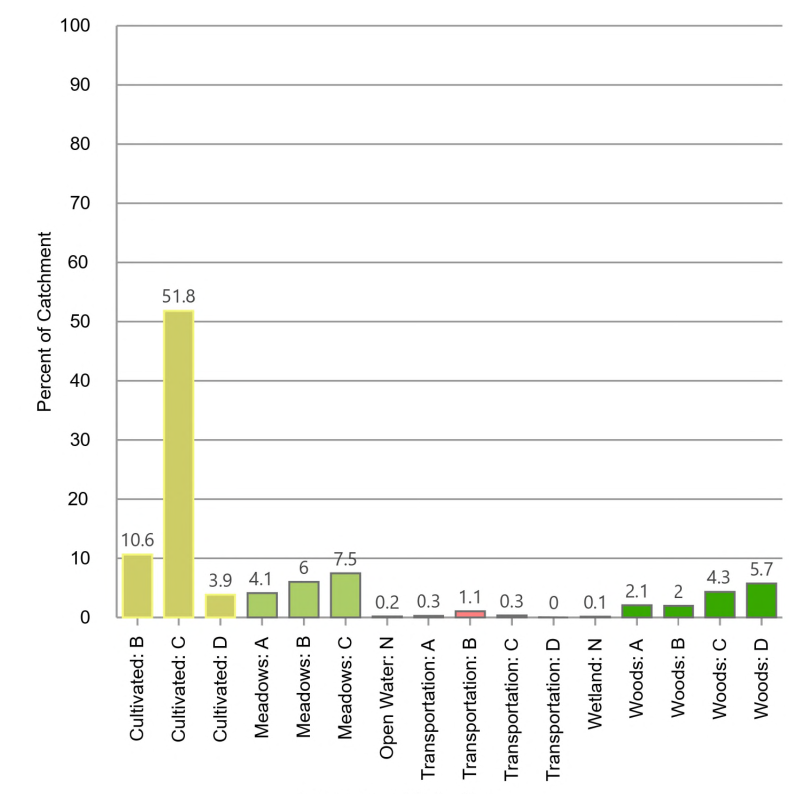
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG







Model Outlet Desc.: Structure Unidentified (2 Line)
Catchment Area: 306.3 ha
Longest Flow Path: 4,785 m
Longest Flow Path Min. Elev: 471.7 m
Longest Flow Path Max. Elev: 493.9 m



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Metres

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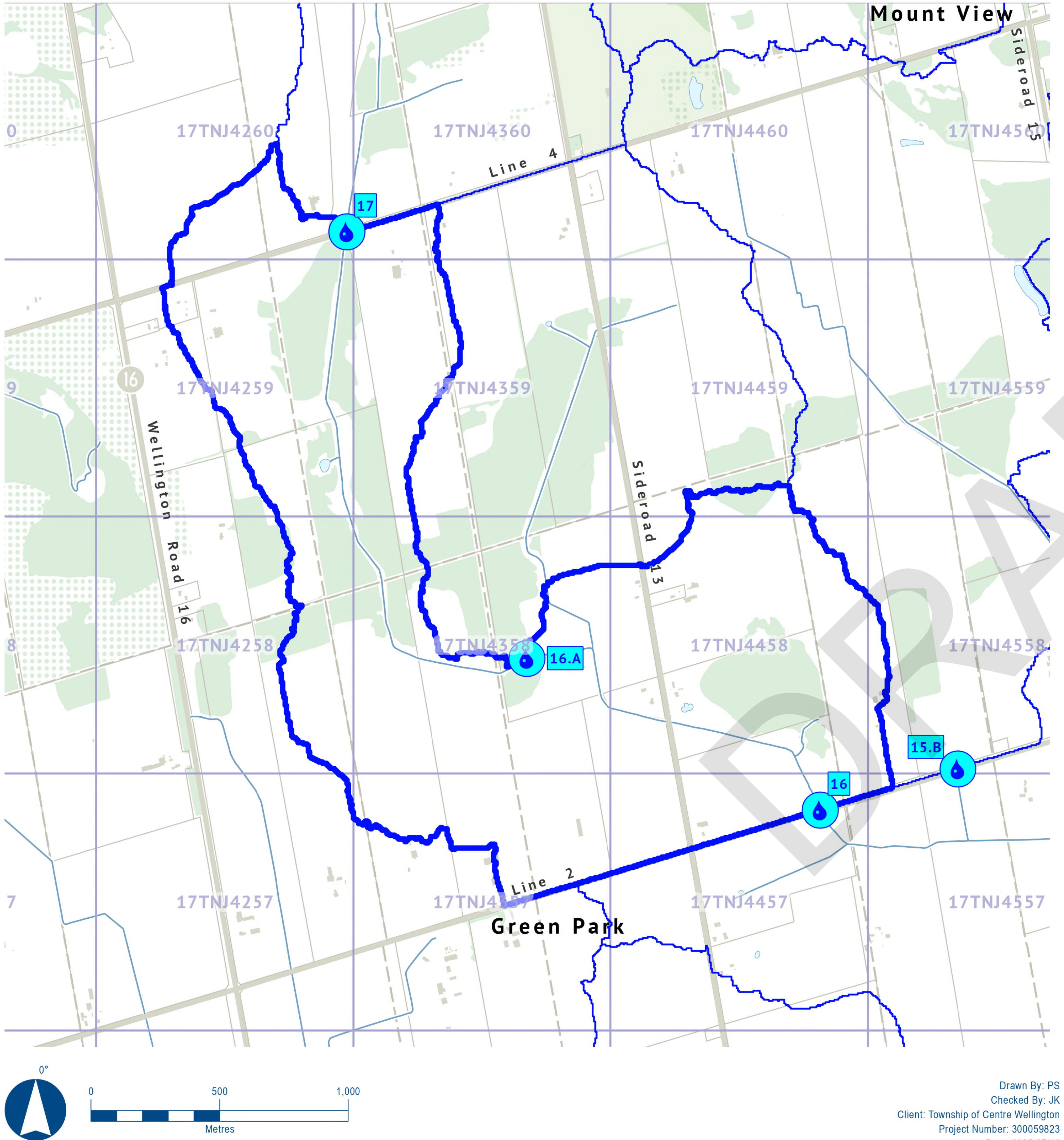
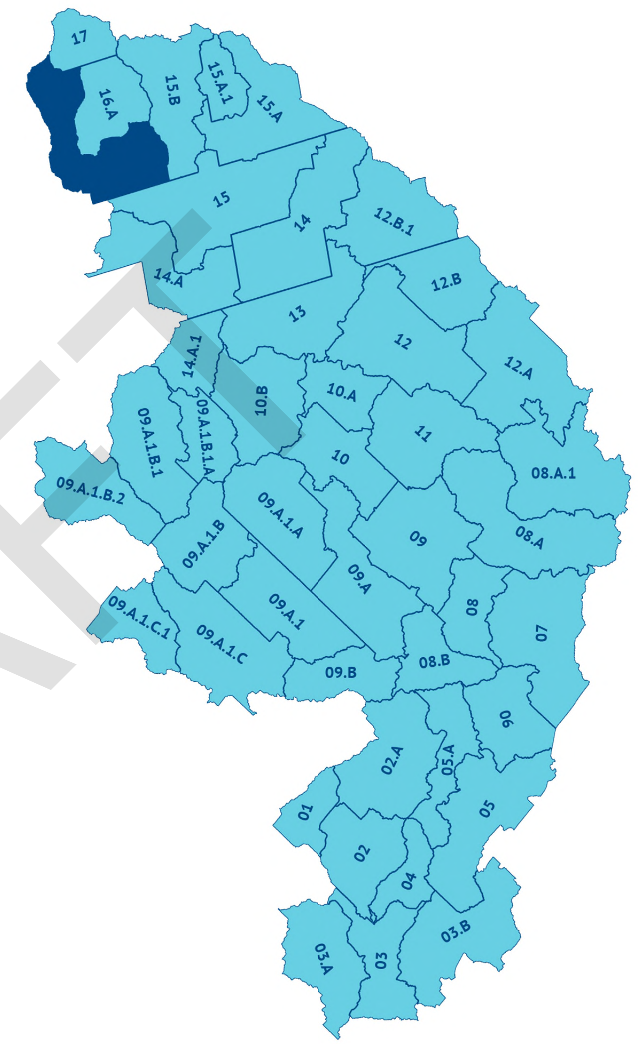
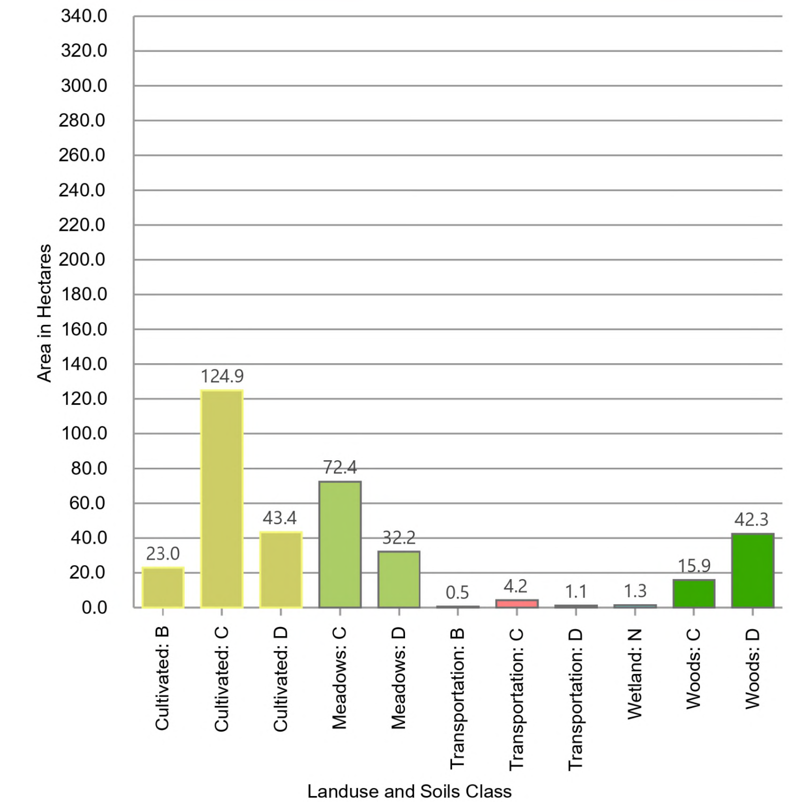
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

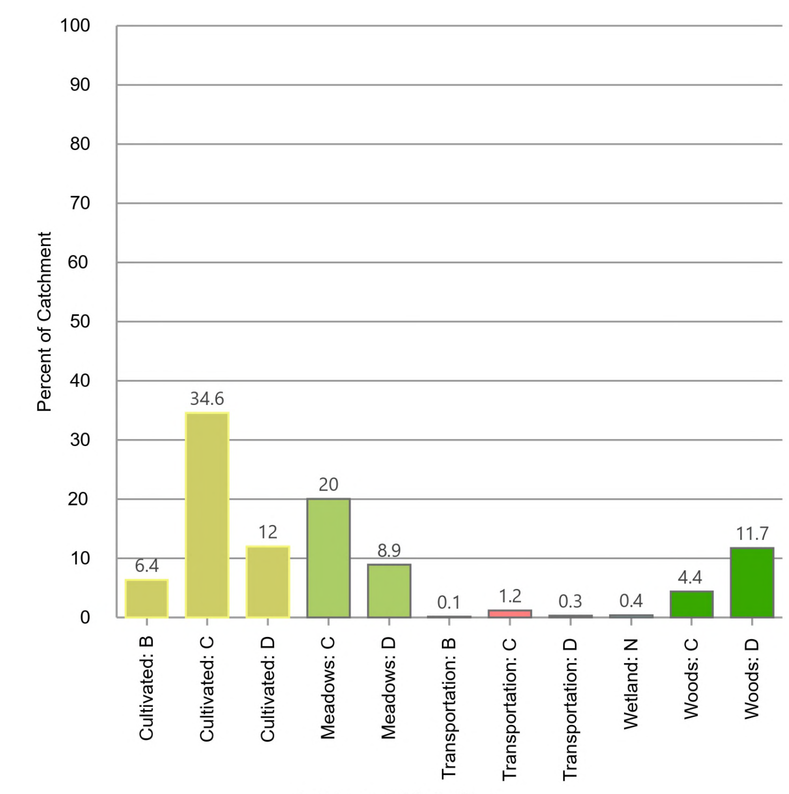
BURNSIDE

Catchment: 15.B









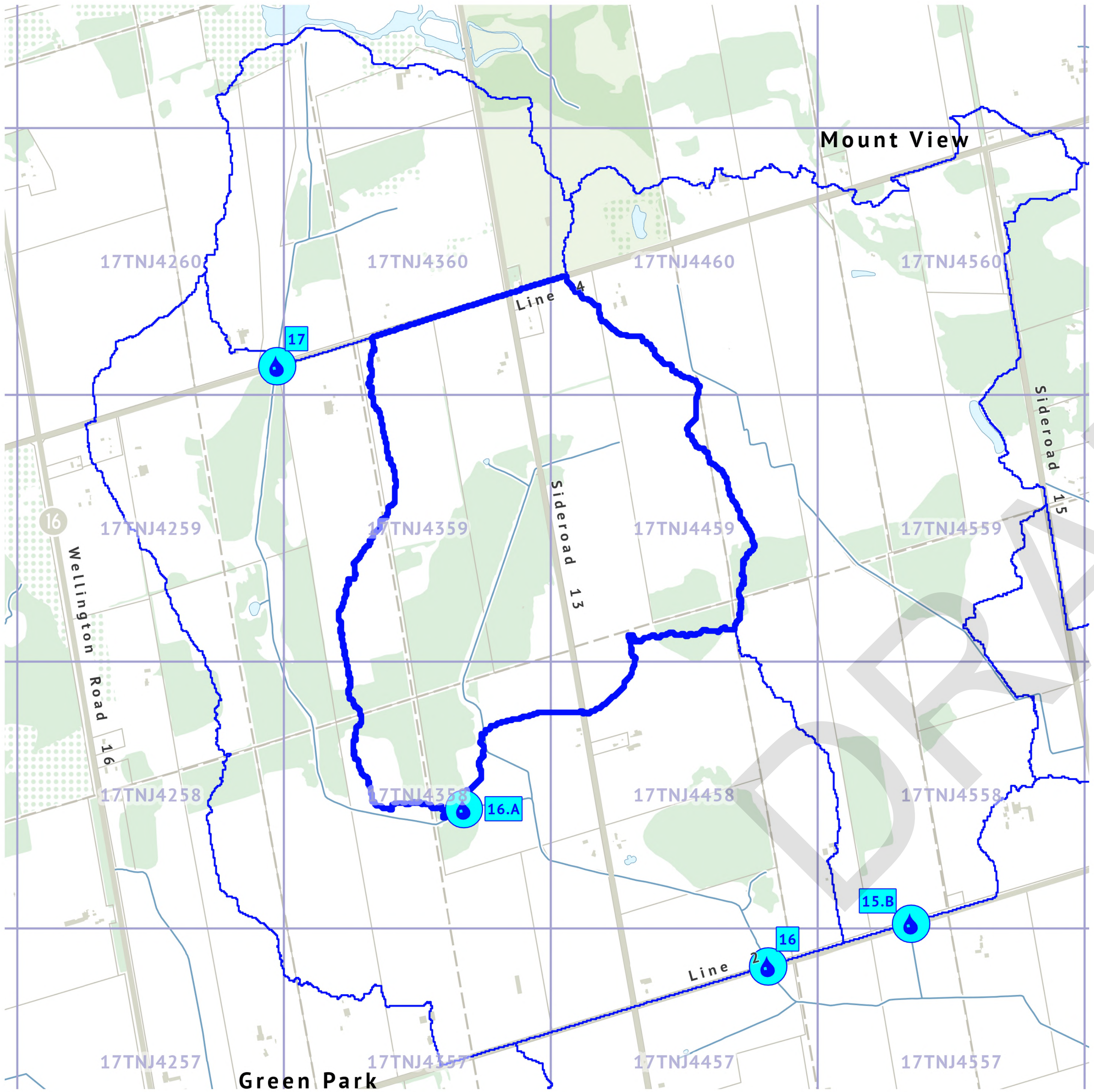
Model Outlet Desc.: Structure Unidentified (2 Line)
Catchment Area: 361.2 ha
Longest Flow Path: 4,771 m
Longest Flow Path Min. Elev: 471.4 m
Longest Flow Path Max. Elev: 492.7 m

Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

BURNSIDE

Catchment: 16

Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG



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Metres

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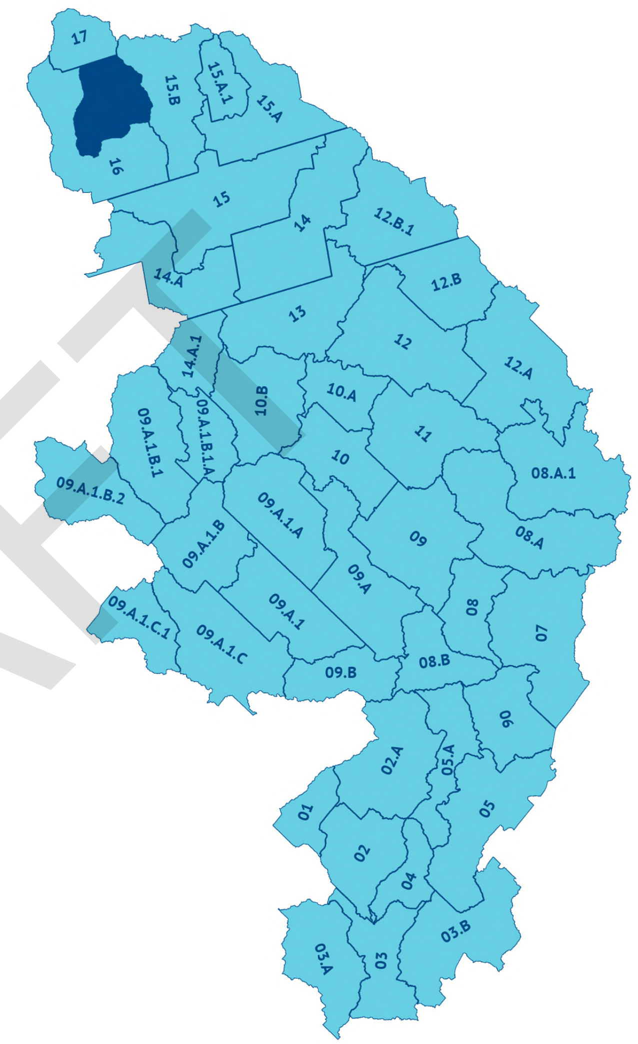
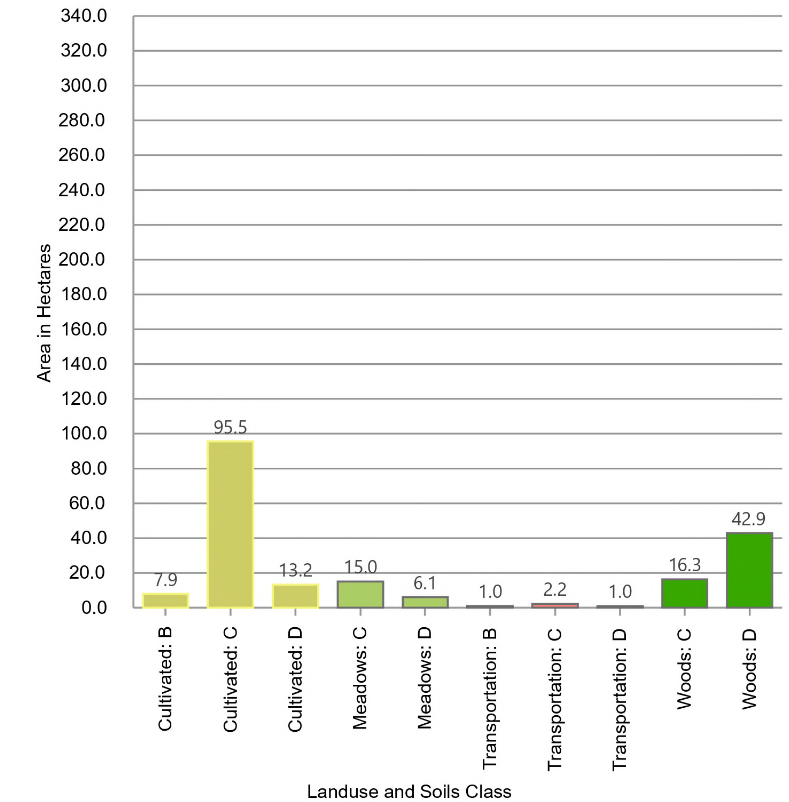
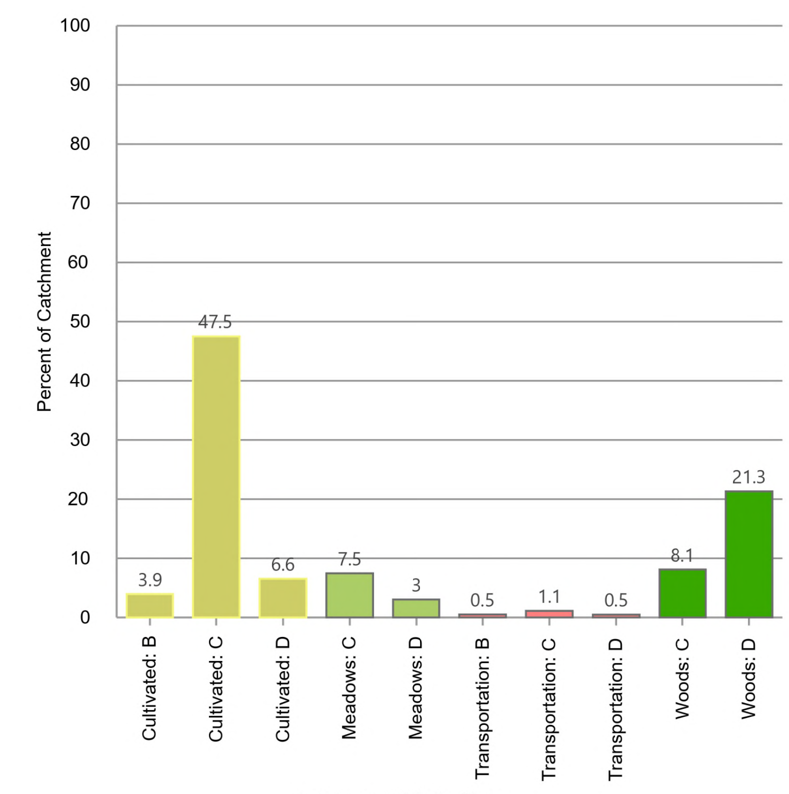


Model Outlet Desc.: Lot 12 Con 3
Catchment Area: 201.1 ha
Longest Flow Path: 3,247 m
Longest Flow Path Min. Elev: 474.3 m
Longest Flow Path Max. Elev: 491.6 m



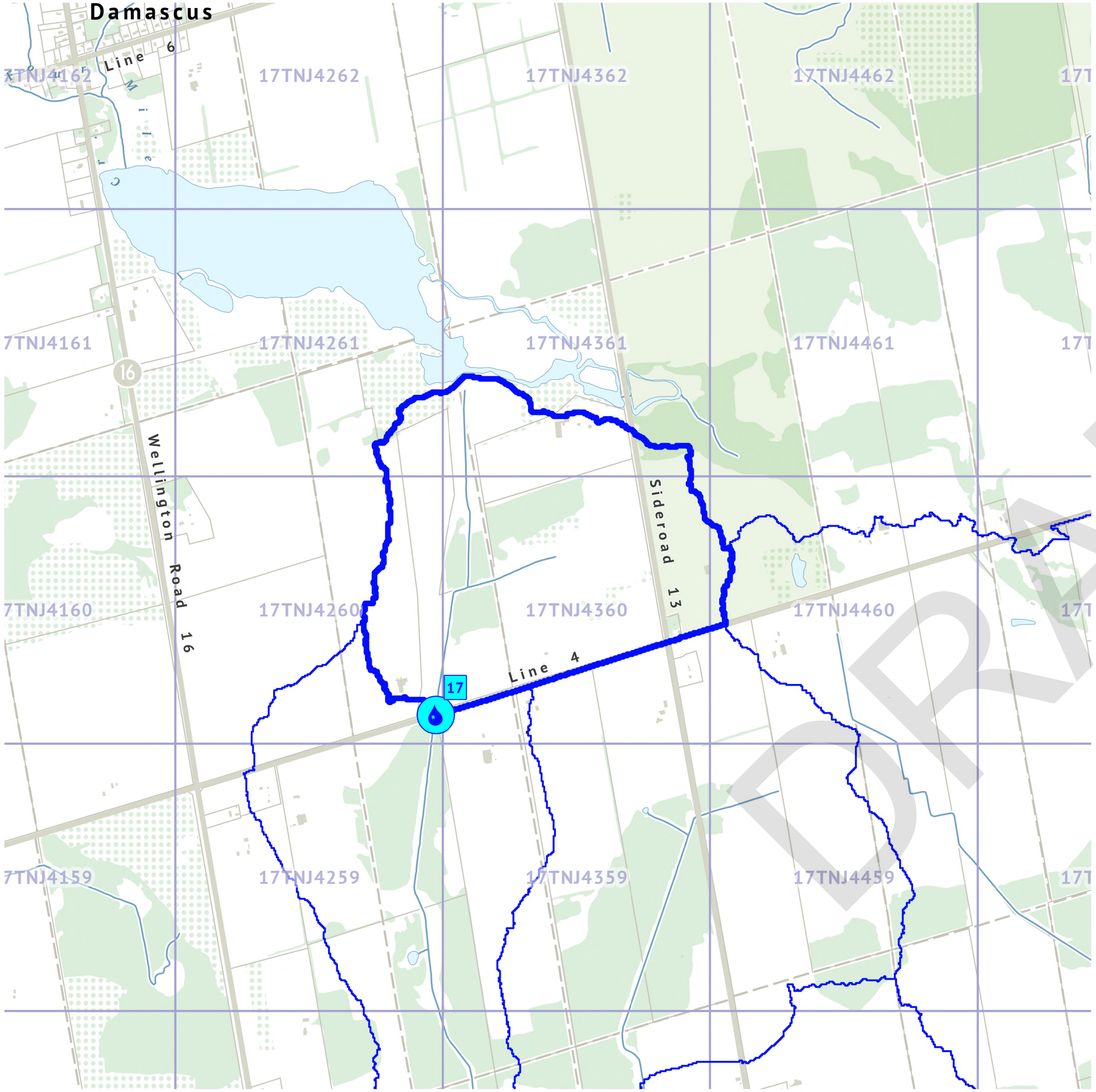


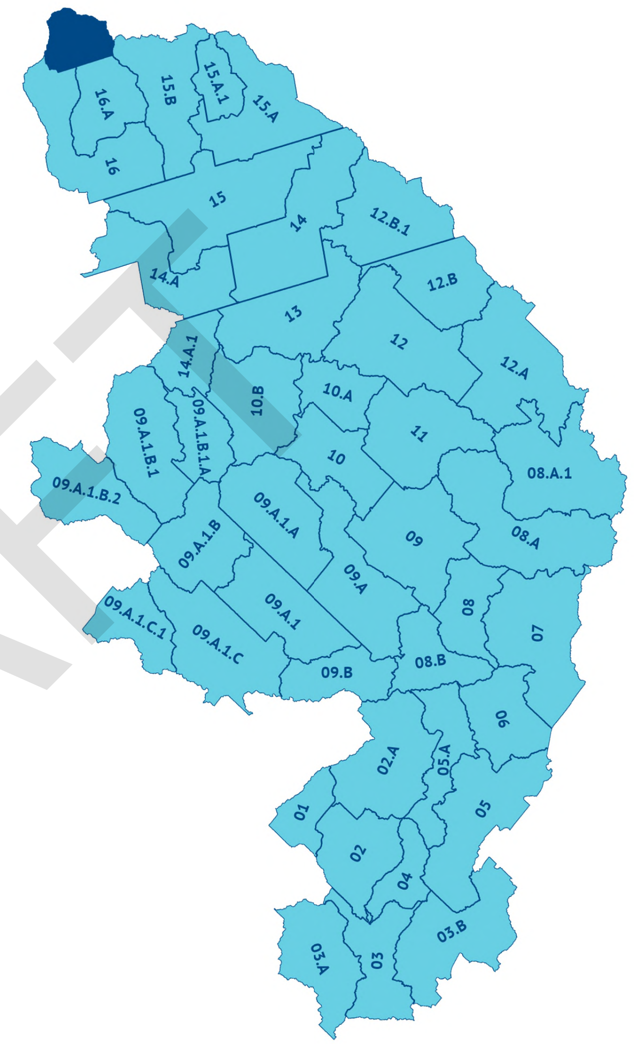
Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10

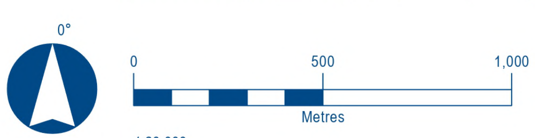
BURNSIDE

Catchment: 16.A

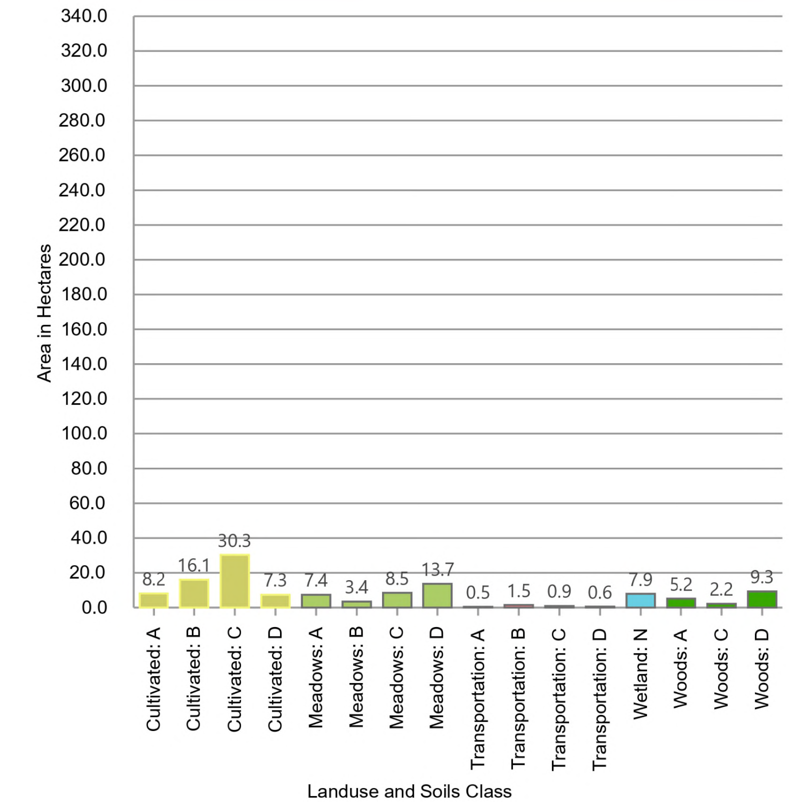
Catchment Summary Sheet
Centre Wellington MCEA for Bridges 21-WG, 29-WG & 30-WG



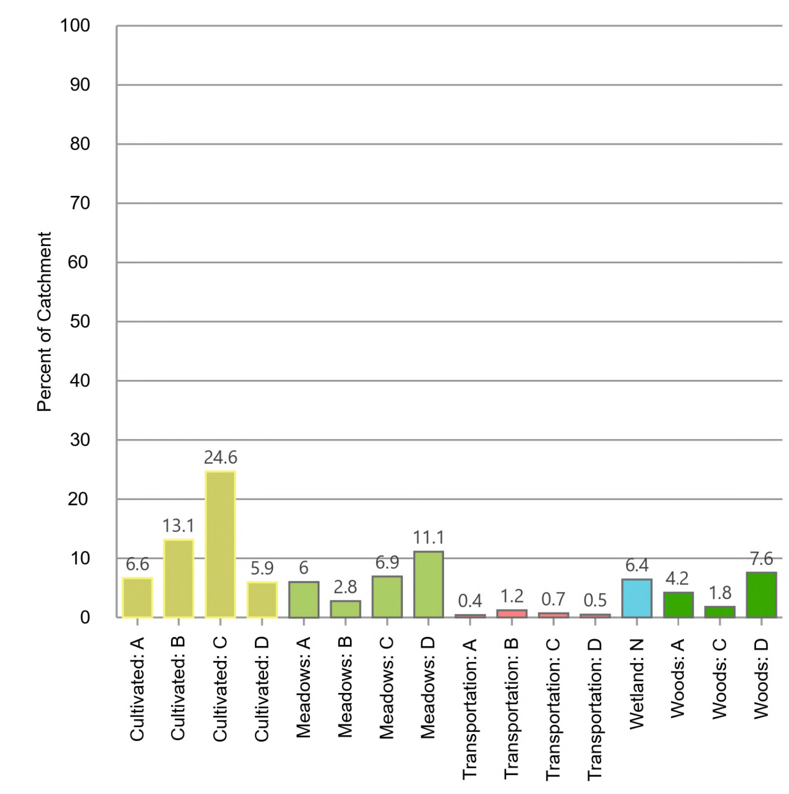




Drawn By: PS
Checked By: JK
Client: Township of Centre Wellington
Project Number: 300059823
Date: 2025/07/10



Model Outlet Desc.: Structure Unidentified (4 Line)
Catchment Area: 123.1 ha
Longest Flow Path: 2,178 m
Longest Flow Path Min. Elev: 478.6 m
Longest Flow Path Max. Elev: 491.6 m



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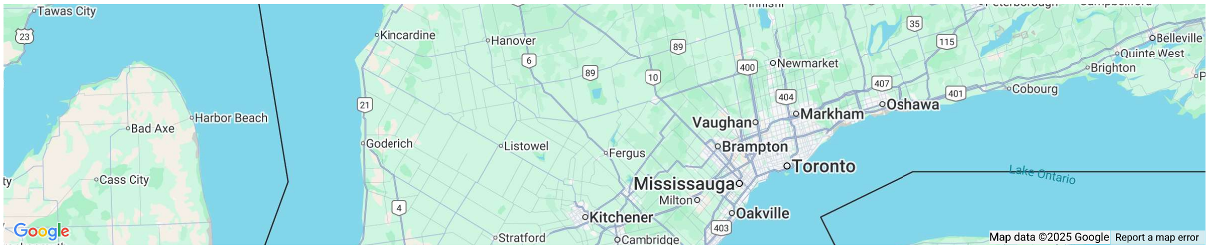
Catchment: 17

Ontario IDF CURVE LOOKUP

Active coordinate

43° 49' 15" N, 80° 23' 15" W (43.820833,-80.387500)

Retrieved: Fri, 08 Aug 2025 16:28:46 GMT



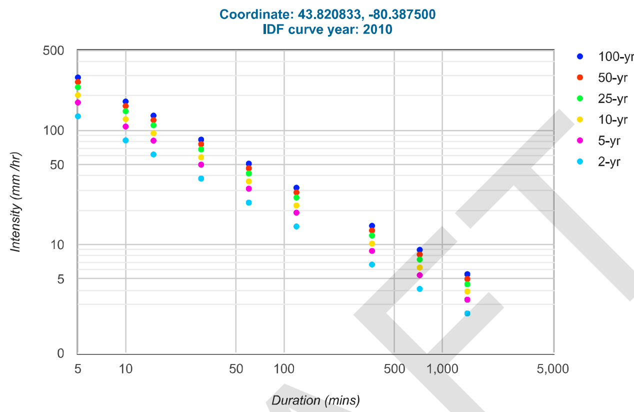
Location summary

These are the locations in the selection.

IDF Curve: 43° 49' 15" N, 80° 23' 15" W (43.820833,-80.387500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 43° 49' 15" N, 80° 23' 15" W (43.820833,-80.387500)

Retrieved: Fri, 08 Aug 2025 16:28:46 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	23.3	30.8	35.7	41.9	46.5	51.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	132.3	81.5	61.4	37.8	23.3	14.4	6.7	4.1	2.5
5-yr	174.9	107.8	81.2	50.0	30.8	19.0	8.8	5.4	3.3
10-yr	202.8	124.9	94.1	58.0	35.7	22.0	10.2	6.3	3.9
25-yr	238.0	146.6	110.4	68.0	41.9	25.8	12.0	7.4	4.5
50-yr	264.1	162.7	122.5	75.5	46.5	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	11.0	13.6	15.4	18.9	23.3	28.7	40.0	49.2	60.6
5-yr	14.6	18.0	20.3	25.0	30.8	37.9	52.8	65.1	80.2
10-yr	16.9	20.8	23.5	29.0	35.7	44.0	61.2	75.4	92.9
25-yr	19.8	24.4	27.6	34.0	41.9	51.6	71.9	88.5	109.1
50-yr	22.0	27.1	30.6	37.7	46.5	57.3	79.7	98.2	121.0
100-yr	24.1	29.7	33.6	41.4	51.0	62.8	87.5	107.7	132.7

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Last Modified: September 2016

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NasHyd - 1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B						
BC						
C	8.143	26.733	82.675		4.012	
CD						
D						

Total area (ha):	121.6	Composite CN(I):	63	Ia (mm) NVCA	7.3
Pervious area (ha):	117.6	Composite CN(II):	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	4.0	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	121.56
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	32.9
Slope (%)	1.33

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	82.34		41.87	62.50		77.05
Tp (hr)	0.92		0.47	0.70		0.86

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	102.47	245.11				77.64
Tp (hr)	1.14	2.74				0.87

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NasHyd - 2**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B		8.318	47.105		1.607	16.807
BC						
C	7.132	30.383	132.325		4.188	
CD						
D						

Total area (ha):	247.9	Composite CN(I):	63	Ia (mm) NVCA	6.7
Pervious area (ha):	225.3	Composite CN(II):	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	22.6	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]32[illegible]33		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]32		30[illegible]3[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]3		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands			[illegible]6[illegible]				
Impervious Area			[illegible]6[illegible]		[illegible]9		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	247.87
Runoff Coefficient	0.36
Length (m)	39[illegible]2
h_1 (m)	[illegible]36[illegible]3
h_2 (m)	[illegible]6[illegible]
Dh (m)	19.9
Slope (%)	0.50

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		191.14	67.69	101.04		164.84
Tp (hr)		2.13	0.76	1.13		1.84

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	190.38	576.15				203.32
Tp (hr)	2.13	6.43				2.27

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NasHyd - 2.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		8.21	9.9		0.722	2.853
AB						
B	43.645	21.078	40.692		2.04	
BC						
C	15.537	14.782	181.935		6.703	
CD						
D	7.445				0.585	

Total area (ha):	356.1	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.5
Pervious area (ha):	343.2	**Composite CN(II):**	75	Ia (mm) NRSCS	16.9
Impervious area (ha):	12.9	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]		[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]		[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	356.13
Runoff Coefficient	0.35
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	44.4
Slope (%)	0.91

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		175.12	69.41	103.61		152.75
Tp (hr)		1.96	0.78	1.16		1.71

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	174.77	585.37				184.63
Tp (hr)	1.95	6.54				2.06

Project Name: □□□r□□ □□□□□□M□□□□r□rd□□□2□□□ □29□□ □□□30□□ □
Project No.: 3000□9□32
Location: □□r□□□
Created By: D□□
Checked By: R□□□□□
Date Created: 30□□□□202□
Date Modified: □9□D□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-03

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A					0.495	14.848
AB						
B	15.365	32.853	92.28		3.595	
BC						
C		19.328	20.505		1.335	
CD						
D	22.497		10.668		1.285	

Total area (ha):	235.1	Composite CN(I):	□□	Ia (mm) NVCA	7.1
Pervious area (ha):	213.5	Composite CN(II):	76	Ia (mm) NRSCS	16.9
Impervious area (ha):	21.6	Composite CN(III):	□□		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			92□2□		20□□□		□0□66□
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			32□□□		□9□33		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			□□3□				22□□9□
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	□□□□□						
Impervious Area	0□□9□		3□60		□3□		□2□□
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	235.05
Runoff Coefficient	0.32
Length (m)	3□□0
h_1 (m)	□30□3
h_2 (m)	□□□3
Dh (m)	12
Slope (%)	0.32

Uplands Method	
Flow Path Cover	□□□r□□r□□□□□□□□r□
x	4.6

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Kerby Method	
Rk =	0□□

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		230.58	72.60	108.37		189.82
Tp (hr)		2.57	0.81	1.21		2.12

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	229.32	801.16				243.07
Tp (hr)	2.56	8.95				2.71

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-03.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						12.145
AB						
B	13.657	17.63	26.795		0.538	
BC						
C	31.975	22.818	54.535		1.54	
CD						
D	73.212	15.115	8.68		0.383	

Total area (ha):	279.0	Composite CN(I):	[illegible]	Ia (mm) NVCA	8.1
Pervious area (ha):	264.4	Composite CN(II):	77	Ia (mm) NRSCS	16.0
Impervious area (ha):	14.6	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]		[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]		[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	279.02
Runoff Coefficient	0.33
Length (m)	3633
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	13.5
Slope (%)	0.37

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		209.34	75.35	112.46		172.87
Tp (hr)		2.34	0.84	1.26		1.93

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	208.30	699.63				215.93
Tp (hr)	2.33	7.81				2.41

Project Name:	□□□r□□ □□□□□□□M□□□□□r□rd□□□2□□□ □□29□□ □□□30□□ □
Project No.:	3000□9□32
Location:	□□r□□□
Created By:	D□□□
Checked By:	R□□□□□□
Date Created:	30□□□□202□
Date Modified:	□9□D□□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-03.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			6.79		0.215	2.01
AB						
B	9.645	75.7	132.37		5.775	
BC						
C		15.473	33.612		1.465	
CD						
D	24.485	16.502	37.082		3.89	

Total area (ha):	365.0	Composite CN(I):	□□	Ia (mm) NVCA	7.4
Pervious area (ha):	351.7	Composite CN(II):	75	Ia (mm) NRSCS	17.8
Impervious area (ha):	13.4	Composite CN(III):	□□		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	6□□9		□32□3□		33□6□		3□□0□2
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			□□□□0		□□□□□		□6□□02
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			9□6□				2□□□□□
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	2□0□						
Impervious Area	0□2□□		□□□□		□□□□		3□□9
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	365.01
Runoff Coefficient	0.35
Length (m)	□6□□
h_1 (m)	□3□□□
h_2 (m)	□2□6
Dh (m)	15.8
Slope (%)	0.34

Uplands Method	
Flow Path Cover	□□□r□□□r□□□□□□□□r□
x	4.6

Kerby Method	
Rk =	0□□

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		241.35	85.49	127.60		218.81
Tp (hr)		2.70	0.95	1.42		2.44

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	240.08	946.36				290.99
Tp (hr)	2.68	10.57				3.25

Project Name:	□□□r□□ □□□□□□M□□□□r□rd□□2□□ □29□ □□30□ □
Project No.:	3000□9□32
Location:	□□r□□□
Created By:	D□□
Checked By:	R□□□□□
Date Created:	30□□□□202□
Date Modified:	□9□D□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-04**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.733
AB						
B	16.717	15.475	66.305		1.522	
BC						
C	7.323	2.447	9.565			
CD						
D						

Total area (ha):	121.1	Composite CN(I):	□2	Ia (mm) NVCA	7.6
Pervious area (ha):	117.8	Composite CN(II):	72	Ia (mm) NRSCS	19.8
Impervious area (ha):	3.3	Composite CN(III):	□6		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			66□3□		9□□□		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			□□□□		2□□□		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			□6□□2		□32		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	□□33						
Impervious Area			□□2				
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	121.09
Runoff Coefficient	0.29
Length (m)	32□2
h_1 (m)	□3□□
h_2 (m)	□□9
Dh (m)	16.7
Slope (%)	0.52

Uplands Method	
Flow Path Cover	□□□r□□r□□□□□□□□r□
x	4.6

Kerby Method	
Rk =	0□□

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		185.67	50.45	75.30		137.36
Tp (hr)		2.07	0.56	0.84		1.53

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	184.96	605.72				161.40
Tp (hr)	2.07	6.76				1.80

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	D[illegible]
Checked By:	R[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-05

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	11.99	23.478	11.82		1.447	32.37
AB						
B	8.1	53.36	62.67		4.19	
BC						
C	27.495	63.002	43.438		1.862	
CD						
D	32.288	11.07			1.755	

Total area (ha):	390.3	Composite CN(I):	[illegible]2	Ia (mm) NVCA	7.3
Pervious area (ha):	348.7	Composite CN(II):	72	Ia (mm) NRSCS	19.8
Impervious area (ha):	41.6	Composite CN(III):	[illegible]6		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]2		62[illegible]6[illegible]		[illegible]3[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	23[illegible]		[illegible]3[illegible]36		63[illegible]00		[illegible]0[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]99		[illegible]0		2[illegible]0		32[illegible]2[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	32[illegible]3[illegible]						
Impervious Area	[illegible]		[illegible]9		[illegible]6		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	390.34
Runoff Coefficient	0.28
Length (m)	[illegible]63[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]2[illegible]2
Dh (m)	24.6
Slope (%)	0.44

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		263.26	83.43	124.53		229.25
Tp (hr)		2.94	0.93	1.39		2.56

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	262.10	1035.82				308.68
Tp (hr)	2.93	11.57				3.45

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-05.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	5.585	30.867	19.005		1.37	15.185
AB						
B	5.333	16.082	25.073		1.383	
BC						
C	8.11	7.6	37.333		1.218	
CD						
D	26.8				0.855	

Total area (ha):	201.8	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.3
Pervious area (ha):	181.8	Composite CN(II):	70	Ia (mm) NRSCS	22.8
Impervious area (ha):	20.0	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]		[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	201.80
Runoff Coefficient	0.27
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	46.2
Slope (%)	0.99

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		185.15	54.43	81.24		143.33
Tp (hr)		2.07	0.61	0.91		1.60

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	184.83	636.67				170.33
Tp (hr)	2.06	7.11				1.90

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-06**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	11.433	48.415	14.917		15.992	9.465
AB						
B	18.155	46.5	36.668		1.502	
BC						
C	12.57	5.25	4.632		0.135	
CD						
D	5.535				0.518	

Total area (ha):	231.7	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.4
Pervious area (ha):	204.1	Composite CN(II):	63	Ia (mm) NRSCS	29.8
Impervious area (ha):	27.6	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]		[illegible]		[illegible]		[illegible]
Gravel	[illegible]						
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	231.69
Runoff Coefficient	0.23
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	36.8
Slope (%)	1.19

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		149.97	55.46	82.78		96.50
Tp (hr)		1.67	0.62	0.92		1.08

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	149.80	494.07				103.24
Tp (hr)	1.67	5.52				1.15

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-07

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		12.933	8.487		6.3	24.165
AB						
B	47.295	39.89	17.825		0.217	
BC						
C	35.978	91.58	127.027		7.183	
CD						
D						

Total area (ha):	418.9	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.4
Pervious area (ha):	381.0	Composite CN(II):	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	37.9	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]		[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]		[illegible]		[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	418.88
Runoff Coefficient	0.32
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	33.3
Slope (%)	0.51

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		259.79	83.36	124.42		245.04
Tp (hr)		2.90	0.93	1.39		2.74

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	258.77	1034.87				335.81
Tp (hr)	2.89	11.56				3.75

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-08**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	7.155	7.057			1.528	12.252
AB						
B		23.725	12.085		1.905	
BC						
C	10.89	46.75	54.805		2.12	
CD						
D	5.005				0.158	

Total area (ha):	185.4	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.2
Pervious area (ha):	167.5	**Composite CN(II):**	74	Ia (mm) NRSCS	17.8
Impervious area (ha):	18.0	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]2[illegible]09		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]0[illegible]		23[illegible]3		[illegible]6[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]				[illegible]0[illegible]9		[illegible]00[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]2[illegible]2[illegible]2						
Impervious Area	[illegible]2[illegible]		[illegible]9[illegible]		2[illegible]2		0[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	185.44
Runoff Coefficient	0.32
Length (m)	3[illegible]03
h_1 (m)	[illegible]62[illegible]6
h_2 (m)	[illegible]3[illegible]6
Dh (m)	25
Slope (%)	0.71

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		168.95	56.16	83.82		129.80
Tp (hr)		1.89	0.63	0.94		1.45

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	168.47	526.65				150.24
Tp (hr)	1.88	5.88				1.68

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-08.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.627
AB						
B						
BC						
C	19.555	135.327	293.59		9.525	
CD						
D						

Total area (ha):	459.6	**Composite CN(I):**	62	Ia (mm) NVCA	7.3
Pervious area (ha):	448.5	**Composite CN(II):**	80	Ia (mm) NRSCS	13.5
Impervious area (ha):	11.2	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area					[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	459.62
Runoff Coefficient	0.39
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	26.3
Slope (%)	0.68

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		163.49	81.56	121.74		143.48
Tp (hr)		1.83	0.91	1.36		1.60

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	163.01	499.20				170.55
Tp (hr)	1.82	5.57				1.90

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-08.A.1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						0.015
AB						
B		9.398	107.66		1.297	
BC						
C	10.12	54.19	209.363		9.027	
CD						
D						

Total area (ha):	401.1	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.1
Pervious area (ha):	390.7	Composite CN(II):	79	Ia (mm) NRSCS	14.3
Impervious area (ha):	10.3	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	401.07
Runoff Coefficient	0.38
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	17.6
Slope (%)	0.47

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		183.68	83.00	123.89		160.00
Tp (hr)		2.05	0.93	1.38		1.79

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	182.92	589.06				195.79
Tp (hr)	2.04	6.58				2.19

Project Name: [illegible]
Project No.: [illegible]
Location: [illegible]
Created By: [illegible]
Checked By: [illegible]
Date Created: [illegible]
Date Modified: [illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-08.B

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						2.237
AB						
B	8.91	12.32	61.062		2.817	
BC						
C	6.113	7.97	42.733		1.038	
CD						
D	38.038		4.68		0.968	

Total area (ha):	188.9	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.7
Pervious area (ha):	181.8	Composite CN(II):	77	Ia (mm) NRSCS	16.0
Impervious area (ha):	7.1	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]		[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	188.89
Runoff Coefficient	0.35
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	29.8
Slope (%)	1.24

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		112.13	50.69	75.66		77.82
Tp (hr)		1.25	0.57	0.84		0.87

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	112.02	276.95				78.62
Tp (hr)	1.25	3.09				0.88

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A					0.107	0.855
AB						
B						
BC						
C	25.478	64.902	277.395		8.572	
CD						
D					1.095	

Total area (ha):	378.4	Composite CN(I):	63	Ia (mm) NVCA	7.2
Pervious area (ha):	367.8	Composite CN(II):	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	10.6	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]				[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	378.40
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	30.4
Slope (%)	0.47

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	237.84		81.26	121.29		249.54
Tp (hr)	2.66		0.91	1.35		2.79

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	234.38	885.82				343.65
Tp (hr)	2.62	9.89				3.84

Project Name:	□□□r□□ □□□□□□M□□□□□r□r d□□□2□□□ □□29□□ □□□30□□ □
Project No.:	3000□9□32
Location:	□□r□□□
Created By:	D□□□
Checked By:	R□□□□□□
Date Created:	30□□□□202□
Date Modified:	□9□D□□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A					0.185	2.118
AB						
B						
BC						
C	19.67	92.635	222.057		7.62	
CD						
D			16.282		1.415	

Total area (ha):	362.0	**Composite CN(I):**	63	Ia (mm) NVCA	7.3
Pervious area (ha):	350.6	**Composite CN(II):**	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	11.3	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					222□06		□6□2□2
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					92□6□		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					□9□6□		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	2□□□□						
Impervious Area	0□□□□				□62		□□□□□
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	361.98
Runoff Coefficient	0.40
Length (m)	□909
h_1 (m)	□□□□□
h_2 (m)	□□2
Dh (m)	32.7
Slope (%)	0.67

Uplands Method	
Flow Path Cover	□□□r□□r□□□□□□□□r□
x	4.6

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Kerby Method	
Rk =	0□□

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	168.38		74.40	111.05		174.13
Tp (hr)	1.88		0.83	1.24		1.94

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	181.96	599.50				217.92
Tp (hr)	2.03	6.69				2.43

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-09.A.1

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.33
AB						
B						
BC						
C		32.408	225.25		5.832	
CD						
D	12.622	13.533	19.415		0.325	

Total area (ha):	310.7	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.1
Pervious area (ha):	303.2	Composite CN(II):	82	Ia (mm) NRSCS	11.9
Impervious area (ha):	7.5	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area					[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	310.72
Runoff Coefficient	0.42
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	11.7
Slope (%)	0.42

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	105.13		76.61	114.34		131.97
Tp (hr)	1.17		0.86	1.28		1.47

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	154.13	452.02				153.42
Tp (hr)	1.72	5.05				1.71

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		9.7	18.53		1.002	0.74
AB						
B						
BC						
C		43.05	252.345		5.158	
CD						
D			14.4		0.99	

Total area (ha):	345.9	**Composite CN(I):**	62	Ia (mm) NVCA	7.0
Pervious area (ha):	338.0	**Composite CN(II):**	79	Ia (mm) NRSCS	13.5
Impervious area (ha):	7.9	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]				[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]				[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]				[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	345.92
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	35.6
Slope (%)	1.13

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	97.61		65.73	98.11		99.50
Tp (hr)	1.09		0.73	1.10		1.11

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	122.59	328.38				107.31
Tp (hr)	1.37	3.67				1.20

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B						
BC						
C		35.487	225.018		6.067	
CD						
D					0.11	

Total area (ha):	266.7	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.0
Pervious area (ha):	260.5	**Composite CN(II):**	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	6.2	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	266.68
Runoff Coefficient	0.42
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	16.9
Slope (%)	0.67

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	89.04		65.76	98.15		102.60
Tp (hr)	0.99		0.73	1.10		1.15

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	127.51	336.95				111.56
Tp (hr)	1.42	3.76				1.25

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.B.1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.778
AB						
B						
BC						
C		50.708	189.905		9.753	
CD						
D	6.585	19.482	73.835		2.458	

Total area (ha):	354.5	Composite CN(I):	66	Ia (mm) NVCA	7.0
Pervious area (ha):	340.5	Composite CN(II):	82	Ia (mm) NRSCS	11.2
Impervious area (ha):	14.0	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area					[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	354.50
Runoff Coefficient	0.44
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	17.6
Slope (%)	0.42

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	159.56		81.05	120.98		186.23
Tp (hr)	1.78		0.91	1.35		2.08

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	185.03	629.31				237.26
Tp (hr)	2.07	7.03				2.65

Project Name:	[illegible]
Project No.:	3000□9□32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30□□□202□
Date Modified:	□9□D□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.B.1.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B						
BC						
C		69.728	75.332		4.362	
CD						
D		7.237	8.095		0.985	

Total area (ha):	**165.7**	**Composite CN(I):**	62	**Ia (mm) NVCA**	**7.3**
Pervious area (ha):	**160.4**	**Composite CN(II):**	**79**	**Ia (mm) NRSCS**	**13.5**
Impervious area (ha):	**5.3**	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					□□33		□09□
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					69□□2□		□23□
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					□36		0□9□□
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	165.74
Runoff Coefficient	0.40
Length (m)	26□2
h_1 (m)	[illegible]
h_2 (m)	□6□□
Dh (m)	6.4
Slope (%)	0.24

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0□□

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		190.80	66.84	99.77		162.02
Tp (hr)		2.13	0.75	1.11		1.81

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	189.58	632.88				198.92
Tp (hr)	2.12	7.07				2.22

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.B.2**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						4.41
AB						
B						
BC						
C	6.233	38.175	196.685		5.075	
CD						
D	17.152	5.857	13.13		1.433	

Total area (ha):	288.2	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.2
Pervious area (ha):	277.2	**Composite CN(II):**	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	10.9	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area	[illegible]				[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	288.15
Runoff Coefficient	0.42
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	17.7
Slope (%)	0.40

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	170.98		75.14	112.15		195.12
Tp (hr)	1.91		0.84	1.25		2.18

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	197.54	682.64				251.70
Tp (hr)	2.21	7.62				2.81

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	D[illegible]
Checked By:	R[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.A.1.C**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						5.805
AB						
B						
BC						
C	32.435	110.595	208.522		8.505	
CD						
D	23.345	10.96			2.128	

Total area (ha):	402.3	**Composite CN(I):**	62	Ia (mm) NVCA	7.5
Pervious area (ha):	385.9	**Composite CN(II):**	79	Ia (mm) NRSCS	13.5
Impervious area (ha):	16.4	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					20[illegible]2		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]0[illegible]9[illegible]		[illegible]0[illegible]96
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					32[illegible]		23[illegible]3[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]0[illegible]						
Impervious Area					[illegible]		2[illegible]2[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	402.30
Runoff Coefficient	0.38
Length (m)	306[illegible]
h_1 (m)	[illegible]6[illegible]3
h_2 (m)	[illegible]0[illegible]
Dh (m)	10.9
Slope (%)	0.36

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		182.43	87.99	131.34		153.79
Tp (hr)		2.04	0.98	1.47		1.72

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	181.50	576.96				186.22
Tp (hr)	2.03	6.44				2.08

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-09.A.1.C.1

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B						
BC						
C	6.032	55.64	119.342		4.428	
CD						
D						

Total area (ha):	185.4	Composite CN(I):	62	Ia (mm) NVCA	7.3
Pervious area (ha):	181.0	Composite CN(II):	80	Ia (mm) NRSCS	13.5
Impervious area (ha):	4.4	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	185.44
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	9.6
Slope (%)	0.32

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		185.95	66.12	98.69		160.33
Tp (hr)		2.08	0.74	1.10		1.79

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	184.93	602.09				196.29
Tp (hr)	2.07	6.72				2.19

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-09.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						6.612
AB						
B			18.03			
BC						
C	13.172	46.842	69.083		2.697	
CD						
D	7.853	15.625	5.965		0.565	

Total area (ha):	186.4	Composite CN(I):	62	Ia (mm) NVCA	7.3
Pervious area (ha):	176.6	Composite CN(II):	79	Ia (mm) NRSCS	13.5
Impervious area (ha):	9.9	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							[illegible]
Impervious Area					[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	186.44
Runoff Coefficient	0.37
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	12.2
Slope (%)	0.42

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		170.45	62.48	93.25		136.75
Tp (hr)		1.90	0.70	1.04		1.53

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	169.67	502.66				160.49
Tp (hr)	1.89	5.61				1.79

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-10**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			5.417			0.27
AB						
B						
BC						
C	9.07	43.552	139.42		2.11	
CD						
D	17.123	6.43	12.98		0.212	

Total area (ha):	236.6	**Composite CN(I):**	62	Ia (mm) NVCA	7.5
Pervious area (ha):	234.0	**Composite CN(II):**	80	Ia (mm) NRSCS	13.5
Impervious area (ha):	2.6	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]				[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area					[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	236.58
Runoff Coefficient	0.40
Length (m)	3966
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	32.6
Slope (%)	0.82

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		154.27	60.18	89.82		135.40
Tp (hr)		1.72	0.67	1.00		1.51

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	153.91	459.69				158.49
Tp (hr)	1.72	5.13				1.77

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-10.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B						
BC						
C		5.108	143.315		1.502	
CD						
D			12.54		1.208	

Total area (ha):	**163.7**	**Composite CN(I):**	66	**Ia (mm) NVCA**	**6.9**
Pervious area (ha):	**161.0**	**Composite CN(II):**	**82**	**Ia (mm) NRSCS**	**11.2**
Impervious area (ha):	**2.7**	**Composite CN(III):**	9[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]3[illegible]32		[illegible]2[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]0[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					[illegible]0		[illegible]20[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	163.67
Runoff Coefficient	0.43
Length (m)	2[illegible]66
h_1 (m)	[illegible]3[illegible]9
h_2 (m)	[illegible]9
Dh (m)	14.9
Slope (%)	0.69

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Kerby Method	
Rk =	0[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	79.92		53.82	80.33		90.08
Tp (hr)	0.89		0.60	0.90		1.01

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	114.35	285.04				94.62
Tp (hr)	1.28	3.18				1.06

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-10.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		5.628	9.077		0.482	4.388
AB						
B						
BC						
C		37.182	174.565		7.105	
CD						
D	0.293	20.012	50.438		2.435	

Total area (ha):	311.6	Composite CN(I):	[illegible]	Ia (mm) NVCA	6.9
Pervious area (ha):	297.2	Composite CN(II):	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	14.4	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]				[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]				[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]				[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	311.61
Runoff Coefficient	0.43
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	8.7
Slope (%)	0.27

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	131.74		83.67	124.88		174.89
Tp (hr)	1.47		0.93	1.39		1.95

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	189.14	636.76				219.14
Tp (hr)	2.11	7.11				2.45

Project Name: [illegible]
Project No.: [illegible]
Location: [illegible]
Created By: [illegible]
Checked By: [illegible]
Date Created: [illegible]
Date Modified: [illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: NASHYD-11

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B			12.085			
BC						
C	22.343	64.612	233.26		9.905	
CD						
D						

Total area (ha):	342.2	Composite CN(I):	63	Ia (mm) NVCA	7.2
Pervious area (ha):	332.3	Composite CN(II):	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	9.9	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area					[illegible]		
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	342.21
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	26
Slope (%)	0.49

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	194.48		77.35	115.45		208.90
Tp (hr)	2.17		0.86	1.29		2.33

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	209.51	743.89				274.40
Tp (hr)	2.34	8.31				3.06

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-12**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B		10.255	14.395		0.975	
BC						
C	9.575	18.615	224.14		6.262	
CD						
D	8.463	17.04	123.697		3.062	

Total area (ha):	**436.5**	**Composite CN(I):**	66	**Ia (mm) NVCA**	**7.1**
Pervious area (ha):	**426.2**	**Composite CN(II):**	**82**	**Ia (mm) NRSCS**	**11.2**
Impervious area (ha):	**10.3**	**Composite CN(III):**	9[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]		[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area			0.9[illegible]		6.26		3.062
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	436.48
Runoff Coefficient	0.45
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	11.1
Slope (%)	0.26

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	174.15		96.85	144.56		226.99
Tp (hr)	1.94		1.08	1.61		2.53

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	216.23	808.06				304.83
Tp (hr)	2.41	9.02				3.40

Project Name:	□□□r□□ □□□□□□□M□□□□□r□rd□□□2□□□ □29□□ □□□30□□ □
Project No.:	3000□9□32
Location:	□□r□□□
Created By:	D□□
Checked By:	R□□□□□
Date Created:	30□□□□202□
Date Modified:	□9□D□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-12.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.89
AB						
B			29.715		0.458	
BC						
C		33.995	333.577		8.513	
CD						
D	11.43		18		1.983	

Total area (ha):	439.6	**Composite CN(I):**	6□	Ia (mm) NVCA	7.0
Pervious area (ha):	426.7	**Composite CN(II):**	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	12.8	**Composite CN(III):**	9□		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			29□□2		333□□□		□□
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					33□99□		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							□□□□3
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	□□□9						
Impervious Area			0□□6		□□□□		□9□3
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	439.56
Runoff Coefficient	0.42
Length (m)	3□□□
h_1 (m)	□□□□□
h_2 (m)	□66□6
Dh (m)	8.2
Slope (%)	0.23

Uplands Method	
Flow Path Cover	□□□r□□□r□□□□□□□□r□
x	4.6

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Kerby Method	
Rk =	0□□

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	149.45		99.59	148.65		207.35
Tp (hr)	1.67		1.11	1.66		2.32

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	216.59	760.67				271.82
Tp (hr)	2.42	8.49				3.04

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-12.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						0.945
AB						
B					1.34	
BC						
C		14.335	133.95		4.867	
CD						
D	33.52	17.553	53.465		0.302	

Total area (ha):	260.3	Composite CN(I):	66	Ia (mm) NVCA	7.4
Pervious area (ha):	252.8	Composite CN(II):	82	Ia (mm) NRSCS	11.2
Impervious area (ha):	7.5	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

DRAFT

Time of Concentration Input Parameters	
Total Area (ha)	260.28
Runoff Coefficient	0.44
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	8.3
Slope (%)	0.26

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	134.48		78.50	117.17		176.98
Tp (hr)	1.50		0.88	1.31		1.98

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	186.97	626.90				222.45
Tp (hr)	2.09	7.00				2.48

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	30 [illegible] 202[illegible]
Date Modified:	[illegible] 202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-12.B.1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						0.765
AB						
B	16.133	22.19	77.017		1.298	
BC						
C	8.27	29.4	179.755		4.218	
CD						
D					0.19	

Total area (ha):	339.2	**Composite CN(I):**	[illegible]9	Ia (mm) NVCA	7.3
Pervious area (ha):	332.8	**Composite CN(II):**	77	Ia (mm) NRSCS	15.2
Impervious area (ha):	6.5	**Composite CN(III):**	[illegible]9		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]02		[illegible]9[illegible]6		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			22[illegible]9		29[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]6[illegible]3		[illegible]2[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	0[illegible]6[illegible]						
Impervious Area			[illegible]30		[illegible]22		0[illegible]9
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	339.24
Runoff Coefficient	0.36
Length (m)	[illegible]660
h_1 (m)	[illegible]2
h_2 (m)	[illegible]69[illegible]2
Dh (m)	12.8
Slope (%)	0.27

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		251.71	86.55	129.18		237.13
Tp (hr)		2.81	0.97	1.44		2.65

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	250.21	968.82				322.15
Tp (hr)	2.79	10.82				3.60

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	D[illegible]
Checked By:	R[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-13**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha) Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						12.218
AB						
B		15.037	34.315		3.028	
BC						
C		13.26	199.605		4.953	
CD						
D	8.82	35.243	25.19		3.858	

Total area (ha):	355.5	**Composite CN(I):**	6[illegible]	Ia (mm) NVCA	6.8
Pervious area (ha):	331.5	**Composite CN(II):**	81	Ia (mm) NRSCS	11.9
Impervious area (ha):	24.1	**Composite CN(III):**	9[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			3[illegible]32		[illegible]99[illegible]6[illegible]		2[illegible]9
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]0[illegible]		[illegible]3[illegible]26		3[illegible]2[illegible]3
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							[illegible]2
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]2[illegible]2[illegible]						
Impervious Area			3[illegible]03		[illegible]9[illegible]		3[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	355.53
Runoff Coefficient	0.41
Length (m)	36[illegible]
h_1 (m)	[illegible]3[illegible]
h_2 (m)	[illegible]6[illegible]
Dh (m)	9.4
Slope (%)	0.25

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	0[illegible]

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	153.57		89.52	133.61		203.03
Tp (hr)	1.71		1.00	1.49		2.27

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	215.53	739.87				264.68
Tp (hr)	2.41	8.26				2.96

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-14**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						0.99
AB						
B		9.433	100.902		2.335	
BC						
C		16.045	234.557		4.618	
CD						
D		18.958	48.1		1.472	

Total area (ha):	437.4	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.0
Pervious area (ha):	428.0	**Composite CN(II):**	81	Ia (mm) NRSCS	12.7
Impervious area (ha):	9.4	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope			[illegible]		[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	437.41
Runoff Coefficient	0.41
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	22
Slope (%)	0.45

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	179.33		86.92	129.73		204.18
Tp (hr)	2.00		0.97	1.45		2.28

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	206.36	721.05				266.58
Tp (hr)	2.30	8.05				2.98

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	D[illegible]
Checked By:	R[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-14.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						5.29
AB						
B						
BC						
C	7.703	45	232.71		5.095	
CD						
D	20.31				0.172	

Total area (ha):	316.3	**Composite CN(I):**	6[illegible]	Ia (mm) NVCA	7.2
Pervious area (ha):	305.7	**Composite CN(II):**	81	Ia (mm) NRSCS	12.7
Impervious area (ha):	10.6	**Composite CN(III):**	9[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					232[illegible]		
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]0		20[illegible]3[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]29						
Impervious Area					[illegible]0		0[illegible]2
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	316.28
Runoff Coefficient	0.40
Length (m)	[illegible]20
h_1 (m)	[illegible]
h_2 (m)	[illegible]66[illegible]
Dh (m)	15
Slope (%)	0.33

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Kerby Method	
Rk =	0[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		222.18	81.03	120.95		214.82
Tp (hr)		2.48	0.90	1.35		2.40

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	221.00	775.45				284.28
Tp (hr)	2.47	8.66				3.17

Project Name:	□□□r□□ □□□□□□□M□□□□□r□□r□d□□□2□□□ □□29□□ □□□30□□ □
Project No.:	3000□9□32
Location:	□□r□□□
Created By:	D□□□
Checked By:	R□□□□□□
Date Created:	30□□□□202□
Date Modified:	□9□D□□□202□

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-14.A.1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						7.853
AB						
B						
BC						
C		41.955	40.898		15.338	
CD						
D		23.465	25.763		1.942	

Total area (ha):	157.2	**Composite CN(I):**	6□	Ia (mm) NVCA	6.5
Pervious area (ha):	132.1	**Composite CN(II):**	83	Ia (mm) NRSCS	11.2
Impervious area (ha):	25.1	**Composite CN(III):**	92		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope					□0□90		2□□□63
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					□□9□□		23□6□
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope							
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	□□□□3						
Impervious Area					□□3□		□9□2
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	157.21
Runoff Coefficient	0.45
Length (m)	2□29
h_1 (m)	□□2□9
h_2 (m)	□6□2
Dh (m)	4.7
Slope (%)	0.19

Uplands Method	
Flow Path Cover	□□□r□□r□□□□□□□□r□
x	4.6

Kerby Method	
Rk =	0□□

Kinematic Wave/Izzard Method	
cr =	0□0□
n =	0□0□
i (mm/hr) =	2□0

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	115.96		68.25	101.87		162.76
Tp (hr)	1.29		0.76	1.14		1.82

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	179.12	578.29				200.07
Tp (hr)	2.00	6.46				2.23

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-15**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.868
AB						
B			65.783		0.69	
BC						
C	17.442	74.84	267.427		8.45	
CD						
D			54.363		0.703	

Total area (ha):	491.6	**Composite CN(I):**	63	Ia (mm) NVCA	7.1
Pervious area (ha):	479.9	**Composite CN(II):**	80	Ia (mm) NRSCS	12.7
Impervious area (ha):	11.7	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	491.57
Runoff Coefficient	0.41
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	13.7
Slope (%)	0.36

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)	143.56		95.15	142.02		182.06
Tp (hr)	1.60		1.06	1.59		2.03

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	195.41	659.38				230.57
Tp (hr)	2.18	7.36				2.57

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-15.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		10.172	34.155			4.838
AB						
B	7.323	13.683	120.897		2.198	
BC						
C		9.25	107.87		5.538	
CD						
D	8.672		15.78		0.632	

Total area (ha):	341.0	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.0
Pervious area (ha):	327.8	Composite CN(II):	76	Ia (mm) NRSCS	16.0
Impervious area (ha):	13.2	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope			[illegible]				[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	341.01
Runoff Coefficient	0.35
Length (m)	3600
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	29.1
Slope (%)	0.81

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		158.41	69.89	104.32		126.26
Tp (hr)		1.77	0.78	1.16		1.41

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	158.03	478.11				145.08
Tp (hr)	1.76	5.34				1.62

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-15.A.1**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	18.103	9.225	7.13		0.73	
AB						
B			4.403			
BC						
C			15.4		0.892	
CD						
D	29.59	7.422	18.893		0.955	

Total area (ha):	112.7	Composite CN(I):	[illegible]	Ia (mm) NVCA	8.3
Pervious area (ha):	110.2	Composite CN(II):	68	Ia (mm) NRSCS	23.9
Impervious area (ha):	2.6	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]						[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]						[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area	[illegible]				[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	112.74
Runoff Coefficient	0.34
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	18.9
Slope (%)	0.69

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		146.72	46.27	69.07		107.46
Tp (hr)		1.64	0.52	0.77		1.20

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	146.29	509.80				118.29
Tp (hr)	1.63	5.69				1.32

DRAFT

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
Created By:	D[illegible]
Checked By:	R[illegible]
Date Created:	30[illegible]202[illegible]
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-15.B**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	6.295	12.615			0.812	0.99
AB						
B	6.015	18.402	32.55		3.26	
BC						
C	13.265	22.903	158.693		1.015	
CD						
D	17.56		11.815		0.08	

Total area (ha):	306.3	**Composite CN(I):**	[illegible]	Ia (mm) NVCA	7.5
Pervious area (ha):	300.1	**Composite CN(II):**	76	Ia (mm) NRSCS	16.9
Impervious area (ha):	6.2	**Composite CN(III):**	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			32[illegible]		[illegible]69		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]2[illegible]6[illegible]		[illegible]0		22[illegible]903		
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	6[illegible]29[illegible]		6[illegible]02		[illegible]3[illegible]2[illegible]		[illegible]6
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	0[illegible]99						
Impervious Area	0[illegible]2		3[illegible]26		[illegible]02		0[illegible]0[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	306.27
Runoff Coefficient	0.36
Length (m)	[illegible]
h_1 (m)	[illegible]93[illegible]9
h_2 (m)	[illegible]
Dh (m)	22.2
Slope (%)	0.46

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	0[illegible]0[illegible]
n =	0[illegible]0[illegible]
i (mm/hr) =	2[illegible]0

Kerby Method	
Rk =	0[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		214.11	74.81	111.67		196.85
Tp (hr)		2.39	0.84	1.25		2.20

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	213.21	797.24				254.53
Tp (hr)	2.38	8.90				2.84

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-16**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						1.327
AB						
B			22.97		0.537	
BC						
C	15.872	72.403	124.885		4.233	
CD						
D	42.335	32.165	43.36		1.137	

Total area (ha):	361.2	Composite CN(I):	62	Ia (mm) NVCA	7.7
Pervious area (ha):	354.0	Composite CN(II):	80	Ia (mm) NRSCS	13.5
Impervious area (ha):	7.2	Composite CN(III):	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	361.22
Runoff Coefficient	0.40
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	21.3
Slope (%)	0.45

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		206.67	80.54	120.21		199.41
Tp (hr)		2.31	0.90	1.34		2.23

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	205.77	726.38				258.71
Tp (hr)	2.30	8.11				2.89

Project Name:	[illegible]	
Project No.:	3000[illegible]9[illegible]32	
Location:	[illegible]	
Created By:	D[illegible]	
Checked By:	R[illegible]	
Date Created:	30[illegible]202[illegible]	
Date Modified:	[illegible]9[illegible]D[illegible]202[illegible]	

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-16.A**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A						
AB						
B			7.935		1.01	
BC						
C	16.31	15.01	95.525		2.22	
CD						
D	42.85	6.112	13.19		0.967	

Total area (ha):	**201.1**	**Composite CN(I):**	62	**Ia (mm) NVCA**	**7.9**
Pervious area (ha):	**196.9**	**Composite CN(II):**	**80**	**Ia (mm) NRSCS**	**13.5**
Impervious area (ha):	**4.2**	**Composite CN(III):**	90		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope			[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope					[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope					[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands							
Impervious Area			[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	201.13
Runoff Coefficient	0.40
Length (m)	32[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	17.3
Slope (%)	0.53

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kerby Method	
Rk =	[illegible]

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		160.52	61.50	91.80		137.21
Tp (hr)		1.79	0.69	1.03		1.53

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	159.91	486.17				161.17
Tp (hr)	1.79	5.43				1.80

Project Name:	[illegible]
Project No.:	[illegible]
Location:	[illegible]
Created By:	[illegible]
Checked By:	[illegible]
Date Created:	[illegible]
Date Modified:	[illegible]

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SWMHYMO NASHYD Hydrologic Modeling Parameters - Rural Land Use

CATCHMENT: **NASHYD-17**

Composite Curve Number and Initial Abstraction

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A	5.178	7.385	8.18		0.515	7.92
AB						
B		3.42	16.133		1.493	
BC						
C	2.217	8.545	30.345		0.87	
CD						
D	9.33	13.695	7.305		0.59	

Total area (ha):	123.1	Composite CN(I):	[illegible]	Ia (mm) NVCA	7.1
Pervious area (ha):	111.7	Composite CN(II):	75	Ia (mm) NRSCS	16.9
Impervious area (ha):	11.4	Composite CN(III):	[illegible]		

Composite Runoff Coefficient

Land Type	Hydrologic Soil Groups						
	A	AB	B	BC	C	CD	D
Cultivated, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Cultivated, 5-10% slope							
Cultivated, 10-30% slope							
Pasture, 0-5% slope	[illegible]		[illegible]		[illegible]		[illegible]
Pasture, 5-10% slope							
Pasture, 10-30% slope							
Woodlot or Cutover, 0-5% slope	[illegible]				[illegible]		[illegible]
Woodlot or Cutover, 5-10% slope							
Woodlot or Cutover, 10-30% slope							
Lakes and Wetlands	[illegible]						
Impervious Area	[illegible]		[illegible]		[illegible]		[illegible]
Gravel							
Residential- Single Family							
Residential - Multiple							
Industrial-Light							
Industrial-Heavy							
Commercial							
Unimproved Areas							
Lawn, <2% slope							
Lawn, 2-7% slope							
Lawn, >7% slope							

Time of Concentration Input Parameters	
Total Area (ha)	123.12
Runoff Coefficient	0.33
Length (m)	[illegible]
h_1 (m)	[illegible]
h_2 (m)	[illegible]
Dh (m)	13
Slope (%)	0.60

Uplands Method	
Flow Path Cover	[illegible]
x	4.6

Kinematic Wave/Izzard Method	
cr =	[illegible]
n =	[illegible]
i (mm/hr) =	[illegible]

Kerby Method	
Rk =	[illegible]

Tc Method	Bransby Williams	Airport (NVCA)	MTC	Williams	Kirpich	Watt & Chow
Tc (min)		138.43	49.41	73.74		95.69
Tp (hr)		1.55	0.55	0.82		1.07

Tc Method	FAA	SCS	Kinematic Wave	Izzard	Kerby	Uplands
Tc (min)	137.96	381.24				102.14
Tp (hr)	1.54	4.26				1.14

DRAFT

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===========================================================================================
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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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\2
15a4d73-3e16-4152-8139-fef9aa37ba17\
  Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\2
15a4d73-3e16-4152-8139-fef9aa37ba17\


DATE: 09/04/2025                           TIME: 08:39:56

USER:


COMMENTS: ____________________________________________________________


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  ************************************************
  ** SIMULATION : 100yr 24hr 5min SCS Type II ( **
  ************************************************


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|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
```

| | 7ff4d3d2-2692-4877-b177-eacb884aaa4b\e4336db3
| Ptotal=132.74 mm | Comments: 100yr 24hr 5min SCS Type II (MTO)

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.39	12.17	19.11	18.25	2.39
0.08	1.46	6.17	2.39	12.25	19.11	18.33	2.39
0.17	1.46	6.25	2.39	12.33	19.11	18.42	2.39
0.25	1.46	6.33	2.39	12.42	19.11	18.50	2.39
0.33	1.46	6.42	2.39	12.50	19.11	18.58	2.39
0.42	1.46	6.50	2.39	12.58	9.82	18.67	2.39
0.50	1.46	6.58	2.39	12.67	9.82	18.75	2.39
0.58	1.46	6.67	2.39	12.75	9.82	18.83	2.39
0.67	1.46	6.75	2.39	12.83	9.82	18.92	2.39
0.75	1.46	6.83	2.39	12.92	9.82	19.00	2.39
0.83	1.46	6.92	2.39	13.00	9.82	19.08	2.39
0.92	1.46	7.00	2.39	13.08	7.17	19.17	2.39
1.00	1.46	7.08	2.92	13.17	7.17	19.25	2.39
1.08	1.46	7.17	2.92	13.25	7.17	19.33	2.39
1.17	1.46	7.25	2.92	13.33	7.17	19.42	2.39
1.25	1.46	7.33	2.92	13.42	7.17	19.50	2.39
1.33	1.46	7.42	2.92	13.50	7.17	19.58	2.39
1.42	1.46	7.50	2.92	13.58	5.58	19.67	2.39
1.50	1.46	7.58	2.92	13.67	5.58	19.75	2.39
1.58	1.46	7.67	2.92	13.75	5.58	19.83	2.39
1.67	1.46	7.75	2.92	13.83	5.58	19.92	2.39
1.75	1.46	7.83	2.92	13.92	5.58	20.00	2.39
1.83	1.46	7.92	2.92	14.00	5.58	20.08	1.59
1.92	1.46	8.00	2.92	14.08	3.98	20.17	1.59
2.00	1.46	8.08	3.45	14.17	3.98	20.25	1.59
2.08	1.73	8.17	3.45	14.25	3.98	20.33	1.59
2.17	1.73	8.25	3.45	14.33	3.98	20.42	1.59
2.25	1.73	8.33	3.45	14.42	3.98	20.50	1.59
2.33	1.73	8.42	3.45	14.50	3.98	20.58	1.59
2.42	1.73	8.50	3.45	14.58	3.98	20.67	1.59
2.50	1.73	8.58	3.72	14.67	3.98	20.75	1.59
2.58	1.73	8.67	3.72	14.75	3.98	20.83	1.59
2.67	1.73	8.75	3.72	14.83	3.98	20.92	1.59
2.75	1.73	8.83	3.72	14.92	3.98	21.00	1.59
2.83	1.73	8.92	3.72	15.00	3.98	21.08	1.59
2.92	1.73	9.00	3.72	15.08	3.98	21.17	1.59
3.00	1.73	9.08	4.25	15.17	3.98	21.25	1.59
3.08	1.73	9.17	4.25	15.25	3.98	21.33	1.59
3.17	1.73	9.25	4.25	15.33	3.98	21.42	1.59
3.25	1.73	9.33	4.25	15.42	3.98	21.50	1.59
3.33	1.73	9.42	4.25	15.50	3.98	21.58	1.59
3.42	1.73	9.50	4.25	15.58	3.98	21.67	1.59
3.50	1.73	9.58	4.78	15.67	3.98	21.75	1.59
3.58	1.73	9.67	4.78	15.75	3.98	21.83	1.59
3.67	1.73	9.75	4.78	15.83	3.98	21.92	1.59

3.75	1.73	9.83	4.78	15.92	3.98	22.00	1.59
3.83	1.73	9.92	4.78	16.00	3.98	22.08	1.59
3.92	1.73	10.00	4.78	16.08	2.39	22.17	1.59
4.00	1.73	10.08	6.11	16.17	2.39	22.25	1.59
4.08	2.12	10.17	6.11	16.25	2.39	22.33	1.59
4.17	2.12	10.25	6.11	16.33	2.39	22.42	1.59
4.25	2.12	10.33	6.11	16.42	2.39	22.50	1.59
4.33	2.12	10.42	6.11	16.50	2.39	22.58	1.59
4.42	2.12	10.50	6.11	16.58	2.39	22.67	1.59
4.50	2.12	10.58	8.23	16.67	2.39	22.75	1.59
4.58	2.12	10.67	8.23	16.75	2.39	22.83	1.59
4.67	2.12	10.75	8.23	16.83	2.39	22.92	1.59
4.75	2.12	10.83	8.23	16.92	2.39	23.00	1.59
4.83	2.12	10.92	8.23	17.00	2.39	23.08	1.59
4.92	2.12	11.00	8.23	17.08	2.39	23.17	1.59
5.00	2.12	11.08	12.74	17.17	2.39	23.25	1.59
5.08	2.12	11.17	12.74	17.25	2.39	23.33	1.59
5.17	2.12	11.25	12.74	17.33	2.39	23.42	1.59
5.25	2.12	11.33	12.74	17.42	2.39	23.50	1.59
5.33	2.12	11.42	12.74	17.50	2.39	23.58	1.59
5.42	2.12	11.50	12.74	17.58	2.39	23.67	1.59
5.50	2.12	11.58	39.29	17.67	2.39	23.75	1.59
5.58	2.12	11.67	39.29	17.75	2.39	23.83	1.59
5.67	2.12	11.75	39.29	17.83	2.39	23.92	1.59
5.75	2.12	11.83	162.47	17.92	2.39	24.00	1.59
5.83	2.12	11.92	162.47	18.00	2.39		
5.92	2.12	12.00	162.47	18.08	2.39		
6.00	2.12	12.08	19.11	18.17	2.39		

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--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   8.955 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  83.281
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.627

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

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| CALIB            |
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```
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445

     PEAK FLOW       (cms)=   9.612 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  83.814
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.631

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

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--------------------
| CALIB            |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   7.137 (i)
     TIME TO PEAK    (hrs)=  14.833
     RUNOFF VOLUME    (mm)=  76.684
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.578

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   3.947 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  69.937
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.527

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

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| CALIB              |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   9.670 (i)
     TIME TO PEAK    (hrs)=  15.250
     RUNOFF VOLUME    (mm)=  70.178
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.529

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299

     PEAK FLOW       (cms)=   7.164 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  57.229
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.431

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=  10.987 (i)
     TIME TO PEAK    (hrs)=  15.250
     RUNOFF VOLUME    (mm)=  73.213
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.552

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

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--------------------
| CALIB              |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   6.833 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  73.378
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.553

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

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--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433

     PEAK FLOW       (cms)=  12.251 (i)
     TIME TO PEAK    (hrs)=  14.917
     RUNOFF VOLUME    (mm)=  83.371
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.628

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

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=  10.767 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  83.104
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.626

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=  13.021 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  83.370
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.628

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94

     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=  19.000 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  87.022
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.656

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941

     PEAK FLOW       (cms)=  16.727 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  85.494
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.644

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB              |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=  18.187 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  85.315
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.643

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=  23.738 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  83.459
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.629

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972

     PEAK FLOW       (cms)=  13.023 (i)
     TIME TO PEAK    (hrs)=  14.500
     RUNOFF VOLUME    (mm)=  82.927
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.625
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     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   5.422 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  75.059
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.565

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=  10.233 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  77.821
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.586

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=  19.960 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  83.282
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.627
```

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   7.684 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  81.547
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.614

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=  15.656 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  81.372
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.613

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   7.287 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  83.282
     TOTAL RAINFALL   (mm)= 132.740
```

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     RUNOFF COEFFICIENT   =   0.627

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290

     PEAK FLOW       (cms)=  19.056 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  85.315
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.643

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=  19.976 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  87.022
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.656

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=  15.397 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  83.282
```

```
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.627

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=  21.923 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  81.810
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.616

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473

     PEAK FLOW       (cms)=  15.608 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  81.723
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.616

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=  21.030 (i)
     TIME TO PEAK    (hrs)=  13.750
```

```
     RUNOFF VOLUME    (mm)=  85.315
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.643

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=  13.801 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  86.751
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.654

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

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--------------------
| CALIB             |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611

     PEAK FLOW       (cms)=   9.798 (i)
     TIME TO PEAK    (hrs)=  15.083
     RUNOFF VOLUME    (mm)=  78.164
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.589

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=  13.890 (i)
```

```
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  76.769
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.578

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   8.841 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  82.750
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.623

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39

     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   9.810 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  76.345
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB             |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626
```

```
     PEAK FLOW       (cms)=   3.962 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  63.473
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.478

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=  11.080 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  85.136
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.641

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29

     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   9.641 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  89.399
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.673

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096
```

```
     PEAK FLOW       (cms)=  16.460 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  85.405
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.643

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=  12.971 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  87.203
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.657

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=  16.513 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  87.113
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.656

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13
```

```
     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   6.246 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  81.547
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.614

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=  12.398 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  85.136
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.641

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

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60  10.767    13.83    83.10
      + ID2= 2 (  0011):   342.20  13.021    14.33    83.37
        ====================================================
        ID = 3 (  0063):   578.80  23.507    14.08    83.26

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  23.507    14.08    83.26
      + ID2= 2 (  0012):   436.50  19.000    14.08    87.02
        ====================================================
        ID = 1 (  0063):  1015.30  42.507    14.08    84.88
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 --------------------
 | ADD HYD  (  0063)|
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (  0063):  1015.30  42.507    14.08    84.88
       + ID2= 2 (  0013):   355.50  16.727    13.83    85.49
         ====================================================
         ID = 3 (  0063):  1370.80  59.059    14.00    85.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 --------------------
 | ADD HYD  (  0063)|
 |   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (  0063):  1370.80  59.059    14.00    85.04
       + ID2= 2 (  0014):   437.40  18.187    14.17    85.32
         ====================================================
         ID = 1 (  0063):  1808.20  77.175    14.00    85.11

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

 --------------------
 | ADD HYD  (  0063)|
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (  0063):  1808.20  77.175    14.00    85.11
       + ID2= 2 (  0015):   491.60  23.738    13.67    83.46
         ====================================================
         ID = 3 (  0063):  2299.80 100.453    13.92    84.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 --------------------
 | ADD HYD  (  0063)|
 |   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (  0063):  2299.80 100.453    13.92    84.75
       + ID2= 2 (  0016):   361.20  13.023    14.50    82.93
         ====================================================
         ID = 1 (  0063):  2661.00 112.933    14.00    84.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00 112.933    14.00    84.51
      + ID2= 2 (  0017):   123.10   5.422    13.67    75.06
        ====================================================
        ID = 3 (  0063):  2784.10 118.203    14.00    84.09

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10 118.203    14.00    84.09
      + ID2= 2 (  0022):   188.89  10.233    13.33    77.82
        ====================================================
        ID = 1 (  0063):  2972.99 127.189    13.92    83.69

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99 127.189    13.92    83.69
      + ID2= 2 (  0023):   459.62  19.960    14.00    83.28
        ====================================================
        ID = 3 (  0063):  3432.61 147.148    13.92    83.64

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61 147.148    13.92    83.64
      + ID2= 2 (  0024):   186.44   7.684    14.08    81.55
        ====================================================
        ID = 1 (  0063):  3619.05 154.809    13.92    83.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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```
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05 154.809    13.92    83.53
      + ID2= 2 (  0025):   402.30  15.656    14.17    81.37
        ====================================================
        ID = 3 (  0063):  4021.35 170.233    13.92    83.31

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35 170.233    13.92    83.31
      + ID2= 2 (  0026):   185.40   7.287    14.25    83.28
        ====================================================
        ID = 1 (  0063):  4206.75 177.389    14.00    83.31

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75 177.389    14.00    83.31
      + ID2= 2 (  0027):   266.70  19.056    13.00    85.31
        ====================================================
        ID = 3 (  0063):  4473.45 190.829    13.83    83.43

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45 190.829    13.83    83.43
      + ID2= 2 (  0028):   310.72  19.976    13.17    87.02
        ====================================================
        ID = 1 (  0063):  4784.17 208.295    13.75    83.66

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
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```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17 208.295    13.75    83.66
      + ID2= 2 (  0029):   361.98  15.397    14.00    83.28
        ====================================================
        ID = 3 (  0063):  5146.15 223.463    13.75    83.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 223.463    13.75    83.64
      + ID2= 2 (  0030):   345.92  21.923    13.08    81.81
        ====================================================
        ID = 1 (  0063):  5492.07 242.181    13.67    83.52

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 242.181    13.67    83.52
      + ID2= 2 (  0031):   401.10  15.608    14.25    81.72
        ====================================================
        ID = 3 (  0063):  5893.17 257.038    13.75    83.40

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 257.038    13.75    83.40
      + ID2= 2 (  0032):   439.56  21.030    13.75    85.32
        ====================================================
        ID = 1 (  0063):  6332.73 278.068    13.75    83.53

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 278.068    13.75    83.53
```

```
      + ID2= 2 (  0033):   260.28  13.801    13.58    86.75
        ====================================================
        ID = 3 (  0063):  6593.01 291.751    13.75    83.66

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 291.751    13.75    83.66
      + ID2= 2 (  0034):   339.20   9.798    15.08    78.16
        ====================================================
        ID = 1 (  0063):  6932.21 299.589    13.75    83.39

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 299.589    13.75    83.39
      + ID2= 2 (  0035):   341.01  13.890    13.92    76.77
        ====================================================
        ID = 3 (  0063):  7273.22 313.399    13.75    83.08

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 313.399    13.75    83.08
      + ID2= 2 (  0036):   201.10   8.841    13.92    82.75
        ====================================================
        ID = 1 (  0063):  7474.32 322.185    13.75    83.07

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 322.185    13.75    83.07
      + ID2= 2 (  0037):   306.27   9.810    14.58    76.35
        ====================================================
```

```
        ID = 3 (  0063):  7780.59 330.913    13.75    82.81

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 330.913    13.75    82.81
      + ID2= 2 (  0038):   112.74   3.962    13.83    63.47
        ===================================================
        ID = 1 (  0063):  7893.33 334.875    13.75    82.53

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 334.875    13.75    82.53
      + ID2= 2 (  0039):   316.30  11.080    14.67    85.14
        ===================================================
        ID = 3 (  0063):  8209.63 344.643    13.83    82.63

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 344.643    13.83    82.63
      + ID2= 2 (  0040):   157.20   9.641    13.33    89.40
        ===================================================
        ID = 1 (  0063):  8366.83 353.685    13.75    82.76

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 353.685    13.75    82.76
      + ID2= 2 (  0041):   311.60  16.460    13.58    85.40
        ===================================================
        ID = 3 (  0063):  8678.43 369.952    13.75    82.85
```

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

 --------------------
 | ADD HYD  (  0063)|
 |   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
 --------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (  0063):  8678.43 369.952    13.75    82.85
       + ID2= 2 (  0042):   163.70  12.971    12.92    87.20
         ====================================================
         ID = 1 (  0063):  8842.13 378.709    13.75    82.93

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

 --------------------
 | ADD HYD  (  0063)|
 |   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
 --------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (  0063):  8842.13 378.709    13.75    82.93
       + ID2= 2 (  0043):   354.50  16.513    13.92    87.11
         ====================================================
         ID = 3 (  0063):  9196.63 395.149    13.75    83.09

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

 --------------------
 | ADD HYD  (  0063)|
 |   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
 --------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (  0063):  9196.63 395.149    13.75    83.09
       + ID2= 2 (  0044):   165.70   6.246    14.33    81.55
         ====================================================
         ID = 1 (  0063):  9362.33 401.057    13.75    83.07

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

 --------------------
 | ADD HYD  (  0063)|
 |   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
 --------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (  0063):  9362.33 401.057    13.75    83.07
       + ID2= 2 (  0045):   288.20  12.398    14.08    85.14
         ====================================================
         ID = 3 (  0063):  9650.53 413.236    13.75    83.13

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

```
--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9650.53 413.236    13.75    83.13
      + ID2= 2 (  0007):   418.90  10.987    15.25    73.21
        ====================================================
        ID = 1 (  0063): 10069.43 421.752    13.75    82.72

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 421.752    13.75    82.72
      + ID2= 2 (  0008):   185.44   6.833    14.08    73.38
        ====================================================
        ID = 3 (  0063): 10254.87 428.453    13.75    82.55

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063): 10254.87 428.453    13.75    82.55
      + ID2= 2 (  0009):   378.40  12.251    14.92    83.37
        ====================================================
        ID = 1 (  0063): 10633.27 438.763    13.83    82.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        441.95        0.0300      Main Channel
                  73.40        438.86        0.0300      Main Channel
                 124.30        438.34        0.0300      Main Channel
                 151.30        437.55        0.0300      Main Channel
                 182.70        439.79        0.0300      Main Channel
                 191.60        440.18        0.0300      Main Channel
                 219.50        440.94        0.0300      Main Channel
                 249.70        442.17        0.0300      Main Channel
```

```
    <-------------------- TRAVEL TIME TABLE -------------------->
     DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
      (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
     0.23   437.78    .242E+05      0.3          0.25      ******
     0.46   438.01    .968E+05      2.1          0.40      785.77
     0.69   438.24    .218E+06      6.1          0.52      599.65
     0.93   438.48    .398E+06     12.1          0.57      546.82
     1.16   438.71    .686E+06     23.1          0.63      495.63
     1.39   438.94    .108E+07     42.4          0.73      425.16
     1.62   439.17    .153E+07     71.5          0.87      356.76
     1.85   439.40    .202E+07    107.6          1.00      312.54
     2.08   439.63    .254E+07    150.8          1.11      281.09
     2.32   439.87    .311E+07    200.6          1.21      258.13
     2.55   440.10    .372E+07    256.8          1.29      241.17
     2.78   440.33    .437E+07    318.6          1.36      228.86
     3.01   440.56    .509E+07    387.9          1.43      218.81
     3.24   440.79    .587E+07    466.8          1.49      209.62
     3.47   441.02    .671E+07    557.6          1.56      200.56
     3.71   441.26    .760E+07    661.7          1.63      191.42
     3.94   441.49    .854E+07    776.1          1.70      183.34
     4.17   441.72    .952E+07    901.3          1.77      176.13
     4.40   441.95    .106E+08   1037.5          1.84      169.64

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0063) *******   438.76   13.83  82.58      3.16      1.47
   OUTFLOW: ID= 1 (  0100) *******   224.46   16.08  82.57      2.41      1.24



-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   9.249 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  77.478
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.584

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

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

```
--------------------
| CALIB            |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70

     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=  10.377 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  74.808
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.564

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939

     PEAK FLOW       (cms)=  13.021 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  74.724
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.563

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   6.288 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  67.159
     TOTAL RAINFALL   (mm)= 132.740
     RUNOFF COEFFICIENT   =   0.506

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

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27 224.460    16.08    82.57
      + ID2= 2 (  0018):   279.02   9.249    14.58    77.48
        ====================================================
        ID = 3 (  0066): 10912.29 232.029    16.00    82.44

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29 232.029    16.00    82.44
      + ID2= 2 (  0019):   365.01  10.377    15.00    74.81
        ====================================================
        ID = 1 (  0066): 11277.30 241.640    16.00    82.19

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30 241.640    16.00    82.19
      + ID2= 2 (  0002):   247.87   9.612    14.33    83.81
        ====================================================
        ID = 3 (  0066): 11525.17 249.128    15.83    82.23

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17 249.128    15.83    82.23
      + ID2= 2 (  0020):   356.10  13.021    14.17    74.72
        ====================================================
        ID = 1 (  0066): 11881.27 258.813    15.67    82.00

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

```
--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 258.813    15.67    82.00
      + ID2= 2 (  0021):   201.80   6.288    14.25    67.16
        ====================================================
        ID = 3 (  0066): 12083.07 263.898    15.67    81.75

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 263.898    15.67    81.75
      + ID2= 2 (  0003):   235.05   7.137    14.83    76.68
        ====================================================
        ID = 1 (  0066): 12318.12 270.613    15.67    81.66

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 270.613    15.67    81.66
      + ID2= 2 (  0004):   121.09   3.947    14.25    69.94
        ====================================================
        ID = 3 (  0066): 12439.21 273.798    15.58    81.54

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 273.798    15.58    81.54
      + ID2= 2 (  0005):   390.34   9.670    15.25    70.18
        ====================================================
        ID = 1 (  0066): 12829.55 283.407    15.58    81.20

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

--------------------
| ADD HYD  (  0066)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 283.407    15.58    81.20
      + ID2= 2 (  0006):   231.69   7.164    13.83    57.23
        ==================================================
        ID = 3 (  0066): 13061.24 288.074    15.58    80.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59         421.25        0.0300      Main Channel
                 143.41         418.57        0.0300      Main Channel
                 160.36         417.90        0.0300      Main Channel
                 173.30         417.80        0.0300      Main Channel
                 177.00         416.45        0.0300      Main Channel
                 192.98         416.45        0.0300      Main Channel
                 209.58         419.51        0.0300      Main Channel
                 216.18         419.46        0.0300      Main Channel
                 257.64         421.03        0.0300      Main Channel

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)       (min)
       0.24   416.69    .466E+05       1.6          0.39      484.44
       0.48   416.93    .987E+05       5.2          0.60      315.64
       0.72   417.17    .156E+06      10.5          0.77      247.92
       0.96   417.41    .219E+06      17.4          0.91      209.82
       1.21   417.66    .287E+06      25.9          1.03      184.80
       1.45   417.90    .368E+06      29.3          0.91      209.43
       1.69   418.14    .489E+06      41.8          0.98      194.88
       1.93   418.38    .630E+06      58.0          1.05      181.01
       2.17   418.62    .792E+06      78.0          1.12      169.24
       2.41   418.86    .976E+06     101.9          1.19      159.69
       2.65   419.10    .118E+07     130.4          1.26      151.07
       2.89   419.34    .141E+07     164.0          1.33      143.32
       3.13   419.58    .167E+07     192.5          1.31      144.64
       3.37   419.82    .198E+07     235.5          1.36      139.89
       3.62   420.07    .232E+07     286.4          1.41      134.93
       3.86   420.31    .270E+07     345.8          1.46      130.02
       4.10   420.55    .311E+07     414.1          1.52      125.26
       4.34   420.79    .356E+07     491.8          1.57      120.74
       4.58   421.03    .405E+07     579.6          1.63      116.47

                                         <---- hydrograph ---->   <-pipe / channel->
                                   AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
```

```
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0066) *******   288.07   15.58  80.77      3.62      1.41
   OUTFLOW: ID= 1 (  0101) *******   226.04   17.75  80.77      3.31      1.35



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


--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):   121.60   8.955    12.92    83.28
      + ID2= 2 (  0101): 13061.24 226.036    17.75    80.77
        ===================================================
        ID = 3 (  0102): 13182.84 226.883    17.75    80.79

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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
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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\c
3ffbb24-fba6-4db4-80ce-bcb53cb62061\
  Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\c
3ffbb24-fba6-4db4-80ce-bcb53cb62061\
```

DATE: 09/04/2025 TIME: 08:39:59

USER:

COMMENTS: ____

```
  ***********************************************
  ** SIMULATION : 10yr 24hr 5min SCS Type II (M **
  ***********************************************
```

```
--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\ff10e18b
| Ptotal= 92.92 mm |    Comments: 10yr 24hr 5min SCS Type II (MTO)
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.67	12.17	13.38	18.25	1.67
0.08	1.02	6.17	1.67	12.25	13.38	18.33	1.67
0.17	1.02	6.25	1.67	12.33	13.38	18.42	1.67
0.25	1.02	6.33	1.67	12.42	13.38	18.50	1.67
0.33	1.02	6.42	1.67	12.50	13.38	18.58	1.67
0.42	1.02	6.50	1.67	12.58	6.88	18.67	1.67
0.50	1.02	6.58	1.67	12.67	6.88	18.75	1.67
0.58	1.02	6.67	1.67	12.75	6.88	18.83	1.67
0.67	1.02	6.75	1.67	12.83	6.88	18.92	1.67
0.75	1.02	6.83	1.67	12.92	6.88	19.00	1.67
0.83	1.02	6.92	1.67	13.00	6.88	19.08	1.67
0.92	1.02	7.00	1.67	13.08	5.02	19.17	1.67
1.00	1.02	7.08	2.04	13.17	5.02	19.25	1.67
1.08	1.02	7.17	2.04	13.25	5.02	19.33	1.67
1.17	1.02	7.25	2.04	13.33	5.02	19.42	1.67
1.25	1.02	7.33	2.04	13.42	5.02	19.50	1.67
1.33	1.02	7.42	2.04	13.50	5.02	19.58	1.67
1.42	1.02	7.50	2.04	13.58	3.90	19.67	1.67
1.50	1.02	7.58	2.04	13.67	3.90	19.75	1.67
1.58	1.02	7.67	2.04	13.75	3.90	19.83	1.67
1.67	1.02	7.75	2.04	13.83	3.90	19.92	1.67
1.75	1.02	7.83	2.04	13.92	3.90	20.00	1.67
1.83	1.02	7.92	2.04	14.00	3.90	20.08	1.12
1.92	1.02	8.00	2.04	14.08	2.79	20.17	1.12
2.00	1.02	8.08	2.42	14.17	2.79	20.25	1.12
2.08	1.21	8.17	2.42	14.25	2.79	20.33	1.12

2.17	1.21	8.25	2.42	14.33	2.79	20.42	1.12
2.25	1.21	8.33	2.42	14.42	2.79	20.50	1.12
2.33	1.21	8.42	2.42	14.50	2.79	20.58	1.12
2.42	1.21	8.50	2.42	14.58	2.79	20.67	1.12
2.50	1.21	8.58	2.60	14.67	2.79	20.75	1.12
2.58	1.21	8.67	2.60	14.75	2.79	20.83	1.12
2.67	1.21	8.75	2.60	14.83	2.79	20.92	1.12
2.75	1.21	8.83	2.60	14.92	2.79	21.00	1.12
2.83	1.21	8.92	2.60	15.00	2.79	21.08	1.12
2.92	1.21	9.00	2.60	15.08	2.79	21.17	1.12
3.00	1.21	9.08	2.97	15.17	2.79	21.25	1.12
3.08	1.21	9.17	2.97	15.25	2.79	21.33	1.12
3.17	1.21	9.25	2.97	15.33	2.79	21.42	1.12
3.25	1.21	9.33	2.97	15.42	2.79	21.50	1.12
3.33	1.21	9.42	2.97	15.50	2.79	21.58	1.12
3.42	1.21	9.50	2.97	15.58	2.79	21.67	1.12
3.50	1.21	9.58	3.35	15.67	2.79	21.75	1.12
3.58	1.21	9.67	3.35	15.75	2.79	21.83	1.12
3.67	1.21	9.75	3.35	15.83	2.79	21.92	1.12
3.75	1.21	9.83	3.35	15.92	2.79	22.00	1.12
3.83	1.21	9.92	3.35	16.00	2.79	22.08	1.12
3.92	1.21	10.00	3.35	16.08	1.67	22.17	1.12
4.00	1.21	10.08	4.27	16.17	1.67	22.25	1.12
4.08	1.49	10.17	4.27	16.25	1.67	22.33	1.12
4.17	1.49	10.25	4.27	16.33	1.67	22.42	1.12
4.25	1.49	10.33	4.27	16.42	1.67	22.50	1.12
4.33	1.49	10.42	4.27	16.50	1.67	22.58	1.12
4.42	1.49	10.50	4.27	16.58	1.67	22.67	1.12
4.50	1.49	10.58	5.76	16.67	1.67	22.75	1.12
4.58	1.49	10.67	5.76	16.75	1.67	22.83	1.12
4.67	1.49	10.75	5.76	16.83	1.67	22.92	1.12
4.75	1.49	10.83	5.76	16.92	1.67	23.00	1.12
4.83	1.49	10.92	5.76	17.00	1.67	23.08	1.12
4.92	1.49	11.00	5.76	17.08	1.67	23.17	1.12
5.00	1.49	11.08	8.92	17.17	1.67	23.25	1.12
5.08	1.49	11.17	8.92	17.25	1.67	23.33	1.12
5.17	1.49	11.25	8.92	17.33	1.67	23.42	1.12
5.25	1.49	11.33	8.92	17.42	1.67	23.50	1.12
5.33	1.49	11.42	8.92	17.50	1.67	23.58	1.12
5.42	1.49	11.50	8.92	17.58	1.67	23.67	1.12
5.50	1.49	11.58	27.50	17.67	1.67	23.75	1.12
5.58	1.49	11.67	27.50	17.75	1.67	23.83	1.12
5.67	1.49	11.75	27.50	17.83	1.67	23.92	1.12
5.75	1.49	11.83	113.73	17.92	1.67	24.00	1.12
5.83	1.49	11.92	113.73	18.00	1.67		
5.92	1.49	12.00	113.73	18.08	1.67		
6.00	1.49	12.08	13.38	18.17	1.67		

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--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   5.233 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  49.160
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.529

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

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--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445

     PEAK FLOW       (cms)=   5.636 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  49.652
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.534

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

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--------------------
| CALIB            |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   4.072 (i)
     TIME TO PEAK    (hrs)=  14.917
     RUNOFF VOLUME    (mm)=  44.360
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.477

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   2.196 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  39.542
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.426

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

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--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   5.396 (i)
     TIME TO PEAK    (hrs)=  15.333
     RUNOFF VOLUME    (mm)=  39.755
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.428

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

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--------------------
| CALIB            |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299

     PEAK FLOW       (cms)=   3.830 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  31.163
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.335

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB              |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=   6.189 (i)
     TIME TO PEAK    (hrs)=  15.333
     RUNOFF VOLUME    (mm)=  41.849
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.450

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

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--------------------
| CALIB              |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   3.854 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  41.997
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.452

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

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--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433

     PEAK FLOW       (cms)=   7.153 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  49.242
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.530
```

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=   6.277 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  48.997
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.527

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

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--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=   7.606 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  49.242
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.530

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94

     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=  11.256 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  52.022
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.560
```

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941

     PEAK FLOW       (cms)=   9.868 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  50.904
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.548

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=  10.710 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  50.737
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.546

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=  13.887 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  49.324
     TOTAL RAINFALL   (mm)=  92.920
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     RUNOFF COEFFICIENT   =   0.531

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

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--------------------
| CALIB             |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972

     PEAK FLOW       (cms)=   7.578 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  48.833
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.526

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   3.076 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  43.200
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.465

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=   5.850 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  45.083
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```
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.485

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

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--------------------
| CALIB              |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=  11.659 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  49.160
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.529

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   4.459 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  47.870
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.515

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=   9.071 (i)
     TIME TO PEAK    (hrs)=  14.250
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```
     RUNOFF VOLUME    (mm)=  47.709
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.513

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   4.253 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  49.160
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.529

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290

     PEAK FLOW       (cms)=  11.237 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  50.737
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.546

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

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--------------------
| CALIB             |
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=  11.860 (i)
```

```
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  52.022
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.560

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=   8.990 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  49.160
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.529

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=  12.766 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  48.112
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.518

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473
```

```
     PEAK FLOW       (cms)=   9.069 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  48.031
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.517

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=  12.390 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  50.737
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.546

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=   8.164 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  51.769
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.557

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611
```

```
     PEAK FLOW       (cms)=   5.615 (i)
     TIME TO PEAK    (hrs)=  15.167
     RUNOFF VOLUME    (mm)=  45.395
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.489

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=   7.931 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  44.437
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.478

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   5.138 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  48.670
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.524

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39
```

```
     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   5.582 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  44.053
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.474

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626

     PEAK FLOW       (cms)=   2.150 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  35.075
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.377

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=   6.513 (i)
     TIME TO PEAK    (hrs)=  14.750
     RUNOFF VOLUME    (mm)=  50.571
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.544

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29
```

```
     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   5.783 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  53.945
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.581

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096

     PEAK FLOW       (cms)=   9.712 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  50.820
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.547

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=   7.719 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  52.191
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.562

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=   9.795 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  52.107
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.561

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   3.623 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  47.870
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.515

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=   7.294 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  50.571
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.544

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

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

--------------------
| ADD HYD  (  0063)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60   6.277    13.92    49.00
      + ID2= 2 (  0011):   342.20   7.606    14.42    49.24
        ====================================================
        ID = 3 (  0063):   578.80  13.716    14.17    49.14

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  13.716    14.17    49.14
      + ID2= 2 (  0012):   436.50  11.256    14.08    52.02
        ====================================================
        ID = 1 (  0063):  1015.30  24.972    14.17    50.38

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  24.972    14.17    50.38
      + ID2= 2 (  0013):   355.50   9.868    13.83    50.90
        ====================================================
        ID = 3 (  0063):  1370.80  34.729    14.08    50.52

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80  34.729    14.08    50.52
      + ID2= 2 (  0014):   437.40  10.710    14.17    50.74
        ====================================================
        ID = 1 (  0063):  1808.20  45.416    14.08    50.57

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 1 (  0063):  1808.20  45.416    14.08    50.57
      + ID2= 2 (  0015):   491.60  13.887    13.75    49.32
        ====================================================
        ID = 3 (  0063):  2299.80  59.021    14.00    50.30

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2299.80  59.021    14.00    50.30
      + ID2= 2 (  0016):   361.20   7.578    14.58    48.83
        ====================================================
        ID = 1 (  0063):  2661.00  66.248    14.08    50.10

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00  66.248    14.08    50.10
      + ID2= 2 (  0017):   123.10   3.076    13.67    43.20
        ====================================================
        ID = 3 (  0063):  2784.10  69.250    14.00    49.80

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10  69.250    14.00    49.80
      + ID2= 2 (  0022):   188.89   5.850    13.33    45.08
        ====================================================
        ID = 1 (  0063):  2972.99  74.352    14.00    49.50

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99  74.352    14.00    49.50
      + ID2= 2 (  0023):   459.62  11.659    14.00    49.16
```

```
        ====================================================
        ID = 3 (  0063):  3432.61  86.010    14.00    49.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |           AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61  86.010    14.00    49.45
      + ID2= 2 (  0024):   186.44   4.459    14.08    47.87
        ====================================================
        ID = 1 (  0063):  3619.05  90.462    14.00    49.37

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |           AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05  90.462    14.00    49.37
      + ID2= 2 (  0025):   402.30   9.071    14.25    47.71
        ====================================================
        ID = 3 (  0063):  4021.35  99.426    14.00    49.21

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |           AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35  99.426    14.00    49.21
      + ID2= 2 (  0026):   185.40   4.253    14.33    49.16
        ====================================================
        ID = 1 (  0063):  4206.75 103.615    14.00    49.20

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |           AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75 103.615    14.00    49.20
      + ID2= 2 (  0027):   266.70  11.237    13.00    50.74
        ====================================================
        ID = 3 (  0063):  4473.45 111.434    13.92    49.30
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45 111.434    13.92    49.30
      + ID2= 2 (  0028):   310.72  11.860    13.25    52.02
        ====================================================
        ID = 1 (  0063):  4784.17 121.746    13.83    49.47

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17 121.746    13.83    49.47
      + ID2= 2 (  0029):   361.98   8.990    14.08    49.16
        ====================================================
        ID = 3 (  0063):  5146.15 130.638    13.83    49.45

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 130.638    13.83    49.45
      + ID2= 2 (  0030):   345.92  12.766    13.17    48.11
        ====================================================
        ID = 1 (  0063):  5492.07 141.483    13.75    49.37

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 141.483    13.75    49.37
      + ID2= 2 (  0031):   401.10   9.069    14.25    48.03
        ====================================================
        ID = 3 (  0063):  5893.17 150.107    13.75    49.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 150.107    13.75    49.28
      + ID2= 2 (  0032):   439.56  12.390    13.83    50.74
        ==================================================
        ID = 1 (  0063):  6332.73 162.486    13.75    49.38

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 162.486    13.75    49.38
      + ID2= 2 (  0033):   260.28   8.164    13.58    51.77
        ==================================================
        ID = 3 (  0063):  6593.01 170.610    13.75    49.47

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 170.610    13.75    49.47
      + ID2= 2 (  0034):   339.20   5.615    15.17    45.39
        ==================================================
        ID = 1 (  0063):  6932.21 174.991    13.75    49.27

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 174.991    13.75    49.27
      + ID2= 2 (  0035):   341.01   7.931    13.92    44.44
        ==================================================
        ID = 3 (  0063):  7273.22 182.865    13.83    49.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 182.865    13.83    49.04
      + ID2= 2 (  0036):   201.10   5.138    14.00    48.67
        ====================================================
        ID = 1 (  0063):  7474.32 187.985    13.83    49.03

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 187.985    13.83    49.03
      + ID2= 2 (  0037):   306.27   5.582    14.67    44.05
        ====================================================
        ID = 3 (  0063):  7780.59 192.993    13.83    48.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 192.993    13.83    48.84
      + ID2= 2 (  0038):   112.74   2.150    13.83    35.08
        ====================================================
        ID = 1 (  0063):  7893.33 195.143    13.83    48.64

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 195.143    13.83    48.64
      + ID2= 2 (  0039):   316.30   6.513    14.75    50.57
        ====================================================
        ID = 3 (  0063):  8209.63 200.912    13.83    48.72

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

--------------------
| ADD HYD  (  0063)|
```

```
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 200.912    13.83    48.72
      + ID2= 2 (  0040):   157.20   5.783    13.33    53.95
        ====================================================
        ID = 1 (  0063):  8366.83 206.285    13.83    48.81

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 206.285    13.83    48.81
      + ID2= 2 (  0041):   311.60   9.712    13.58    50.82
        ====================================================
        ID = 3 (  0063):  8678.43 215.825    13.83    48.89

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 215.825    13.83    48.89
      + ID2= 2 (  0042):   163.70   7.719    12.92    52.19
        ====================================================
        ID = 1 (  0063):  8842.13 221.031    13.75    48.95

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 221.031    13.75    48.95
      + ID2= 2 (  0043):   354.50   9.795    13.92    52.11
        ====================================================
        ID = 3 (  0063):  9196.63 230.751    13.75    49.07

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (  0063):  9196.63 230.751    13.75    49.07
      + ID2= 2 (  0044):   165.70   3.623    14.33    47.87
        ====================================================
        ID = 1 (  0063):  9362.33 234.139    13.75    49.05

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  9362.33 234.139    13.75    49.05
      + ID2= 2 (  0045):   288.20   7.294    14.08    50.57
        ====================================================
        ID = 3 (  0063):  9650.53 241.263    13.83    49.09

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9650.53 241.263    13.83    49.09
      + ID2= 2 (  0007):   418.90   6.189    15.33    41.85
        ====================================================
        ID = 1 (  0063): 10069.43 246.104    13.83    48.79

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 246.104    13.83    48.79
      + ID2= 2 (  0008):   185.44   3.854    14.08    42.00
        ====================================================
        ID = 3 (  0063): 10254.87 249.901    13.83    48.67

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063): 10254.87 249.901    13.83    48.67
      + ID2= 2 (  0009):   378.40   7.153    15.00    49.24
```

===

ID = 1 (0063): 10633.27 255.948   13.83   48.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ROUTE CHN(0100)|
| IN= 2---> OUT= 1 | Routing time step (min)'= 5.00

<------ DATA FOR SECTION (1.1) ------>

Distance	Elevation	Manning	
0.00	441.95	0.0300	Main Channel
73.40	438.86	0.0300	Main Channel
124.30	438.34	0.0300	Main Channel
151.30	437.55	0.0300	Main Channel
182.70	439.79	0.0300	Main Channel
191.60	440.18	0.0300	Main Channel
219.50	440.94	0.0300	Main Channel
249.70	442.17	0.0300	Main Channel

<--------------------- TRAVEL TIME TABLE --------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.23	437.78	.242E+05	0.3	0.25	******
0.46	438.01	.968E+05	2.1	0.40	785.77
0.69	438.24	.218E+06	6.1	0.52	599.65
0.93	438.48	.398E+06	12.1	0.57	546.82
1.16	438.71	.686E+06	23.1	0.63	495.63
1.39	438.94	.108E+07	42.4	0.73	425.16
1.62	439.17	.153E+07	71.5	0.87	356.76
1.85	439.40	.202E+07	107.6	1.00	312.54
2.08	439.63	.254E+07	150.8	1.11	281.09
2.32	439.87	.311E+07	200.6	1.21	258.13
2.55	440.10	.372E+07	256.8	1.29	241.17
2.78	440.33	.437E+07	318.6	1.36	228.86
3.01	440.56	.509E+07	387.9	1.43	218.81
3.24	440.79	.587E+07	466.8	1.49	209.62
3.47	441.02	.671E+07	557.6	1.56	200.56
3.71	441.26	.760E+07	661.7	1.63	191.42
3.94	441.49	.854E+07	776.1	1.70	183.34
4.17	441.72	.952E+07	901.3	1.77	176.13
4.40	441.95	.106E+08	1037.5	1.84	169.64

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0063)	*******	255.95	13.83	48.69	2.54	1.29
OUTFLOW: ID= 1 (0100)	*******	117.97	16.25	48.68	1.91	1.02

```
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   5.266 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  44.772
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.482

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70

     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=   5.875 (i)
     TIME TO PEAK    (hrs)=  15.083
     RUNOFF VOLUME    (mm)=  42.975
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.462

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939

     PEAK FLOW       (cms)=   7.367 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  42.899
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.462
```

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   3.473 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  37.695
     TOTAL RAINFALL   (mm)=  92.920
     RUNOFF COEFFICIENT   =   0.406

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

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27 117.971    16.25    48.68
      + ID2= 2 (  0018):   279.02   5.266    14.67    44.77
        ====================================================
        ID = 3 (  0066): 10912.29 122.205    16.25    48.58

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


--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29 122.205    16.25    48.58
      + ID2= 2 (  0019):   365.01   5.875    15.08    42.97
        ====================================================
        ID = 1 (  0066): 11277.30 127.531    16.25    48.40

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30 127.531    16.25    48.40
```

```
      + ID2= 2 (  0002):   247.87   5.636    14.33    49.65
        ====================================================
        ID = 3 (  0066): 11525.17 131.645    16.17    48.43

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17 131.645    16.17    48.43
      + ID2= 2 (  0020):   356.10   7.367    14.17    42.90
        ====================================================
        ID = 1 (  0066): 11881.27 136.758    15.92    48.26

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 136.758    15.92    48.26
      + ID2= 2 (  0021):   201.80   3.473    14.33    37.69
        ====================================================
        ID = 3 (  0066): 12083.07 139.446    15.92    48.09

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 139.446    15.92    48.09
      + ID2= 2 (  0003):   235.05   4.072    14.92    44.36
        ====================================================
        ID = 1 (  0066): 12318.12 143.191    15.92    48.02

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 143.191    15.92    48.02
      + ID2= 2 (  0004):   121.09   2.196    14.33    39.54
        ====================================================
```

```
        ID = 3 (  0066): 12439.21 144.898    15.83    47.93

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

 --------------------
 | ADD HYD  (  0066)|
 |   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 144.898    15.83    47.93
      + ID2= 2 (  0005):   390.34   5.396    15.33    39.76
        ==================================================
        ID = 1 (  0066): 12829.55 150.216    15.83    47.68

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

 --------------------
 | ADD HYD  (  0066)|
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 150.216    15.83    47.68
      + ID2= 2 (  0006):   231.69   3.830    13.92    31.16
        ==================================================
        ID = 3 (  0066): 13061.24 152.583    15.75    47.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 ------------------------------------------------------------------------------
 --------------------
 | ROUTE CHN(  0101)|
 | IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
 --------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59        421.25        0.0300      Main Channel
                 143.41        418.57        0.0300      Main Channel
                 160.36        417.90        0.0300      Main Channel
                 173.30        417.80        0.0300      Main Channel
                 177.00        416.45        0.0300      Main Channel
                 192.98        416.45        0.0300      Main Channel
                 209.58        419.51        0.0300      Main Channel
                 216.18        419.46        0.0300      Main Channel
                 257.64        421.03        0.0300      Main Channel

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.24   416.69    .466E+05       1.6          0.39      484.44
       0.48   416.93    .987E+05       5.2          0.60      315.64
       0.72   417.17    .156E+06      10.5          0.77      247.92
```

```
       0.96   417.41    .219E+06      17.4          0.91     209.82
       1.21   417.66    .287E+06      25.9          1.03     184.80
       1.45   417.90    .368E+06      29.3          0.91     209.43
       1.69   418.14    .489E+06      41.8          0.98     194.88
       1.93   418.38    .630E+06      58.0          1.05     181.01
       2.17   418.62    .792E+06      78.0          1.12     169.24
       2.41   418.86    .976E+06     101.9          1.19     159.69
       2.65   419.10    .118E+07     130.4          1.26     151.07
       2.89   419.34    .141E+07     164.0          1.33     143.32
       3.13   419.58    .167E+07     192.5          1.31     144.64
       3.37   419.82    .198E+07     235.5          1.36     139.89
       3.62   420.07    .232E+07     286.4          1.41     134.93
       3.86   420.31    .270E+07     345.8          1.46     130.02
       4.10   420.55    .311E+07     414.1          1.52     125.26
       4.34   420.79    .356E+07     491.8          1.57     120.74
       4.58   421.03    .405E+07     579.6          1.63     116.47

                                     <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0066) *******   152.58   15.75  47.39      2.81      1.30
   OUTFLOW: ID= 1 (  0101) *******   118.77   18.08  47.39      2.54      1.23



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


 --------------------
 | ADD HYD  (  0102)|
 |   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
 --------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (  0001):   121.60   5.233    12.92    49.16
       + ID2= 2 (  0101): 13061.24 118.774    18.08    47.39
         ====================================================
         ID = 3 (  0102): 13182.84 119.280    18.08    47.40

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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
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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\f
db04c71-7827-4eb8-97c4-10e8253ac6e1\
  Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\f
db04c71-7827-4eb8-97c4-10e8253ac6e1\


DATE: 09/04/2025                           TIME: 08:40:00

USER:


COMMENTS: ____________________________________________________________


-------------------------------------------------------------------------------------
-----------------------
  ************************************************
  ** SIMULATION : 25yr 24hr 5min SCS Type II (M **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\473d4463
| Ptotal=109.06 mm |    Comments: 25yr 24hr 5min SCS Type II (MTO)
--------------------
                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.00    0.00 |  6.08    1.96 | 12.17   15.70 | 18.25    1.96
                  0.08    1.20 |  6.17    1.96 | 12.25   15.70 | 18.33    1.96
                  0.17    1.20 |  6.25    1.96 | 12.33   15.70 | 18.42    1.96
                  0.25    1.20 |  6.33    1.96 | 12.42   15.70 | 18.50    1.96
                  0.33    1.20 |  6.42    1.96 | 12.50   15.70 | 18.58    1.96
                  0.42    1.20 |  6.50    1.96 | 12.58    8.07 | 18.67    1.96
                  0.50    1.20 |  6.58    1.96 | 12.67    8.07 | 18.75    1.96
```

0.58	1.20	6.67	1.96	12.75	8.07	18.83	1.96
0.67	1.20	6.75	1.96	12.83	8.07	18.92	1.96
0.75	1.20	6.83	1.96	12.92	8.07	19.00	1.96
0.83	1.20	6.92	1.96	13.00	8.07	19.08	1.96
0.92	1.20	7.00	1.96	13.08	5.89	19.17	1.96
1.00	1.20	7.08	2.40	13.17	5.89	19.25	1.96
1.08	1.20	7.17	2.40	13.25	5.89	19.33	1.96
1.17	1.20	7.25	2.40	13.33	5.89	19.42	1.96
1.25	1.20	7.33	2.40	13.42	5.89	19.50	1.96
1.33	1.20	7.42	2.40	13.50	5.89	19.58	1.96
1.42	1.20	7.50	2.40	13.58	4.58	19.67	1.96
1.50	1.20	7.58	2.40	13.67	4.58	19.75	1.96
1.58	1.20	7.67	2.40	13.75	4.58	19.83	1.96
1.67	1.20	7.75	2.40	13.83	4.58	19.92	1.96
1.75	1.20	7.83	2.40	13.92	4.58	20.00	1.96
1.83	1.20	7.92	2.40	14.00	4.58	20.08	1.31
1.92	1.20	8.00	2.40	14.08	3.27	20.17	1.31
2.00	1.20	8.08	2.84	14.17	3.27	20.25	1.31
2.08	1.42	8.17	2.84	14.25	3.27	20.33	1.31
2.17	1.42	8.25	2.84	14.33	3.27	20.42	1.31
2.25	1.42	8.33	2.84	14.42	3.27	20.50	1.31
2.33	1.42	8.42	2.84	14.50	3.27	20.58	1.31
2.42	1.42	8.50	2.84	14.58	3.27	20.67	1.31
2.50	1.42	8.58	3.05	14.67	3.27	20.75	1.31
2.58	1.42	8.67	3.05	14.75	3.27	20.83	1.31
2.67	1.42	8.75	3.05	14.83	3.27	20.92	1.31
2.75	1.42	8.83	3.05	14.92	3.27	21.00	1.31
2.83	1.42	8.92	3.05	15.00	3.27	21.08	1.31
2.92	1.42	9.00	3.05	15.08	3.27	21.17	1.31
3.00	1.42	9.08	3.49	15.17	3.27	21.25	1.31
3.08	1.42	9.17	3.49	15.25	3.27	21.33	1.31
3.17	1.42	9.25	3.49	15.33	3.27	21.42	1.31
3.25	1.42	9.33	3.49	15.42	3.27	21.50	1.31
3.33	1.42	9.42	3.49	15.50	3.27	21.58	1.31
3.42	1.42	9.50	3.49	15.58	3.27	21.67	1.31
3.50	1.42	9.58	3.93	15.67	3.27	21.75	1.31
3.58	1.42	9.67	3.93	15.75	3.27	21.83	1.31
3.67	1.42	9.75	3.93	15.83	3.27	21.92	1.31
3.75	1.42	9.83	3.93	15.92	3.27	22.00	1.31
3.83	1.42	9.92	3.93	16.00	3.27	22.08	1.31
3.92	1.42	10.00	3.93	16.08	1.96	22.17	1.31
4.00	1.42	10.08	5.02	16.17	1.96	22.25	1.31
4.08	1.74	10.17	5.02	16.25	1.96	22.33	1.31
4.17	1.74	10.25	5.02	16.33	1.96	22.42	1.31
4.25	1.74	10.33	5.02	16.42	1.96	22.50	1.31
4.33	1.74	10.42	5.02	16.50	1.96	22.58	1.31
4.42	1.74	10.50	5.02	16.58	1.96	22.67	1.31
4.50	1.74	10.58	6.76	16.67	1.96	22.75	1.31
4.58	1.74	10.67	6.76	16.75	1.96	22.83	1.31
4.67	1.74	10.75	6.76	16.83	1.96	22.92	1.31

```
                     4.75    1.74 | 10.83    6.76 | 16.92    1.96 | 23.00    1.31
                     4.83    1.74 | 10.92    6.76 | 17.00    1.96 | 23.08    1.31
                     4.92    1.74 | 11.00    6.76 | 17.08    1.96 | 23.17    1.31
                     5.00    1.74 | 11.08   10.47 | 17.17    1.96 | 23.25    1.31
                     5.08    1.74 | 11.17   10.47 | 17.25    1.96 | 23.33    1.31
                     5.17    1.74 | 11.25   10.47 | 17.33    1.96 | 23.42    1.31
                     5.25    1.74 | 11.33   10.47 | 17.42    1.96 | 23.50    1.31
                     5.33    1.74 | 11.42   10.47 | 17.50    1.96 | 23.58    1.31
                     5.42    1.74 | 11.50   10.47 | 17.58    1.96 | 23.67    1.31
                     5.50    1.74 | 11.58   32.28 | 17.67    1.96 | 23.75    1.31
                     5.58    1.74 | 11.67   32.28 | 17.75    1.96 | 23.83    1.31
                     5.67    1.74 | 11.75   32.28 | 17.83    1.96 | 23.92    1.31
                     5.75    1.74 | 11.83  133.49 | 17.92    1.96 | 24.00    1.31
                     5.83    1.74 | 11.92  133.49 | 18.00    1.96 |
                     5.92    1.74 | 12.00  133.49 | 18.08    1.96 |
                     6.00    1.74 | 12.08   15.70 | 18.17    1.96 |

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| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   6.709 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  62.659
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445

     PEAK FLOW       (cms)=   7.211 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  63.172
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.579
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     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   5.275 (i)
     TIME TO PEAK    (hrs)=  14.833
     RUNOFF VOLUME    (mm)=  57.067
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.523

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

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--------------------
| CALIB              |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   2.878 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  51.410
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.471

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

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--------------------
| CALIB              |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   7.061 (i)
     TIME TO PEAK    (hrs)=  15.333
     RUNOFF VOLUME    (mm)=  51.637
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.473
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     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299

     PEAK FLOW       (cms)=   5.108 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  41.202
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.378

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

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--------------------
| CALIB              |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=   8.065 (i)
     TIME TO PEAK    (hrs)=  15.250
     RUNOFF VOLUME    (mm)=  54.136
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.496

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

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--------------------
| CALIB              |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   5.020 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  54.293
     TOTAL RAINFALL   (mm)= 109.060
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     RUNOFF COEFFICIENT   =   0.498

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

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--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433

     PEAK FLOW       (cms)=   9.171 (i)
     TIME TO PEAK    (hrs)=  14.917
     RUNOFF VOLUME    (mm)=  62.745
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=   8.055 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  62.489
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.573

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

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--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=   9.748 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  62.745
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     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB             |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94

     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=  14.337 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  65.915
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.604

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

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--------------------
| CALIB             |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941

     PEAK FLOW       (cms)=  12.592 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  64.614
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.592

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

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--------------------
| CALIB             |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=  13.678 (i)
     TIME TO PEAK    (hrs)=  14.167
```

```
     RUNOFF VOLUME    (mm)=  64.441
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.591

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

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--------------------
| CALIB              |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=  17.787 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  62.830
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.576

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

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--------------------
| CALIB              |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972

     PEAK FLOW       (cms)=   9.731 (i)
     TIME TO PEAK    (hrs)=  14.500
     RUNOFF VOLUME    (mm)=  62.319
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.571

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

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--------------------
| CALIB              |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   3.996 (i)
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```
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  55.704
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.511

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

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--------------------
| CALIB              |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=   7.576 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  57.969
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.532

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

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--------------------
| CALIB              |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=  14.948 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  62.660
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB              |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748
```

```
     PEAK FLOW       (cms)=   5.734 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  61.172
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.561

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

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--------------------
| CALIB              |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=  11.674 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  61.004
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.559

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

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--------------------
| CALIB              |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   5.455 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  62.660
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB              |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290
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```
     PEAK FLOW       (cms)=  14.344 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  64.441
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.591

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

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--------------------
| CALIB             |
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=  15.089 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  65.915
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.604

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

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--------------------
| CALIB             |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=  11.524 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  62.660
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.575

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

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--------------------
| CALIB             |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09
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```
     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=  16.387 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  61.424
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.563

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

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--------------------
| CALIB             |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473

     PEAK FLOW       (cms)=  11.654 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  61.340
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.562

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

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--------------------
| CALIB             |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=  15.815 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  64.441
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.591

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

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--------------------
| CALIB             |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50
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     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=  10.408 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  65.653
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.602

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

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--------------------
| CALIB             |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611

     PEAK FLOW       (cms)=   7.259 (i)
     TIME TO PEAK    (hrs)=  15.167
     RUNOFF VOLUME    (mm)=  58.296
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.535

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

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--------------------
| CALIB             |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=  10.272 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  57.147
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.524

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

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| CALIB             |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   6.604 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  62.149
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.570

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39

     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   7.242 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  56.745
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.520

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626

     PEAK FLOW       (cms)=   2.851 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  46.088
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.423

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=   8.323 (i)
     TIME TO PEAK    (hrs)=  14.750
     RUNOFF VOLUME    (mm)=  64.268
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.589

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29

     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   7.322 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  68.044
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.624

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096

     PEAK FLOW       (cms)=  12.393 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  64.528
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.592

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
```

```
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=   9.812 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  66.090
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.606

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=  12.468 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  66.003
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.605

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   4.660 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  61.172
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.561

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

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

```
| CALIB              |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=   9.321 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  64.268
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.589

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

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60   8.055    13.83    62.49
      + ID2= 2 (  0011):   342.20   9.748    14.42    62.74
        ====================================================
        ID = 3 (  0063):   578.80  17.590    14.08    62.64

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  17.590    14.08    62.64
      + ID2= 2 (  0012):   436.50  14.337    14.08    65.92
        ====================================================
        ID = 1 (  0063):  1015.30  31.927    14.08    64.05

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  31.927    14.08    64.05
      + ID2= 2 (  0013):   355.50  12.592    13.83    64.61
        ====================================================
        ID = 3 (  0063):  1370.80  44.382    14.00    64.20
```

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80  44.382    14.00    64.20
      + ID2= 2 (  0014):   437.40  13.678    14.17    64.44
        ====================================================
        ID = 1 (  0063):  1808.20  58.017    14.08    64.25

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1808.20  58.017    14.08    64.25
      + ID2= 2 (  0015):   491.60  17.787    13.75    62.83
        ====================================================
        ID = 3 (  0063):  2299.80  75.444    14.00    63.95

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2299.80  75.444    14.00    63.95
      + ID2= 2 (  0016):   361.20   9.731    14.50    62.32
        ====================================================
        ID = 1 (  0063):  2661.00  84.761    14.00    63.73

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00  84.761    14.00    63.73
      + ID2= 2 (  0017):   123.10   3.996    13.67    55.70
        ====================================================
        ID = 3 (  0063):  2784.10  88.659    14.00    63.37

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

```
--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10  88.659    14.00    63.37
      + ID2= 2 (  0022):   188.89   7.576    13.33    57.97
        ====================================================
        ID = 1 (  0063):  2972.99  95.286    13.92    63.03

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99  95.286    13.92    63.03
      + ID2= 2 (  0023):   459.62  14.948    14.00    62.66
        ====================================================
        ID = 3 (  0063):  3432.61 110.220    13.92    62.98

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61 110.220    13.92    62.98
      + ID2= 2 (  0024):   186.44   5.734    14.08    61.17
        ====================================================
        ID = 1 (  0063):  3619.05 115.927    13.92    62.89

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05 115.927    13.92    62.89
      + ID2= 2 (  0025):   402.30  11.674    14.25    61.00
        ====================================================
        ID = 3 (  0063):  4021.35 127.455    14.00    62.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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```
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35 127.455    14.00    62.70
      + ID2= 2 (  0026):   185.40   5.455    14.25    62.66
        ====================================================
        ID = 1 (  0063):  4206.75 132.841    14.00    62.70

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75 132.841    14.00    62.70
      + ID2= 2 (  0027):   266.70  14.344    13.00    64.44
        ====================================================
        ID = 3 (  0063):  4473.45 142.848    13.83    62.80

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45 142.848    13.83    62.80
      + ID2= 2 (  0028):   310.72  15.089    13.25    65.92
        ====================================================
        ID = 1 (  0063):  4784.17 156.008    13.75    63.00

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17 156.008    13.75    63.00
      + ID2= 2 (  0029):   361.98  11.524    14.08    62.66
        ====================================================
        ID = 3 (  0063):  5146.15 167.379    13.83    62.98

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 167.379    13.83    62.98
      + ID2= 2 (  0030):   345.92  16.387    13.17    61.42
        ====================================================
        ID = 1 (  0063):  5492.07 181.332    13.75    62.88

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 181.332    13.75    62.88
      + ID2= 2 (  0031):   401.10  11.654    14.25    61.34
        ====================================================
        ID = 3 (  0063):  5893.17 192.465    13.75    62.78

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 192.465    13.75    62.78
      + ID2= 2 (  0032):   439.56  15.815    13.83    64.44
        ====================================================
        ID = 1 (  0063):  6332.73 208.279    13.75    62.89

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 208.279    13.75    62.89
      + ID2= 2 (  0033):   260.28  10.408    13.58    65.65
        ====================================================
        ID = 3 (  0063):  6593.01 218.618    13.75    63.00

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 218.618    13.75    63.00
```

```
      + ID2= 2 (  0034):   339.20   7.259    15.17    58.30
        ====================================================
        ID = 1 (  0063):  6932.21 224.349    13.75    62.77

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 224.349    13.75    62.77
      + ID2= 2 (  0035):   341.01  10.272    13.92    57.15
        ====================================================
        ID = 3 (  0063):  7273.22 234.546    13.75    62.51

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 234.546    13.75    62.51
      + ID2= 2 (  0036):   201.10   6.604    13.92    62.15
        ====================================================
        ID = 1 (  0063):  7474.32 241.096    13.75    62.50

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 241.096    13.75    62.50
      + ID2= 2 (  0037):   306.27   7.242    14.67    56.74
        ====================================================
        ID = 3 (  0063):  7780.59 247.525    13.83    62.27

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 247.525    13.83    62.27
      + ID2= 2 (  0038):   112.74   2.851    13.83    46.09
        ====================================================
```

```
        ID = 1 (  0063):  7893.33 250.376    13.83    62.04

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 250.376    13.83    62.04
      + ID2= 2 (  0039):   316.30   8.323    14.75    64.27
        ===================================================
        ID = 3 (  0063):  8209.63 257.807    13.83    62.13

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 257.807    13.83    62.13
      + ID2= 2 (  0040):   157.20   7.322    13.33    68.04
        ===================================================
        ID = 1 (  0063):  8366.83 264.578    13.83    62.24

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 264.578    13.83    62.24
      + ID2= 2 (  0041):   311.60  12.393    13.58    64.53
        ===================================================
        ID = 3 (  0063):  8678.43 276.768    13.75    62.32

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 276.768    13.75    62.32
      + ID2= 2 (  0042):   163.70   9.812    12.92    66.09
        ===================================================
        ID = 1 (  0063):  8842.13 283.467    13.75    62.39
```

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 283.467    13.75    62.39
      + ID2= 2 (  0043):   354.50  12.468    13.92    66.00
        ====================================================
        ID = 3 (  0063):  9196.63 295.859    13.75    62.53

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9196.63 295.859    13.75    62.53
      + ID2= 2 (  0044):   165.70   4.660    14.33    61.17
        ====================================================
        ID = 1 (  0063):  9362.33 300.241    13.75    62.50

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  9362.33 300.241    13.75    62.50
      + ID2= 2 (  0045):   288.20   9.321    14.08    64.27
        ====================================================
        ID = 3 (  0063):  9650.53 309.365    13.75    62.56

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9650.53 309.365    13.75    62.56
      + ID2= 2 (  0007):   418.90   8.065    15.25    54.14
        ====================================================
        ID = 1 (  0063): 10069.43 315.534    13.83    62.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 315.534    13.83    62.21
      + ID2= 2 (  0008):   185.44   5.020    14.08    54.29
        ====================================================
        ID = 3 (  0063): 10254.87 320.491    13.83    62.06

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063): 10254.87 320.491    13.83    62.06
      + ID2= 2 (  0009):   378.40   9.171    14.92    62.74
        ====================================================
        ID = 1 (  0063): 10633.27 328.317    13.83    62.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00         441.95        0.0300      Main Channel
                  73.40         438.86        0.0300      Main Channel
                 124.30         438.34        0.0300      Main Channel
                 151.30         437.55        0.0300      Main Channel
                 182.70         439.79        0.0300      Main Channel
                 191.60         440.18        0.0300      Main Channel
                 219.50         440.94        0.0300      Main Channel
                 249.70         442.17        0.0300      Main Channel

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.23   437.78    .242E+05       0.3          0.25      ******
       0.46   438.01    .968E+05       2.1          0.40      785.77
       0.69   438.24    .218E+06       6.1          0.52      599.65
       0.93   438.48    .398E+06      12.1          0.57      546.82
       1.16   438.71    .686E+06      23.1          0.63      495.63
       1.39   438.94    .108E+07      42.4          0.73      425.16
       1.62   439.17    .153E+07      71.5          0.87      356.76
       1.85   439.40    .202E+07     107.6          1.00      312.54
```

```
     2.08   439.63    .254E+07     150.8          1.11     281.09
     2.32   439.87    .311E+07     200.6          1.21     258.13
     2.55   440.10    .372E+07     256.8          1.29     241.17
     2.78   440.33    .437E+07     318.6          1.36     228.86
     3.01   440.56    .509E+07     387.9          1.43     218.81
     3.24   440.79    .587E+07     466.8          1.49     209.62
     3.47   441.02    .671E+07     557.6          1.56     200.56
     3.71   441.26    .760E+07     661.7          1.63     191.42
     3.94   441.49    .854E+07     776.1          1.70     183.34
     4.17   441.72    .952E+07     901.3          1.77     176.13
     4.40   441.95    .106E+08    1037.5          1.84     169.64

                                 <---- hydrograph ---->   <-pipe / channel->
                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                           (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0063) *******   328.32   13.83  62.09      2.81      1.37
   OUTFLOW: ID= 1 (  0100) *******   159.35   16.08  62.08      2.12      1.13


-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   6.833 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  57.643
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.529

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70

     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=   7.639 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  55.466
     TOTAL RAINFALL   (mm)= 109.060
```

```
     RUNOFF COEFFICIENT   =   0.509

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939

     PEAK FLOW       (cms)=   9.584 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  55.387
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.508

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   4.566 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  49.166
     TOTAL RAINFALL   (mm)= 109.060
     RUNOFF COEFFICIENT   =   0.451

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

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27 159.346    16.08    62.08
      + ID2= 2 (  0018):   279.02   6.833    14.58    57.64
        ====================================================
        ID = 3 (  0066): 10912.29 164.985    16.00    61.97

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

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29 164.985    16.00    61.97
      + ID2= 2 (  0019):   365.01   7.639    15.00    55.47
        ==================================================
        ID = 1 (  0066): 11277.30 172.104    16.00    61.76

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30 172.104    16.00    61.76
      + ID2= 2 (  0002):   247.87   7.211    14.33    63.17
        ==================================================
        ID = 3 (  0066): 11525.17 177.551    16.00    61.79

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17 177.551    16.00    61.79
      + ID2= 2 (  0020):   356.10   9.584    14.17    55.39
        ==================================================
        ID = 1 (  0066): 11881.27 184.277    15.92    61.60

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 184.277    15.92    61.60
      + ID2= 2 (  0021):   201.80   4.566    14.33    49.17
        ==================================================
        ID = 3 (  0066): 12083.07 187.881    15.75    61.39

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

```
--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 187.881    15.75    61.39
      + ID2= 2 (  0003):   235.05   5.275    14.83    57.07
        ====================================================
        ID = 1 (  0066): 12318.12 192.818    15.75    61.31

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 192.818    15.75    61.31
      + ID2= 2 (  0004):   121.09   2.878    14.33    51.41
        ====================================================
        ID = 3 (  0066): 12439.21 195.114    15.75    61.21

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 195.114    15.75    61.21
      + ID2= 2 (  0005):   390.34   7.061    15.33    51.64
        ====================================================
        ID = 1 (  0066): 12829.55 202.090    15.75    60.92

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 202.090    15.75    60.92
      + ID2= 2 (  0006):   231.69   5.108    13.83    41.20
        ====================================================
        ID = 3 (  0066): 13061.24 205.320    15.67    60.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
```

<------ DATA FOR SECTION (1.2) ------>

Distance	Elevation	Manning	
67.59	421.25	0.0300	Main Channel
143.41	418.57	0.0300	Main Channel
160.36	417.90	0.0300	Main Channel
173.30	417.80	0.0300	Main Channel
177.00	416.45	0.0300	Main Channel
192.98	416.45	0.0300	Main Channel
209.58	419.51	0.0300	Main Channel
216.18	419.46	0.0300	Main Channel
257.64	421.03	0.0300	Main Channel

<--------------------- TRAVEL TIME TABLE --------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.24	416.69	.466E+05	1.6	0.39	484.44
0.48	416.93	.987E+05	5.2	0.60	315.64
0.72	417.17	.156E+06	10.5	0.77	247.92
0.96	417.41	.219E+06	17.4	0.91	209.82
1.21	417.66	.287E+06	25.9	1.03	184.80
1.45	417.90	.368E+06	29.3	0.91	209.43
1.69	418.14	.489E+06	41.8	0.98	194.88
1.93	418.38	.630E+06	58.0	1.05	181.01
2.17	418.62	.792E+06	78.0	1.12	169.24
2.41	418.86	.976E+06	101.9	1.19	159.69
2.65	419.10	.118E+07	130.4	1.26	151.07
2.89	419.34	.141E+07	164.0	1.33	143.32
3.13	419.58	.167E+07	192.5	1.31	144.64
3.37	419.82	.198E+07	235.5	1.36	139.89
3.62	420.07	.232E+07	286.4	1.41	134.93
3.86	420.31	.270E+07	345.8	1.46	130.02
4.10	420.55	.311E+07	414.1	1.52	125.26
4.34	420.79	.356E+07	491.8	1.57	120.74
4.58	421.03	.405E+07	579.6	1.63	116.47

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0066)	*******	205.32	15.67	60.57	3.21	1.33
OUTFLOW: ID= 1 (0101)	*******	163.15	18.08	60.56	2.88	1.32

```
--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 1 (  0001):   121.60   6.709    12.92    62.66
      + ID2= 2 (  0101): 13061.24 163.151    18.08    60.56
        ====================================================
        ID = 3 (  0102): 13182.84 163.779    18.00    60.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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
```
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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\9350c21e-950b-4653-9224-d09317ae0e6f\
  Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\9350c21e-950b-4653-9224-d09317ae0e6f\

DATE: 09/04/2025   TIME: 08:39:58

USER:

COMMENTS: ____

  ****

** SIMULATION : 2yr 24hr 5min SCS Type II (MT **
****

```
--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\57a81cd0
| Ptotal= 60.65 mm |    Comments: 2yr 24hr 5min SCS Type II (MTO)
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.09	12.17	8.73	18.25	1.09
0.08	0.67	6.17	1.09	12.25	8.73	18.33	1.09
0.17	0.67	6.25	1.09	12.33	8.73	18.42	1.09
0.25	0.67	6.33	1.09	12.42	8.73	18.50	1.09
0.33	0.67	6.42	1.09	12.50	8.73	18.58	1.09
0.42	0.67	6.50	1.09	12.58	4.49	18.67	1.09
0.50	0.67	6.58	1.09	12.67	4.49	18.75	1.09
0.58	0.67	6.67	1.09	12.75	4.49	18.83	1.09
0.67	0.67	6.75	1.09	12.83	4.49	18.92	1.09
0.75	0.67	6.83	1.09	12.92	4.49	19.00	1.09
0.83	0.67	6.92	1.09	13.00	4.49	19.08	1.09
0.92	0.67	7.00	1.09	13.08	3.28	19.17	1.09
1.00	0.67	7.08	1.33	13.17	3.28	19.25	1.09
1.08	0.67	7.17	1.33	13.25	3.28	19.33	1.09
1.17	0.67	7.25	1.33	13.33	3.28	19.42	1.09
1.25	0.67	7.33	1.33	13.42	3.28	19.50	1.09
1.33	0.67	7.42	1.33	13.50	3.28	19.58	1.09
1.42	0.67	7.50	1.33	13.58	2.55	19.67	1.09
1.50	0.67	7.58	1.33	13.67	2.55	19.75	1.09
1.58	0.67	7.67	1.33	13.75	2.55	19.83	1.09
1.67	0.67	7.75	1.33	13.83	2.55	19.92	1.09
1.75	0.67	7.83	1.33	13.92	2.55	20.00	1.09
1.83	0.67	7.92	1.33	14.00	2.55	20.08	0.73
1.92	0.67	8.00	1.33	14.08	1.82	20.17	0.73
2.00	0.67	8.08	1.58	14.17	1.82	20.25	0.73
2.08	0.79	8.17	1.58	14.25	1.82	20.33	0.73
2.17	0.79	8.25	1.58	14.33	1.82	20.42	0.73
2.25	0.79	8.33	1.58	14.42	1.82	20.50	0.73
2.33	0.79	8.42	1.58	14.50	1.82	20.58	0.73
2.42	0.79	8.50	1.58	14.58	1.82	20.67	0.73
2.50	0.79	8.58	1.70	14.67	1.82	20.75	0.73
2.58	0.79	8.67	1.70	14.75	1.82	20.83	0.73
2.67	0.79	8.75	1.70	14.83	1.82	20.92	0.73
2.75	0.79	8.83	1.70	14.92	1.82	21.00	0.73
2.83	0.79	8.92	1.70	15.00	1.82	21.08	0.73
2.92	0.79	9.00	1.70	15.08	1.82	21.17	0.73
3.00	0.79	9.08	1.94	15.17	1.82	21.25	0.73
3.08	0.79	9.17	1.94	15.25	1.82	21.33	0.73

3.17	0.79	9.25	1.94	15.33	1.82	21.42	0.73
3.25	0.79	9.33	1.94	15.42	1.82	21.50	0.73
3.33	0.79	9.42	1.94	15.50	1.82	21.58	0.73
3.42	0.79	9.50	1.94	15.58	1.82	21.67	0.73
3.50	0.79	9.58	2.18	15.67	1.82	21.75	0.73
3.58	0.79	9.67	2.18	15.75	1.82	21.83	0.73
3.67	0.79	9.75	2.18	15.83	1.82	21.92	0.73
3.75	0.79	9.83	2.18	15.92	1.82	22.00	0.73
3.83	0.79	9.92	2.18	16.00	1.82	22.08	0.73
3.92	0.79	10.00	2.18	16.08	1.09	22.17	0.73
4.00	0.79	10.08	2.79	16.17	1.09	22.25	0.73
4.08	0.97	10.17	2.79	16.25	1.09	22.33	0.73
4.17	0.97	10.25	2.79	16.33	1.09	22.42	0.73
4.25	0.97	10.33	2.79	16.42	1.09	22.50	0.73
4.33	0.97	10.42	2.79	16.50	1.09	22.58	0.73
4.42	0.97	10.50	2.79	16.58	1.09	22.67	0.73
4.50	0.97	10.58	3.76	16.67	1.09	22.75	0.73
4.58	0.97	10.67	3.76	16.75	1.09	22.83	0.73
4.67	0.97	10.75	3.76	16.83	1.09	22.92	0.73
4.75	0.97	10.83	3.76	16.92	1.09	23.00	0.73
4.83	0.97	10.92	3.76	17.00	1.09	23.08	0.73
4.92	0.97	11.00	3.76	17.08	1.09	23.17	0.73
5.00	0.97	11.08	5.82	17.17	1.09	23.25	0.73
5.08	0.97	11.17	5.82	17.25	1.09	23.33	0.73
5.17	0.97	11.25	5.82	17.33	1.09	23.42	0.73
5.25	0.97	11.33	5.82	17.42	1.09	23.50	0.73
5.33	0.97	11.42	5.82	17.50	1.09	23.58	0.73
5.42	0.97	11.50	5.82	17.58	1.09	23.67	0.73
5.50	0.97	11.58	17.95	17.67	1.09	23.75	0.73
5.58	0.97	11.67	17.95	17.75	1.09	23.83	0.73
5.67	0.97	11.75	17.95	17.83	1.09	23.92	0.73
5.75	0.97	11.83	74.24	17.92	1.09	24.00	0.73
5.83	0.97	11.92	74.24	18.00	1.09		
5.92	0.97	12.00	74.24	18.08	1.09		
6.00	0.97	12.08	8.73	18.17	1.09		


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

--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   2.526 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  24.358
     TOTAL RAINFALL   (mm)=  60.650
```

```
     RUNOFF COEFFICIENT   =   0.402

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445

     PEAK FLOW       (cms)=   2.747 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  24.782
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.409

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   1.917 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  21.438
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.353

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

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--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   0.999 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  18.536
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     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.306

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

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--------------------
| CALIB              |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   2.473 (i)
     TIME TO PEAK    (hrs)=  15.500
     RUNOFF VOLUME    (mm)=  18.709
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.308

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

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--------------------
| CALIB              |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299

     PEAK FLOW       (cms)=   1.672 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  14.008
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.231

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

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--------------------
| CALIB              |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=   2.864 (i)
     TIME TO PEAK    (hrs)=  15.417
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```
     RUNOFF VOLUME    (mm)=  19.900
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.328

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

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--------------------
| CALIB              |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   1.786 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  20.021
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.330

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

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--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433

     PEAK FLOW       (cms)=   3.460 (i)
     TIME TO PEAK    (hrs)=  15.083
     RUNOFF VOLUME    (mm)=  24.428
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.403

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

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--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=   3.018 (i)
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```
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  24.217
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.399

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

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--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=   3.677 (i)
     TIME TO PEAK    (hrs)=  14.500
     RUNOFF VOLUME    (mm)=  24.428
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.403

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

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--------------------
| CALIB              |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94

     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=   5.542 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  26.235
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.433

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

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--------------------
| CALIB              |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941
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```
     PEAK FLOW       (cms)=   4.840 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  25.565
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.422

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

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--------------------
| CALIB            |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=   5.236 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  25.420
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.419

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

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--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=   6.721 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  24.499
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.404

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

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--------------------
| CALIB            |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972
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```
     PEAK FLOW       (cms)=   3.633 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  24.076
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.397

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

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--------------------
| CALIB             |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   1.437 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  20.747
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.342

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

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--------------------
| CALIB             |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=   2.739 (i)
     TIME TO PEAK    (hrs)=  13.417
     RUNOFF VOLUME    (mm)=  21.764
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.359

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

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--------------------
| CALIB             |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83
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```
     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=   5.626 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  24.358
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.402

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

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--------------------
| CALIB             |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   2.135 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  23.548
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.388

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=   4.329 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  23.411
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.386

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

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08
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```
     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   2.053 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  24.358
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.402

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

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--------------------
| CALIB             |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290

     PEAK FLOW       (cms)=   5.496 (i)
     TIME TO PEAK    (hrs)=  13.083
     RUNOFF VOLUME    (mm)=  25.420
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.419

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

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--------------------
| CALIB             |
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=   5.840 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  26.235
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.433

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

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--------------------
| CALIB             |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
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```
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=   4.338 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  24.358
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.402

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

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--------------------
| CALIB              |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=   6.141 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  23.755
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.392

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

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--------------------
| CALIB              |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473

     PEAK FLOW       (cms)=   4.357 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  23.686
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.391

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

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--------------------
| CALIB              |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
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```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=   6.056 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  25.420
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.419

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

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--------------------
| CALIB            |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=   4.001 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  26.013
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.429

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

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--------------------
| CALIB            |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611

     PEAK FLOW       (cms)=   2.653 (i)
     TIME TO PEAK    (hrs)=  15.250
     RUNOFF VOLUME    (mm)=  22.026
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.363

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

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| CALIB            |
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| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=   3.735 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  21.502
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.355

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

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--------------------
| CALIB            |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   2.454 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  23.936
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.395

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

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--------------------
| CALIB            |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39

     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   2.608 (i)
     TIME TO PEAK    (hrs)=  14.750
     RUNOFF VOLUME    (mm)=  21.183
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.349

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

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| CALIB              |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626

     PEAK FLOW       (cms)=   0.944 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  15.944
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.263

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

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--------------------
| CALIB              |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=   3.174 (i)
     TIME TO PEAK    (hrs)=  14.833
     RUNOFF VOLUME    (mm)=  25.276
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.417

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

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--------------------
| CALIB              |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29

     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   2.901 (i)
     TIME TO PEAK    (hrs)=  13.417
     RUNOFF VOLUME    (mm)=  27.617
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.455

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

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| CALIB            |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096

     PEAK FLOW       (cms)=   4.754 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  25.492
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.420

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

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--------------------
| CALIB            |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=   3.814 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  26.383
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.435

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

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--------------------
| CALIB            |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=   4.830 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  26.309
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   1.735 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  23.548
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.388

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=   3.554 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  25.276
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.417

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

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60   3.018    13.92    24.22
      + ID2= 2 (  0011):   342.20   3.677    14.50    24.43
        ==================================================
        ID = 3 (  0063):   578.80   6.613    14.25    24.34

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

--------------------
| ADD HYD  (  0063)|
```

```
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80   6.613    14.25    24.34
      + ID2= 2 (  0012):   436.50   5.542    14.17    26.23
        ====================================================
        ID = 1 (  0063):  1015.30  12.154    14.25    25.16

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  12.154    14.25    25.16
      + ID2= 2 (  0013):   355.50   4.840    13.92    25.56
        ====================================================
        ID = 3 (  0063):  1370.80  16.936    14.08    25.26

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80  16.936    14.08    25.26
      + ID2= 2 (  0014):   437.40   5.236    14.25    25.42
        ====================================================
        ID = 1 (  0063):  1808.20  22.161    14.17    25.30

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1808.20  22.161    14.17    25.30
      + ID2= 2 (  0015):   491.60   6.721    13.83    24.50
        ====================================================
        ID = 3 (  0063):  2299.80  28.740    14.08    25.13

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (  0063):  2299.80  28.740    14.08    25.13
      + ID2= 2 (  0016):   361.20   3.633    14.67    24.08
        ====================================================
        ID = 1 (  0063):  2661.00  32.200    14.08    24.99

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00  32.200    14.08    24.99
      + ID2= 2 (  0017):   123.10   1.437    13.75    20.75
        ====================================================
        ID = 3 (  0063):  2784.10  33.601    14.08    24.80

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10  33.601    14.08    24.80
      + ID2= 2 (  0022):   188.89   2.739    13.42    21.76
        ====================================================
        ID = 1 (  0063):  2972.99  35.981    14.00    24.61

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99  35.981    14.00    24.61
      + ID2= 2 (  0023):   459.62   5.626    14.08    24.36
        ====================================================
        ID = 3 (  0063):  3432.61  41.601    14.08    24.57

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61  41.601    14.08    24.57
      + ID2= 2 (  0024):   186.44   2.135    14.17    23.55
```

```
        ====================================================
        ID = 1 (  0063):  3619.05  43.733    14.08    24.52

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05  43.733    14.08    24.52
      + ID2= 2 (  0025):   402.30   4.329    14.33    23.41
        ====================================================
        ID = 3 (  0063):  4021.35  48.013    14.08    24.41

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35  48.013    14.08    24.41
      + ID2= 2 (  0026):   185.40   2.053    14.42    24.36
        ====================================================
        ID = 1 (  0063):  4206.75  50.036    14.08    24.41

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75  50.036    14.08    24.41
      + ID2= 2 (  0027):   266.70   5.496    13.08    25.42
        ====================================================
        ID = 3 (  0063):  4473.45  53.813    14.00    24.47

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45  53.813    14.00    24.47
      + ID2= 2 (  0028):   310.72   5.840    13.25    26.23
        ====================================================
        ID = 1 (  0063):  4784.17  58.859    13.83    24.58
```

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17  58.859    13.83    24.58
      + ID2= 2 (  0029):   361.98   4.338    14.17    24.36
        ==================================================
        ID = 3 (  0063):  5146.15  63.151    13.92    24.57

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15  63.151    13.92    24.57
      + ID2= 2 (  0030):   345.92   6.141    13.17    23.75
        ==================================================
        ID = 1 (  0063):  5492.07  68.328    13.83    24.51

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07  68.328    13.83    24.51
      + ID2= 2 (  0031):   401.10   4.357    14.33    23.69
        ==================================================
        ID = 3 (  0063):  5893.17  72.481    13.83    24.46

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17  72.481    13.83    24.46
      + ID2= 2 (  0032):   439.56   6.056    13.92    25.42
        ==================================================
        ID = 1 (  0063):  6332.73  78.536    13.83    24.53

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

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73  78.536    13.83    24.53
      + ID2= 2 (  0033):   260.28   4.001    13.67    26.01
        ====================================================
        ID = 3 (  0063):  6593.01  82.510    13.83    24.58

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01  82.510    13.83    24.58
      + ID2= 2 (  0034):   339.20   2.653    15.25    22.03
        ====================================================
        ID = 1 (  0063):  6932.21  84.575    13.83    24.46

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21  84.575    13.83    24.46
      + ID2= 2 (  0035):   341.01   3.735    14.00    21.50
        ====================================================
        ID = 3 (  0063):  7273.22  88.283    13.83    24.32

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22  88.283    13.83    24.32
      + ID2= 2 (  0036):   201.10   2.454    14.08    23.94
        ====================================================
        ID = 1 (  0063):  7474.32  90.714    13.83    24.31

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

```
--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32  90.714    13.83    24.31
      + ID2= 2 (  0037):   306.27   2.608    14.75    21.18
        ===================================================
        ID = 3 (  0063):  7780.59  93.036    13.92    24.19

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59  93.036    13.92    24.19
      + ID2= 2 (  0038):   112.74   0.944    13.92    15.94
        ===================================================
        ID = 1 (  0063):  7893.33  93.980    13.92    24.07

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33  93.980    13.92    24.07
      + ID2= 2 (  0039):   316.30   3.174    14.83    25.28
        ===================================================
        ID = 3 (  0063):  8209.63  96.791    13.92    24.12

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63  96.791    13.92    24.12
      + ID2= 2 (  0040):   157.20   2.901    13.42    27.62
        ===================================================
        ID = 1 (  0063):  8366.83  99.465    13.92    24.18

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

--------------------
| ADD HYD  (  0063)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83  99.465    13.92    24.18
      + ID2= 2 (  0041):   311.60   4.754    13.67    25.49
        ===================================================
        ID = 3 (  0063):  8678.43 104.121    13.92    24.23

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 104.121    13.92    24.23
      + ID2= 2 (  0042):   163.70   3.814    12.92    26.38
        ===================================================
        ID = 1 (  0063):  8842.13 106.694    13.83    24.27

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 106.694    13.83    24.27
      + ID2= 2 (  0043):   354.50   4.830    14.00    26.31
        ===================================================
        ID = 3 (  0063):  9196.63 111.493    13.83    24.35

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9196.63 111.493    13.83    24.35
      + ID2= 2 (  0044):   165.70   1.735    14.42    23.55
        ===================================================
        ID = 1 (  0063):  9362.33 113.119    13.83    24.33

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
     ID1= 1 (  0063):  9362.33 113.119    13.83    24.33
   + ID2= 2 (  0045):   288.20   3.554    14.17    25.28
     ====================================================
     ID = 3 (  0063):  9650.53 116.594    13.83    24.36

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
     ID1= 3 (  0063):  9650.53 116.594    13.83    24.36
   + ID2= 2 (  0007):   418.90   2.864    15.42    19.90
     ====================================================
     ID = 1 (  0063): 10069.43 118.774    13.92    24.18

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
     ID1= 1 (  0063): 10069.43 118.774    13.92    24.18
   + ID2= 2 (  0008):   185.44   1.786    14.17    20.02
     ====================================================
     ID = 3 (  0063): 10254.87 120.536    13.92    24.10

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
     ID1= 3 (  0063): 10254.87 120.536    13.92    24.10
   + ID2= 2 (  0009):   378.40   3.460    15.08    24.43
     ====================================================
     ID = 1 (  0063): 10633.27 123.457    13.92    24.11

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
              <------ DATA FOR SECTION (   1.1) ------>
              Distance      Elevation       Manning
                  0.00        441.95        0.0300      Main Channel
```

73.40	438.86	0.0300	Main Channel
124.30	438.34	0.0300	Main Channel
151.30	437.55	0.0300	Main Channel
182.70	439.79	0.0300	Main Channel
191.60	440.18	0.0300	Main Channel
219.50	440.94	0.0300	Main Channel
249.70	442.17	0.0300	Main Channel

<---------------------- TRAVEL TIME TABLE ---------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.23	437.78	.242E+05	0.3	0.25	******
0.46	438.01	.968E+05	2.1	0.40	785.77
0.69	438.24	.218E+06	6.1	0.52	599.65
0.93	438.48	.398E+06	12.1	0.57	546.82
1.16	438.71	.686E+06	23.1	0.63	495.63
1.39	438.94	.108E+07	42.4	0.73	425.16
1.62	439.17	.153E+07	71.5	0.87	356.76
1.85	439.40	.202E+07	107.6	1.00	312.54
2.08	439.63	.254E+07	150.8	1.11	281.09
2.32	439.87	.311E+07	200.6	1.21	258.13
2.55	440.10	.372E+07	256.8	1.29	241.17
2.78	440.33	.437E+07	318.6	1.36	228.86
3.01	440.56	.509E+07	387.9	1.43	218.81
3.24	440.79	.587E+07	466.8	1.49	209.62
3.47	441.02	.671E+07	557.6	1.56	200.56
3.71	441.26	.760E+07	661.7	1.63	191.42
3.94	441.49	.854E+07	776.1	1.70	183.34
4.17	441.72	.952E+07	901.3	1.77	176.13
4.40	441.95	.106E+08	1037.5	1.84	169.64

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0063)	*******	123.46	13.92	24.11	1.94	1.04
OUTFLOW: ID= 1 (0100)	*******	47.90	16.58	24.11	1.43	0.76

```
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   2.453 (i)
     TIME TO PEAK    (hrs)=  14.750
```

```
     RUNOFF VOLUME    (mm)=  21.504
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.355

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70

     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=   2.735 (i)
     TIME TO PEAK    (hrs)=  15.167
     RUNOFF VOLUME    (mm)=  20.560
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.339

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939

     PEAK FLOW       (cms)=   3.419 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  20.498
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.338

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   1.571 (i)
```

```
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  17.547
     TOTAL RAINFALL   (mm)=  60.650
     RUNOFF COEFFICIENT   =   0.289

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

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27  47.902    16.58    24.11
      + ID2= 2 (  0018):   279.02   2.453    14.75    21.50
        ====================================================
        ID = 3 (  0066): 10912.29  49.802    16.58    24.04

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


--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29  49.802    16.58    24.04
      + ID2= 2 (  0019):   365.01   2.735    15.17    20.56
        ====================================================
        ID = 1 (  0066): 11277.30  52.239    16.50    23.93

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30  52.239    16.50    23.93
      + ID2= 2 (  0002):   247.87   2.747    14.42    24.78
        ====================================================
        ID = 3 (  0066): 11525.17  54.142    16.50    23.95

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


--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17  54.142    16.50    23.95
```

```
      + ID2= 2 (  0020):   356.10   3.419    14.25    20.50
        ====================================================
        ID = 1 (  0066): 11881.27  56.349    16.42    23.84

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27  56.349    16.42    23.84
      + ID2= 2 (  0021):   201.80   1.571    14.42    17.55
        ====================================================
        ID = 3 (  0066): 12083.07  57.473    16.33    23.74

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07  57.473    16.33    23.74
      + ID2= 2 (  0003):   235.05   1.917    15.00    21.44
        ====================================================
        ID = 1 (  0066): 12318.12  59.163    16.33    23.69

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12  59.163    16.33    23.69
      + ID2= 2 (  0004):   121.09   0.999    14.42    18.54
        ====================================================
        ID = 3 (  0066): 12439.21  59.881    16.33    23.64

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21  59.881    16.33    23.64
      + ID2= 2 (  0005):   390.34   2.473    15.50    18.71
        ====================================================
```

```
    ID = 1 (  0066): 12829.55  62.256    16.25    23.49

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
    ID1= 1 (  0066): 12829.55  62.256    16.25    23.49
  + ID2= 2 (  0006):   231.69   1.672    13.92    14.01
    ===================================================
    ID = 3 (  0066): 13061.24  63.184    16.17    23.33

 NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59         421.25        0.0300      Main Channel
                 143.41         418.57        0.0300      Main Channel
                 160.36         417.90        0.0300      Main Channel
                 173.30         417.80        0.0300      Main Channel
                 177.00         416.45        0.0300      Main Channel
                 192.98         416.45        0.0300      Main Channel
                 209.58         419.51        0.0300      Main Channel
                 216.18         419.46        0.0300      Main Channel
                 257.64         421.03        0.0300      Main Channel

      <---------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)       (min)
       0.24   416.69    .466E+05       1.6          0.39      484.44
       0.48   416.93    .987E+05       5.2          0.60      315.64
       0.72   417.17    .156E+06      10.5          0.77      247.92
       0.96   417.41    .219E+06      17.4          0.91      209.82
       1.21   417.66    .287E+06      25.9          1.03      184.80
       1.45   417.90    .368E+06      29.3          0.91      209.43
       1.69   418.14    .489E+06      41.8          0.98      194.88
       1.93   418.38    .630E+06      58.0          1.05      181.01
       2.17   418.62    .792E+06      78.0          1.12      169.24
       2.41   418.86    .976E+06     101.9          1.19      159.69
       2.65   419.10    .118E+07     130.4          1.26      151.07
       2.89   419.34    .141E+07     164.0          1.33      143.32
       3.13   419.58    .167E+07     192.5          1.31      144.64
       3.37   419.82    .198E+07     235.5          1.36      139.89
       3.62   420.07    .232E+07     286.4          1.41      134.93
```

```
      3.86   420.31    .270E+07     345.8          1.46     130.02
      4.10   420.55    .311E+07     414.1          1.52     125.26
      4.34   420.79    .356E+07     491.8          1.57     120.74
      4.58   421.03    .405E+07     579.6          1.63     116.47

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
  INFLOW : ID= 2 (  0066) *******    63.18   16.17  23.33      1.99      1.07
  OUTFLOW: ID= 1 (  0101) *******    47.85   19.25  23.32      1.77      1.00



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

--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):   121.60   2.526    13.00    24.36
      + ID2= 2 (  0101): 13061.24  47.849    19.25    23.32
        ====================================================
        ID = 3 (  0102): 13182.84  48.104    19.25    23.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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
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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\04e4874b-7f06-4f2b-80ed-ee3ca30cf889\
Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\04e4874b-7f06-4f2b-80ed-ee3ca30cf889\

DATE: 09/04/2025 TIME: 08:39:55

USER:

COMMENTS: ____

```
**************************************************
** SIMULATION : 50yr 24hr 5min SCS Type II (M **
**************************************************
```

```
--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\a83e3d50
| Ptotal=121.03 mm |    Comments: 50yr 24hr 5min SCS Type II (MTO)
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.18	12.17	17.43	18.25	2.18
0.08	1.33	6.17	2.18	12.25	17.43	18.33	2.18
0.17	1.33	6.25	2.18	12.33	17.43	18.42	2.18
0.25	1.33	6.33	2.18	12.42	17.43	18.50	2.18
0.33	1.33	6.42	2.18	12.50	17.43	18.58	2.18
0.42	1.33	6.50	2.18	12.58	8.96	18.67	2.18
0.50	1.33	6.58	2.18	12.67	8.96	18.75	2.18
0.58	1.33	6.67	2.18	12.75	8.96	18.83	2.18
0.67	1.33	6.75	2.18	12.83	8.96	18.92	2.18
0.75	1.33	6.83	2.18	12.92	8.96	19.00	2.18
0.83	1.33	6.92	2.18	13.00	8.96	19.08	2.18
0.92	1.33	7.00	2.18	13.08	6.54	19.17	2.18
1.00	1.33	7.08	2.66	13.17	6.54	19.25	2.18
1.08	1.33	7.17	2.66	13.25	6.54	19.33	2.18
1.17	1.33	7.25	2.66	13.33	6.54	19.42	2.18
1.25	1.33	7.33	2.66	13.42	6.54	19.50	2.18
1.33	1.33	7.42	2.66	13.50	6.54	19.58	2.18
1.42	1.33	7.50	2.66	13.58	5.08	19.67	2.18
1.50	1.33	7.58	2.66	13.67	5.08	19.75	2.18

1.58	1.33	7.67	2.66	13.75	5.08	19.83	2.18
1.67	1.33	7.75	2.66	13.83	5.08	19.92	2.18
1.75	1.33	7.83	2.66	13.92	5.08	20.00	2.18
1.83	1.33	7.92	2.66	14.00	5.08	20.08	1.45
1.92	1.33	8.00	2.66	14.08	3.63	20.17	1.45
2.00	1.33	8.08	3.15	14.17	3.63	20.25	1.45
2.08	1.57	8.17	3.15	14.25	3.63	20.33	1.45
2.17	1.57	8.25	3.15	14.33	3.63	20.42	1.45
2.25	1.57	8.33	3.15	14.42	3.63	20.50	1.45
2.33	1.57	8.42	3.15	14.50	3.63	20.58	1.45
2.42	1.57	8.50	3.15	14.58	3.63	20.67	1.45
2.50	1.57	8.58	3.39	14.67	3.63	20.75	1.45
2.58	1.57	8.67	3.39	14.75	3.63	20.83	1.45
2.67	1.57	8.75	3.39	14.83	3.63	20.92	1.45
2.75	1.57	8.83	3.39	14.92	3.63	21.00	1.45
2.83	1.57	8.92	3.39	15.00	3.63	21.08	1.45
2.92	1.57	9.00	3.39	15.08	3.63	21.17	1.45
3.00	1.57	9.08	3.87	15.17	3.63	21.25	1.45
3.08	1.57	9.17	3.87	15.25	3.63	21.33	1.45
3.17	1.57	9.25	3.87	15.33	3.63	21.42	1.45
3.25	1.57	9.33	3.87	15.42	3.63	21.50	1.45
3.33	1.57	9.42	3.87	15.50	3.63	21.58	1.45
3.42	1.57	9.50	3.87	15.58	3.63	21.67	1.45
3.50	1.57	9.58	4.36	15.67	3.63	21.75	1.45
3.58	1.57	9.67	4.36	15.75	3.63	21.83	1.45
3.67	1.57	9.75	4.36	15.83	3.63	21.92	1.45
3.75	1.57	9.83	4.36	15.92	3.63	22.00	1.45
3.83	1.57	9.92	4.36	16.00	3.63	22.08	1.45
3.92	1.57	10.00	4.36	16.08	2.18	22.17	1.45
4.00	1.57	10.08	5.57	16.17	2.18	22.25	1.45
4.08	1.94	10.17	5.57	16.25	2.18	22.33	1.45
4.17	1.94	10.25	5.57	16.33	2.18	22.42	1.45
4.25	1.94	10.33	5.57	16.42	2.18	22.50	1.45
4.33	1.94	10.42	5.57	16.50	2.18	22.58	1.45
4.42	1.94	10.50	5.57	16.58	2.18	22.67	1.45
4.50	1.94	10.58	7.50	16.67	2.18	22.75	1.45
4.58	1.94	10.67	7.50	16.75	2.18	22.83	1.45
4.67	1.94	10.75	7.50	16.83	2.18	22.92	1.45
4.75	1.94	10.83	7.50	16.92	2.18	23.00	1.45
4.83	1.94	10.92	7.50	17.00	2.18	23.08	1.45
4.92	1.94	11.00	7.50	17.08	2.18	23.17	1.45
5.00	1.94	11.08	11.62	17.17	2.18	23.25	1.45
5.08	1.94	11.17	11.62	17.25	2.18	23.33	1.45
5.17	1.94	11.25	11.62	17.33	2.18	23.42	1.45
5.25	1.94	11.33	11.62	17.42	2.18	23.50	1.45
5.33	1.94	11.42	11.62	17.50	2.18	23.58	1.45
5.42	1.94	11.50	11.62	17.58	2.18	23.67	1.45
5.50	1.94	11.58	35.82	17.67	2.18	23.75	1.45
5.58	1.94	11.67	35.82	17.75	2.18	23.83	1.45
5.67	1.94	11.75	35.82	17.83	2.18	23.92	1.45

```
                 5.75    1.94 | 11.83  148.14 | 17.92    2.18 | 24.00    1.45
                 5.83    1.94 | 11.92  148.14 | 18.00    2.18 |
                 5.92    1.94 | 12.00  148.14 | 18.08    2.18 |
                 6.00    1.94 | 12.08   17.43 | 18.17    2.18 |

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

--------------------
| CALIB              |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   7.834 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  72.981
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.603

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445

     PEAK FLOW       (cms)=   8.414 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  73.505
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.607

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   6.204 (i)
```

```
     TIME TO PEAK    (hrs)=  14.833
     RUNOFF VOLUME    (mm)=  66.859
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.552

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   3.409 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  60.631
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.501

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   8.358 (i)
     TIME TO PEAK    (hrs)=  15.333
     RUNOFF VOLUME    (mm)=  60.866
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.503

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299
```

```
     PEAK FLOW       (cms)=   6.124 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  49.131
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.406

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=   9.521 (i)
     TIME TO PEAK    (hrs)=  15.250
     RUNOFF VOLUME    (mm)=  63.644
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.526

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   5.923 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  63.806
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.527

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433
```

```
     PEAK FLOW       (cms)=  10.713 (i)
     TIME TO PEAK    (hrs)=  14.917
     RUNOFF VOLUME    (mm)=  73.069
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.604

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=   9.414 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  72.807
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.602

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=  11.388 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  73.069
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.604

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94
```

```
     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=  16.677 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  76.494
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.632

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941

     PEAK FLOW       (cms)=  14.666 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  75.073
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.620

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=  15.939 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  74.897
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.619

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60
```

```
     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=  20.765 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  73.156
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.604

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972

     PEAK FLOW       (cms)=  11.380 (i)
     TIME TO PEAK    (hrs)=  14.500
     RUNOFF VOLUME    (mm)=  72.633
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.600

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   4.707 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  65.359
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.540

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=   8.904 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  67.884
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.561

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=  17.459 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  72.981
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.603

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   6.710 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  71.363
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.590

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

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--------------------
| CALIB             |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
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```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=  13.666 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  71.191
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.588

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   6.373 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  72.981
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.603

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290

     PEAK FLOW       (cms)=  16.708 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  74.896
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.619

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

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| CALIB            |
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```
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=  17.538 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  76.494
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.632

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

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--------------------
| CALIB            |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=  13.464 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  72.981
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.603

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=  19.156 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  71.621
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.592

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

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| CALIB              |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473

     PEAK FLOW       (cms)=  13.633 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  71.535
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.591

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

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--------------------
| CALIB              |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=  18.430 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  74.897
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.619

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

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--------------------
| CALIB              |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=  12.111 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  76.227
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.630

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

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| CALIB              |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611

     PEAK FLOW       (cms)=   8.526 (i)
     TIME TO PEAK    (hrs)=  15.083
     RUNOFF VOLUME    (mm)=  68.220
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.564

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

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--------------------
| CALIB              |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=  12.078 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  66.942
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.553

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

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--------------------
| CALIB              |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   7.725 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  72.459
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.599

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39

     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   8.523 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  66.527
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.550

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

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--------------------
| CALIB            |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626

     PEAK FLOW       (cms)=   3.402 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  54.715
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.452

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

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--------------------
| CALIB            |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=   9.704 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  74.720
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.617

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB              |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29

     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   8.488 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  78.756
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.651

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

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--------------------
| CALIB              |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096

     PEAK FLOW       (cms)=  14.433 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  74.985
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.620

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

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--------------------
| CALIB              |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=  11.398 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  76.672
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.633
```

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

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--------------------
| CALIB              |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=  14.498 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  76.584
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.633

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   5.454 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  71.363
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.590

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=  10.864 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  74.720
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.617
```

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

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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60   9.414    13.83    72.81
      + ID2= 2 (  0011):   342.20  11.388    14.33    73.07
        ===================================================
        ID = 3 (  0063):   578.80  20.554    14.08    72.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  20.554    14.08    72.96
      + ID2= 2 (  0012):   436.50  16.677    14.08    76.49
        ===================================================
        ID = 1 (  0063):  1015.30  37.231    14.08    74.48

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  37.231    14.08    74.48
      + ID2= 2 (  0013):   355.50  14.666    13.83    75.07
        ===================================================
        ID = 3 (  0063):  1370.80  51.740    14.00    74.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80  51.740    14.00    74.63
      + ID2= 2 (  0014):   437.40  15.939    14.17    74.90
        ===================================================
        ID = 1 (  0063):  1808.20  67.614    14.08    74.70
```

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     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1808.20  67.614    14.08    74.70
      + ID2= 2 (  0015):   491.60  20.765    13.67    73.16
        ====================================================
        ID = 3 (  0063):  2299.80  87.967    13.92    74.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2299.80  87.967    13.92    74.37
      + ID2= 2 (  0016):   361.20  11.380    14.50    72.63
        ====================================================
        ID = 1 (  0063):  2661.00  98.882    14.00    74.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00  98.882    14.00    74.13
      + ID2= 2 (  0017):   123.10   4.707    13.67    65.36
        ====================================================
        ID = 3 (  0063):  2784.10 103.464    14.00    73.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10 103.464    14.00    73.74
      + ID2= 2 (  0022):   188.89   8.904    13.33    67.88
        ====================================================
        ID = 1 (  0063):  2972.99 111.270    13.92    73.37

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

```
--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99 111.270    13.92    73.37
      + ID2= 2 (  0023):   459.62  17.459    14.00    72.98
        ===================================================
        ID = 3 (  0063):  3432.61 128.721    13.92    73.32

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61 128.721    13.92    73.32
      + ID2= 2 (  0024):   186.44   6.710    14.08    71.36
        ===================================================
        ID = 1 (  0063):  3619.05 135.406    13.92    73.22

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05 135.406    13.92    73.22
      + ID2= 2 (  0025):   402.30  13.666    14.25    71.19
        ===================================================
        ID = 3 (  0063):  4021.35 148.858    14.00    73.02

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35 148.858    14.00    73.02
      + ID2= 2 (  0026):   185.40   6.373    14.25    72.98
        ===================================================
        ID = 1 (  0063):  4206.75 155.158    14.00    73.01

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

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

```
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75 155.158    14.00    73.01
      + ID2= 2 (  0027):   266.70  16.708    13.00    74.90
        ===================================================
        ID = 3 (  0063):  4473.45 166.883    13.83    73.13

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45 166.883    13.83    73.13
      + ID2= 2 (  0028):   310.72  17.538    13.25    76.49
        ===================================================
        ID = 1 (  0063):  4784.17 182.203    13.75    73.35

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17 182.203    13.75    73.35
      + ID2= 2 (  0029):   361.98  13.464    14.00    72.98
        ===================================================
        ID = 3 (  0063):  5146.15 195.451    13.75    73.32

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 195.451    13.75    73.32
      + ID2= 2 (  0030):   345.92  19.156    13.17    71.62
        ===================================================
        ID = 1 (  0063):  5492.07 211.784    13.67    73.21

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 211.784    13.67    73.21
      + ID2= 2 (  0031):   401.10  13.633    14.25    71.54
        ====================================================
        ID = 3 (  0063):  5893.17 224.813    13.75    73.10

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 224.813    13.75    73.10
      + ID2= 2 (  0032):   439.56  18.430    13.75    74.90
        ====================================================
        ID = 1 (  0063):  6332.73 243.243    13.75    73.22

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 243.243    13.75    73.22
      + ID2= 2 (  0033):   260.28  12.111    13.58    76.23
        ====================================================
        ID = 3 (  0063):  6593.01 255.260    13.75    73.34

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 255.260    13.75    73.34
      + ID2= 2 (  0034):   339.20   8.526    15.08    68.22
        ====================================================
        ID = 1 (  0063):  6932.21 262.041    13.75    73.09

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 262.041    13.75    73.09
```

```
      + ID2= 2 (  0035):   341.01  12.078    13.92    66.94
        ====================================================
        ID = 3 (  0063):  7273.22 274.041    13.75    72.80

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 274.041    13.75    72.80
      + ID2= 2 (  0036):   201.10   7.725    13.92    72.46
        ====================================================
        ID = 1 (  0063):  7474.32 281.711    13.75    72.79

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 281.711    13.75    72.79
      + ID2= 2 (  0037):   306.27   8.523    14.67    66.53
        ====================================================
        ID = 3 (  0063):  7780.59 289.263    13.75    72.55

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 289.263    13.75    72.55
      + ID2= 2 (  0038):   112.74   3.402    13.83    54.71
        ====================================================
        ID = 1 (  0063):  7893.33 292.663    13.75    72.29

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 292.663    13.75    72.29
      + ID2= 2 (  0039):   316.30   9.704    14.67    74.72
        ====================================================
```

```
        ID = 3 (  0063):  8209.63 301.294    13.83    72.39

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 301.294    13.83    72.39
      + ID2= 2 (  0040):   157.20   8.488    13.33    78.76
        ====================================================
        ID = 1 (  0063):  8366.83 309.160    13.75    72.51

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 309.160    13.75    72.51
      + ID2= 2 (  0041):   311.60  14.433    13.58    74.98
        ====================================================
        ID = 3 (  0063):  8678.43 323.435    13.75    72.59

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 323.435    13.75    72.59
      + ID2= 2 (  0042):   163.70  11.398    12.92    76.67
        ====================================================
        ID = 1 (  0063):  8842.13 331.170    13.75    72.67

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 331.170    13.75    72.67
      + ID2= 2 (  0043):   354.50  14.498    13.92    76.58
        ====================================================
        ID = 3 (  0063):  9196.63 345.593    13.75    72.82
```

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9196.63 345.593    13.75    72.82
      + ID2= 2 (  0044):   165.70   5.454    14.33    71.36
        ====================================================
        ID = 1 (  0063):  9362.33 350.738    13.75    72.80

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  9362.33 350.738    13.75    72.80
      + ID2= 2 (  0045):   288.20  10.864    14.08    74.72
        ====================================================
        ID = 3 (  0063):  9650.53 361.393    13.75    72.85

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9650.53 361.393    13.75    72.85
      + ID2= 2 (  0007):   418.90   9.521    15.25    63.64
        ====================================================
        ID = 1 (  0063): 10069.43 368.725    13.75    72.47

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 368.725    13.75    72.47
      + ID2= 2 (  0008):   185.44   5.923    14.08    63.81
        ====================================================
        ID = 3 (  0063): 10254.87 374.525    13.75    72.31

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

```
--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |
--------------------
```

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (	0063):	10254.87	374.525	13.75	72.31
+ ID2= 2 (	0009):	378.40	10.713	14.92	73.07
ID = 1 (	0063):	10633.27	383.628	13.83	72.34

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
```

Distance	Elevation	Manning	
0.00	441.95	0.0300	Main Channel
73.40	438.86	0.0300	Main Channel
124.30	438.34	0.0300	Main Channel
151.30	437.55	0.0300	Main Channel
182.70	439.79	0.0300	Main Channel
191.60	440.18	0.0300	Main Channel
219.50	440.94	0.0300	Main Channel
249.70	442.17	0.0300	Main Channel

```
<--------------------- TRAVEL TIME TABLE --------------------->
```

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.23	437.78	.242E+05	0.3	0.25	******
0.46	438.01	.968E+05	2.1	0.40	785.77
0.69	438.24	.218E+06	6.1	0.52	599.65
0.93	438.48	.398E+06	12.1	0.57	546.82
1.16	438.71	.686E+06	23.1	0.63	495.63
1.39	438.94	.108E+07	42.4	0.73	425.16
1.62	439.17	.153E+07	71.5	0.87	356.76
1.85	439.40	.202E+07	107.6	1.00	312.54
2.08	439.63	.254E+07	150.8	1.11	281.09
2.32	439.87	.311E+07	200.6	1.21	258.13
2.55	440.10	.372E+07	256.8	1.29	241.17
2.78	440.33	.437E+07	318.6	1.36	228.86
3.01	440.56	.509E+07	387.9	1.43	218.81
3.24	440.79	.587E+07	466.8	1.49	209.62
3.47	441.02	.671E+07	557.6	1.56	200.56
3.71	441.26	.760E+07	661.7	1.63	191.42
3.94	441.49	.854E+07	776.1	1.70	183.34
4.17	441.72	.952E+07	901.3	1.77	176.13
4.40	441.95	.106E+08	1037.5	1.84	169.64

```
                                     <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
    INFLOW : ID= 2 (  0063) *******   383.63   13.83  72.34      3.00      1.42
    OUTFLOW: ID= 1 (  0100) *******   191.59   16.00  72.33      2.27      1.19



-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   8.040 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  67.549
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.558

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

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70

     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=   9.004 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  65.113
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.538

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

-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939
```

```
     PEAK FLOW       (cms)=  11.298 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  65.032
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.537

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   5.421 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  58.110
     TOTAL RAINFALL   (mm)= 121.030
     RUNOFF COEFFICIENT   =   0.480

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

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27 191.589    16.00    72.33
      + ID2= 2 (  0018):   279.02   8.040    14.58    67.55
        ===================================================
        ID = 3 (  0066): 10912.29 198.361    15.92    72.21

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


--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29 198.361    15.92    72.21
      + ID2= 2 (  0019):   365.01   9.004    15.00    65.11
        ===================================================
        ID = 1 (  0066): 11277.30 206.814    15.92    71.98

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

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30 206.814    15.92    71.98
      + ID2= 2 (  0002):   247.87   8.414    14.33    73.50
        ====================================================
        ID = 3 (  0066): 11525.17 213.284    15.83    72.01

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17 213.284    15.83    72.01
      + ID2= 2 (  0020):   356.10  11.298    14.17    65.03
        ====================================================
        ID = 1 (  0066): 11881.27 221.493    15.75    71.80

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 221.493    15.75    71.80
      + ID2= 2 (  0021):   201.80   5.421    14.33    58.11
        ====================================================
        ID = 3 (  0066): 12083.07 225.818    15.67    71.57

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 225.818    15.67    71.57
      + ID2= 2 (  0003):   235.05   6.204    14.83    66.86
        ====================================================
        ID = 1 (  0066): 12318.12 231.671    15.67    71.48

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

```
--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 231.671    15.67    71.48
      + ID2= 2 (  0004):   121.09   3.409    14.25    60.63
        ====================================================
        ID = 3 (  0066): 12439.21 234.433    15.67    71.38

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 234.433    15.67    71.38
      + ID2= 2 (  0005):   390.34   8.358    15.33    60.87
        ====================================================
        ID = 1 (  0066): 12829.55 242.715    15.67    71.06

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 242.715    15.67    71.06
      + ID2= 2 (  0006):   231.69   6.124    13.83    49.13
        ====================================================
        ID = 3 (  0066): 13061.24 246.610    15.67    70.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59        421.25        0.0300      Main Channel
                 143.41        418.57        0.0300      Main Channel
                 160.36        417.90        0.0300      Main Channel
                 173.30        417.80        0.0300      Main Channel
                 177.00        416.45        0.0300      Main Channel
                 192.98        416.45        0.0300      Main Channel
                 209.58        419.51        0.0300      Main Channel
                 216.18        419.46        0.0300      Main Channel
                 257.64        421.03        0.0300      Main Channel
```

```
 <--------------------- TRAVEL TIME TABLE ---------------------->
  DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
   (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
  0.24   416.69    .466E+05      1.6           0.39     484.44
  0.48   416.93    .987E+05      5.2           0.60     315.64
  0.72   417.17    .156E+06     10.5           0.77     247.92
  0.96   417.41    .219E+06     17.4           0.91     209.82
  1.21   417.66    .287E+06     25.9           1.03     184.80
  1.45   417.90    .368E+06     29.3           0.91     209.43
  1.69   418.14    .489E+06     41.8           0.98     194.88
  1.93   418.38    .630E+06     58.0           1.05     181.01
  2.17   418.62    .792E+06     78.0           1.12     169.24
  2.41   418.86    .976E+06    101.9           1.19     159.69
  2.65   419.10    .118E+07    130.4           1.26     151.07
  2.89   419.34    .141E+07    164.0           1.33     143.32
  3.13   419.58    .167E+07    192.5           1.31     144.64
  3.37   419.82    .198E+07    235.5           1.36     139.89
  3.62   420.07    .232E+07    286.4           1.41     134.93
  3.86   420.31    .270E+07    345.8           1.46     130.02
  4.10   420.55    .311E+07    414.1           1.52     125.26
  4.34   420.79    .356E+07    491.8           1.57     120.74
  4.58   421.03    .405E+07    579.6           1.63     116.47

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0066) *******   246.61   15.67  70.67      3.43      1.37
   OUTFLOW: ID= 1 (  0101) *******   191.80   17.83  70.67      3.13      1.31



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


--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):   121.60   7.834    12.92    72.98
      + ID2= 2 (  0101): 13061.24 191.802    17.83    70.67
        ====================================================
        ID = 3 (  0102): 13182.84 192.545    17.83    70.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\795f7604-17a4-4d1b-aa14-991d3f76c0cb\
Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\795f7604-17a4-4d1b-aa14-991d3f76c0cb\

DATE: 09/04/2025   TIME: 08:39:57

USER:

COMMENTS: ____

```
-------------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 5yr 24hr 5min SCS Type II (MT **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\1bd3245d
| Ptotal= 80.17 mm |    Comments: 5yr 24hr 5min SCS Type II (MTO)
--------------------
                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.00	0.00	6.08	1.44	12.17	11.54	18.25	1.44
0.08	0.88	6.17	1.44	12.25	11.54	18.33	1.44
0.17	0.88	6.25	1.44	12.33	11.54	18.42	1.44
0.25	0.88	6.33	1.44	12.42	11.54	18.50	1.44
0.33	0.88	6.42	1.44	12.50	11.54	18.58	1.44
0.42	0.88	6.50	1.44	12.58	5.93	18.67	1.44
0.50	0.88	6.58	1.44	12.67	5.93	18.75	1.44
0.58	0.88	6.67	1.44	12.75	5.93	18.83	1.44
0.67	0.88	6.75	1.44	12.83	5.93	18.92	1.44
0.75	0.88	6.83	1.44	12.92	5.93	19.00	1.44
0.83	0.88	6.92	1.44	13.00	5.93	19.08	1.44
0.92	0.88	7.00	1.44	13.08	4.33	19.17	1.44
1.00	0.88	7.08	1.76	13.17	4.33	19.25	1.44
1.08	0.88	7.17	1.76	13.25	4.33	19.33	1.44
1.17	0.88	7.25	1.76	13.33	4.33	19.42	1.44
1.25	0.88	7.33	1.76	13.42	4.33	19.50	1.44
1.33	0.88	7.42	1.76	13.50	4.33	19.58	1.44
1.42	0.88	7.50	1.76	13.58	3.37	19.67	1.44
1.50	0.88	7.58	1.76	13.67	3.37	19.75	1.44
1.58	0.88	7.67	1.76	13.75	3.37	19.83	1.44
1.67	0.88	7.75	1.76	13.83	3.37	19.92	1.44
1.75	0.88	7.83	1.76	13.92	3.37	20.00	1.44
1.83	0.88	7.92	1.76	14.00	3.37	20.08	0.96
1.92	0.88	8.00	1.76	14.08	2.41	20.17	0.96
2.00	0.88	8.08	2.08	14.17	2.41	20.25	0.96
2.08	1.04	8.17	2.08	14.25	2.41	20.33	0.96
2.17	1.04	8.25	2.08	14.33	2.41	20.42	0.96
2.25	1.04	8.33	2.08	14.42	2.41	20.50	0.96
2.33	1.04	8.42	2.08	14.50	2.41	20.58	0.96
2.42	1.04	8.50	2.08	14.58	2.41	20.67	0.96
2.50	1.04	8.58	2.24	14.67	2.41	20.75	0.96
2.58	1.04	8.67	2.24	14.75	2.41	20.83	0.96
2.67	1.04	8.75	2.24	14.83	2.41	20.92	0.96
2.75	1.04	8.83	2.24	14.92	2.41	21.00	0.96
2.83	1.04	8.92	2.24	15.00	2.41	21.08	0.96
2.92	1.04	9.00	2.24	15.08	2.41	21.17	0.96
3.00	1.04	9.08	2.57	15.17	2.41	21.25	0.96
3.08	1.04	9.17	2.57	15.25	2.41	21.33	0.96
3.17	1.04	9.25	2.57	15.33	2.41	21.42	0.96
3.25	1.04	9.33	2.57	15.42	2.41	21.50	0.96
3.33	1.04	9.42	2.57	15.50	2.41	21.58	0.96
3.42	1.04	9.50	2.57	15.58	2.41	21.67	0.96
3.50	1.04	9.58	2.89	15.67	2.41	21.75	0.96
3.58	1.04	9.67	2.89	15.75	2.41	21.83	0.96
3.67	1.04	9.75	2.89	15.83	2.41	21.92	0.96
3.75	1.04	9.83	2.89	15.92	2.41	22.00	0.96
3.83	1.04	9.92	2.89	16.00	2.41	22.08	0.96
3.92	1.04	10.00	2.89	16.08	1.44	22.17	0.96
4.00	1.04	10.08	3.69	16.17	1.44	22.25	0.96
4.08	1.28	10.17	3.69	16.25	1.44	22.33	0.96

4.17	1.28	10.25	3.69	16.33	1.44	22.42	0.96
4.25	1.28	10.33	3.69	16.42	1.44	22.50	0.96
4.33	1.28	10.42	3.69	16.50	1.44	22.58	0.96
4.42	1.28	10.50	3.69	16.58	1.44	22.67	0.96
4.50	1.28	10.58	4.97	16.67	1.44	22.75	0.96
4.58	1.28	10.67	4.97	16.75	1.44	22.83	0.96
4.67	1.28	10.75	4.97	16.83	1.44	22.92	0.96
4.75	1.28	10.83	4.97	16.92	1.44	23.00	0.96
4.83	1.28	10.92	4.97	17.00	1.44	23.08	0.96
4.92	1.28	11.00	4.97	17.08	1.44	23.17	0.96
5.00	1.28	11.08	7.70	17.17	1.44	23.25	0.96
5.08	1.28	11.17	7.70	17.25	1.44	23.33	0.96
5.17	1.28	11.25	7.70	17.33	1.44	23.42	0.96
5.25	1.28	11.33	7.70	17.42	1.44	23.50	0.96
5.33	1.28	11.42	7.70	17.50	1.44	23.58	0.96
5.42	1.28	11.50	7.70	17.58	1.44	23.67	0.96
5.50	1.28	11.58	23.73	17.67	1.44	23.75	0.96
5.58	1.28	11.67	23.73	17.75	1.44	23.83	0.96
5.67	1.28	11.75	23.73	17.83	1.44	23.92	0.96
5.75	1.28	11.83	98.13	17.92	1.44	24.00	0.96
5.83	1.28	11.92	98.13	18.00	1.44		
5.92	1.28	12.00	98.13	18.08	1.44		
6.00	1.28	12.08	11.54	18.17	1.44		

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

--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

     Unit Hyd Qpeak  (cms)=   5.048

     PEAK FLOW       (cms)=   4.114 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  38.938
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.486

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

------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   4.445
```

```
     PEAK FLOW       (cms)=   4.443 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  39.409
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.492

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57

     Unit Hyd Qpeak  (cms)=   3.493

     PEAK FLOW       (cms)=   3.173 (i)
     TIME TO PEAK    (hrs)=  14.917
     RUNOFF VOLUME    (mm)=  34.833
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.434

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   2.234

     PEAK FLOW       (cms)=   1.692 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  30.735
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.383

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94
```

```
     Unit Hyd Qpeak  (cms)=   5.071

     PEAK FLOW       (cms)=   4.166 (i)
     TIME TO PEAK    (hrs)=  15.417
     RUNOFF VOLUME    (mm)=  30.936
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.386

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=   5.299

     PEAK FLOW       (cms)=   2.907 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  23.859
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.298

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

     Unit Hyd Qpeak  (cms)=   5.517

     PEAK FLOW       (cms)=   4.795 (i)
     TIME TO PEAK    (hrs)=  15.333
     RUNOFF VOLUME    (mm)=  32.685
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.408

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89
```

```
     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   2.987 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  32.825
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.409

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66

     Unit Hyd Qpeak  (cms)=   5.433

     PEAK FLOW       (cms)=   5.628 (i)
     TIME TO PEAK    (hrs)=  15.000
     RUNOFF VOLUME    (mm)=  39.017
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.487

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

     Unit Hyd Qpeak  (cms)=   5.254

     PEAK FLOW       (cms)=   4.933 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  38.782
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.484

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   2.17

     Unit Hyd Qpeak  (cms)=   6.023

     PEAK FLOW       (cms)=   5.984 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  39.017
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.487

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94

     Unit Hyd Qpeak  (cms)=   8.594

     PEAK FLOW       (cms)=   8.912 (i)
     TIME TO PEAK    (hrs)=  14.167
     RUNOFF VOLUME    (mm)=  41.445
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.517

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71

     Unit Hyd Qpeak  (cms)=   7.941

     PEAK FLOW       (cms)=   7.798 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  40.490
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.505

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

     Unit Hyd Qpeak  (cms)=   8.353

     PEAK FLOW       (cms)=   8.457 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  40.330
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.503

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

     Unit Hyd Qpeak  (cms)=  11.735

     PEAK FLOW       (cms)=  10.931 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  39.095
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.488

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

     Unit Hyd Qpeak  (cms)=   5.972

     PEAK FLOW       (cms)=   5.948 (i)
     TIME TO PEAK    (hrs)=  14.583
     RUNOFF VOLUME    (mm)=  38.625
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.482

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
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```
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

     Unit Hyd Qpeak  (cms)=   3.033

     PEAK FLOW       (cms)=   2.391 (i)
     TIME TO PEAK    (hrs)=  13.750
     RUNOFF VOLUME    (mm)=  33.849
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.422

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25

     Unit Hyd Qpeak  (cms)=   5.772

     PEAK FLOW       (cms)=   4.555 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  35.404
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.442

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

     Unit Hyd Qpeak  (cms)=   9.593

     PEAK FLOW       (cms)=   9.166 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  38.938
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.486

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

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| CALIB              |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

     Unit Hyd Qpeak  (cms)=   3.748

     PEAK FLOW       (cms)=   3.496 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  37.824
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.472

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

     Unit Hyd Qpeak  (cms)=   7.532

     PEAK FLOW       (cms)=   7.106 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  37.670
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.470

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

     Unit Hyd Qpeak  (cms)=   3.405

     PEAK FLOW       (cms)=   3.345 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  38.938
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.486

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

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--------------------
| CALIB            |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99

     Unit Hyd Qpeak  (cms)=  10.290

     PEAK FLOW       (cms)=   8.872 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)=  40.330
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.503

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

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--------------------
| CALIB            |
| NASHYD   (  0028)|   Area    (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17

     Unit Hyd Qpeak  (cms)=  10.144

     PEAK FLOW       (cms)=   9.393 (i)
     TIME TO PEAK    (hrs)=  13.250
     RUNOFF VOLUME    (mm)=  41.445
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.517

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

     Unit Hyd Qpeak  (cms)=   7.354

     PEAK FLOW       (cms)=   7.070 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  38.938
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.486

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

     Unit Hyd Qpeak  (cms)=  12.121

     PEAK FLOW       (cms)=  10.028 (i)
     TIME TO PEAK    (hrs)=  13.167
     RUNOFF VOLUME    (mm)=  38.054
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.475

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

     Unit Hyd Qpeak  (cms)=   7.473

     PEAK FLOW       (cms)=   7.117 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  37.977
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.474

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

     Unit Hyd Qpeak  (cms)=  10.053

     PEAK FLOW       (cms)=   9.785 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  40.330
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.503

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

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--------------------
| CALIB              |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

     Unit Hyd Qpeak  (cms)=   6.628

     PEAK FLOW       (cms)=   6.455 (i)
     TIME TO PEAK    (hrs)=  13.667
     RUNOFF VOLUME    (mm)=  41.201
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.514

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

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--------------------
| CALIB              |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

     Unit Hyd Qpeak  (cms)=   4.611

     PEAK FLOW       (cms)=   4.381 (i)
     TIME TO PEAK    (hrs)=  15.167
     RUNOFF VOLUME    (mm)=  35.700
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.445

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

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--------------------
| CALIB              |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

     Unit Hyd Qpeak  (cms)=   7.359

     PEAK FLOW       (cms)=   6.182 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  34.906
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.435
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     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

     Unit Hyd Qpeak  (cms)=   4.291

     PEAK FLOW       (cms)=   4.030 (i)
     TIME TO PEAK    (hrs)=  14.000
     RUNOFF VOLUME    (mm)=  38.469
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.480

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39

     Unit Hyd Qpeak  (cms)=   4.895

     PEAK FLOW       (cms)=   4.340 (i)
     TIME TO PEAK    (hrs)=  14.750
     RUNOFF VOLUME    (mm)=  34.543
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.431

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

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--------------------
| CALIB              |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64

     Unit Hyd Qpeak  (cms)=   2.626

     PEAK FLOW       (cms)=   1.637 (i)
     TIME TO PEAK    (hrs)=  13.833
     RUNOFF VOLUME    (mm)=  26.987
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.337
```

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

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--------------------
| CALIB              |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

     Unit Hyd Qpeak  (cms)=   4.871

     PEAK FLOW       (cms)=   5.137 (i)
     TIME TO PEAK    (hrs)=  14.750
     RUNOFF VOLUME    (mm)=  40.170
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.501

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29

     Unit Hyd Qpeak  (cms)=   4.654

     PEAK FLOW       (cms)=   4.603 (i)
     TIME TO PEAK    (hrs)=  13.333
     RUNOFF VOLUME    (mm)=  43.178
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.539

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

     Unit Hyd Qpeak  (cms)=   8.096

     PEAK FLOW       (cms)=   7.673 (i)
     TIME TO PEAK    (hrs)=  13.583
     RUNOFF VOLUME    (mm)=  40.410
     TOTAL RAINFALL   (mm)=  80.170
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     RUNOFF COEFFICIENT   =   0.504

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   7.025

     PEAK FLOW       (cms)=   6.119 (i)
     TIME TO PEAK    (hrs)=  12.917
     RUNOFF VOLUME    (mm)=  41.608
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.519

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=   7.755 (i)
     TIME TO PEAK    (hrs)=  13.917
     RUNOFF VOLUME    (mm)=  41.526
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.518

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

     Unit Hyd Qpeak  (cms)=   2.971

     PEAK FLOW       (cms)=   2.841 (i)
     TIME TO PEAK    (hrs)=  14.417
     RUNOFF VOLUME    (mm)=  37.824
```

```
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.472

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

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--------------------
| CALIB              |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

     Unit Hyd Qpeak  (cms)=   5.763

     PEAK FLOW       (cms)=   5.753 (i)
     TIME TO PEAK    (hrs)=  14.083
     RUNOFF VOLUME    (mm)=  40.170
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.501

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

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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60   4.933    13.92    38.78
      + ID2= 2 (  0011):   342.20   5.984    14.42    39.02
        ====================================================
        ID = 3 (  0063):   578.80  10.785    14.17    38.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  10.785    14.17    38.92
      + ID2= 2 (  0012):   436.50   8.912    14.17    41.45
        ====================================================
        ID = 1 (  0063):  1015.30  19.697    14.17    40.01

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

--------------------
| ADD HYD  (  0063)|
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```
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  19.697    14.17    40.01
      + ID2= 2 (  0013):   355.50   7.798    13.92    40.49
        ====================================================
        ID = 3 (  0063):  1370.80  27.409    14.08    40.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80  27.409    14.08    40.13
      + ID2= 2 (  0014):   437.40   8.457    14.25    40.33
        ====================================================
        ID = 1 (  0063):  1808.20  35.839    14.08    40.18

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1808.20  35.839    14.08    40.18
      + ID2= 2 (  0015):   491.60  10.931    13.75    39.10
        ====================================================
        ID = 3 (  0063):  2299.80  46.547    14.00    39.95

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2299.80  46.547    14.00    39.95
      + ID2= 2 (  0016):   361.20   5.948    14.58    38.63
        ====================================================
        ID = 1 (  0063):  2661.00  52.228    14.08    39.77

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 1 (  0063):  2661.00  52.228    14.08    39.77
      + ID2= 2 (  0017):   123.10   2.391    13.75    33.85
        ====================================================
        ID = 3 (  0063):  2784.10  54.545    14.08    39.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10  54.545    14.08    39.51
      + ID2= 2 (  0022):   188.89   4.555    13.33    35.40
        ====================================================
        ID = 1 (  0063):  2972.99  58.531    14.00    39.25

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99  58.531    14.00    39.25
      + ID2= 2 (  0023):   459.62   9.166    14.00    38.94
        ====================================================
        ID = 3 (  0063):  3432.61  67.698    14.00    39.20

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61  67.698    14.00    39.20
      + ID2= 2 (  0024):   186.44   3.496    14.08    37.82
        ====================================================
        ID = 1 (  0063):  3619.05  71.185    14.00    39.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  3619.05  71.185    14.00    39.13
      + ID2= 2 (  0025):   402.30   7.106    14.25    37.67
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        ====================================================
        ID = 3 (  0063):  4021.35  78.192    14.00    38.99

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4021.35  78.192    14.00    38.99
      + ID2= 2 (  0026):   185.40   3.345    14.33    38.94
        ====================================================
        ID = 1 (  0063):  4206.75  81.478    14.00    38.98

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4206.75  81.478    14.00    38.98
      + ID2= 2 (  0027):   266.70   8.872    13.00    40.33
        ====================================================
        ID = 3 (  0063):  4473.45  87.659    13.92    39.07

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  4473.45  87.659    13.92    39.07
      + ID2= 2 (  0028):   310.72   9.393    13.25    41.45
        ====================================================
        ID = 1 (  0063):  4784.17  95.814    13.83    39.22

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17  95.814    13.83    39.22
      + ID2= 2 (  0029):   361.98   7.070    14.08    38.94
        ====================================================
        ID = 3 (  0063):  5146.15 102.790    13.83    39.20
```

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     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 102.790    13.83    39.20
      + ID2= 2 (  0030):   345.92  10.028    13.17    38.05
        ============================================================
        ID = 1 (  0063):  5492.07 111.289    13.75    39.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 111.289    13.75    39.13
      + ID2= 2 (  0031):   401.10   7.117    14.33    37.98
        ============================================================
        ID = 3 (  0063):  5893.17 118.025    13.75    39.05

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 118.025    13.75    39.05
      + ID2= 2 (  0032):   439.56   9.785    13.83    40.33
        ============================================================
        ID = 1 (  0063):  6332.73 127.797    13.83    39.14

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 127.797    13.83    39.14
      + ID2= 2 (  0033):   260.28   6.455    13.67    41.20
        ============================================================
        ID = 3 (  0063):  6593.01 134.227    13.75    39.22

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

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 134.227    13.75    39.22
      + ID2= 2 (  0034):   339.20   4.381    15.17    35.70
        ====================================================
        ID = 1 (  0063):  6932.21 137.680    13.83    39.05

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 137.680    13.83    39.05
      + ID2= 2 (  0035):   341.01   6.182    14.00    34.91
        ====================================================
        ID = 3 (  0063):  7273.22 143.837    13.83    38.85

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 143.837    13.83    38.85
      + ID2= 2 (  0036):   201.10   4.030    14.00    38.47
        ====================================================
        ID = 1 (  0063):  7474.32 147.846    13.83    38.84

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 147.846    13.83    38.84
      + ID2= 2 (  0037):   306.27   4.340    14.75    34.54
        ====================================================
        ID = 3 (  0063):  7780.59 151.712    13.83    38.67

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

```
--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 151.712    13.83    38.67
      + ID2= 2 (  0038):   112.74   1.637    13.83    26.99
        ===================================================
        ID = 1 (  0063):  7893.33 153.349    13.83    38.51

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 153.349    13.83    38.51
      + ID2= 2 (  0039):   316.30   5.137    14.75    40.17
        ===================================================
        ID = 3 (  0063):  8209.63 157.863    13.83    38.57

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 157.863    13.83    38.57
      + ID2= 2 (  0040):   157.20   4.603    13.33    43.18
        ===================================================
        ID = 1 (  0063):  8366.83 162.163    13.83    38.66

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 162.163    13.83    38.66
      + ID2= 2 (  0041):   311.60   7.673    13.58    40.41
        ===================================================
        ID = 3 (  0063):  8678.43 169.717    13.83    38.72

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

--------------------
| ADD HYD  (  0063)|
```

```
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 169.717    13.83    38.72
      + ID2= 2 (  0042):   163.70   6.119    12.92    41.61
        ====================================================
        ID = 1 (  0063):  8842.13 173.766    13.75    38.77

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 173.766    13.75    38.77
      + ID2= 2 (  0043):   354.50   7.755    13.92    41.53
        ====================================================
        ID = 3 (  0063):  9196.63 181.476    13.83    38.88

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9196.63 181.476    13.83    38.88
      + ID2= 2 (  0044):   165.70   2.841    14.42    37.82
        ====================================================
        ID = 1 (  0063):  9362.33 184.169    13.83    38.86

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  9362.33 184.169    13.83    38.86
      + ID2= 2 (  0045):   288.20   5.753    14.08    40.17
        ====================================================
        ID = 3 (  0063):  9650.53 189.831    13.83    38.90

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (  0063):  9650.53 189.831    13.83    38.90
      + ID2= 2 (  0007):   418.90   4.795    15.33    32.69
        ====================================================
        ID = 1 (  0063): 10069.43 193.537    13.83    38.64

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 193.537    13.83    38.64
      + ID2= 2 (  0008):   185.44   2.987    14.17    32.82
        ====================================================
        ID = 3 (  0063): 10254.87 196.473    13.83    38.54

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063): 10254.87 196.473    13.83    38.54
      + ID2= 2 (  0009):   378.40   5.628    15.00    39.02
        ====================================================
        ID = 1 (  0063): 10633.27 201.185    13.83    38.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00         441.95       0.0300      Main Channel
                  73.40         438.86       0.0300      Main Channel
                 124.30         438.34       0.0300      Main Channel
                 151.30         437.55       0.0300      Main Channel
                 182.70         439.79       0.0300      Main Channel
                 191.60         440.18       0.0300      Main Channel
                 219.50         440.94       0.0300      Main Channel
                 249.70         442.17       0.0300      Main Channel

      <--------------------- TRAVEL TIME TABLE ---------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY   TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)      (min)
       0.23   437.78    .242E+05       0.3          0.25     ******
```

```
       0.46   438.01    .968E+05       2.1          0.40     785.77
       0.69   438.24    .218E+06       6.1          0.52     599.65
       0.93   438.48    .398E+06      12.1          0.57     546.82
       1.16   438.71    .686E+06      23.1          0.63     495.63
       1.39   438.94    .108E+07      42.4          0.73     425.16
       1.62   439.17    .153E+07      71.5          0.87     356.76
       1.85   439.40    .202E+07     107.6          1.00     312.54
       2.08   439.63    .254E+07     150.8          1.11     281.09
       2.32   439.87    .311E+07     200.6          1.21     258.13
       2.55   440.10    .372E+07     256.8          1.29     241.17
       2.78   440.33    .437E+07     318.6          1.36     228.86
       3.01   440.56    .509E+07     387.9          1.43     218.81
       3.24   440.79    .587E+07     466.8          1.49     209.62
       3.47   441.02    .671E+07     557.6          1.56     200.56
       3.71   441.26    .760E+07     661.7          1.63     191.42
       3.94   441.49    .854E+07     776.1          1.70     183.34
       4.17   441.72    .952E+07     901.3          1.77     176.13
       4.40   441.95    .106E+08    1037.5          1.84     169.64

                                    <---- hydrograph ---->   <-pipe / channel->
                              AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                              (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
    INFLOW : ID= 2 (  0063) *******   201.18   13.83  38.55      2.32      1.21
    OUTFLOW: ID= 1 (  0100) *******    87.70   16.50  38.55      1.72      0.92


-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34

     Unit Hyd Qpeak  (cms)=   4.554

     PEAK FLOW       (cms)=   4.095 (i)
     TIME TO PEAK    (hrs)=  14.667
     RUNOFF VOLUME    (mm)=  35.109
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.438

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70
```

```
     Unit Hyd Qpeak  (cms)=   5.164

     PEAK FLOW       (cms)=   4.562 (i)
     TIME TO PEAK    (hrs)=  15.083
     RUNOFF VOLUME    (mm)=  33.635
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.420

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

     Unit Hyd Qpeak  (cms)=   6.939

     PEAK FLOW       (cms)=   5.715 (i)
     TIME TO PEAK    (hrs)=  14.250
     RUNOFF VOLUME    (mm)=  33.564
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.419

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

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=   2.669 (i)
     TIME TO PEAK    (hrs)=  14.333
     RUNOFF VOLUME    (mm)=  29.220
     TOTAL RAINFALL   (mm)=  80.170
     RUNOFF COEFFICIENT   =   0.364

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

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27  87.703    16.50    38.55
      + ID2= 2 (  0018):   279.02   4.095    14.67    35.11
        ====================================================
        ID = 3 (  0066): 10912.29  90.866    16.42    38.46

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29  90.866    16.42    38.46
      + ID2= 2 (  0019):   365.01   4.562    15.08    33.64
        ====================================================
        ID = 1 (  0066): 11277.30  94.955    16.33    38.30

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30  94.955    16.33    38.30
      + ID2= 2 (  0002):   247.87   4.443    14.42    39.41
        ====================================================
        ID = 3 (  0066): 11525.17  98.153    16.17    38.33

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17  98.153    16.17    38.33
      + ID2= 2 (  0020):   356.10   5.715    14.25    33.56
        ====================================================
        ID = 1 (  0066): 11881.27 102.022    16.17    38.18

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 102.022    16.17    38.18
```

```
      + ID2= 2 (  0021):   201.80   2.669    14.33    29.22
        ====================================================
        ID = 3 (  0066): 12083.07 103.996    16.08    38.03

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 103.996    16.08    38.03
      + ID2= 2 (  0003):   235.05   3.173    14.92    34.83
        ====================================================
        ID = 1 (  0066): 12318.12 106.906    15.92    37.97

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 106.906    15.92    37.97
      + ID2= 2 (  0004):   121.09   1.692    14.33    30.74
        ====================================================
        ID = 3 (  0066): 12439.21 108.226    15.92    37.90

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 108.226    15.92    37.90
      + ID2= 2 (  0005):   390.34   4.166    15.42    30.94
        ====================================================
        ID = 1 (  0066): 12829.55 112.321    15.92    37.69

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 112.321    15.92    37.69
      + ID2= 2 (  0006):   231.69   2.907    13.92    23.86
        ====================================================
```

```
      ID = 3 (  0066): 13061.24 114.071    15.83    37.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59        421.25        0.0300      Main Channel
                 143.41        418.57        0.0300      Main Channel
                 160.36        417.90        0.0300      Main Channel
                 173.30        417.80        0.0300      Main Channel
                 177.00        416.45        0.0300      Main Channel
                 192.98        416.45        0.0300      Main Channel
                 209.58        419.51        0.0300      Main Channel
                 216.18        419.46        0.0300      Main Channel
                 257.64        421.03        0.0300      Main Channel

      <--------------------- TRAVEL TIME TABLE --------------------->
       DEPTH    ELEV      VOLUME    FLOW RATE    VELOCITY    TRAV.TIME
        (m)      (m)     (cu.m.)      (cms)        (m/s)       (min)
       0.24   416.69    .466E+05       1.6          0.39      484.44
       0.48   416.93    .987E+05       5.2          0.60      315.64
       0.72   417.17    .156E+06      10.5          0.77      247.92
       0.96   417.41    .219E+06      17.4          0.91      209.82
       1.21   417.66    .287E+06      25.9          1.03      184.80
       1.45   417.90    .368E+06      29.3          0.91      209.43
       1.69   418.14    .489E+06      41.8          0.98      194.88
       1.93   418.38    .630E+06      58.0          1.05      181.01
       2.17   418.62    .792E+06      78.0          1.12      169.24
       2.41   418.86    .976E+06     101.9          1.19      159.69
       2.65   419.10    .118E+07     130.4          1.26      151.07
       2.89   419.34    .141E+07     164.0          1.33      143.32
       3.13   419.58    .167E+07     192.5          1.31      144.64
       3.37   419.82    .198E+07     235.5          1.36      139.89
       3.62   420.07    .232E+07     286.4          1.41      134.93
       3.86   420.31    .270E+07     345.8          1.46      130.02
       4.10   420.55    .311E+07     414.1          1.52      125.26
       4.34   420.79    .356E+07     491.8          1.57      120.74
       4.58   421.03    .405E+07     579.6          1.63      116.47

                                     <---- hydrograph ---->   <-pipe / channel->
                               AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
                               (ha)    (cms)   (hrs)   (mm)      (m)      (m/s)
   INFLOW : ID= 2 (  0066) *******   114.07   15.83  37.45      2.51      1.22
   OUTFLOW: ID= 1 (  0101) *******    87.97   18.33  37.44      2.27      1.15
```

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


--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):   121.60   4.114    13.00    38.94
      + ID2= 2 (  0101): 13061.24  87.974    18.33    37.44
        ====================================================
        ID = 3 (  0102): 13182.84  88.375    18.33    37.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS 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\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\a
1954246-027b-4b8d-b72f-27c6f475701f\
  Summary filename:
C:\Users\DKankanamge\AppData\Local\Civica\VH5\05dc2b32-23fd-4009-8cff-60216a4a9577\a
1954246-027b-4b8d-b72f-27c6f475701f\


DATE: 09/04/2025                           TIME: 08:40:01

USER:
```

COMMENTS: ____

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  ************************************************
  ** SIMULATION : Hurricane Hazel              **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\DKankanamge\AppD
|                  |              ata\Local\Temp\
|                  |              7ff4d3d2-2692-4877-b177-eacb884aaa4b\e37e2fe9
| 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            |
| NASHYD   (  0001)|   Area    (ha)= 121.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.92

         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

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    Unit Hyd Qpeak  (cms)=   5.048

    PEAK FLOW       (cms)=  12.172 (i)
    TIME TO PEAK    (hrs)=  11.083
    RUNOFF VOLUME    (mm)= 156.234
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.737

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

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--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)= 247.87   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

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

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Unit Hyd Qpeak  (cms)=   4.445

PEAK FLOW       (cms)=  17.539 (i)
TIME TO PEAK    (hrs)=  12.167
RUNOFF VOLUME    (mm)= 156.801
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.740

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| NASHYD   (  0003)|   Area    (ha)= 235.05   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.57
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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

Unit Hyd Qpeak (cms)= 3.493

PEAK FLOW (cms)= 14.348 (i)
TIME TO PEAK (hrs)= 12.500
RUNOFF VOLUME (mm)= 147.255
TOTAL RAINFALL (mm)= 212.000

RUNOFF COEFFICIENT = 0.695

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

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----------------------------------------------------------------------------------------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)= 121.09   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.60   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07
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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

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          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)=   2.234

     PEAK FLOW       (cms)=   7.900 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)= 137.805
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.650

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

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--------------------
| CALIB             |
| NASHYD   (  0005)|   Area    (ha)= 390.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.94

         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

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Unit Hyd Qpeak  (cms)=   5.071

PEAK FLOW       (cms)=  20.844 (i)
TIME TO PEAK    (hrs)=  12.833
RUNOFF VOLUME    (mm)= 138.073
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.651

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0006)|   Area    (ha)= 231.69   Curve Number   (CN)= 63.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67

        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

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                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)=   5.299

     PEAK FLOW       (cms)=  14.843 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)= 118.327
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.558

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

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| CALIB             |
| NASHYD   (  0007)|   Area    (ha)= 418.90   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.90

         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
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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

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Unit Hyd Qpeak  (cms)=   5.517

PEAK FLOW       (cms)=  23.169 (i)
TIME TO PEAK    (hrs)=  12.750
RUNOFF VOLUME    (mm)= 142.461
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.672

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

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--------------------
| CALIB            |
| NASHYD   (  0008)|   Area    (ha)= 185.44   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.89
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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


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Unit Hyd Qpeak  (cms)=   3.748

PEAK FLOW       (cms)=  12.998 (i)
TIME TO PEAK    (hrs)=  12.000
RUNOFF VOLUME    (mm)= 142.643
TOTAL RAINFALL   (mm)= 212.000
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RUNOFF COEFFICIENT = 0.673

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

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| CALIB              |
| NASHYD   (  0009)|   Area    (ha)= 378.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.66
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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

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           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)=   5.433

     PEAK FLOW       (cms)=  23.734 (i)
     TIME TO PEAK    (hrs)=  12.583
     RUNOFF VOLUME    (mm)= 156.329
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.737

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

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--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)= 236.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.72

         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
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                 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)=   5.254

     PEAK FLOW       (cms)=  18.538 (i)
     TIME TO PEAK    (hrs)=  11.750
     RUNOFF VOLUME    (mm)= 156.046
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.736

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

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--------------------
| CALIB              |
| NASHYD   (  0011)|   Area    (ha)= 342.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.17

         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)= 6.023

PEAK FLOW (cms)= 23.965 (i)
TIME TO PEAK (hrs)= 12.167
RUNOFF VOLUME (mm)= 156.329
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.737

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

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| CALIB              |
| NASHYD   (  0012)|   Area    (ha)= 436.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.94
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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


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Unit Hyd Qpeak  (cms)=   8.594

PEAK FLOW       (cms)=  32.975 (i)
TIME TO PEAK    (hrs)=  12.000
RUNOFF VOLUME    (mm)= 161.071
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.760

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0013)|   Area    (ha)= 355.50   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.80   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.71
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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

Unit Hyd Qpeak (cms)=   7.941

PEAK FLOW   (cms)= 28.241 (i)
TIME TO PEAK   (hrs)= 11.750
RUNOFF VOLUME   (mm)= 159.027
TOTAL RAINFALL   (mm)= 212.000

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     RUNOFF COEFFICIENT   =   0.750

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

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| CALIB             |
| NASHYD   (  0014)|   Area    (ha)= 437.40   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.00

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

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            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)=   8.353

     PEAK FLOW       (cms)=  32.239 (i)
     TIME TO PEAK    (hrs)=  12.000
     RUNOFF VOLUME    (mm)= 158.837
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.749

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

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--------------------
| CALIB             |
| NASHYD   (  0015)|   Area    (ha)= 491.60   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.60

         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
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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

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Unit Hyd Qpeak  (cms)=  11.735

PEAK FLOW       (cms)=  39.860 (i)
TIME TO PEAK    (hrs)=  11.667
RUNOFF VOLUME    (mm)= 156.423
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.738

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0016)|   Area    (ha)= 361.20   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.31

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

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    Unit Hyd Qpeak  (cms)=   5.972

    PEAK FLOW       (cms)=  24.460 (i)
    TIME TO PEAK    (hrs)=  12.333
    RUNOFF VOLUME    (mm)= 155.857
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.735

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

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| CALIB              |
| NASHYD   (  0017)|   Area    (ha)= 123.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.55

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

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Unit Hyd Qpeak  (cms)=   3.033

PEAK FLOW       (cms)=   9.598 (i)
TIME TO PEAK    (hrs)=  11.667
RUNOFF VOLUME    (mm)= 144.989
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.684

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB             |
| NASHYD   (  0022)|   Area    (ha)= 188.89   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.25
```

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

Unit Hyd Qpeak (cms)= 5.772

PEAK FLOW (cms)= 16.509 (i)
TIME TO PEAK (hrs)= 11.333
RUNOFF VOLUME (mm)= 148.975
TOTAL RAINFALL (mm)= 212.000

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     RUNOFF COEFFICIENT   =   0.703

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

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| CALIB            |
| NASHYD   (  0023)|   Area    (ha)= 459.62   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.83

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

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Unit Hyd Qpeak  (cms)=   9.593

PEAK FLOW       (cms)=  34.985 (i)
TIME TO PEAK    (hrs)=  11.917
RUNOFF VOLUME    (mm)= 156.235
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.737

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0024)|   Area    (ha)= 186.44   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.90

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

```
Unit Hyd Qpeak  (cms)=   3.748

PEAK FLOW       (cms)=  13.792 (i)
TIME TO PEAK    (hrs)=  12.000
RUNOFF VOLUME    (mm)= 153.928
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.726

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0025)|   Area    (ha)= 402.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.04

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

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Unit Hyd Qpeak  (cms)=   7.532

PEAK FLOW       (cms)=  28.740 (i)
TIME TO PEAK    (hrs)=  12.083
RUNOFF VOLUME    (mm)= 153.740
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.725

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0026)|   Area    (ha)= 185.40   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.08

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

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Unit Hyd Qpeak  (cms)=   3.405

PEAK FLOW       (cms)=  13.261 (i)
TIME TO PEAK    (hrs)=  12.083
RUNOFF VOLUME    (mm)= 156.235
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.737

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

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| CALIB            |
| NASHYD   (  0027)|   Area    (ha)= 266.70   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.99
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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

Unit Hyd Qpeak (cms)= 10.290

PEAK FLOW   (cms)= 26.382 (i)
TIME TO PEAK   (hrs)= 11.167
RUNOFF VOLUME   (mm)= 158.836
TOTAL RAINFALL   (mm)= 212.000

RUNOFF COEFFICIENT = 0.749

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

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| CALIB              |
| NASHYD   (  0028)|   Area     (ha)= 310.72   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.17
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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

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Unit Hyd Qpeak  (cms)=  10.144

PEAK FLOW       (cms)=  29.271 (i)
TIME TO PEAK    (hrs)=  11.250
RUNOFF VOLUME    (mm)= 161.070
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.760

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

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| CALIB              |
| NASHYD   (  0029)|   Area    (ha)= 361.98   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.88

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

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              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)=   7.354

     PEAK FLOW       (cms)=  27.202 (i)
     TIME TO PEAK    (hrs)=  11.917
     RUNOFF VOLUME    (mm)= 156.235
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.737

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

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| CALIB              |
| NASHYD   (  0030)|   Area    (ha)= 345.92   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.09

         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
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                 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)=  12.121

      PEAK FLOW       (cms)=  32.543 (i)
      TIME TO PEAK    (hrs)=  11.250
      RUNOFF VOLUME    (mm)= 154.209
      TOTAL RAINFALL   (mm)= 212.000
      RUNOFF COEFFICIENT   =   0.727

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

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| CALIB            |
| NASHYD   (  0031)|   Area    (ha)= 401.10   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.05

          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
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               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)=   7.473

     PEAK FLOW       (cms)=  28.604 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)= 154.116
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.727

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

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| CALIB            |
| NASHYD   (  0032)|   Area    (ha)= 439.56   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.67
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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


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Unit Hyd Qpeak  (cms)=  10.053

PEAK FLOW       (cms)=  35.294 (i)
TIME TO PEAK    (hrs)=  11.750
RUNOFF VOLUME    (mm)= 158.837
TOTAL RAINFALL   (mm)= 212.000
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     RUNOFF COEFFICIENT   =   0.749

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

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| CALIB             |
| NASHYD   (  0033)|   Area    (ha)= 260.28   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.50

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

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Unit Hyd Qpeak  (cms)=   6.628

PEAK FLOW       (cms)=  22.138 (i)
TIME TO PEAK    (hrs)=  11.583
RUNOFF VOLUME    (mm)= 160.784
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.758

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0034)|   Area    (ha)= 339.20   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.81

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

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Unit Hyd Qpeak  (cms)=   4.611

PEAK FLOW       (cms)=  19.878 (i)
TIME TO PEAK    (hrs)=  12.667
RUNOFF VOLUME    (mm)= 149.346
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.704

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0035)|   Area    (ha)= 341.01   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.77

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

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              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)=   7.359

     PEAK FLOW       (cms)=  25.271 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)= 147.347
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.695

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

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| CALIB             |
| NASHYD   (  0036)|   Area    (ha)= 201.10   Curve Number   (CN)= 80.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.79

         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
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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)=   4.291

PEAK FLOW       (cms)=  15.456 (i)
TIME TO PEAK    (hrs)=  11.833
RUNOFF VOLUME    (mm)= 155.668
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.734

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| NASHYD   (  0037)|   Area    (ha)= 306.27   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.39
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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

Unit Hyd Qpeak (cms)= 4.895

PEAK FLOW (cms)= 19.454 (i)
TIME TO PEAK (hrs)= 12.417
RUNOFF VOLUME (mm)= 146.887
TOTAL RAINFALL (mm)= 212.000

RUNOFF COEFFICIENT = 0.693

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

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| CALIB              |
| NASHYD   (  0038)|   Area    (ha)= 112.74   Curve Number   (CN)= 68.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.64
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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

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Unit Hyd Qpeak  (cms)=   2.626

PEAK FLOW       (cms)=   7.816 (i)
TIME TO PEAK    (hrs)=  11.750
RUNOFF VOLUME    (mm)= 128.372
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.606

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB              |
| NASHYD   (  0039)|   Area    (ha)= 316.30   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.48

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

Unit Hyd Qpeak (cms)= 4.871

PEAK FLOW (cms)= 20.864 (i)
TIME TO PEAK (hrs)= 12.417
RUNOFF VOLUME (mm)= 158.647
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.748

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

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| CALIB              |
| NASHYD   (  0040)|   Area    (ha)= 157.20   Curve Number   (CN)= 83.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.29
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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

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               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)=   4.654

     PEAK FLOW       (cms)=  14.392 (i)
     TIME TO PEAK    (hrs)=  11.417
     RUNOFF VOLUME    (mm)= 163.986
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.774

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

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| CALIB             |
| NASHYD   (  0041)|   Area    (ha)= 311.60   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.47

         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
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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


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Unit Hyd Qpeak  (cms)=   8.096

PEAK FLOW       (cms)=  26.502 (i)
TIME TO PEAK    (hrs)=  11.583
RUNOFF VOLUME    (mm)= 158.932
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.750

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| NASHYD   (  0042)|   Area    (ha)= 163.70   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   6.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89
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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


```
Unit Hyd Qpeak  (cms)=   7.025

PEAK FLOW       (cms)=  16.826 (i)
TIME TO PEAK    (hrs)=  11.083
RUNOFF VOLUME    (mm)= 161.261
TOTAL RAINFALL   (mm)= 212.000
```

RUNOFF COEFFICIENT = 0.761

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

```
------------------------------------------------------------------------------------------------------
| CALIB              |
| NASHYD   (  0043)|   Area    (ha)= 354.50   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.78
```

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

     Unit Hyd Qpeak  (cms)=   7.607

     PEAK FLOW       (cms)=  27.900 (i)
     TIME TO PEAK    (hrs)=  11.833
     RUNOFF VOLUME    (mm)= 161.166
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.760

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0044)|   Area    (ha)= 165.70   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.13

         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)=   2.971

PEAK FLOW       (cms)=  11.587 (i)
TIME TO PEAK    (hrs)=  12.167
RUNOFF VOLUME    (mm)= 153.928
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.726

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

```
--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0045)|   Area    (ha)= 288.20   Curve Number   (CN)= 81.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.91

    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

```
    Unit Hyd Qpeak  (cms)=   5.763

    PEAK FLOW       (cms)=  21.713 (i)
    TIME TO PEAK    (hrs)=  12.000
    RUNOFF VOLUME    (mm)= 158.647
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.748

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

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):   236.60  18.538    11.75   156.05
      + ID2= 2 (  0011):   342.20  23.965    12.17   156.33
        ==================================================
        ID = 3 (  0063):   578.80  42.258    12.00   156.21

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

--------------------
| ADD HYD  (  0063)|
```

```
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):   578.80  42.258    12.00   156.21
      + ID2= 2 (  0012):   436.50  32.975    12.00   161.07
        ====================================================
        ID = 1 (  0063):  1015.30  75.234    12.00   158.30

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1015.30  75.234    12.00   158.30
      + ID2= 2 (  0013):   355.50  28.241    11.75   159.03
        ====================================================
        ID = 3 (  0063):  1370.80 103.321    11.92   158.49

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  1370.80 103.321    11.92   158.49
      + ID2= 2 (  0014):   437.40  32.239    12.00   158.84
        ====================================================
        ID = 1 (  0063):  1808.20 135.500    11.92   158.57

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  1808.20 135.500    11.92   158.57
      + ID2= 2 (  0015):   491.60  39.860    11.67   156.42
        ====================================================
        ID = 3 (  0063):  2299.80 174.932    11.83   158.11

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 3 (  0063):  2299.80 174.932    11.83   158.11
      + ID2= 2 (  0016):   361.20  24.460    12.33   155.86
        ====================================================
        ID = 1 (  0063):  2661.00 198.948    11.92   157.81

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2661.00 198.948    11.92   157.81
      + ID2= 2 (  0017):   123.10   9.598    11.67   144.99
        ====================================================
        ID = 3 (  0063):  2784.10 208.415    11.92   157.24

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  2784.10 208.415    11.92   157.24
      + ID2= 2 (  0022):   188.89  16.509    11.33   148.98
        ====================================================
        ID = 1 (  0063):  2972.99 223.890    11.83   156.72

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  2972.99 223.890    11.83   156.72
      + ID2= 2 (  0023):   459.62  34.985    11.92   156.23
        ====================================================
        ID = 3 (  0063):  3432.61 258.864    11.83   156.65

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  3432.61 258.864    11.83   156.65
      + ID2= 2 (  0024):   186.44  13.792    12.00   153.93
```

```
          ====================================================
          ID = 1 (  0063):  3619.05 272.627    11.83   156.51

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (  0063):  3619.05 272.627    11.83   156.51
        + ID2= 2 (  0025):   402.30  28.740    12.08   153.74
          ====================================================
          ID = 3 (  0063):  4021.35 301.126    11.92   156.23

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (  0063):  4021.35 301.126    11.92   156.23
        + ID2= 2 (  0026):   185.40  13.261    12.08   156.23
          ====================================================
          ID = 1 (  0063):  4206.75 314.318    11.92   156.23

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (  0063):  4206.75 314.318    11.92   156.23
        + ID2= 2 (  0027):   266.70  26.382    11.17   158.84
          ====================================================
          ID = 3 (  0063):  4473.45 336.644    11.75   156.39

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (  0063):  4473.45 336.644    11.75   156.39
        + ID2= 2 (  0028):   310.72  29.271    11.25   161.07
          ====================================================
          ID = 1 (  0063):  4784.17 364.158    11.75   156.69
```

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  4784.17 364.158    11.75   156.69
      + ID2= 2 (  0029):   361.98  27.202    11.92   156.23
        ===================================================
        ID = 3 (  0063):  5146.15 391.223    11.75   156.66

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5146.15 391.223    11.75   156.66
      + ID2= 2 (  0030):   345.92  32.543    11.25   154.21
        ===================================================
        ID = 1 (  0063):  5492.07 421.487    11.67   156.51

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  5492.07 421.487    11.67   156.51
      + ID2= 2 (  0031):   401.10  28.604    12.08   154.12
        ===================================================
        ID = 3 (  0063):  5893.17 449.374    11.67   156.34

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  5893.17 449.374    11.67   156.34
      + ID2= 2 (  0032):   439.56  35.294    11.75   158.84
        ===================================================
        ID = 1 (  0063):  6332.73 484.642    11.67   156.52

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

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6332.73 484.642    11.67   156.52
      + ID2= 2 (  0033):   260.28  22.138    11.58   160.78
        =====================================================
        ID = 3 (  0063):  6593.01 506.740    11.67   156.69

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  6593.01 506.740    11.67   156.69
      + ID2= 2 (  0034):   339.20  19.878    12.67   149.35
        =====================================================
        ID = 1 (  0063):  6932.21 524.602    11.75   156.33

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  6932.21 524.602    11.75   156.33
      + ID2= 2 (  0035):   341.01  25.271    11.83   147.35
        =====================================================
        ID = 3 (  0063):  7273.22 549.833    11.75   155.91

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7273.22 549.833    11.75   155.91
      + ID2= 2 (  0036):   201.10  15.456    11.83   155.67
        =====================================================
        ID = 1 (  0063):  7474.32 565.265    11.75   155.90

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

```
--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7474.32 565.265    11.75   155.90
      + ID2= 2 (  0037):   306.27  19.454    12.42   146.89
        ====================================================
        ID = 3 (  0063):  7780.59 583.774    11.75   155.54

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  7780.59 583.774    11.75   155.54
      + ID2= 2 (  0038):   112.74   7.816    11.75   128.37
        ====================================================
        ID = 1 (  0063):  7893.33 591.590    11.75   155.16

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  7893.33 591.590    11.75   155.16
      + ID2= 2 (  0039):   316.30  20.864    12.42   158.65
        ====================================================
        ID = 3 (  0063):  8209.63 611.378    11.75   155.29

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8209.63 611.378    11.75   155.29
      + ID2= 2 (  0040):   157.20  14.392    11.42   163.99
        ====================================================
        ID = 1 (  0063):  8366.83 625.290    11.75   155.45

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

--------------------
| ADD HYD  (  0063)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8366.83 625.290    11.75   155.45
      + ID2= 2 (  0041):   311.60  26.502    11.58   158.93
        ====================================================
        ID = 3 (  0063):  8678.43 651.571    11.75   155.58

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  8678.43 651.571    11.75   155.58
      + ID2= 2 (  0042):   163.70  16.826    11.08   161.26
        ====================================================
        ID = 1 (  0063):  8842.13 665.616    11.67   155.68

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063):  8842.13 665.616    11.67   155.68
      + ID2= 2 (  0043):   354.50  27.900    11.83   161.17
        ====================================================
        ID = 3 (  0063):  9196.63 693.395    11.67   155.90

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

--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9196.63 693.395    11.67   155.90
      + ID2= 2 (  0044):   165.70  11.587    12.17   153.93
        ====================================================
        ID = 1 (  0063):  9362.33 704.710    11.75   155.86

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

--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
        ID1= 1 (  0063):  9362.33 704.710    11.75   155.86
      + ID2= 2 (  0045):   288.20  21.713    12.00   158.65
        ====================================================
        ID = 3 (  0063):  9650.53 726.292    11.75   155.94

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063):  9650.53 726.292    11.75   155.94
      + ID2= 2 (  0007):   418.90  23.169    12.75   142.46
        ====================================================
        ID = 1 (  0063): 10069.43 747.056    11.75   155.38

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


--------------------
| ADD HYD  (  0063)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0063): 10069.43 747.056    11.75   155.38
      + ID2= 2 (  0008):   185.44  12.998    12.00   142.64
        ====================================================
        ID = 3 (  0063): 10254.87 759.954    11.75   155.15

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


--------------------
| ADD HYD  (  0063)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0063): 10254.87 759.954    11.75   155.15
      + ID2= 2 (  0009):   378.40  23.734    12.58   156.33
        ====================================================
        ID = 1 (  0063): 10633.27 782.025    11.75   155.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0100)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.1) ------>
               Distance      Elevation       Manning
                   0.00        441.95        0.0300      Main Channel
```

73.40	438.86	0.0300	Main Channel
124.30	438.34	0.0300	Main Channel
151.30	437.55	0.0300	Main Channel
182.70	439.79	0.0300	Main Channel
191.60	440.18	0.0300	Main Channel
219.50	440.94	0.0300	Main Channel
249.70	442.17	0.0300	Main Channel

<--------------------- TRAVEL TIME TABLE ---------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.23	437.78	.242E+05	0.3	0.25	******
0.46	438.01	.968E+05	2.1	0.40	785.77
0.69	438.24	.218E+06	6.1	0.52	599.65
0.93	438.48	.398E+06	12.1	0.57	546.82
1.16	438.71	.686E+06	23.1	0.63	495.63
1.39	438.94	.108E+07	42.4	0.73	425.16
1.62	439.17	.153E+07	71.5	0.87	356.76
1.85	439.40	.202E+07	107.6	1.00	312.54
2.08	439.63	.254E+07	150.8	1.11	281.09
2.32	439.87	.311E+07	200.6	1.21	258.13
2.55	440.10	.372E+07	256.8	1.29	241.17
2.78	440.33	.437E+07	318.6	1.36	228.86
3.01	440.56	.509E+07	387.9	1.43	218.81
3.24	440.79	.587E+07	466.8	1.49	209.62
3.47	441.02	.671E+07	557.6	1.56	200.56
3.71	441.26	.760E+07	661.7	1.63	191.42
3.94	441.49	.854E+07	776.1	1.70	183.34
4.17	441.72	.952E+07	901.3	1.77	176.13
4.40	441.95	.106E+08	1037.5	1.84	169.64

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0063)	*******	782.03	11.75	155.19	3.95	1.71
OUTFLOW: ID= 1 (0100)	*******	519.81	13.00	155.18	3.37	1.53

```
---------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0018)|   Area    (ha)= 279.02   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   8.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.34
```

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

```
Unit Hyd Qpeak  (cms)=   4.554

PEAK FLOW       (cms)=  18.124 (i)
TIME TO PEAK    (hrs)=  12.333
RUNOFF VOLUME    (mm)= 148.605
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.701

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

```
--------------------
| CALIB            |
| NASHYD   (  0019)|   Area    (ha)= 365.01   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.70
```

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

Unit Hyd Qpeak (cms)= 5.164

```
    PEAK FLOW       (cms)=  21.359 (i)
    TIME TO PEAK    (hrs)=  12.583
    RUNOFF VOLUME    (mm)= 144.715
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.683

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

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0020)|   Area    (ha)= 356.10   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.50   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.96

        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

```
Unit Hyd Qpeak  (cms)=   6.939

PEAK FLOW       (cms)=  24.792 (i)
TIME TO PEAK    (hrs)=  12.000
RUNOFF VOLUME    (mm)= 144.624
TOTAL RAINFALL   (mm)= 212.000
RUNOFF COEFFICIENT   =   0.682

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

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)= 201.80   Curve Number   (CN)= 70.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   7.30   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   2.07

     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

     Unit Hyd Qpeak  (cms)=   3.724

     PEAK FLOW       (cms)=  12.834 (i)
     TIME TO PEAK    (hrs)=  12.167
     RUNOFF VOLUME    (mm)= 133.635
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.630

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

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


--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100): 10633.27 519.810    13.00   155.18
      + ID2= 2 (  0018):   279.02  18.124    12.33   148.61
        ====================================================
        ID = 3 (  0066): 10912.29 536.988    13.00   155.02

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


--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 10912.29 536.988    13.00   155.02
      + ID2= 2 (  0019):   365.01  21.359    12.58   144.71
        ====================================================
```

```
        ID = 1 (  0066): 11277.30 558.041    13.00   154.68

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11277.30 558.041    13.00   154.68
      + ID2= 2 (  0002):   247.87  17.539    12.17   156.80
        ====================================================
        ID = 3 (  0066): 11525.17 574.022    12.92   154.73

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 11525.17 574.022    12.92   154.73
      + ID2= 2 (  0020):   356.10  24.792    12.00   144.62
        ====================================================
        ID = 1 (  0066): 11881.27 596.143    12.92   154.43

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 11881.27 596.143    12.92   154.43
      + ID2= 2 (  0021):   201.80  12.834    12.17   133.63
        ====================================================
        ID = 3 (  0066): 12083.07 607.961    12.92   154.08

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12083.07 607.961    12.92   154.08
      + ID2= 2 (  0003):   235.05  14.348    12.50   147.26
        ====================================================
        ID = 1 (  0066): 12318.12 622.059    12.92   153.95
```

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12318.12 622.059    12.92   153.95
      + ID2= 2 (  0004):   121.09   7.900    12.17   137.80
        ====================================================
        ID = 3 (  0066): 12439.21 629.322    12.92   153.79

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

--------------------
| ADD HYD  (  0066)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0066): 12439.21 629.322    12.92   153.79
      + ID2= 2 (  0005):   390.34  20.844    12.83   138.07
        ====================================================
        ID = 1 (  0066): 12829.55 650.150    12.92   153.31

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

--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0066): 12829.55 650.150    12.92   153.31
      + ID2= 2 (  0006):   231.69  14.843    11.83   118.33
        ====================================================
        ID = 3 (  0066): 13061.24 662.414    12.83   152.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| ROUTE CHN(  0101)|
| IN= 2---> OUT= 1 |     Routing time step (min)'=  5.00
--------------------
               <------ DATA FOR SECTION (   1.2) ------>
               Distance      Elevation       Manning
                  67.59        421.25        0.0300      Main Channel
                 143.41        418.57        0.0300      Main Channel
                 160.36        417.90        0.0300      Main Channel
                 173.30        417.80        0.0300      Main Channel
                 177.00        416.45        0.0300      Main Channel
                 192.98        416.45        0.0300      Main Channel
```

209.58	419.51	0.0300	Main Channel
216.18	419.46	0.0300	Main Channel
257.64	421.03	0.0300	Main Channel

<--------------------- TRAVEL TIME TABLE --------------------->

DEPTH (m)	ELEV (m)	VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)
0.24	416.69	.466E+05	1.6	0.39	484.44
0.48	416.93	.987E+05	5.2	0.60	315.64
0.72	417.17	.156E+06	10.5	0.77	247.92
0.96	417.41	.219E+06	17.4	0.91	209.82
1.21	417.66	.287E+06	25.9	1.03	184.80
1.45	417.90	.368E+06	29.3	0.91	209.43
1.69	418.14	.489E+06	41.8	0.98	194.88
1.93	418.38	.630E+06	58.0	1.05	181.01
2.17	418.62	.792E+06	78.0	1.12	169.24
2.41	418.86	.976E+06	101.9	1.19	159.69
2.65	419.10	.118E+07	130.4	1.26	151.07
2.89	419.34	.141E+07	164.0	1.33	143.32
3.13	419.58	.167E+07	192.5	1.31	144.64
3.37	419.82	.198E+07	235.5	1.36	139.89
3.62	420.07	.232E+07	286.4	1.41	134.93
3.86	420.31	.270E+07	345.8	1.46	130.02
4.10	420.55	.311E+07	414.1	1.52	125.26
4.34	420.79	.356E+07	491.8	1.57	120.74
4.58	421.03	.405E+07	579.6	1.63	116.47

**** WARNING: TRAVEL TIME TABLE EXCEEDED

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 2 (0066)	*******	662.41	12.83	152.69	4.56	1.63
OUTFLOW: ID= 1 (0101)	*******	562.75	14.33	152.69	4.53	1.62

```
--------------------
| ADD HYD  (  0102)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):   121.60  12.172    11.08   156.23
      + ID2= 2 (  0101): 13061.24 562.754    14.33   152.69
        ====================================================
        ID = 3 (  0102): 13182.84 563.403    14.33   152.72
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

UNIFIED ONTARIO FLOOD METHOD - 21-WG

Q_{uofm} = Kr *

Inputs

Parameter	Symbol	Units	Input*
Drainage Area	A	km^2	132.048
Ecozone		Input 1 = Boreal Sheild or 2 = Mixed Wood Plains	2
Lake/Wetland Areas	WA	km^2	8.554
Lake Attenuation Index	LI (LI = 1+(WA/A))	dimensionless	1.065
Mean Annual	P	mm	947

*Input from OFAT

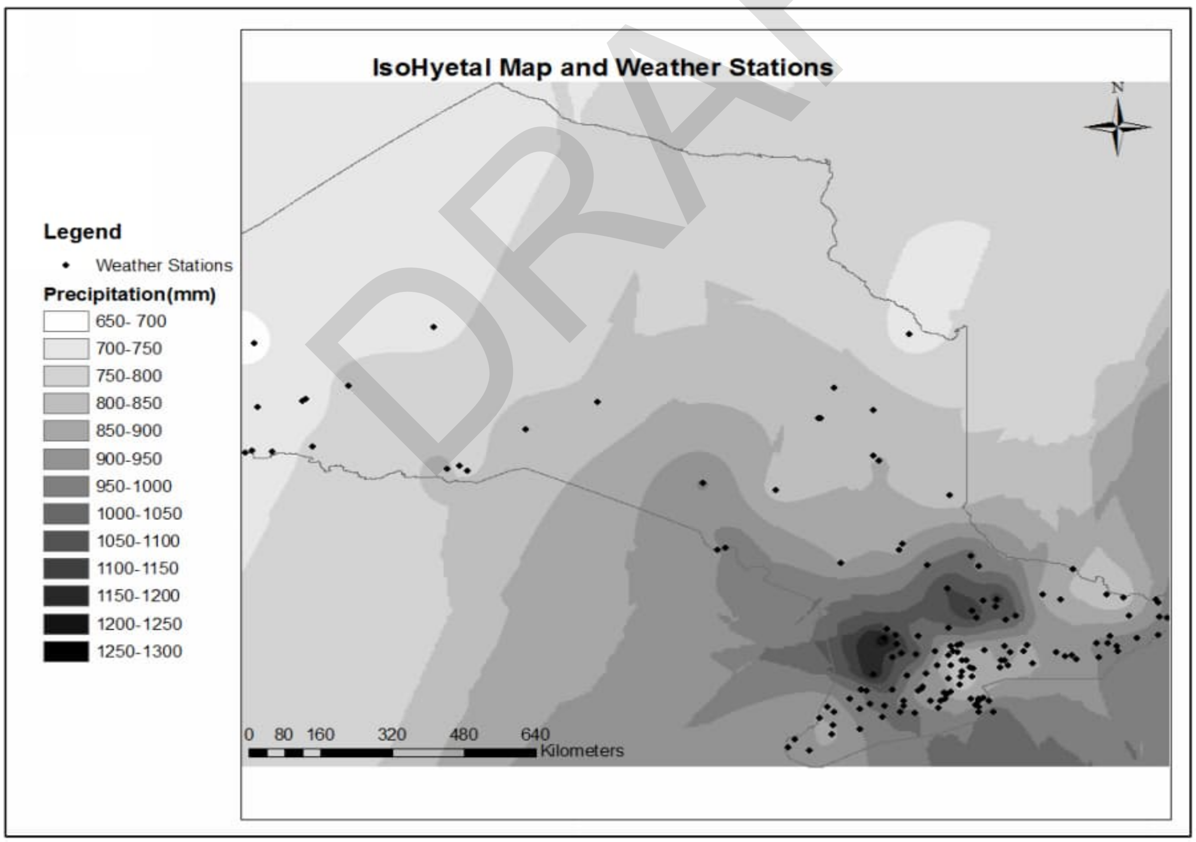


Figure 2: Isohyetal Map with Location of Environment Canada Weather Stations

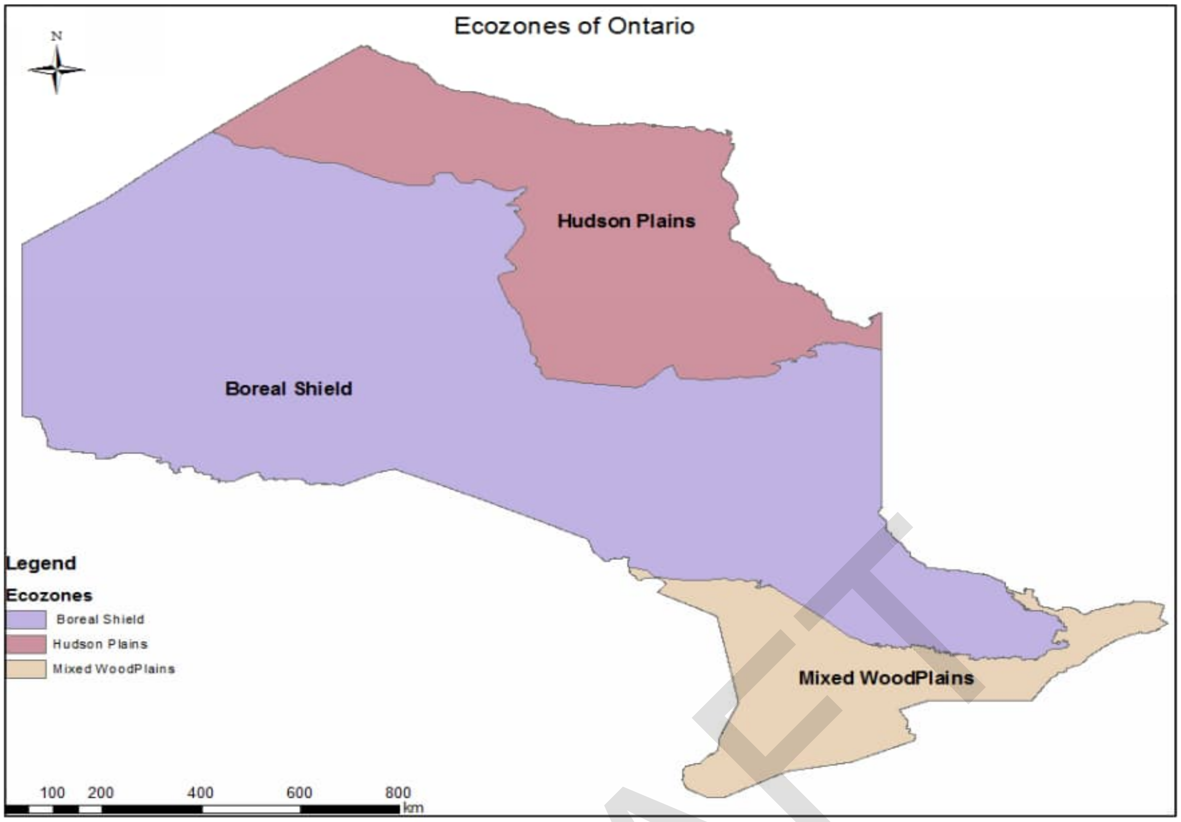


Figure 1: Ecozones of Ontario (EcoZone, 2012)

Regression Parameters

x	a	b	c
-5.483	0.756	-3.061	1.837
-4.139	0.734	-3.78	1.491
-3.68	0.728	-4.017	1.372
-3.397	0.724	-4.162	1.299
-3.151	0.721	-4.287	1.236

T	Standard Error	Lower Limit (%)	Upper Limit (%)
2	0.159	-29	40
10	0.174	-32	46
25	0.183	-33	50
50	0.189	-35	53
100	0.195	-36	57

Results

T	Flow (Q_{uofm}) m^3/s	Lower Limit m^3/s	Upper Limit m^3/s
2.00	31.94	22.68	44.72
10.00	56.53	38.44	82.54
25.00	68.86	46.13	103.28
50.00	77.85	50.60	119.10
100.00	87.09	55.74	136.73

UNIFIED ONTARIO FLOOD METHOD - 29-WG

Q_{uofm} = Kr *

Inputs

Parameter	Symbol	Units	Input*
Drainage Area	A	km^2	131.008
Ecozone		Input 1 = Boreal Sheild or 2 = Mixed Wood Plains	2
Lake/Wetland Areas	WA	km^2	8.536
Lake Attenuation Index	LI (LI = 1+(WA/A))	dimensionless	1.065
Mean Annual	P	mm	947

*Input from OFAT

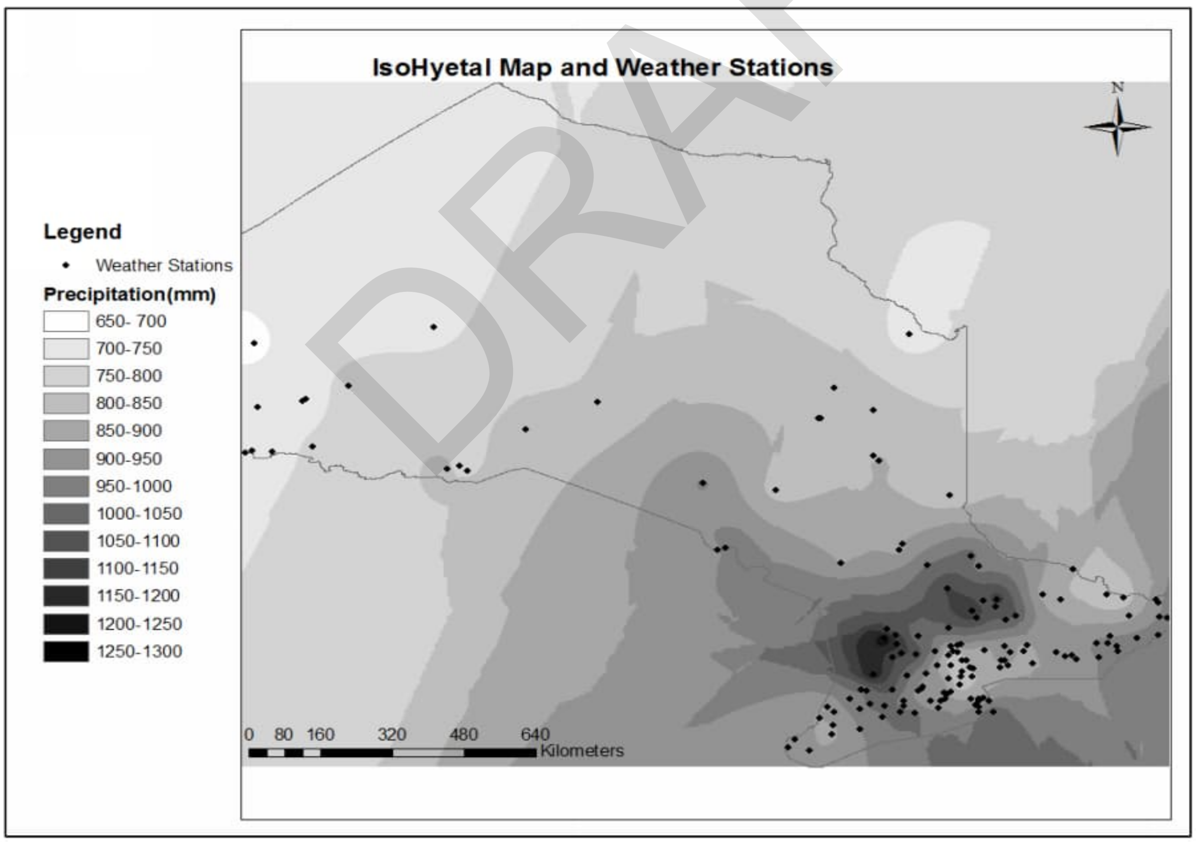


Figure 2: Isohyetal Map with Location of Environment Canada Weather Stations

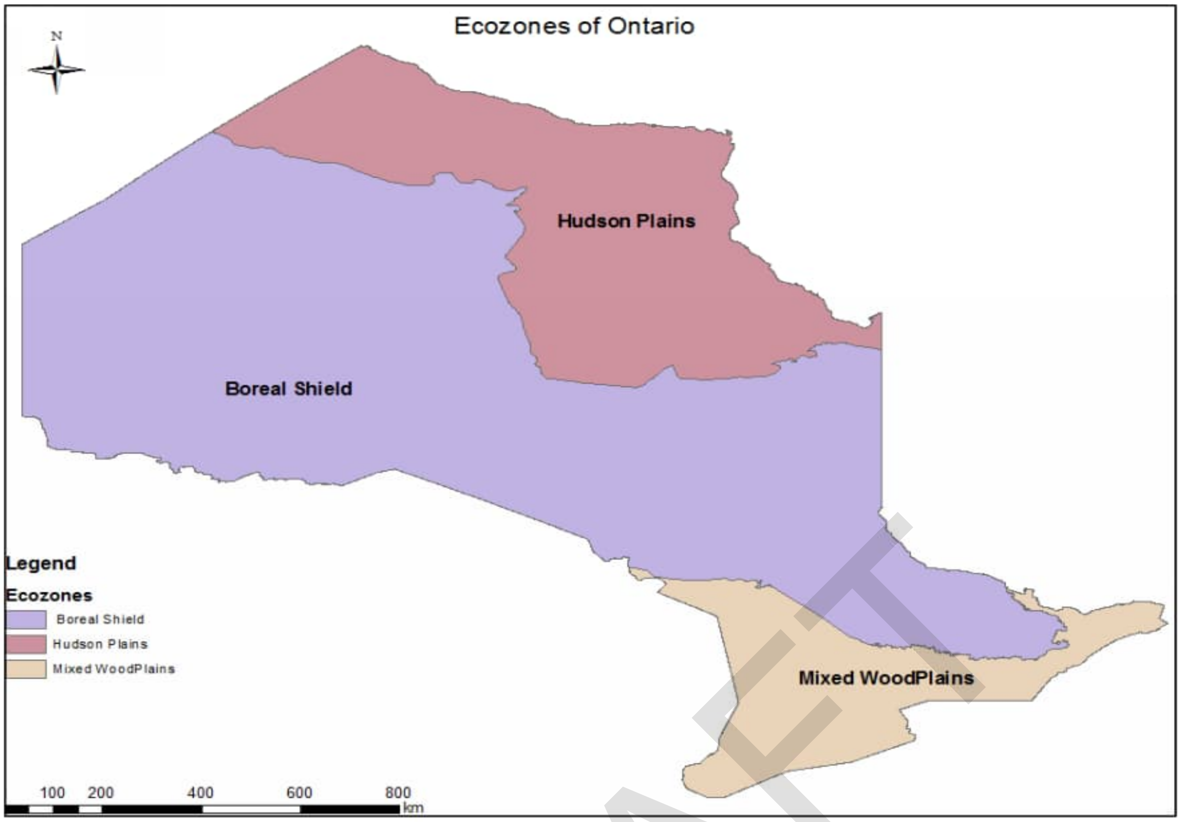


Figure 1: Ecozones of Ontario (EcoZone, 2012)

Regression Parameters

x	a	b	c
-5.483	0.756	-3.061	1.837
-4.139	0.734	-3.78	1.491
-3.68	0.728	-4.017	1.372
-3.397	0.724	-4.162	1.299
-3.151	0.721	-4.287	1.236

T	Standard Error	Lower Limit (%)	Upper Limit (%)
2	0.159	-29	40
10	0.174	-32	46
25	0.183	-33	50
50	0.189	-35	53
100	0.195	-36	57

Results			
T	Flow (Q_{uofm}) m^3/s	Lower Limit m^3/s	Upper Limit m^3/s
2.00	31.72	22.52	44.41
10.00	56.13	38.17	81.95
25.00	68.36	45.80	102.55
50.00	77.29	50.24	118.25
100.00	86.46	55.33	135.74

UNIFIED ONTARIO FLOOD METHOD - 30-WG

Q_{uofm} = Kr *

Inputs

Parameter	Symbol	Units	Input*
Drainage Area	A	km^2	102.103
Ecozone		Input 1 = Boreal Sheild or 2 = Mixed Wood Plains	2
Lake/Wetland Areas	WA	km^2	3.802
Lake Attenuation Index	LI (LI = 1+(WA/A))	dimensionless	1.037
Mean Annual	P	mm	951

*Input from OFAT

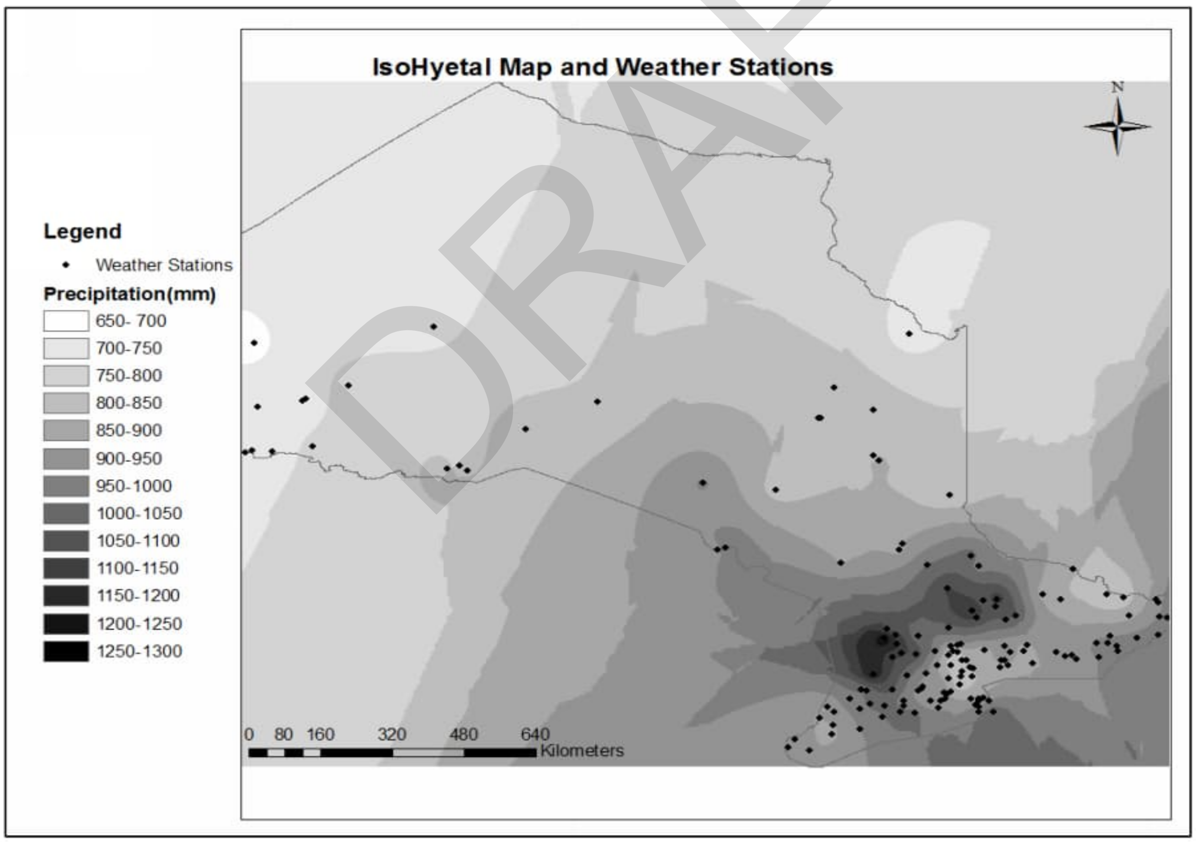


Figure 2: Isohyetal Map with Location of Environment Canada Weather Stations

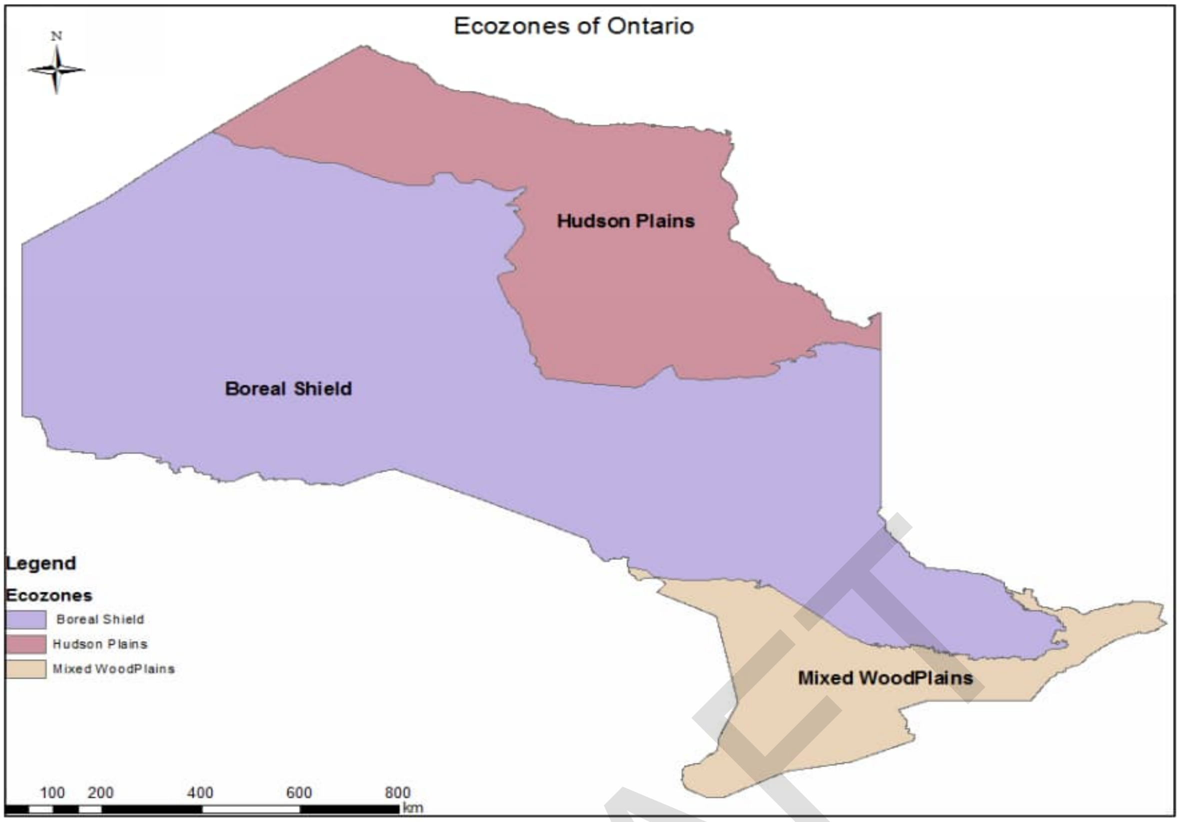


Figure 1: Ecozones of Ontario (EcoZone, 2012)

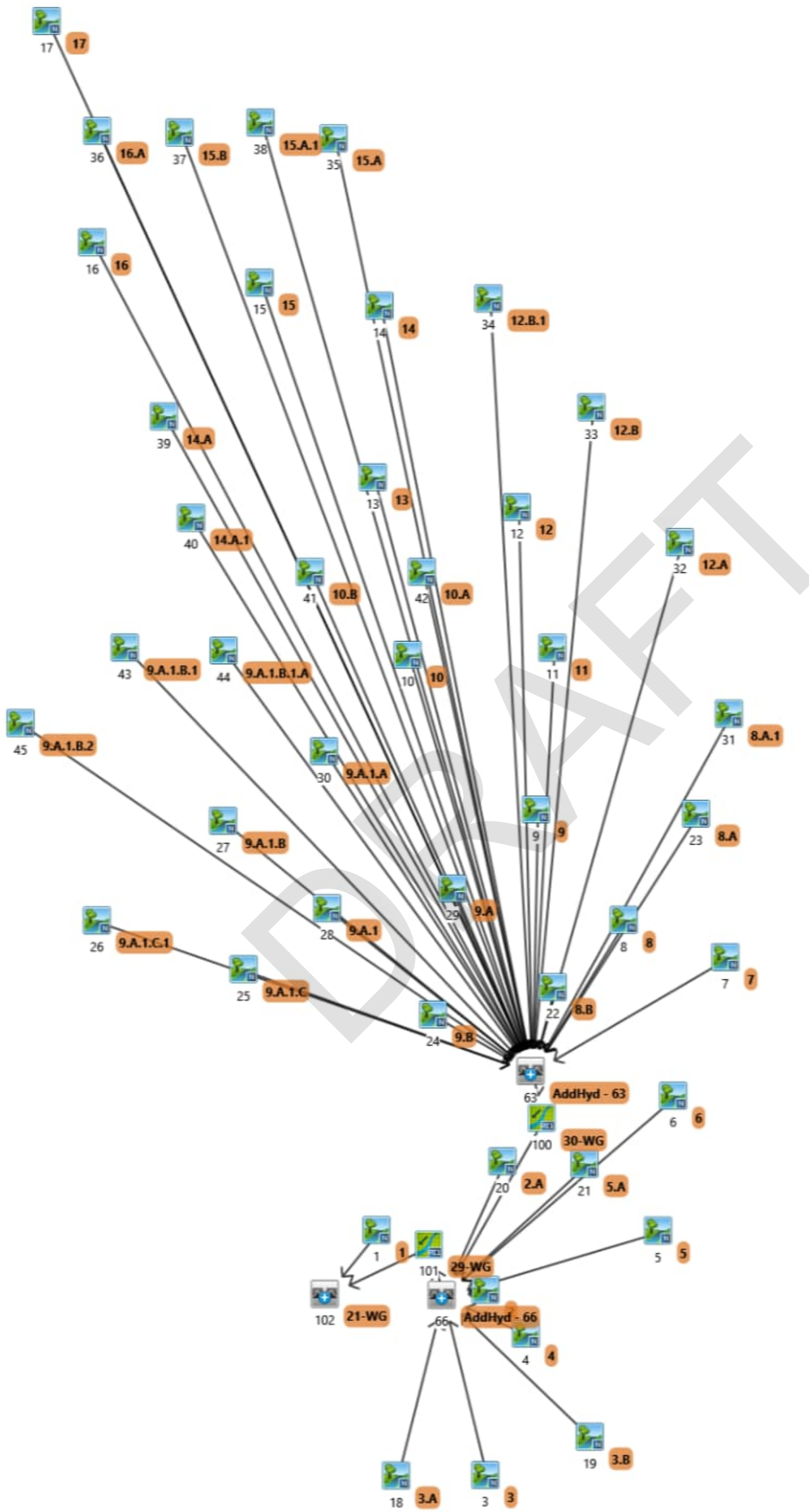
Regression Parameters

x	a	b	c
-5.483	0.756	-3.061	1.837
-4.139	0.734	-3.78	1.491
-3.68	0.728	-4.017	1.372
-3.397	0.724	-4.162	1.299
-3.151	0.721	-4.287	1.236

T	Standard Error	Lower Limit (%)	Upper Limit (%)
2	0.159	-29	40
10	0.174	-32	46
25	0.183	-33	50
50	0.189	-35	53
100	0.195	-36	57

Results			
T	Flow (Q_{uofm}) m^3/s	Lower Limit m^3/s	Upper Limit m^3/s
2.00	28.72	20.39	40.20
10.00	52.01	35.37	75.93
25.00	63.81	42.75	95.71
50.00	72.46	47.10	110.87
100.00	81.37	52.08	127.76

C.5 - VO model Schematic



□□□□R□□□□R□□r□□r□□□□r□□□□R□□□□□30□□ □

R□□□□	R□□r□□□	□r□□□	□□□	□ □□□□□	M□□□ □□□□	□ □□□□□□	□r□□□ □□□	□□ □□□□□	□□ □□□□□□	□□□□ □□□	□□□□ □r□□	□□□□□ d□□	□r□□d□□□□ □□
				□□3□□□	□□ □	□□ □	□□ □	□□ □	□□ □□ □	□□ □□□	□□2□	□□ □	
30□□ □	□□0	2□□□□r	□r□□□□□d	□0□20	□3□2□	□39□□3		□39□□□	0□00□□23	□□□□	□2□□□	□26□63	0□□□
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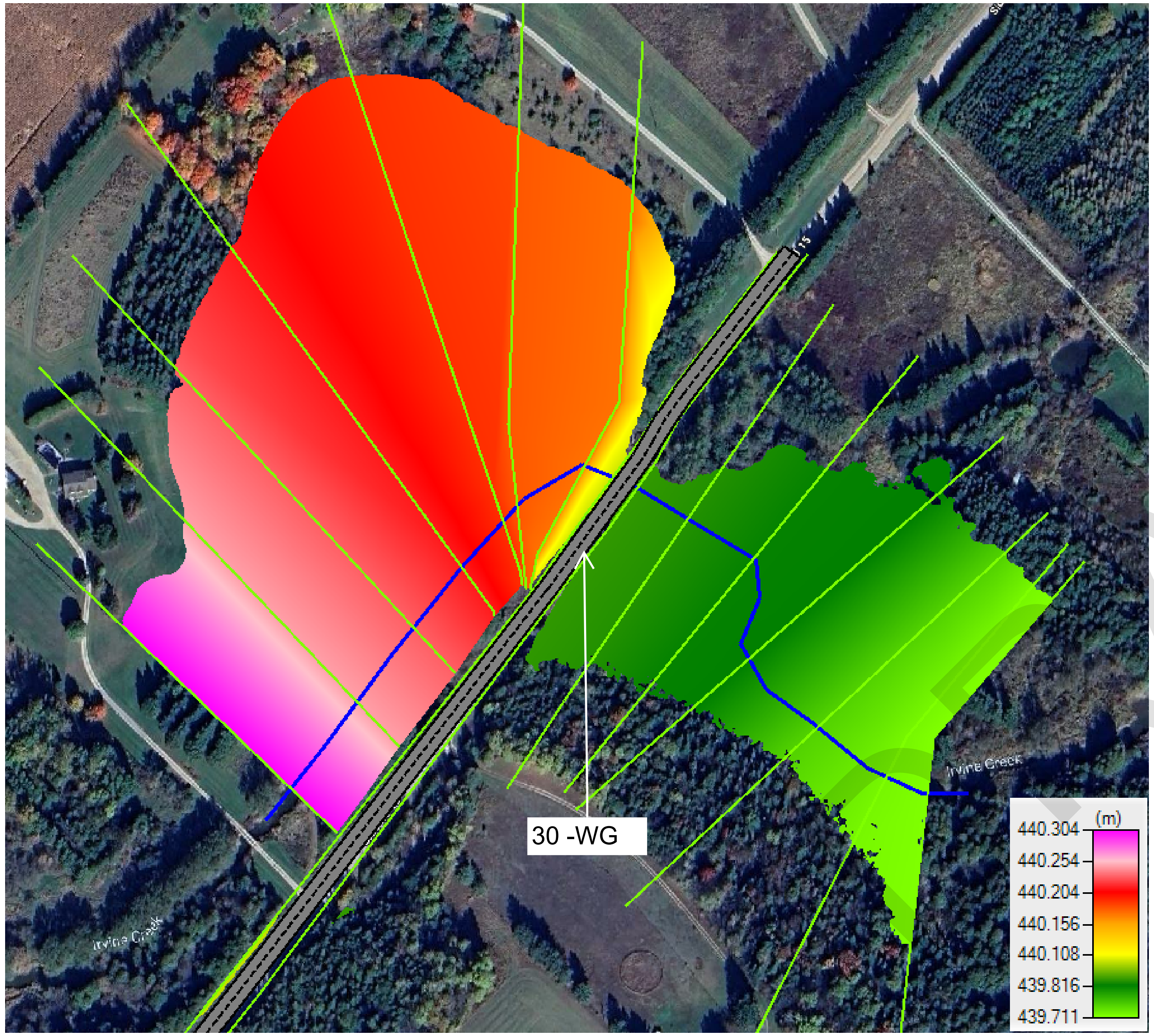

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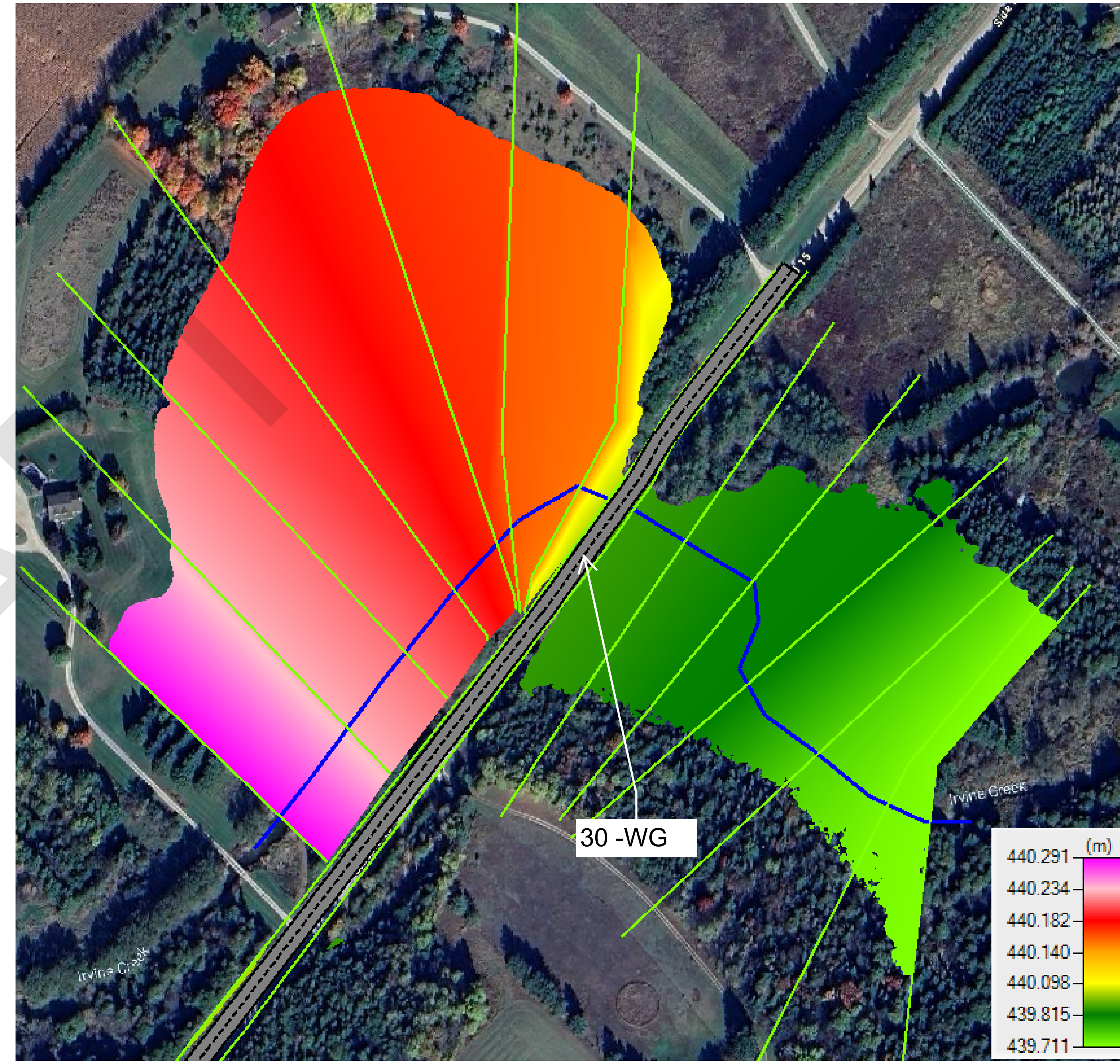


4% AEP - PROPOSED WSE

BURNSIDE

Figure Title

CENTRE WELLINGTON MCEA FOR BRIDGES 21-WG, 29-WG & 30-WG

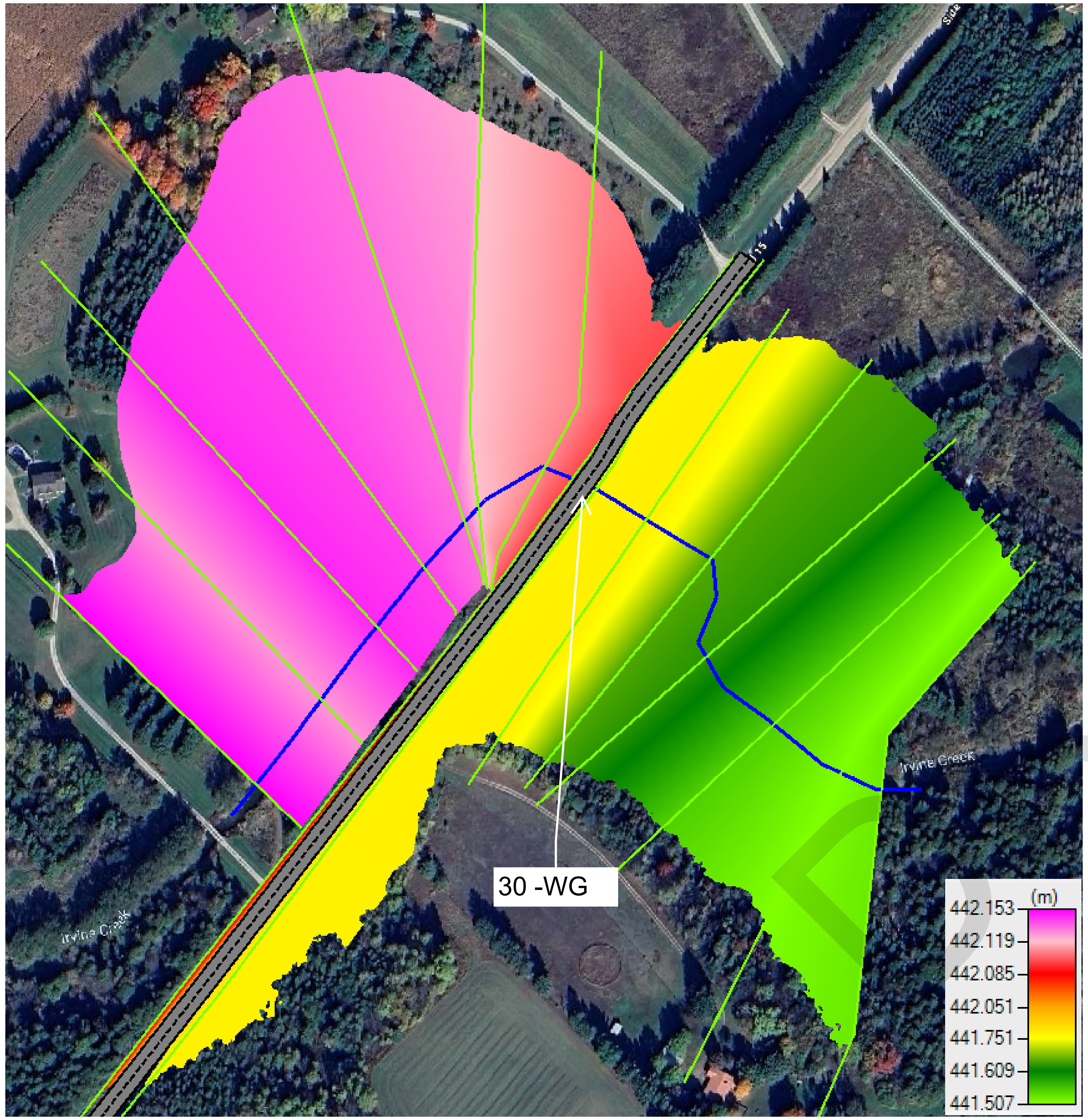
WATER SURFACE ELEVATION

Client

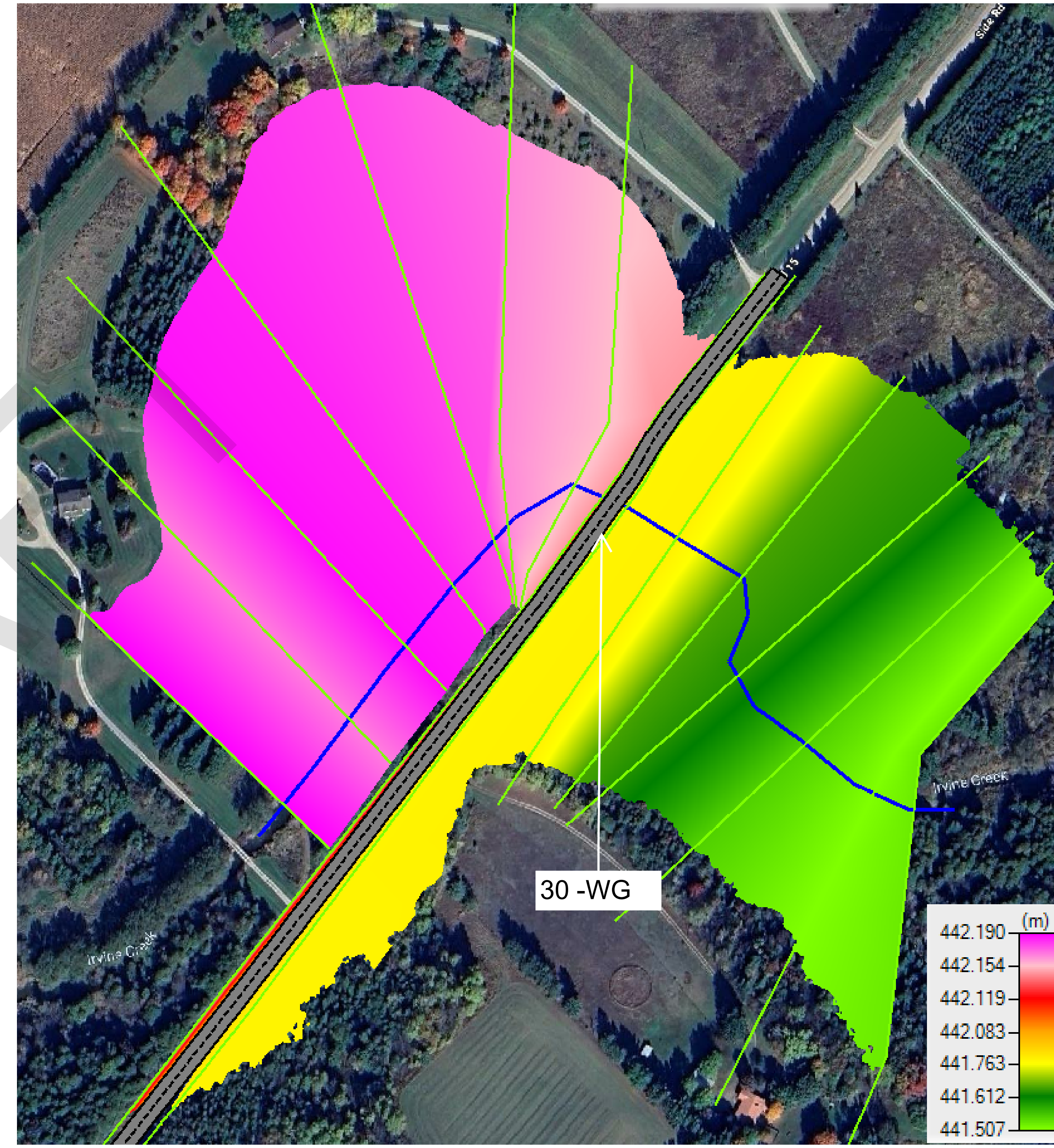
TOWNSHIP OF CENTRE WELLINGTON

Drawn	Checked	Date	Figure No.
DK	RW	NOVEMBER 2025	1
Scale		Project No.	
N.T.S.		300059832.000	

File: Drawing1.dwg Date Plotted: November 12, 2025 - 11:04 AM



REGIONAL STORM - EXISTING WSE



REGIONAL STORM - PROPOSED WSE

BURNSIDE

Figure Title

CENTRE WELLINGTON MCEA FOR BRIDGES 21-WG, 29-WG & 30-WG

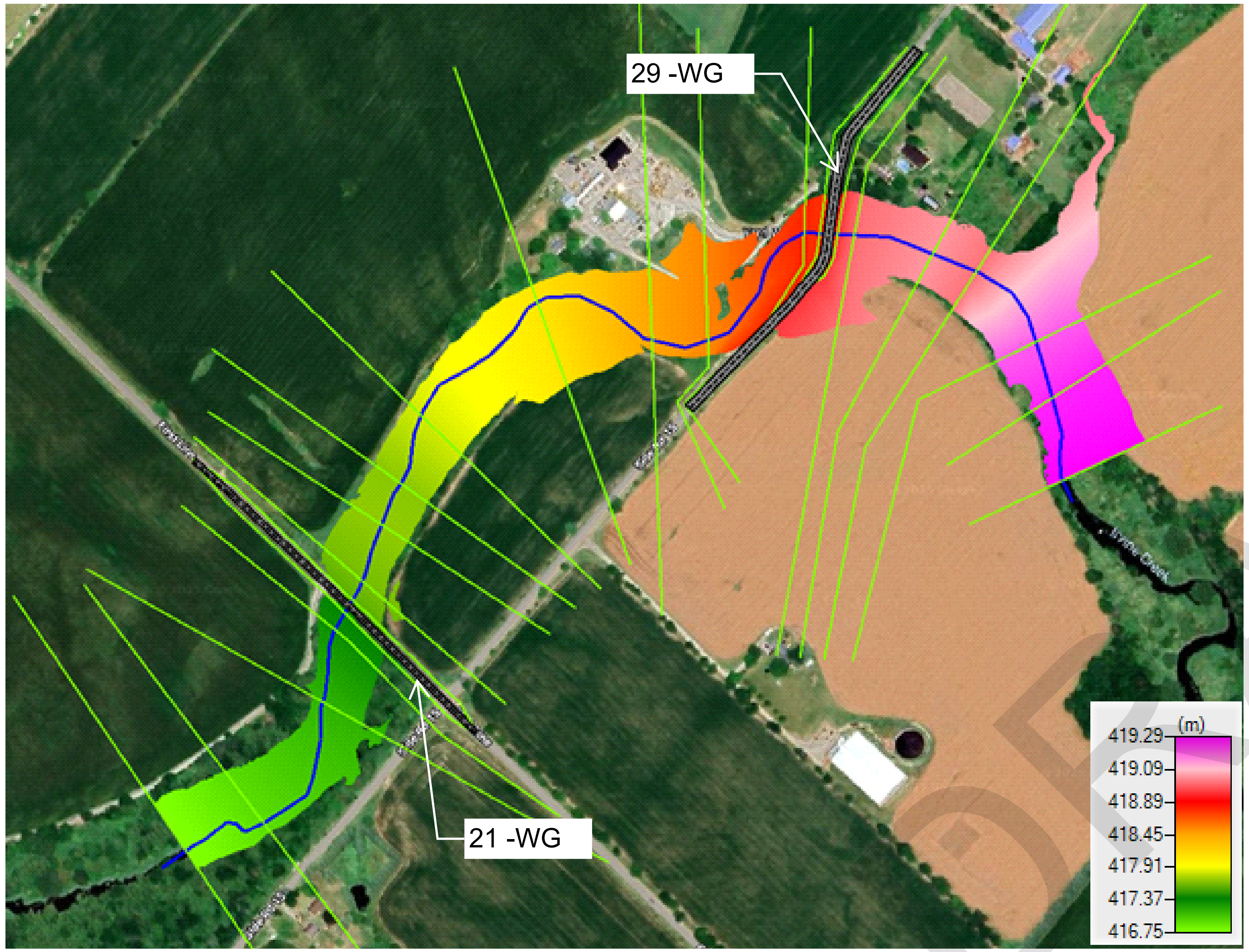
WATER SURFACE ELEVATION

Client

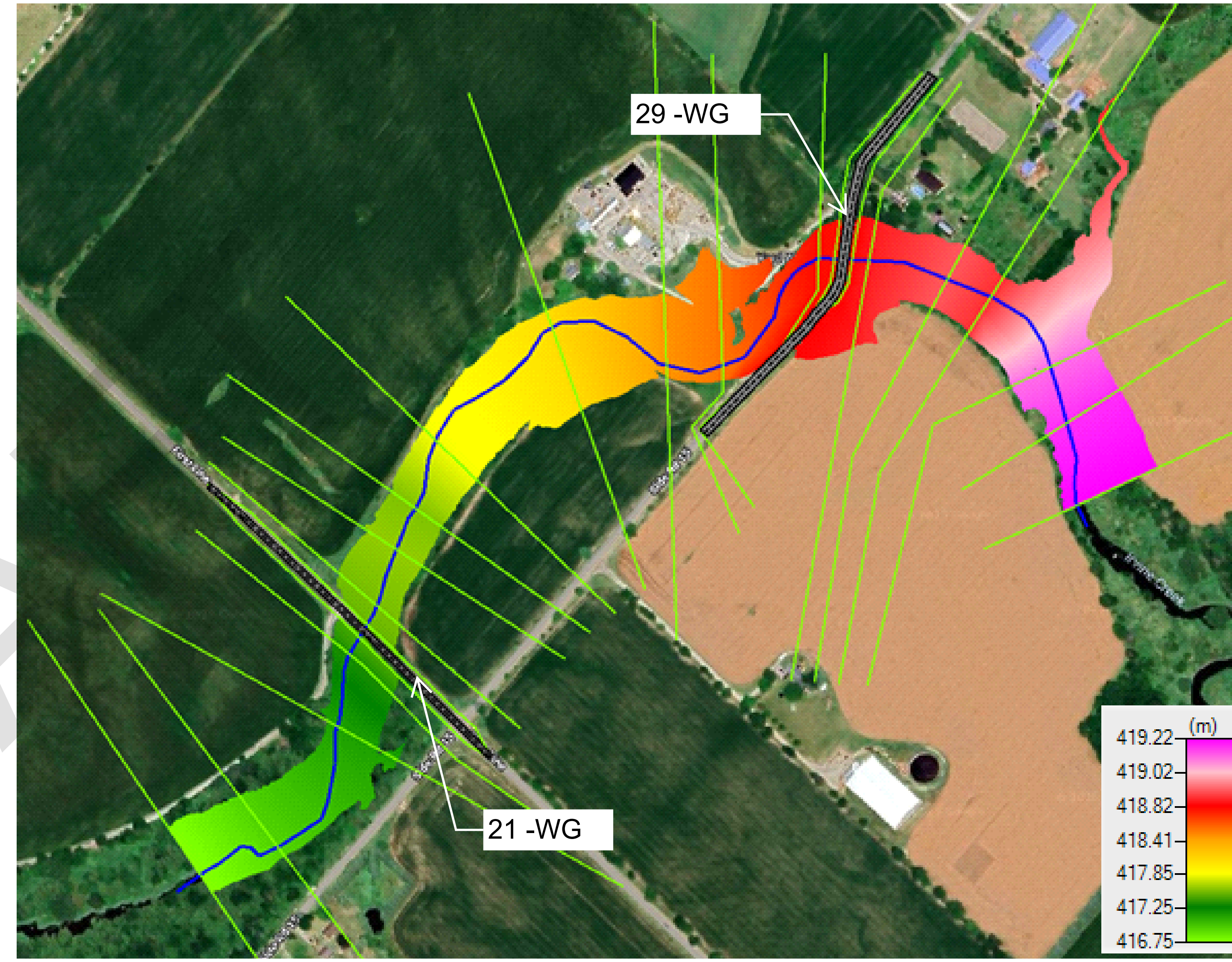
TOWNSHIP OF CENTRE WELLINGTON

Drawn	Checked	Date	Figure No.
DK	RW	NOVEMBER 2025	2
Scale		Project No.	
N.T.S.		300059832.000	

File: Drawing1.dwg Date Plotted: November 12, 2025 - 11:04 AM



4% AEP - EXISTING WSE

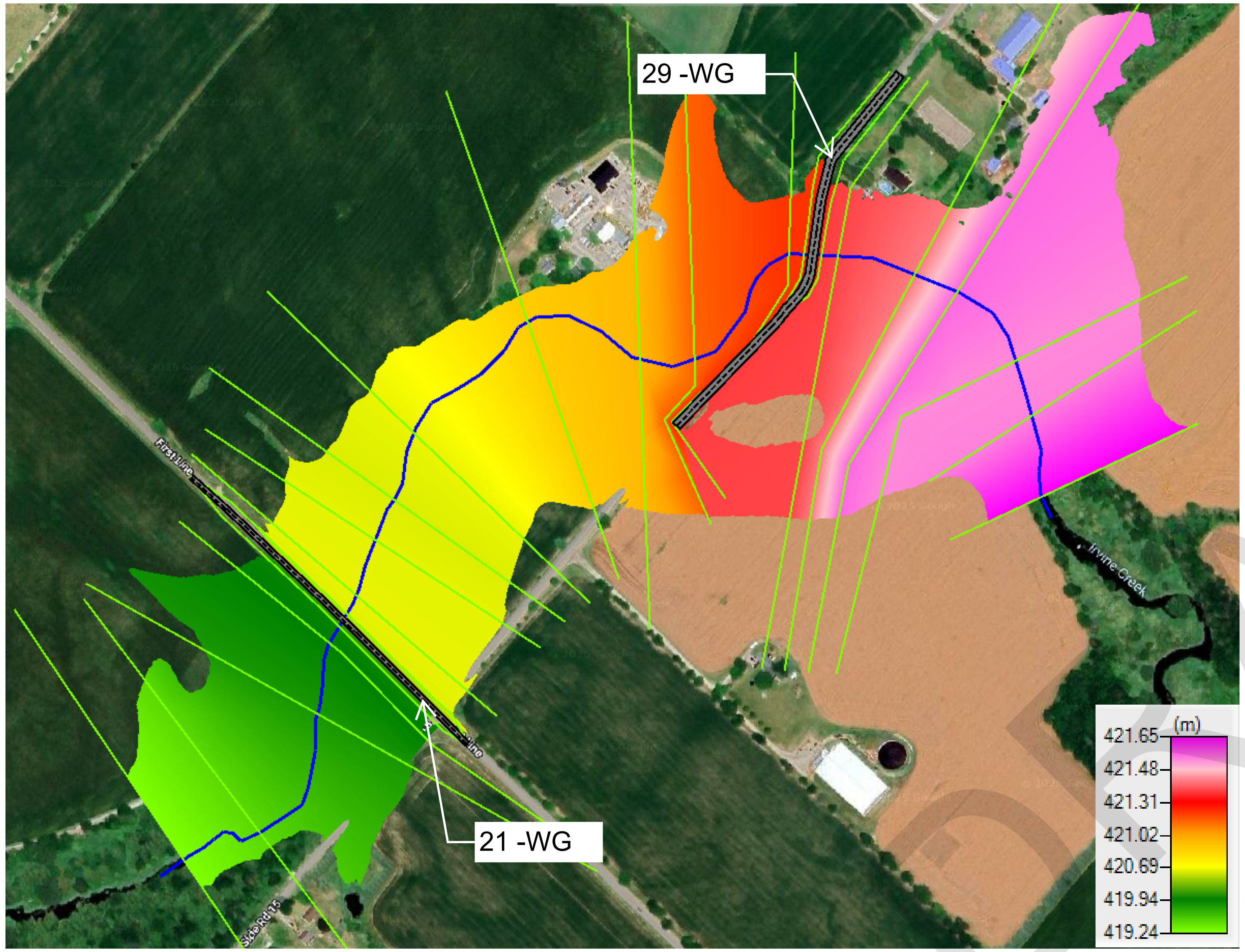


4% AEP - PROPOSED WSE

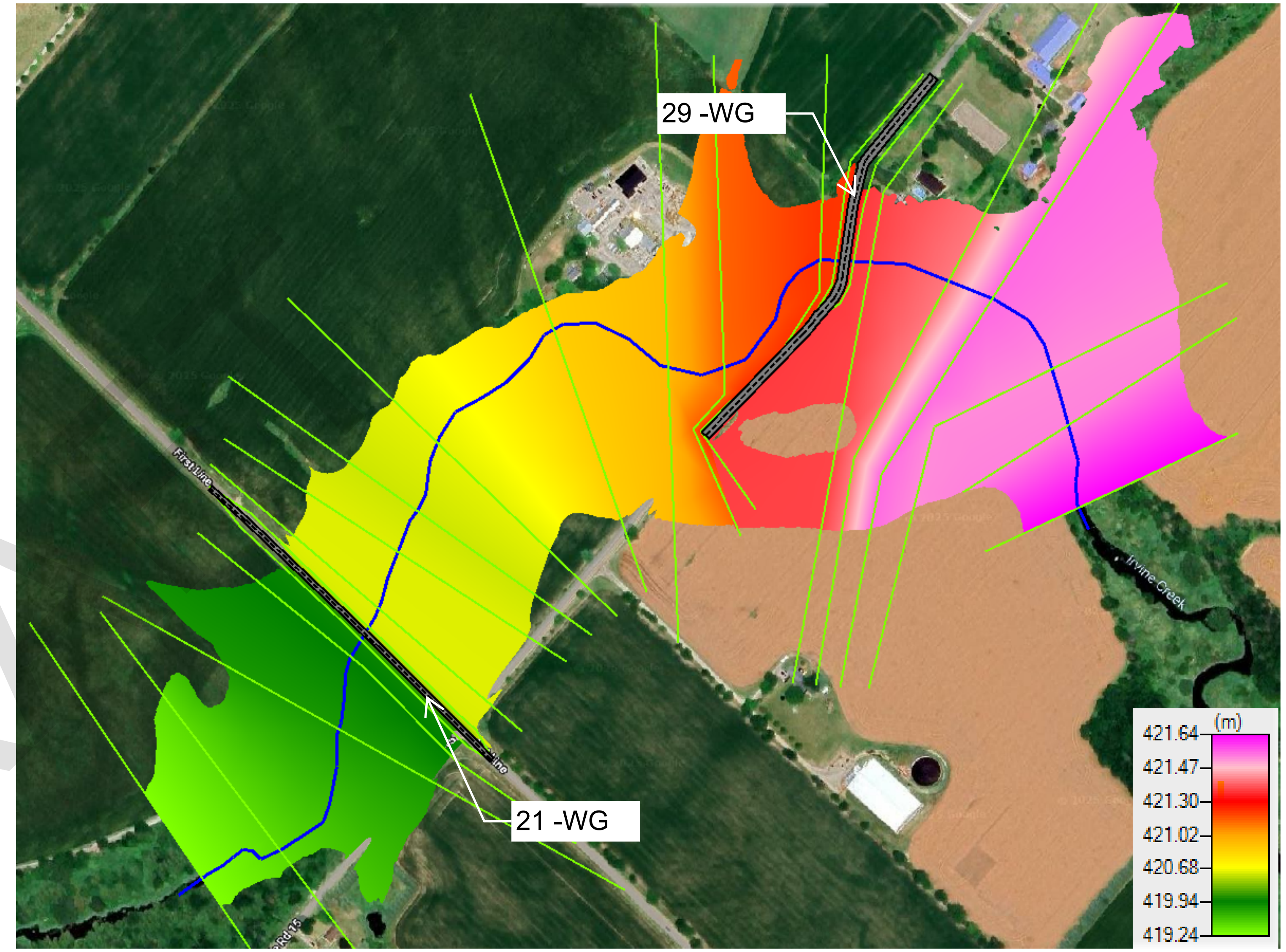
BURNSIDE	Figure Title **CENTRE WELLINGTON MCEA FOR BRIDGES 21-WG, 29-WG & 30-WG** WATER SURFACE ELEVATION

Client	Drawn	Checked	Date	Figure No.
TOWNSHIP OF CENTRE WELLINGTON	DK	RW	NOVEMBER 2025	**3**
	Scale: N.T.S.		Project No.: 300059832.000	

File: Drawing1.dwg Date Plotted: November 12, 2025 - 11:04 AM



REGIONAL STORM - EXISTING WSE



REGIONAL STORM - PROPOSED WSE

Figure Title	**CENTRE WELLINGTON MCEA FOR BRIDGES 21-WG, 29-WG & 30-WG** WATER SURFACE ELEVATION		
Client: **TOWNSHIP OF CENTRE WELLINGTON**	Drawn: DK / Checked: RW	Date: NOVEMBER 2025	Figure No. **4**
	Scale: N.T.S.	Project No. 300059832.000	

File: Drawing1.dwg Date Plotted: November 12, 2025 - 11:04 AM

Project Name: □□□r□□ □□□□□M□□□□r□rd□□□2□□ □□29□□ □□□30□□ □
Project No.: 3000□9□32
Location: □□r□□□
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Checked By: R□□□□□□
Date Created: 30□□□□202□
Date Modified: 22□D□□□202□

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]
R. J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, Ontario
telephone (705) 446-0515 **fax** (705) 446-2399
web www.rjburnside.com

Cross Section Results Summary - 30-WG

River Sta	Profile	Min Ch El (m)	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
510	2-Year	438.25	439.73	1.41	439.73	1.41	0	0
510	10-Year	438.25	440.11	1.58	440.1	1.59	-0.01	0.01
510	25-Year	438.25	440.3	1.63	440.29	1.65	-0.01	0.02
510	50-Year	438.25	440.45	1.65	440.43	1.68	-0.02	0.03
510	100-Year	438.25	440.61	1.66	440.58	1.7	-0.03	0.04
510	Regional	438.25	442.15	2.86	442.19	2.82	0.04	-0.04
455	2-Year	438.09	439.61	1.48	439.61	1.48	0	0
455	10-Year	438.09	440.04	1.47	440.03	1.48	-0.01	0.01
455	25-Year	438.09	440.25	1.48	440.23	1.5	-0.02	0.02
455	50-Year	438.09	440.39	1.49	440.37	1.52	-0.02	0.03
455	100-Year	438.09	440.56	1.49	440.53	1.53	-0.03	0.04
455	Regional	438.09	442.13	2.32	442.17	2.26	0.04	-0.06
408	2-Year	437.81	439.59	1.02	439.59	1.03	0	0.01
408	10-Year	437.81	440.02	1.07	440.01	1.08	-0.01	0.01
408	25-Year	437.81	440.23	1.1	440.21	1.11	-0.02	0.01
408	50-Year	437.81	440.38	1.11	440.36	1.13	-0.02	0.02
408	100-Year	437.81	440.55	1.12	440.51	1.15	-0.04	0.03
408	Regional	437.81	442.15	1.53	442.19	1.48	0.04	-0.05
369	2-Year	437.65	439.56	0.92	439.56	0.93	0	0.01
369	10-Year	437.65	440	0.93	439.99	0.94	-0.01	0.01
369	25-Year	437.65	440.21	0.95	440.19	0.96	-0.02	0.01
369	50-Year	437.65	440.36	0.96	440.34	0.98	-0.02	0.02
369	100-Year	437.65	440.54	0.97	440.5	1	-0.04	0.03
369	Regional	437.65	442.14	1.21	442.18	1.15	0.04	-0.06
338	2-Year	437.64	439.53	0.8	439.53	0.8	0	0
338	10-Year	437.64	439.98	0.83	439.97	0.84	-0.01	0.01
338	25-Year	437.64	440.19	0.85	440.17	0.86	-0.02	0.01
338	50-Year	437.64	440.34	0.86	440.32	0.88	-0.02	0.02
338	100-Year	437.64	440.52	0.87	440.48	0.9	-0.04	0.03
338	Regional	437.64	442.13	1	442.18	0.95	0.05	-0.05

Project Name: □□□r□□ □□□□□M□□□□r□rd□□□2□□ □□29□□ □□□30□□ □
Project No.: 3000□9□32
Location: □□r□□□
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Cross Section Results Summary - 30-WG

River Sta	Profile	Min Ch El (m)	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
328	2-Year	437.67	439.53	0.63	439.52	0.63	-0.01	0
328	10-Year	437.67	439.97	0.74	439.96	0.74	-0.01	0
328	25-Year	437.67	440.18	0.78	440.16	0.79	-0.02	0.01
328	50-Year	437.67	440.33	0.81	440.31	0.82	-0.02	0.01
328	100-Year	437.67	440.51	0.83	440.47	0.85	-0.04	0.02
328	Regional	437.67	442.12	1.03	442.16	0.97	0.04	-0.06
288	2-Year	437.58	439.52	0.44	439.52	0.44	0	0
288	10-Year	437.58	439.96	0.57	439.95	0.57	-0.01	0
288	25-Year	437.58	440.17	0.62	440.15	0.63	-0.02	0.01
288	50-Year	437.58	440.32	0.66	440.3	0.67	-0.02	0.01
288	100-Year	437.58	440.5	0.69	440.46	0.7	-0.04	0.01
288	Regional	437.58	442.11	0.9	442.16	0.85	0.05	-0.05
272	2-Year	437.65	439.48	0.9	439.48	0.91	0	0.01
272	10-Year	437.65	439.87	1.32	439.85	1.37	-0.02	0.05
272	25-Year	437.65	440.05	1.51	440.02	1.57	-0.03	0.06
272	50-Year	437.65	440.18	1.64	440.14	1.72	-0.04	0.08
272	100-Year	437.65	440.33	1.76	440.27	1.86	-0.06	0.1
272	Regional	437.65	442.1	1.08	442.15	1.01	0.05	-0.07
259	2-Year	437.67	439.42	1.22	439.42	1.22	0	0
259	10-Year	437.67	439.74	1.81	439.74	1.81	0	0
259	25-Year	437.67	439.87	2.09	439.87	2.09	0	0
259	50-Year	437.67	439.96	2.29	439.96	2.29	0	0
259	100-Year	437.67	440.06	2.5	440.06	2.5	0	0
259	Regional	437.67	441.79	2.02	441.8	1.92	0.01	-0.1
229	2-Year	437.74	439.37	1.34	439.37	1.34	0	0
229	10-Year	437.74	439.71	1.67	439.71	1.67	0	0
229	25-Year	437.74	439.85	1.83	439.85	1.83	0	0
229	50-Year	437.74	439.96	1.93	439.96	1.93	0	0
229	100-Year	437.74	440.07	1.99	440.07	1.99	0	0
229	Regional	437.74	441.81	1.69	441.81	1.61	0	-0.08

Project Name: □□□r□□ □□□□□□M□□□□r□rd□□□2□□ □29□ □□30□□ □
Project No.: 3000□9□32
Location: □□r□□□
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Cross Section Results Summary - 30-WG

River Sta	Profile	Min Ch El (m)	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
191	2-Year	437.73	439.32	1.27	439.32	1.27	0	0
191	10-Year	437.73	439.67	1.54	439.67	1.54	0	0
191	25-Year	437.73	439.82	1.66	439.82	1.66	0	0
191	50-Year	437.73	439.93	1.74	439.93	1.74	0	0
191	100-Year	437.73	440.04	1.85	440.04	1.85	0	0
191	Regional	437.73	441.65	2.81	441.65	2.81	0	0
136	2-Year	437.46	439.33	0.65	439.33	0.65	0	0
136	10-Year	437.46	439.67	0.93	439.67	0.93	0	0
136	25-Year	437.46	439.82	1.05	439.82	1.05	0	0
136	50-Year	437.46	439.92	1.14	439.92	1.14	0	0
136	100-Year	437.46	440.03	1.21	440.03	1.21	0	0
136	Regional	437.46	441.63	2.15	441.63	2.15	0	0
87	2-Year	437.55	439.27	1.13	439.27	1.13	0	0
87	10-Year	437.55	439.6	1.41	439.6	1.41	0	0
87	25-Year	437.55	439.75	1.53	439.75	1.53	0	0
87	50-Year	437.55	439.85	1.61	439.85	1.61	0	0
87	100-Year	437.55	439.97	1.68	439.97	1.68	0	0
87	Regional	437.55	441.55	2.7	441.55	2.7	0	0
44	2-Year	437.46	439.25	0.99	439.25	0.99	0	0
44	10-Year	437.46	439.57	1.32	439.57	1.32	0	0
44	25-Year	437.46	439.72	1.45	439.72	1.45	0	0
44	50-Year	437.46	439.82	1.54	439.82	1.54	0	0
44	100-Year	437.46	439.93	1.61	439.93	1.61	0	0
44	Regional	437.46	441.51	2.66	441.51	2.66	0	0
21	2-Year	437.43	439.23	1.11	439.23	1.11	0	0
21	10-Year	437.43	439.56	1.31	439.56	1.31	0	0
21	25-Year	437.43	439.71	1.4	439.71	1.4	0	0
21	50-Year	437.43	439.81	1.46	439.81	1.46	0	0
21	100-Year	437.43	439.93	1.53	439.93	1.53	0	0
21	Regional	437.43	441.52	2.33	441.52	2.33	0	0

Project Name:	□□□r□□ □□□□□□M□□□□r□r□d□□□2□□ □□29□□ □□□30□□ □
Project No.:	3000□9□32
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Cross Section Results Summary - 29-WG and 21-WG

River Sta	Profile	Min Ch El (m	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
1529	2-Year	416.6	418.49	1.24	418.47	1.26	-0.02	0.02
1529	10-Year	416.6	419.02	1.43	418.96	1.5	-0.06	0.07
1529	25-Year	416.6	419.26	1.53	419.17	1.63	-0.09	0.1
1529	50-Year	416.6	419.44	1.57	419.32	1.71	-0.12	0.14
1529	100-Year	416.6	419.63	1.6	419.47	1.77	-0.16	0.17
1529	Regional	416.6	421.63	2.59	421.63	2.6	0	0.01
1443	2-Year	416.6	418.45	0.86	418.43	0.87	-0.02	0.01
1443	10-Year	416.6	418.98	1.09	418.92	1.14	-0.06	0.05
1443	25-Year	416.6	419.23	1.19	419.13	1.26	-0.1	0.07
1443	50-Year	416.6	419.4	1.24	419.27	1.33	-0.13	0.09
1443	100-Year	416.6	419.59	1.3	419.42	1.41	-0.17	0.11
1443	Regional	416.6	421.52	2.5	421.52	2.5	0	0
1383	2-Year	416.59	418.41	0.98	418.39	1	-0.02	0.02
1383	10-Year	416.59	418.93	1.26	418.86	1.32	-0.07	0.06
1383	25-Year	416.59	419.18	1.35	419.06	1.45	-0.12	0.1
1383	50-Year	416.59	419.35	1.41	419.21	1.53	-0.14	0.12
1383	100-Year	416.59	419.54	1.47	419.35	1.62	-0.19	0.15
1383	Regional	416.59	421.52	2.42	421.52	2.42	0	0
1284	2-Year	416.59	418.22	1.67	418.17	1.78	-0.05	0.11
1284	10-Year	416.59	418.76	1.81	418.63	2.02	-0.13	0.21
1284	25-Year	416.59	419.01	1.9	418.83	2.16	-0.18	0.26
1284	50-Year	416.59	419.19	1.94	418.96	2.28	-0.23	0.34
1284	100-Year	416.59	419.39	1.97	419.09	2.37	-0.3	0.4
1284	Regional	416.59	421.55	1.81	421.54	1.81	-0.01	0
1237	2-Year	416.59	418.24	0.83	418.2	0.87	-0.04	0.04
1237	10-Year	416.59	418.79	1.03	418.67	1.12	-0.12	0.09
1237	25-Year	416.59	419.04	1.12	418.87	1.24	-0.17	0.12
1237	50-Year	416.59	419.22	1.17	419	1.32	-0.22	0.15
1237	100-Year	416.59	419.42	1.22	419.15	1.4	-0.27	0.18
1237	Regional	416.59	421.42	2.11	421.41	2.12	-0.01	0.01

Project Name: [illegible]r[illegible] [illegible]M[illegible]r[illegible]r[illegible]d[illegible]2[illegible] [illegible]29[illegible] [illegible]30[illegible]
Project No.: 3000[illegible]9[illegible]32
Location: [illegible]r[illegible]
Created By: D[illegible]
Checked By: R[illegible]
Date Created: 30[illegible]202[illegible]
Date Modified: 22[illegible]D[illegible]202[illegible]

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Cross Section Results Summary - 29-WG and 21-WG

River Sta	Profile	Min Ch El (m	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
1153	2-Year	416.58	418.2	0.86	418.15	0.9	-0.05	0.04
1153	10-Year	416.58	418.75	1.07	418.61	1.18	-0.14	0.11
1153	25-Year	416.58	419	1.13	418.81	1.29	-0.19	0.16
1153	50-Year	416.58	419.19	1.16	418.95	1.35	-0.24	0.19
1153	100-Year	416.58	419.39	1.19	419.09	1.42	-0.3	0.23
1153	Regional	416.58	421.37	2.16	421.37	2.17	0	0.01
1136	2-Year	416.58	418.19	0.89	418.13	0.93	-0.06	0.04
1136	10-Year	416.58	418.73	1.12	418.59	1.23	-0.14	0.11
1136	25-Year	416.58	418.98	1.22	418.78	1.37	-0.2	0.15
1136	50-Year	416.58	419.16	1.29	418.91	1.46	-0.25	0.17
1136	100-Year	416.58	419.35	1.35	419.05	1.56	-0.3	0.21
1136	Regional	416.58	421.36	2.04	421.36	2.04	0	0
1118	2-Year	416.58	418.11	1.01	418.11	1.01	0	0
1118	10-Year	416.58	418.56	1.33	418.55	1.33	-0.01	0
1118	25-Year	416.58	418.74	1.48	418.74	1.48	0	0
1118	50-Year	416.58	418.87	1.59	418.87	1.59	0	0
1118	100-Year	416.58	419	1.7	418.99	1.71	-0.01	0.01
1118	Regional	416.58	421.22	2.27	421.23	2.25	0.01	-0.02
1102	2-Year	416.57	418.11	0.81	418.11	0.81	0	0
1102	10-Year	416.57	418.57	1	418.56	1.01	-0.01	0.01
1102	25-Year	416.57	418.76	1.09	418.76	1.09	0	0
1102	50-Year	416.57	418.89	1.15	418.89	1.16	0	0.01
1102	100-Year	416.57	419.03	1.22	419.02	1.22	-0.01	0
1102	Regional	416.57	421.22	2.01	421.24	1.99	0.02	-0.02
947	2-Year	416.37	417.91	1.41	417.91	1.41	0	0
947	10-Year	416.37	418.33	1.77	418.33	1.77	0	0
947	25-Year	416.37	418.51	1.9	418.5	1.91	-0.01	0.01
947	50-Year	416.37	418.63	1.99	418.63	2.01	0	0.02
947	100-Year	416.37	418.78	2.03	418.76	2.06	-0.02	0.03
947	Regional	416.37	421.14	2.21	421.16	2.19	0.02	-0.02

Project Name:	□□□r□□ □□□□□M□□□□r□rd□□□2□□ □29□ □□30□ □
Project No.:	3000□9□32
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Cross Section Results Summary - 29-WG and 21-WG

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887	2-Year	416.25	417.8	1.47	417.8	1.47	0	0
887	10-Year	416.25	418.25	1.68	418.25	1.68	0	0
887	25-Year	416.25	418.43	1.8	418.43	1.81	0	0.01
887	50-Year	416.25	418.56	1.88	418.55	1.89	-0.01	0.01
887	100-Year	416.25	418.7	1.95	418.68	1.98	-0.02	0.03
887	Regional	416.25	420.97	2.84	421	2.8	0.03	-0.04
757	2-Year	415.92	417.48	1.73	417.47	1.73	-0.01	0
757	10-Year	415.92	417.94	2.06	417.93	2.08	-0.01	0.02
757	25-Year	415.92	418.14	2.15	418.13	2.18	-0.01	0.03
757	50-Year	415.92	418.29	2.19	418.27	2.24	-0.02	0.05
757	100-Year	415.92	418.46	2.23	418.41	2.31	-0.05	0.08
757	Regional	415.92	420.9	2.69	420.93	2.67	0.03	-0.02
587	2-Year	415.53	417.12	1.7	417.11	1.71	-0.01	0.01
587	10-Year	415.53	417.63	2	417.59	2.05	-0.04	0.05
587	25-Year	415.53	417.86	2.09	417.8	2.18	-0.06	0.09
587	50-Year	415.53	418.02	2.15	417.95	2.26	-0.07	0.11
587	100-Year	415.53	418.2	2.2	418.1	2.35	-0.1	0.15
587	Regional	415.53	420.62	3.16	420.66	3.11	0.04	-0.05
513	2-Year	415.36	416.93	1.76	416.91	1.8	-0.02	0.04
513	10-Year	415.36	417.48	1.98	417.43	2.07	-0.05	0.09
513	25-Year	415.36	417.72	2.09	417.63	2.22	-0.09	0.13
513	50-Year	415.36	417.89	2.16	417.78	2.32	-0.11	0.16
513	100-Year	415.36	418.06	2.24	417.92	2.42	-0.14	0.18
513	Regional	415.36	420.58	2.91	420.62	2.86	0.04	-0.05
467	2-Year	415.13	416.94	1.11	416.92	1.13	-0.02	0.02
467	10-Year	415.13	417.49	1.39	417.44	1.44	-0.05	0.05
467	25-Year	415.13	417.73	1.52	417.64	1.59	-0.09	0.07
467	50-Year	415.13	417.9	1.6	417.79	1.69	-0.11	0.09
467	100-Year	415.13	418.07	1.68	417.94	1.8	-0.13	0.12
467	Regional	415.13	420.61	2.31	420.65	2.28	0.04	-0.03

Project Name:	[illegible]
Project No.:	3000[illegible]9[illegible]32
Location:	[illegible]
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Date Created:	30[illegible]202[illegible]
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405	2-Year	415.13	416.88	1.17	416.85	1.2	-0.03	0.03
405	10-Year	415.13	417.44	1.43	417.37	1.49	-0.07	0.06
405	25-Year	415.13	417.68	1.52	417.58	1.62	-0.1	0.1
405	50-Year	415.13	417.84	1.65	417.73	1.7	-0.11	0.05
405	100-Year	415.13	418.03	1.69	417.86	1.86	-0.17	0.17
405	Regional	415.13	420.62	2.02	420.66	1.99	0.04	-0.03
384	2-Year	415.13	416.87	1.05	416.85	1.07	-0.02	0.02
384	10-Year	415.13	417.42	1.4	417.36	1.45	-0.06	0.05
384	25-Year	415.13	417.64	1.58	417.55	1.65	-0.09	0.07
384	50-Year	415.13	417.8	1.7	417.68	1.79	-0.12	0.09
384	100-Year	415.13	417.97	1.82	417.81	1.94	-0.16	0.12
384	Regional	415.13	420.6	2	420.64	1.97	0.04	-0.03
368	2-Year	415.13	416.81	1.27	416.81	1.27	0	0
368	10-Year	415.13	417.29	1.67	417.29	1.67	0	0
368	25-Year	415.13	417.47	1.88	417.47	1.88	0	0
368	50-Year	415.13	417.59	2.04	417.59	2.04	0	0
368	100-Year	415.13	417.71	2.21	417.71	2.21	0	0
368	Regional	415.13	420.01	2.59	420.01	2.59	0	0
348	2-Year	415.13	416.68	1.84	416.68	1.84	0	0
348	10-Year	415.13	417.16	2.23	417.16	2.23	0	0
348	25-Year	415.13	417.37	2.35	417.37	2.35	0	0
348	50-Year	415.13	417.51	2.43	417.51	2.43	0	0
348	100-Year	415.13	417.65	2.51	417.65	2.51	0	0
348	Regional	415.13	419.99	2.91	419.99	2.91	0	0
273	2-Year	414.95	416.53	1.77	416.53	1.77	0	0
273	10-Year	414.95	416.99	2.23	416.99	2.23	0	0
273	25-Year	414.95	417.19	2.41	417.19	2.41	0	0
273	50-Year	414.95	417.33	2.51	417.33	2.51	0	0
273	100-Year	414.95	417.48	2.59	417.48	2.59	0	0
273	Regional	414.95	419.86	3.15	419.86	3.15	0	0

Project Name: [illegible]
Project No.: [illegible]
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telephone (705) 446-0515 **fax** (705) 446-2399
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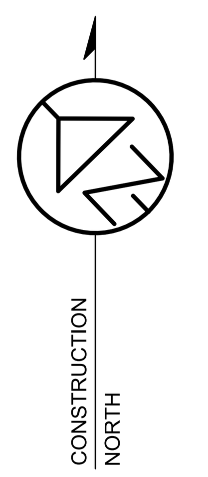
Cross Section Results Summary - 29-WG and 21-WG

River Sta	Profile	Min Ch El (m	Existing W.S. Elev(m)	Existing Chnl Vel (m/s)	Proposed W.S. Elev(m)	Proposed Chnl Vel (m/s)	Elevation Difference (m)	Velocity Difference (m/s)
124	2-Year	414.66	416.35	1.35	416.35	1.35	0	0
124	10-Year	414.66	416.8	1.74	416.8	1.74	0	0
124	25-Year	414.66	416.99	1.91	416.99	1.91	0	0
124	50-Year	414.66	417.13	2.01	417.13	2.01	0	0
124	100-Year	414.66	417.26	2.14	417.26	2.14	0	0
124	Regional	414.66	419.5	3.5	419.5	3.5	0	0
30	2-Year	414.51	416.16	1.68	416.16	1.68	0	0
30	10-Year	414.51	416.61	2.07	416.61	2.07	0	0
30	25-Year	414.51	416.8	2.23	416.8	2.23	0	0
30	50-Year	414.51	416.93	2.33	416.93	2.33	0	0
30	100-Year	414.51	417.07	2.44	417.07	2.44	0	0
30	Regional	414.51	419.29	3.93	419.29	3.93	0	0



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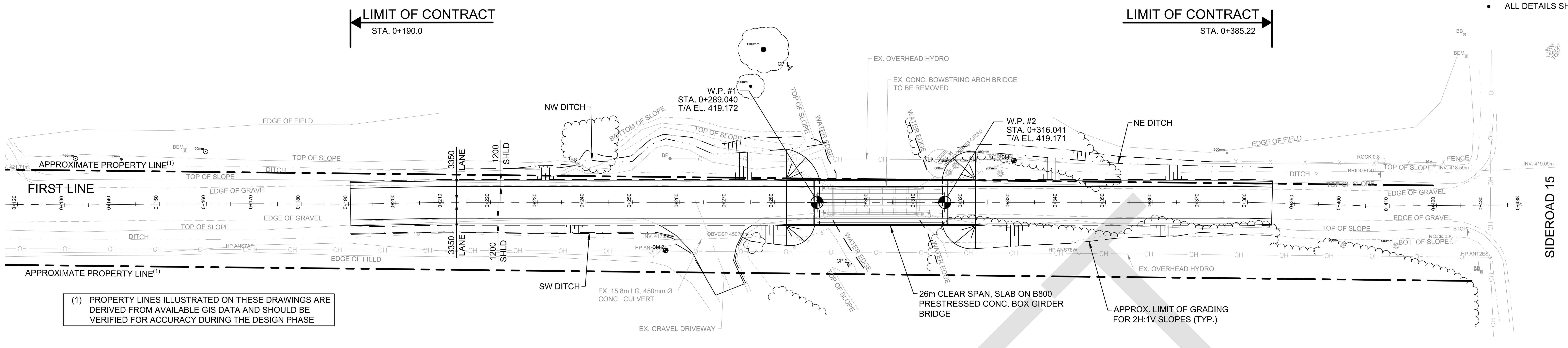

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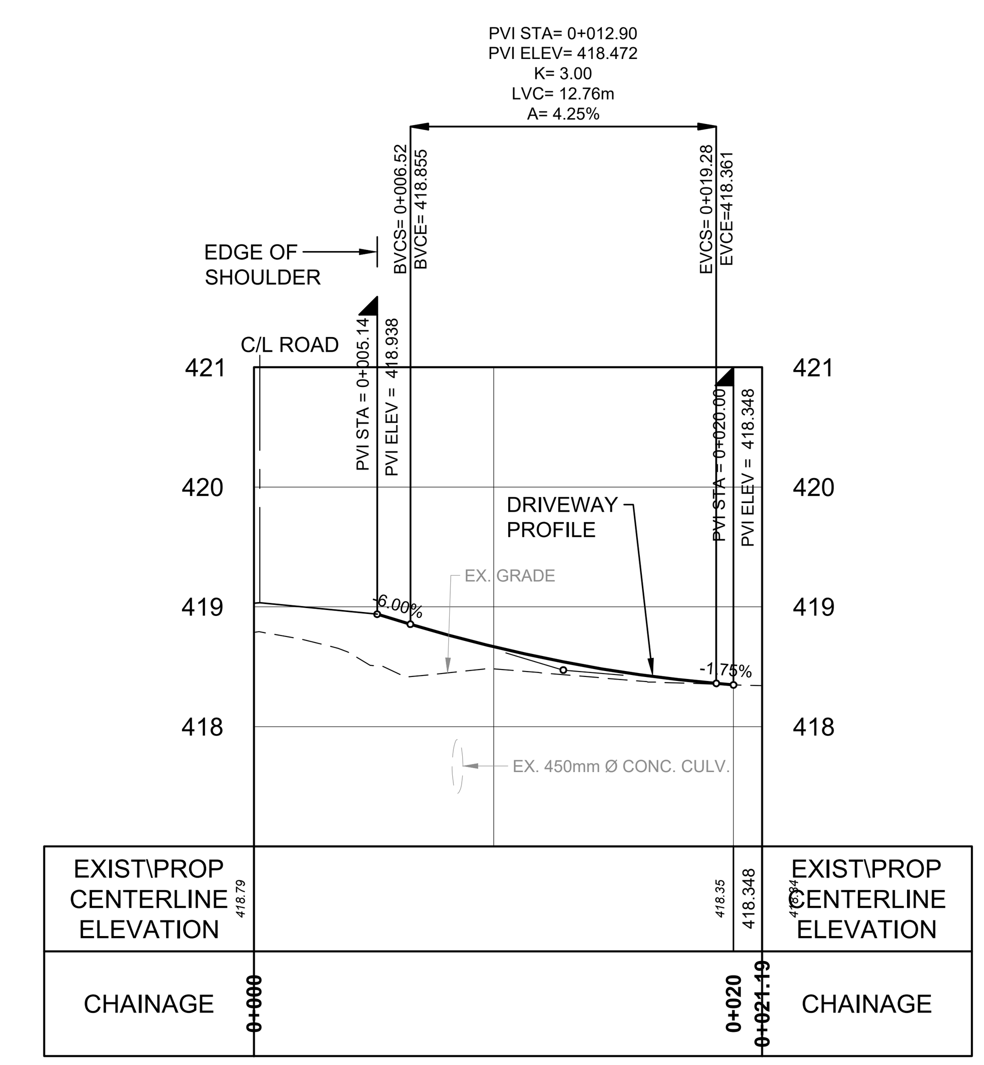
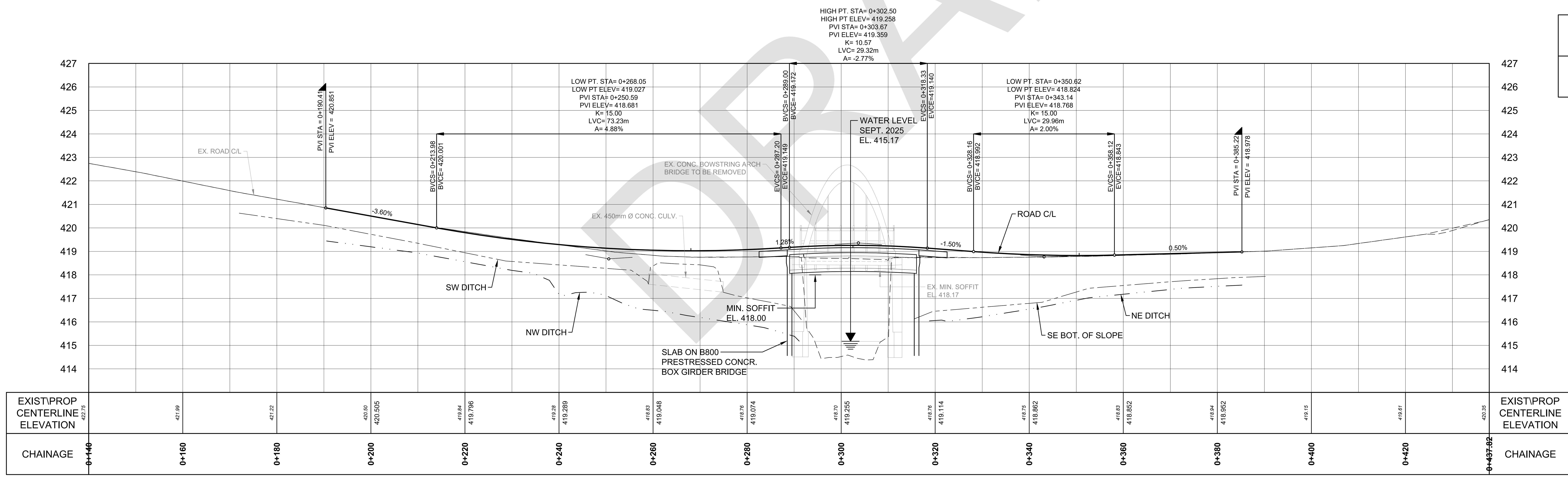


PROFILE - GRAVEL DRIVEWAY
SCALE: H 1:250 V 1:50



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ELORA, ONTARIO
N0B 1S0

Drawing Title
BRIDGE CLASS EA - 21-WG
CONCEPTUAL PLAN & PROFILE
B-211

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ASC	ASD	ASD	MOB	25/10/01	B-211
Project No. 300059832		Contract No. CONTRACT NO.		Revision No. 0	
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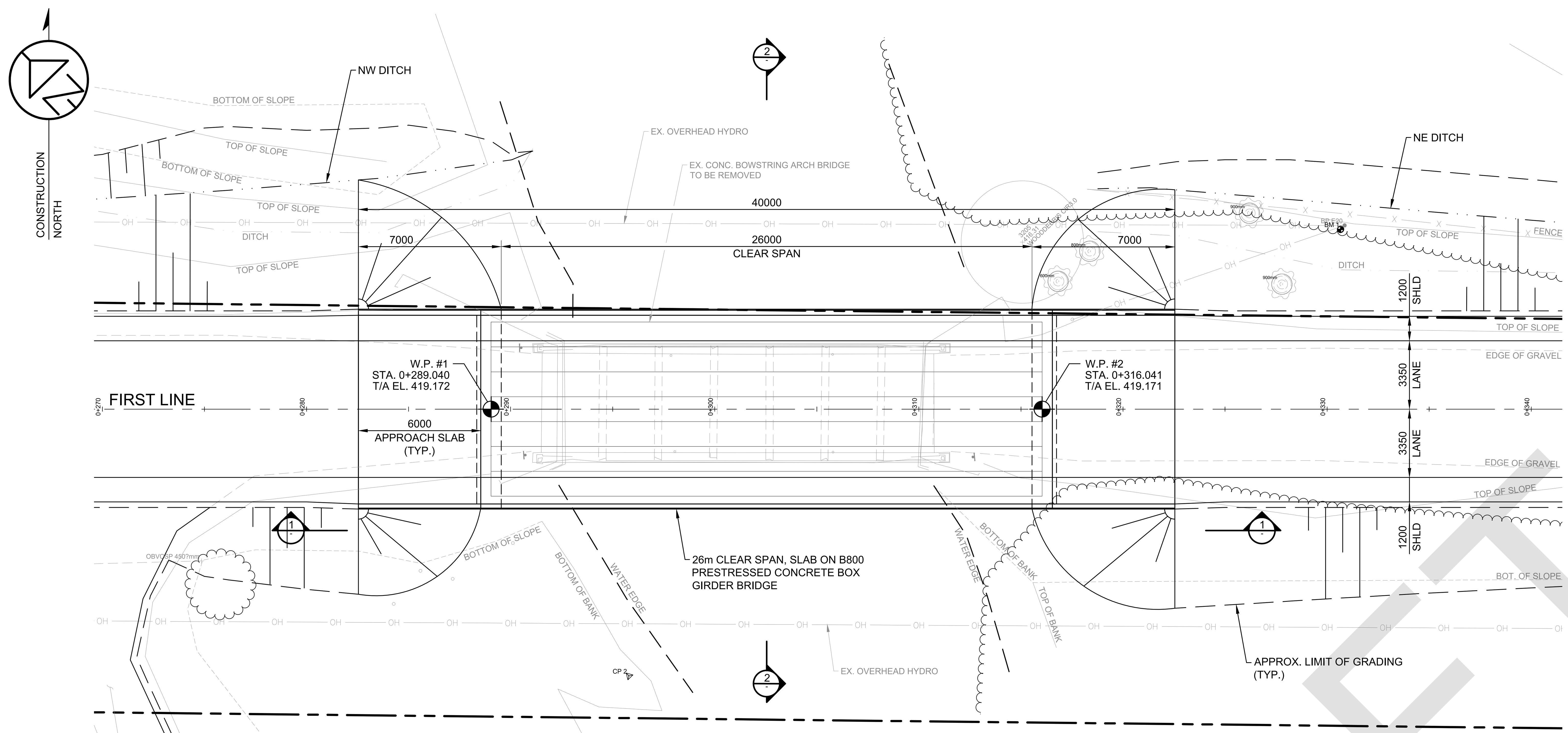

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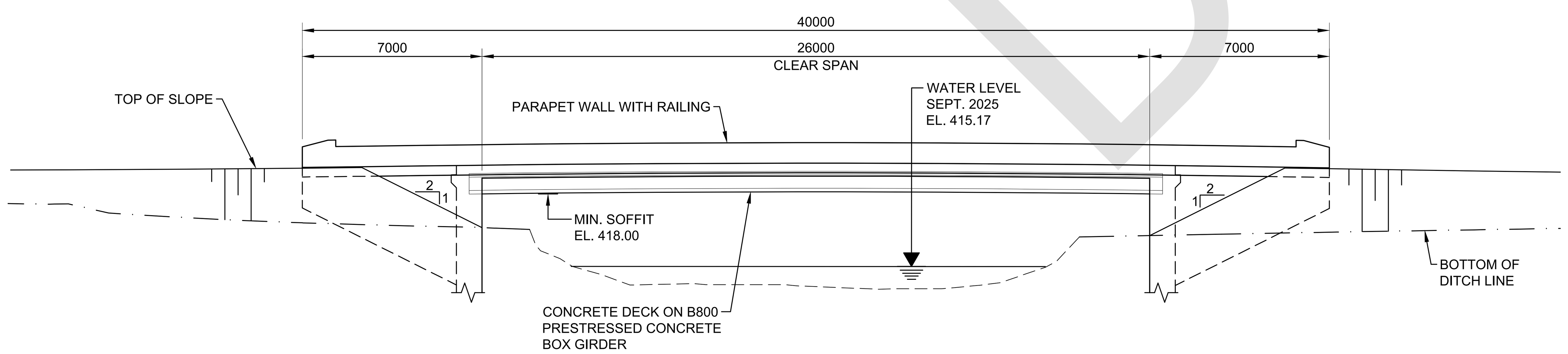

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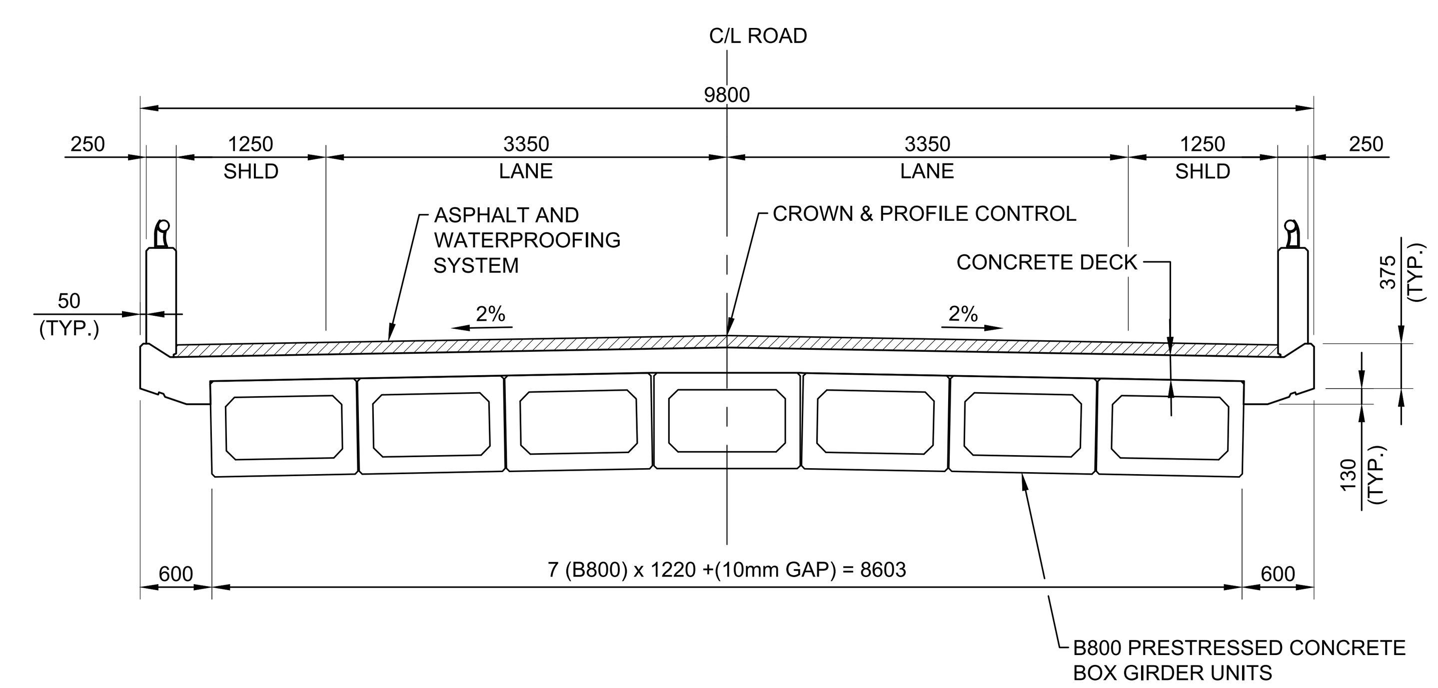

2 SECTION
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Drawing Title
BRIDGE CLASS EA - 21-WG
CONCEPTUAL GENERAL ARRANGEMENT

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Project No. 300059832		Contract No. CONTRACT NO.		Revision No. 0	
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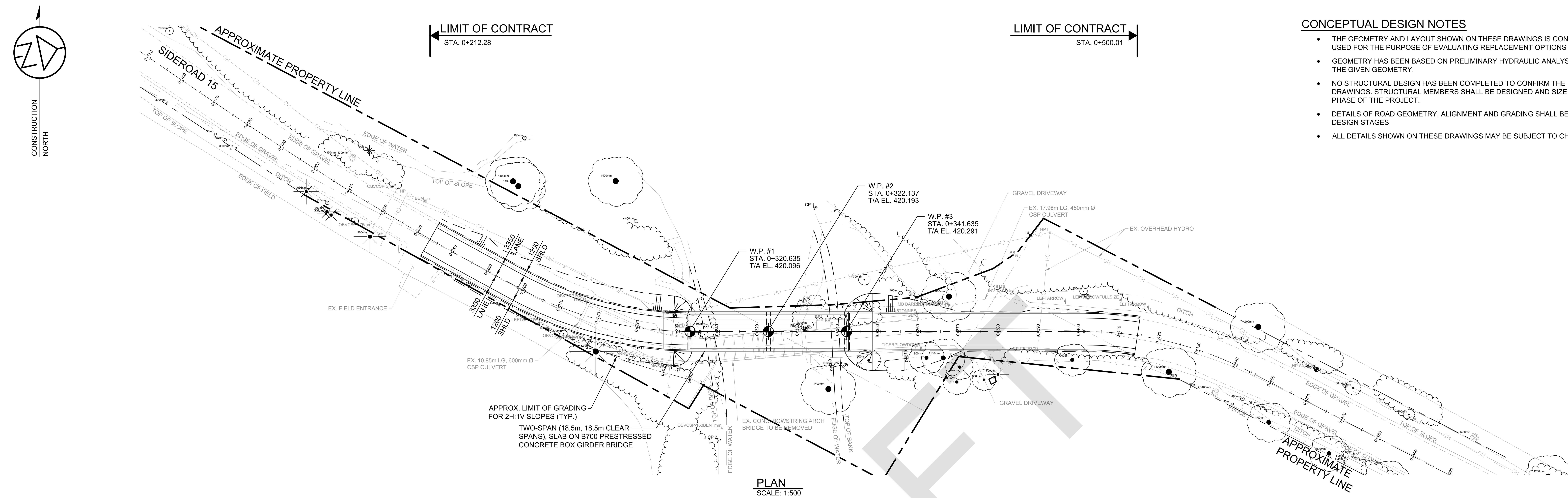

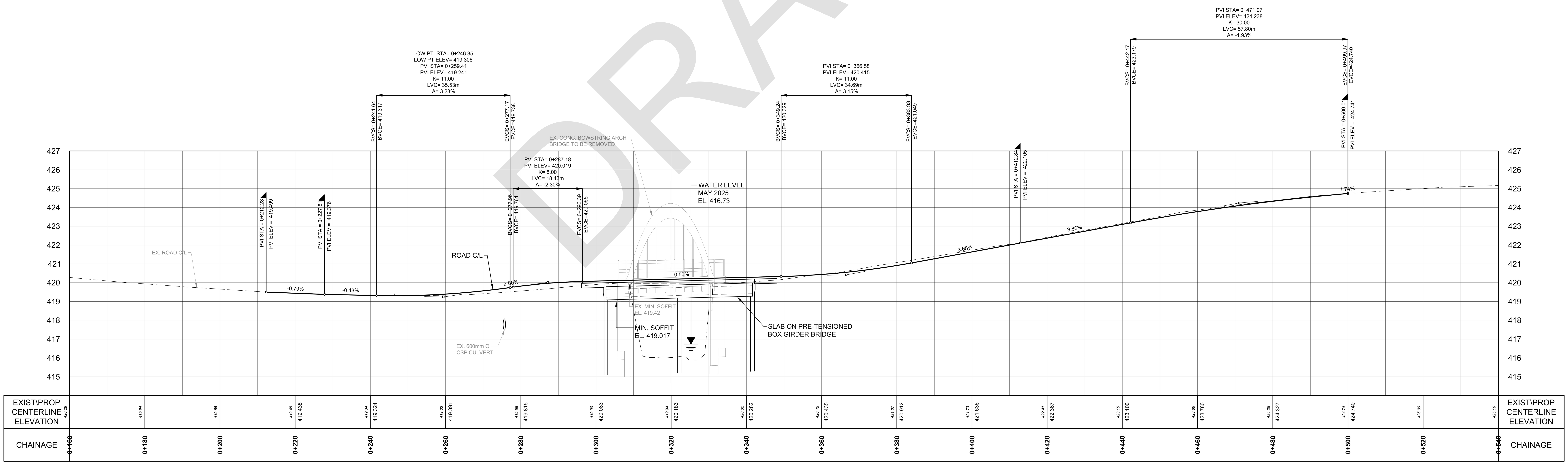

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Drawing Title
BRIDGE AND TRANSPORTATION NETWORK STUDY OF BRIDGES 21-WG, 29-WG & 30-WG
CONSEPTUAL PLAN & PROFILE
BRIDGE 29-WG

Drawn	Checked	Designed	Checked	Date	Drawing No.
ASC	ASD	ASD	MOB	25/10/01	B-291

Project No. 300059832 | Contract No. CONTRACT NO. | Revision No. 0

Scale H 1:500 V 1:100

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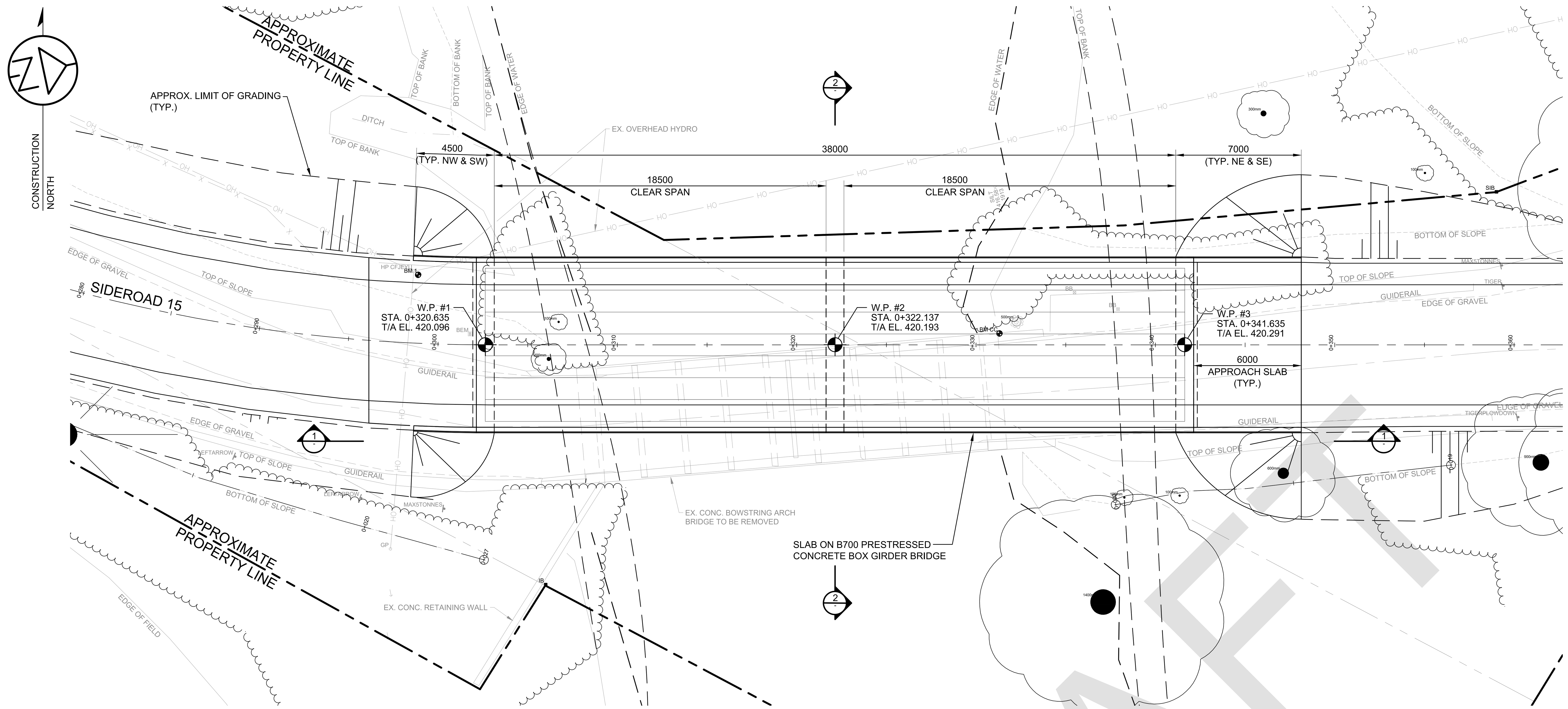

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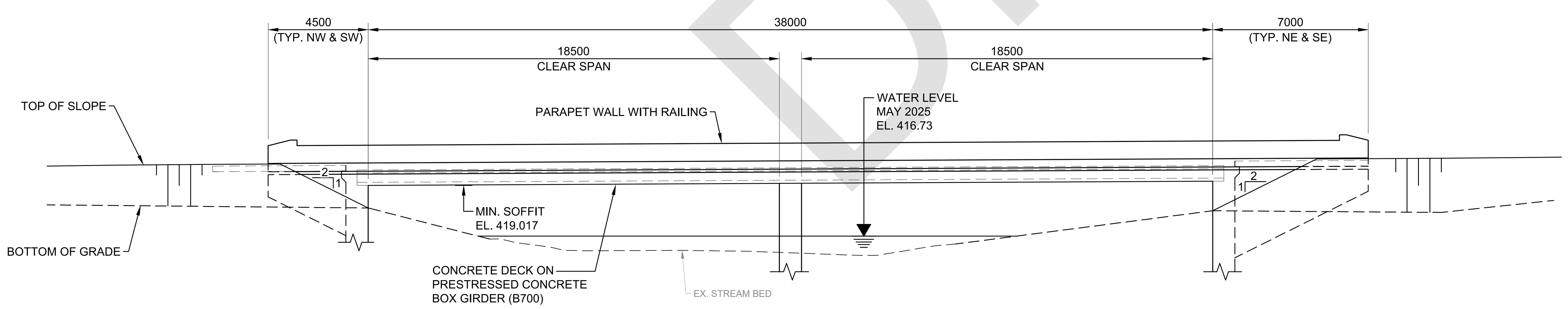

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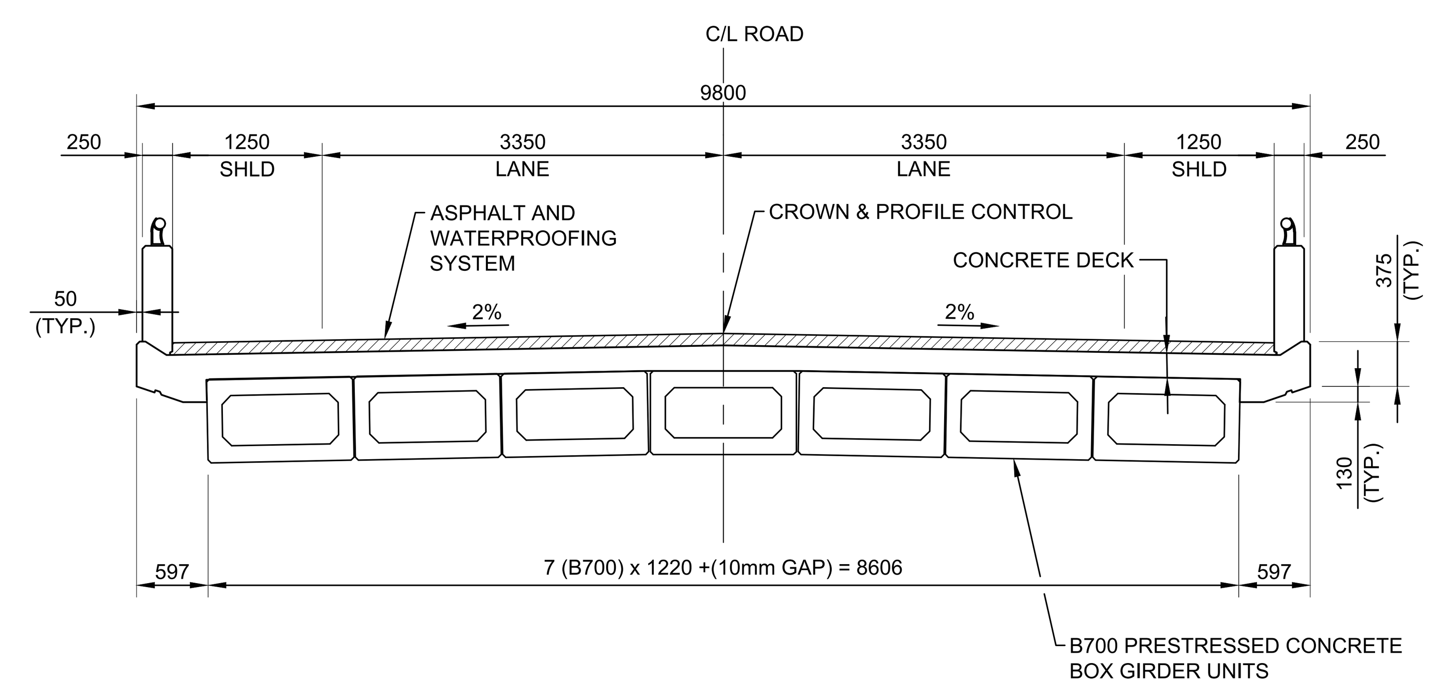

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BRIDGE AND TRANSPORTATION NETWORK STUDY OF BRIDGES 21-WG, 29-WG & 30-WG
CONCEPTUAL GENERAL ARRANGEMENT
BRIDGE 29-WG

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Project No. 300059832		Contract No. CONTRACT NO.		Revision No. 0	
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File: U:\059832\0029\03-PRD\059832 29-WG GA.dwg Date Plotted: December 18, 2025 -

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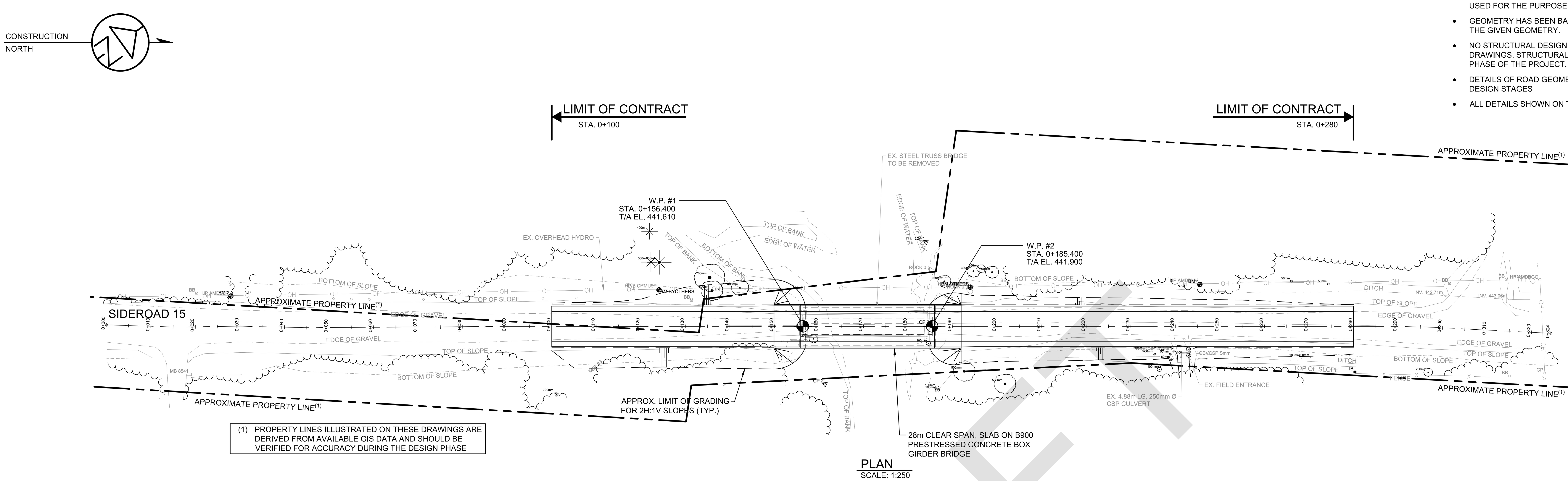

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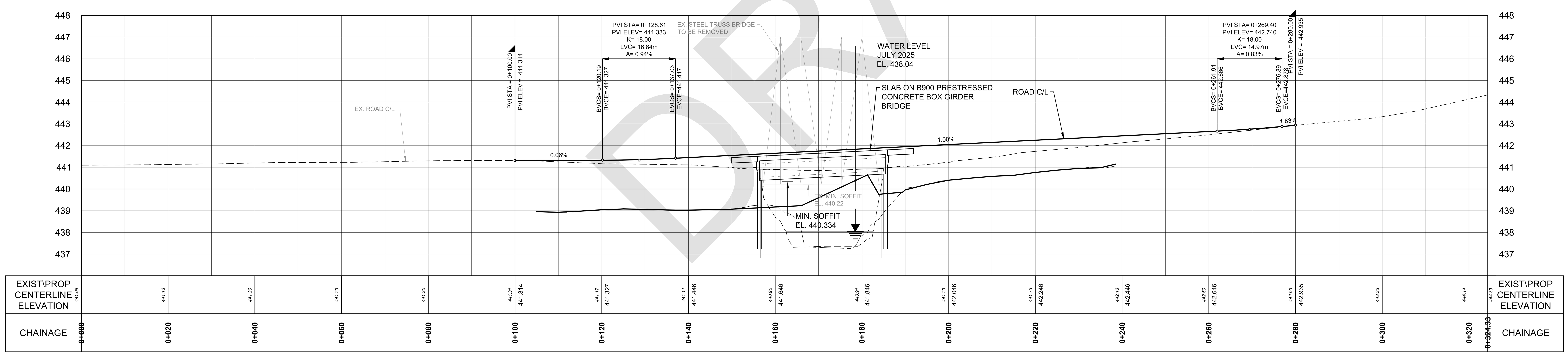

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Drawing Title
BRIDGE AND TRANSPORTATION NETWORK STUDY OF BRIDGES 21-WG, 29-WG & 30-WG
CONCEPTUAL PLAN & PROFILE
BRIDGE 30-WG

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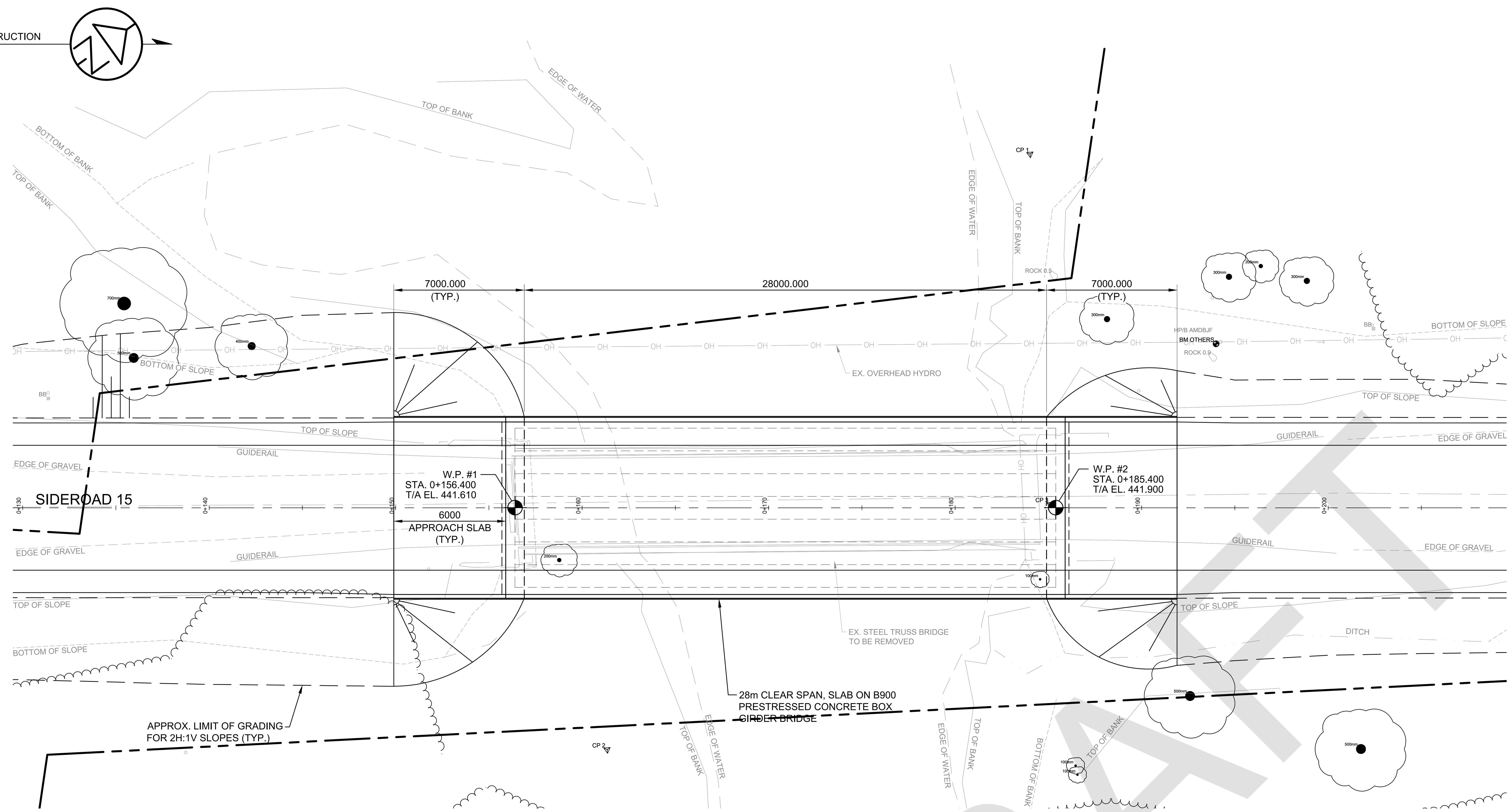

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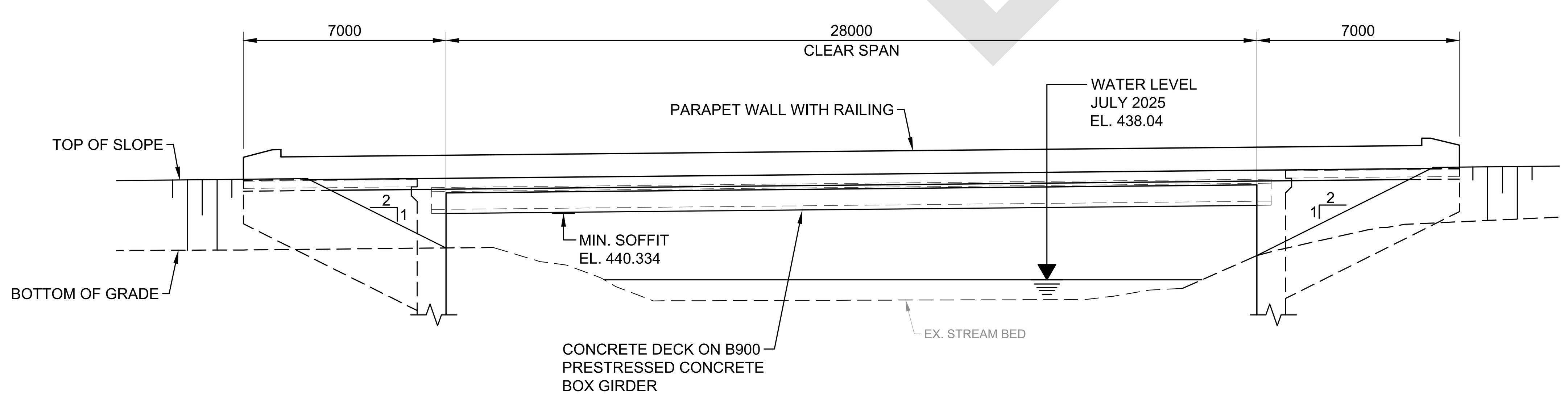

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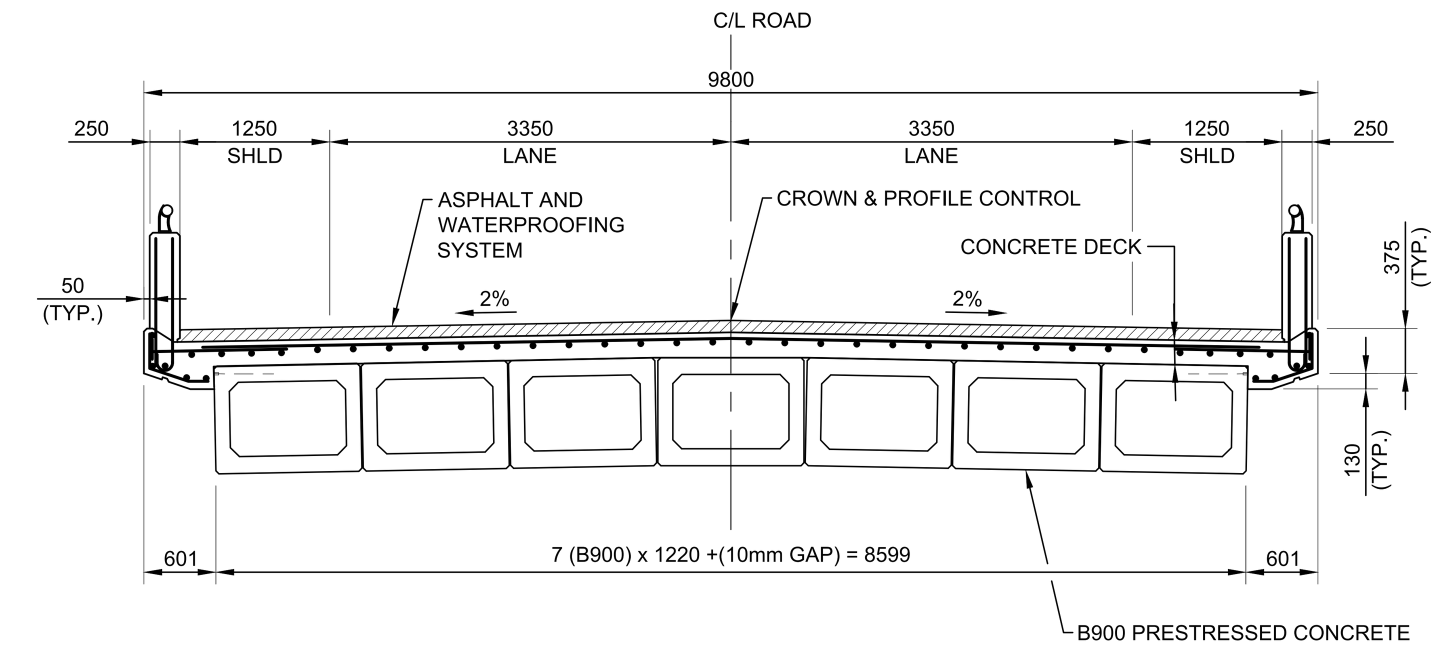

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BRIDGE AND TRANSPORTATION NETWORK STUDY OF BRIDGES 21-WG, 29-WG & 30-WG
CONCEPTUAL GENERAL ARRANGEMENT
BRIDGE 30-WG

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Project No. 300059832		Contract No. CONTRACT NO.		Revision No. 0	
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BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

A.5 Natural Heritage Report

Bridge and Transportation Network Study for Bridges 21-WG, 29-WG and 30-WG
Natural Heritage Report

Township of Centre Wellington
1 MacDonald Square
Elora ON N0B 1S0

R.J. Burnside & Associates Limited
292 Speedvale Avenue West Unit 20
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August 2025
300059832.0000

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Record of Revisions

Revision	Date	Description
0	August 13, 2025	Initial Submission to Township of Centre Wellington

R.J. Burnside & Associates Limited

Report Prepared By:

Sarah Yoshida, B.Sc. (Env.) Eco. Rest. Cert.
Ecologist
SY:af

Mark Saunders, MES, B.Sc. (Hons), CAN-CISEC-IT
Aquatic Ecologist

Report Reviewed By:

Tricia Radburn, MCIP, RPP
Senior Environmental Planner

Kevin Butt, B.Sc. (Env)., Eco. Rest. Cert.
ISA Certified Arborist with TRAQ Certification

Table of Contents

Tables

Figures

Appendices

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1.0 Introduction

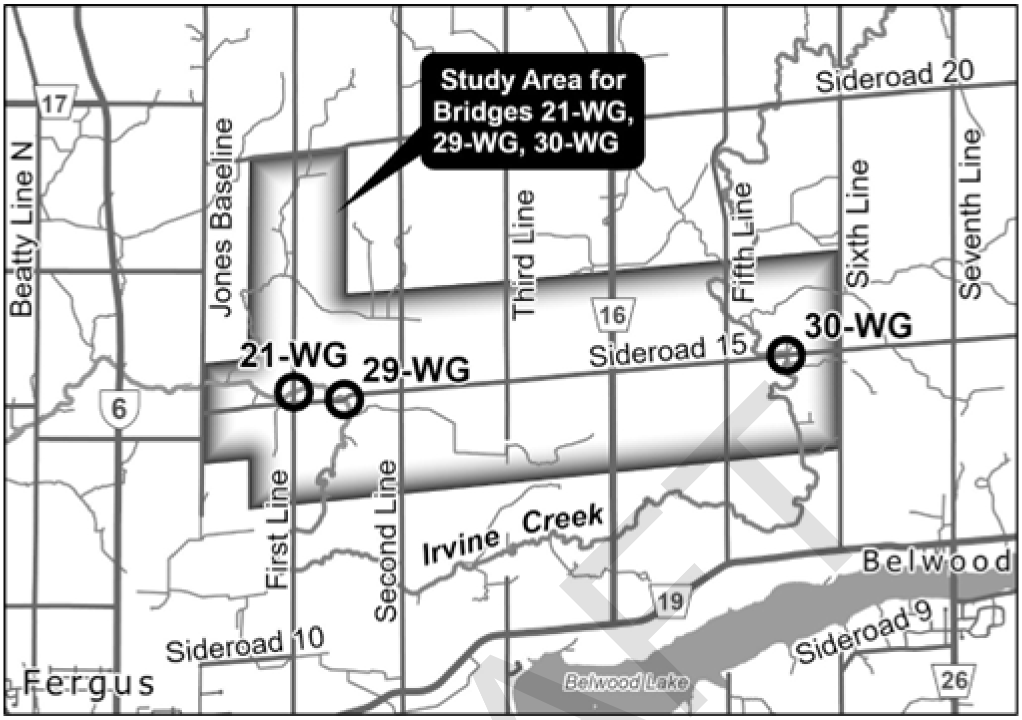
R.J. Burnside & Associates Limited (Burnside) has been retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 21-WG, 29-WG, and 30-WG located northeast of the community of Fergus (Figure 1).

This Natural Heritage Report documents the existing natural heritage conditions, both terrestrial and aquatic, in a 120 m study area around each respective bridge. The natural features associated with Irvine Creek and its associated bridge crossings are a part of larger connected natural systems comprised of varied forests, hedgerows, wetlands, meadow and thicket communities that comprise Wellington County's Natural Heritage System.

This report will inform the preferred alternative decision by identifying natural feature constraints that will need to be protected or mitigated from short-term or long-term impacts.

A review of existing documents and databases was used to identify the presence, or potential presence, of the natural features and their associated policy constraints, supported by a field investigation by Burnside ecologists.

Figure 1: Study Area



2.0 Methodology

The following sources of information were used to determine the ecological constraints in the vicinity of each structure.

- Aerial photographic imaging and 1:10,000 Ontario Base Mapping (OBM)
- Department of Fisheries and Oceans (DFO) Aquatic SAR mapping (2023)
- Ministry of Natural Resources and Forestry (MNRF) Make a Map: Natural Heritage Areas to identify natural heritage features and Natural Heritage Information Centre (NHIC) data of rare wildlife species on, and in the vicinity of, the subject lands: 1x1 km^2 Squares: 17NJ4644, 17NJ4645, 17NJ4844, 17NJ4744, 17NJ4845, 17NJ5048, 17NJ5049, 17NJ5149, and 17NJ5148
- MNRF Land Information Ontario (LIO) database
- MNRF Aquatic Resource Area (ARA) summary data
- Ontario Hydrology Network (OHN) mapping
- The Ontario Breeding Bird Atlas (OBBA) 2001-2005 – 10x10 km^2 Square 17NJ44 and 17NJ54
- Ontario Reptile and Amphibian Atlas (ORAA) – 10x10 km^2 Square 17NJ44 and 17NJ54
- Ontario Insect Atlas (OIA) 2005 – 2021 – 10x10 km^2 Square 17NJ44 and 17NJ54
- iNaturalist records
- eBird records

- GRCA Regulated Areas and Features Mapping
- Township of Centre Wellington Official Plan (2023)
- Wellington County Official Plan (2022)

In addition, field investigations were carried out, as follows:

- An Ecological Land Classification (ELC) and botanical inventory were undertaken from the road ROW. ELC communities were described according to the updated Second Approximation 2008 codes (Lee, 2008) with reference to Ecological Land Classification for Southern Ontario: First Approximation and Its Application (Lee et al. 1998) for units that could not be adequately described by the 2008 codes. Approximations of communities were made where permission to enter was not available and work was completed from the publicly-owned road right-of-way. Air photos were used to delineate the features, as needed.
- Wetland boundary delineation was completed in accordance with the Ontario Wetland Evaluation System (OWES) protocol. Wetland Staking was completed with Tony Zammit (Watershed Ecologist) and Jessica Conroy (Planner) from the GRCA at bridge 30-WG. Site visits with the GRCA also took place at bridge 21-WG and 29-WG to confirm the absence of wetlands.
- Each bridge structure was surveyed by a Burnside ecologist for evidence of breeding birds, primarily Cliff Swallow and Barn Swallow nests.
- Visual aquatic habitat survey.
- Onsite meeting with Indigenous Community Field Liaison Representatives. Billye Bomberry and Matthew Turner from Haudenosaunee Development Institute were in attendance.

A summary of conditions during field investigations is presented in Table 1.

Table 1: Natural Environment Field Investigations

Field Study	Methodology	Staff Involved	Date(s)	Time of Day	Weather Conditions		
					Precipitation/Cloud Cover	**Temperature (°C)**	**Wind (Beaufort Wind Scale)[1]**
Ecological Land Classification	Ecological Land Classification for Southern Ontario (Lee et al.,1998) of entire property.	Sarah Yoshida, Ecologist	June 11, 2025	1000 - 1620	No precipitation Clear	17°C on arrival 25°C on departure	3
Wetland Boundary Delineation	Ontario Wetland Evaluation System						
Aquatic Habitat Assessment	Ontario Ministry of Transportation (MTO) Fisheries Protocol - Environmental Guide for Fish and Fish Habitat (June 2009)	Mark Saunders	June 23, 2025	1030 - 1230	No precipitation Clear	29°C on arrival 31°C on departure	6 - Strong Breeze

Field Study	Methodology	Staff Involved	Date(s)	Time of Day	Weather Conditions		
					Precipitation/Cloud Cover	Temperature (°C)	Wind (Beaufort Wind Scale)[1]
Search for potential wildlife habitats	Survey throughout study areas to search for features that could provide habitat for wildlife or SAR habitat such as: Nests, reptile hibernacula, old barns, structures, uncapped chimneys, foundations, mature forest areas with cavities or other features suitable for bat roosting, turtle nesting or overwintering sites.	All staff	All site visits				
Incidental flora and fauna observations	Visual observations of animals, tracks or scat and compilation of a plant inventory during all site visits.	Sarah Yoshida, Ecologist	June 11, 2025	1000 - 1620	No precipitation Clear	17°C on arrival 25°C on departure	3

[1] Beaufort Wind Scale: 0 = calm, smoke rises vertically (0-2 km/hr); 1 = light air movement, smoke drifts (3-5); 3 = gentle breeze, wind felt on face; leaves rustle (6-11); 4 = moderate breeze, small branches moving, raises dust & loose paper (20-30); 5 = fresh breeze, small trees begin to sway (31-39); 6 = strong breeze, large branches in motion (40-50)

3.0 Background Review

3.1 County of Wellington Official Plan

Per Schedule B1 of the Wellington County OP, all three structures occur in association with the Couty of Wellington Core Greenlands system. The Greenlands in Wellington County are determined by their composition of natural features. Any wetland in Wellington County is considered significant. Additionally, in Wellington County, all streams and valleylands are considered significant, providing protection to these watercourses at all structures.

3.2 Terrestrial Environment

A review of NHIC demonstrates that bridge 30-WG are situated adjacent to the Living Springs Wetland Complex. All three structures are surrounded by the County Natural Heritage System (NHS). Based on a review of OBBA, ORAA, and OIA, the following SAR (endangered of Threatened) and Species of Special Concern (SCCO were identified as potentially being present within the Study Area.

Table 2: Species at Risk within the Study Area

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
Arthropods									
Monarch (Source: OIA)	*Danaus plexippus*		S2N, S4B	SC	END	END	1	Throughout their life cycle, Monarchs use three different types of habitats. Only the caterpillars (larvae) feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Monarchs spend the winter in Oyamel Fir forests found in central Mexico. The largest threat to Ontario Monarchs is habitat loss and fragmentation at overwintering sites in central Mexico where forests are being logged and converted into agricultural fields and pastures. Widespread pesticide and herbicide use throughout the Monarch's range may also limit recovery.[9]	Moderate potential. Suitable habitat may occur within the meadow marsh communities associated with Structures 21-WG and 29-WG as well as roadsides. Habitat is unlikely to be considered significant
Birds									
Bank Swallow (Source: OBBA)	*Riparia riparia*		S4B	THR	THR	THR	1	Prefers open habitats including, farmland, lake/river shorelines, grasslands, and wetlands. Nests in exposed earthen banks along shorelines and in artificial sites such as gravel pits.[6]	Moderate potential. May occur in association with the banks of Irvine Creek.
Barn Swallow (Source: OBBA)	*Hirundo rustica*		S4B	SC	SC	THR	1	Prefers farmland, lake/river shorelines, wooded clearings, urban populated areas, rocky cliffs, and wetlands. Nests inside or on exterior of buildings; under bridges and in road culverts; on rock faces, and in caves, etc.[7]	Moderate potential. May occur in association with the bridges at the crossings of Irvine Creek.
Bobolink (Source: NHIC, OBBA)	*Dolichonyx oryzivorus*		S4B	THR	SC	THR	1	Generally, prefers open grasslands and hay fields for nesting, typically featuring relatively tall vegetation. Sometimes uses large fields of winter wheat and rye in southwestern Ontario. Sensitive to vegetation structure and composition. Positively associated with high grass-to-forb ratios; moderate litter depth;	Low potential. May be supported within pastures and hayfields located on private lands well beyond bridge 29-WG.

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
								tolerate wetter portions of fields compared to Eastern Meadowlark (EAME) and more likely to nest closer to field centres rather than field margins. Lower tolerance to presence of patches of bare ground. Appear to prefer larger fields than EAME.[8]	
Canada Warbler (Source: OBBA)	*Cardellina canadensis*		S5B	SC	SC	THR	1	Generally, prefers wet coniferous, deciduous and mixed forest types, with a dense shrub layer. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest.[6]	Moderate potential. May occur in association with the deciduous swamp communities associated with structure 30-WG. Unlikely to be supported in association with Structure 21-WG and 29-WG
Eastern Meadowlark (Source: NHIC, OBBA)	*Sturnella magna*		S4B, S3N	THR	THR	THR	1	Generally prefers grassy pastures, meadows and hay fields. Prefers moderately tall grass with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation cover, and low percent of bare ground. Prefers to nest in drier sites and frequently nests around field margins.[9]	Low potential. Suitable habitat observed within a Rye Field located south of bridge 29-WG on private lands well beyond the bridge.
Eastern Wood-Pewee (Source: NHIC, OBBA)	*Contopus virens*		S4B	SC	SC	SC	1	Prefers open space near the nest in the form of forest edges, clearings, roadways, and water. Does not require large areas of woods but occurs less frequently in woodlots surrounded by development than in those without.[6]	Moderate potential. May occur in association with the swamp and communities associated with structures 21-WG and 30-WG
Grasshopper Sparrow (Source: NHIC, OBBA)	*Ammodramus savannarum*	29-WG	S4B	SC	SC	SC	1	Prefers drier, sparsely vegetated grasslands, particularly rough or unimproved pastures with scattered forb and shrub growth, at least 30 ha in size. It will occasionally also use cultivated hayfields and cereal crops.[6]	Very low potential. May be supported within rye fields adjacent to bridge 29-WG located on private lands well beyond the structure.
Wood Thrush (Source: NHIC, OBBA)	*Hylocichla mustelina*	21-WG 30-WG	S4B	SC	THR	THR	1	Inhabits and breeds in woodlands ranging from small (3 ha) and isolated to large and contiguous. The presence of tall trees and a	Moderate potential. May occur in association with the deciduous swamp

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
								thick understorey are usually prerequisites for site occupancy.[6]	communities associated with bridge 30-WG and deciduous forests in association with bridge 21-WG. Unlikely to be supported in association with bridge 29-WG
Mammals									
Eastern Small-footed Myotis (Source: Burnside)	*Myotis leibii*	All	S2	END	END	END	1	Overwintering habitat: Caves and abandoned mines. According to the Recovery Strategy for the Eastern Small-footed Myotis in Ontario, summer/roosting habitats used by the species in Ontario are poorly understood, but elsewhere in its range it primarily roosts in open, sunny rocky habitats, and, occasionally, in buildings. Summer roosts for this species are believed to be located in close proximity to their hibernacula (i.e., less than 100 m). The species' preference for rocky habitats in summer may limit an individual's home range to those rocky areas which also contain hibernacula (i.e., karst areas and Canadian Shield areas containing abandoned mines with adits).[11]	Low potential. May occur in association with crossing structures.
Eastern Red Bat (Source: Burnside)	*Lasiurus borealis*	All	S4	END	END	0	0	Roost within the foliage of trees and shrubs in both deciduous and coniferous trees in forests of any age class. Eastern Red bats are known to avoid roosting within conifer species if deciduous trees are present. Typical roost trees are large in diameter and are as tall or taller than the surrounding canopy. Roost sites tend to be along southern aspects and are sheltered from the wind, with Eastern Red Bats being known to be select locations are that unlikely to experience temperature extremes. This	Moderate potential. May occur in association with the mixed swamp communities associated with structure 30-WG. Moderate potential to be supported within the treed riparian areas associated with structures 21-WG and 29-WG.

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
								species is known to utilize a number of roost trees during the season with average roosting areas spanning <1 ha during the summer months.[26]	
Hoary Bat (Source: Burnside)	*Lasiurus cinereus*		S4	END	END	0	0	Roost within the foliage of trees and shrubs in both deciduous and coniferous trees in forests of any age class. Typical roost trees are large in diameter and are as tall or taller than the surrounding canopy. Roost sites tend to be along southern aspects and are sheltered from the wind.[26]	Moderate potential. May occur in association with the mixed swamp communities associated with structure 30-WG. Moderate potential to be supported within the treed riparian areas associated with structures 21-WG and 29-WG.
Little Brown Myotis (Source: Burnside)	*Myotis lucifugus*	All	S3	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).[11]	Moderate potential. May occur in association with the swamp and forest mixed swamp communities associated with structures 21-WG and 30-WG. Moderate potential to be supported within the treed riparian areas associated with structure 29-WG.
Northern Myotis (Source: Burnside)	*Myotis septentrionalis*	All	S3	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns, etc.)[11]	Moderate potential. May occur in association with the swamp and forest mixed swamp communities associated with structures 21-WG and 30-WG. Moderate potential to be supported within the

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
									treed riparian areas associated with structure 29-WG.
Silver-haired Bat (Source: Burnside)	*Lasionycteris noctivagans*	All	S4	END	END	0	0	Primarily roost under large sheets of exfoliating bark and within tree cavities. This species will typically roost within a variety of large diameter coniferous and deciduous roost trees. High-quality roost trees include trees with heart-rot infections at the site of limb breakages that have resulted in the creation of well-protected inner chambers. Members of this species, including lactating females, are well documented to roost switch. Silver-haired bats are also known to occasionally roost on or within buildings but only when treed habitats are scarce.[26]	Moderate potential. May occur in association with the mixed swamp communities associated with structure 30-WG. Moderate potential to be supported within the treed riparian areas associated with structures 21-WG and 29-WG.
Tri-colored Bat (Source: Burnside)	*Perimyotis subflavus*	All	S3?	END	END	END	1	Overwintering habitat: Deepest parts of caves and mines where temperature is the least variable. Maternal Roosts: Less is known about roosts of Tri-colored Bats. Most roost sites found within forested habitats. May roost in clumps of dead foliage and lichens. In more anthropogenically modified landscapes, maternity roosts may be barns or similar human-made structures.[11]	Moderate potential. May occur in association with the deciduous forest and swamp communities associated with structures 21-WG and 30-WG. Low potential to be supported within the treed riparian areas associated with structure 29-WG.

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
Plants									
Black Ash (Source: Burnside)	*Fraxinus nigra*	30-WG	S4	END	THR		0	Black Ash is a shade intolerant species. Occurs in riparian areas, floodplains, and wetlands including swamps and bogs.[10]	High potential. May be supported in association with the mixed swamp community adjacent to structure 30-WG. May also be present in association with the riparian habitats adjacent to structure 21-H+GW and 29-WG.
Butternut (Source: Burnside)	*Juglans cinerea*	All	S2?	END	END	END	1	Butternut grows best in rich, moist and well-drained soils or limestone gravel sites. They are less commonly found in dry, rocky and sterile soils. They generally grow alone or in small groups in deciduous forests that are commonly comprised of Basswood, Black Cherry, Beed, Black Walnut, Elm, Hemlock, Hickory, Oak, Red Maple, Sugar Maple, Poplar, White Ash and Yellow Birch.6 In Ontario, they can be found throughout the southern Ontario, south of the Canadian Shield.[10]	Low potential. May occur in upland habitats associated with all three structures.
Hill's Pondweed (Source: Oldham and Brinker, 20059)	*Potamogeton hillii*	None	S2S3	SC	SC	SC	1	Occurs within cold, clear, alkaline water of open wetlands, small slow-moving streams, ponds, and marshes.[12]	No potential. Suitable habitat absent.
Reptiles and Amphibians									
Midland Painted Turtle (Source: ORAA)	*Chrysemys picta marginata*	All	S4	No Status	SC	SC	1	Generally, prefers waterbodies such as ponds, marshes, lakes and slow-moving creeks that have a soft bottom and provide abundant basking sites and aquatic vegetation.[10]	High potential. May be supported within Irvine Creek at all three structures.
Snapping Turtle (Source: ORAA, NHIC)	*Chelydra serpentina*	All	S4	SC	SC	SC	1	Generally, inhabit shallow waters where they can hide under the soft mud and leaf litter. Nesting sites usually occur on gravely or	High potential.

COMMON NAME **(Source)	SCIENTIFIC NAME		Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present on the Subject Lands and/or Adjacent Lands?
								sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.[9]	May be supported within Irvine Creek at all three structures.
Western Chorus Frog (Source: ORAA)	*Pseudacris maculata*	30-WG	S4	No status	THR (Great Lakes - St Lawrence population in Canada)	THR (Great Lakes - St Lawrence population in Canada)	1	The Western Chorus Frog is primarily a lowland terrestrial species. In marshes or wooded wetland areas, it is found on the ground or in low shrubs and grass. Like all other frogs, the Western Chorus Frog requires both terrestrial and aquatic habitats in close proximity. For breeding and tadpole development, it requires seasonally dry temporary ponds devoid of predators, particularly fish. It is very rarely found in permanent ponds. In southern Ontario, its range is bounded by the United States border in the south, Georgian Bay in the northwest, and south of Algonquin Park and up the Ottawa River valley to the vicinity of Eganville in the east.[7, 8, 10]	Low potential. May occur in association with the Living Springs Wetland complex at Structure 30-WG.

1 Provincial S-Rank: S1 to S3 are provincially tracked (S1-critically imperiled; S2-imperiled; S3-vulnerable). Breeding (B) status qualifier: Conservation status refers only to the breeding population of the species in the province. Non-breeding (N) status qualifier: Conservation status refers only to the non-breeding population of the species in the province.

2 SARO: Official Species at Risk in Ontario list under the ESA, 2007. Status Coding – Endangered (END), Threatened (THR), Special Concern (SC)

3 COSEWIC: Committee on the Status of Endangered Wildlife in Canada

4 SARA and Schedule: Species at Risk Act; The Act establishes Schedule 1 as the official list of wildlife SAR

5 Cadman, M.D., et al. (eds). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706 pp

6 Species at Risk Public Registry https://species-registry.canada.ca/

7 McCracken, J.D. et al. 2013. Recovery Strategy for the Bobolink (Dolichonyx oryzivorus) and Eastern Meadowlark (Sturnella magna) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, viii + 88 pp.

8 SARO List Species Descriptions (Species at risk in Ontario | ontario.ca)

9 Ontario Nature Reptile and Amphibian Atlas (ON Reptile & Amphibian Atlas (ontarioinsects.org))

10 MNR SARO List Species Descriptions (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html)

11 Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (Myotis leibii) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.

12 Oldham, M.J., and S.R. Brinker. 2009. Rare Vascular Plants of Ontario, Fourth Edition. Natural Heritage Information Centre, Ontario Ministry of Natural Resources. Peterborough, Ontario. 188 pp. Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (SWHTG) & Appendices. 151 pp.

4.0 Existing Conditions

The following sections document the terrestrial and aquatic natural heritage features and functions at each structure.

4.1 Terrestrial Environment

A review of NHIC shows that bridge 30-WG is situated on the border of Evaluated Provincially Significant Wetland (PSW), Living Springs Wetland Complex. Structure 30-WG is also located within the Irvine Creek Life Science Regionally Significant Area of Natural and Scientific Interest. Bridges 21-WG and 29-WG do not occur in association with either the previously identified ANSI or mapped wetlands.

Based on a review of the OBBA, ORAA, and OIA, the following SAR (Endangered or Threatened) and Species of Conservation Concern (SCC) were identified as potentially being present on or adjacent to the subject lands (see Table 2) for all three bridges.

4.1.1 Terrestrial Natural Heritage Features at Each Structure

Bridge 21-WG

In total, five ELC communities are present within the Study Area associated with the structure. The natural heritage system adjacent to this structure consists of narrow bands of forested lands.

An active Cliff Swallow (*Petrochelidon pyrrhonota*) colony comprised of over 20 nests is present under the bridge deck. No other species of bird were observed nesting on the structure.

A summary of natural heritage conditions is provided in Table 3 and is illustrated on Figure 2.

Table 3: Summary of Conditions at Bridge 21-WG

ELC Code	ELC Description	Provincially Significant Wetlands/Other Wetlands	Woodlands	Candidate Significant Wildlife Habitat	Endangered and Threatened Species[1]
MEGM3-5 (CUM1)	Smooth Brome Graminoid Meadow Type	n/a	n/a	Monarch (SC)	No
FODM7 (FOD7)	Fresh – Moist Lowland Deciduous Forest Ecosite	n/a	Yes	Bat Maternity Colonies Bald Eagle & Osprey Nesting, Foraging & Perching Habitat Eastern Wood-pewee (SC) Wood Thrush (SC)	Eastern Red Bat (END) Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END) Tri-colored Bat (END) Butternut (END)
OAG	Agricultural	n/a	n/a	No	No
TAGM5	Fencerow	n/a	n/a	No	Eastern Red Bat (END) Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END) Tri-colored Bat (END)
OAO	Open Water	n/a	n/a	Waterfowl Stopover & Staging Areas (Aquatic)	No

[1] SARO: Official Species at Risk in Ontario list under the ESA, 2007. Status Coding – Endangered (END), Threatened (THR), Special Concern (SC)

Bridge 29-WG

The natural heritage system adjacent to this structure is narrow, with hedgerows of trees or shrubs and meadows separating the watercourse from the agricultural lands and rural residential areas.

In total, eight ELC communities occur in association with this structure. No birds were noted to be breeding on this structure.

A summary of natural heritage conditions is provided in Table 4 and is illustrated on Figure 3.

Table 4: Bridge 29-WG

ELC Code	ELC Description	Provincially Significant Wetlands/Other Wetlands	Woodlands	Candidate Significant Wildlife Habitat	Endangered and Threatened Species
MEMM4 (CUM1)	Fresh - Moist Mixed Meadow Ecosite	No	No	Monarch (SC)	No
THDM3-2	Native Shrub Deciduous Hedgerow Thicket Type	No	No	Monarch (SC)	No
TAGM5a	Fencerow	No	No	Monarch (SC)	Eastern Red Bat (END) Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END) Tri-colored Bat (END)
TAGM5b	Fencerow	No	No	No	No
OAG	Agricultural	No	No	No	No
CVR	Residential	No	No	No	No
ME	Meadow	No	No	No	No
OAO	Open Water	No	No	Waterfowl Stopover & Staging Areas (Aquatic)	No

Bridge 30-WG

This structure is located within the Living Springs Wetland Complex provincially-significant wetland complies. Southeast of the structure, a mature coniferous swamp is present, while a deciduous swamp is located to the northwest, well beyond the existing structure. Deciduous woodlands and meadows are located immediately adjacent to the structure to the northeast, northwest, and southwest of the structure.

Wetland boundary delineation was completed at this structure with the GRCA. Due to issues with cell service, the wetland boundary west of the bridge 30-WG is not 100% accurate and should be considered approximate. It should also be noted that the mapped wetland boundary span >0.5 ha. The wetland boundary east of the structure is accurate.

A summary of natural heritage conditions is provided in Table 5 and is illustrated on Figure 4.

Table 5: Bridge 30-WG

ELC Code	ELC Description	Provincially Significant Wetlands/Other Wetlands	Woodlands	Candidate Significant Wildlife Habitat	Endangered and Threatened Species
MEGM3 (CUM1)	Dry - Fresh Graminoid Meadow Ecosite	No	No	Raptor Wintering Area Monarch (SC)	No
WODM4-1 (CUW1)	Hawthorn / Apple Deciduous Woodland Type	No	No	Raptor Wintering Area	No
FOCM4-1	Fresh-Moist White Cedar Coniferous Forest Ecosite	No	Yes	Raptor Wintering Area Bald Eagle & Osprey Nesting, Foraging & Perching Habitat	Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END)
FOCM6	Naturalized Coniferous Plantation	No	Yes	Raptor Wintering Area Deer Yarding Areas Deer Winter Congregation Areas Bald Eagle & Osprey Nesting, Foraging & Perching Habitat Deer Movement Corridors Eastern Wood-pewee Wood Thrush	Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END)
TAGM1	Plantation	No	No	No	Silver-haired Bat (END) Hoary Bat (END)
TAGM5	fencerow	No	No	No	Silver-haired Bat (END) Hoary Bat (END)
MAM	Meadow Marsh	Yes	No	Marsh Breeding Bird Habitat Terrestrial Crayfish	

ELC Code	ELC Description	Provincially Significant Wetlands/Other Wetlands	Woodlands	Candidate Significant Wildlife Habitat	Endangered and Threatened Species
SWCM1-2	White Cedar – Conifer Mineral Coniferous Swamp Type	Yes	Yes	Amphibian Breeding Habitat (Woodland) Deer Yarding Areas Deer Winter Congregation Areas Bald Eagle & Osprey Nesting, Foraging & Perching Habitat Terrestrial Crayfish Deer Movement Corridors Eastern Wood-pewee Wood Thrush	Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END) Black Ash (END)
SWDM4 (SWD4)	Mineral Deciduous swamp ecosite	Yes	Yes	Bat Maternity Colonies Bald Eagle & Osprey Nesting, Foraging & Perching Habitat Seeps and Springs Amphibian Breeding Habitat (Woodland) Canada Warbler (SC) Eastern Wood-pewee (SC) Wood Thrush (SC) Terrestrial Crayfish Deer Movement Corridors	Eastern Red Bat (END) Hoary Bat (END) Northern Myotis (END) Little Brown Myotis (END) Silver-haired Bat (END) Tri-colored Bat (END) Black Ash (END)
OAO	Open Water			Waterfowl Stopover & Staging Areas (Aquatic) Snapping Turtle (SC) - Confirmed	No

Incidental Wildlife (all bridges)

Table 6 provides a list of the incidental wildlife recorded during ecologist site visits.

Table 6: Incidental Wildlife Observations

Common Name	Scientific Name	SRank	ESA	Structure	Comments
American Redstart	*Setophaga ruticilla*	S5B		29-WG	
American Robin	*Turdus migratorius*	S5		21-WG 29-WG 30-WG	
American Crow	*Corvus brachyrhynchos*	S5		30-WG	
American Goldfinch	*Spinus tristis*	S5		30-WG	
Baltimore Oriole	*Icterus galbula*	S4B		30-WG	
Barn Swallow	*Hirundo rustica*	S4B	SC	29-WG	Flyover, not nesting on the structure.
Black-and-White Warbler	*Mniotilta varia*	S5B		30-WG	
Black-throated Green Warbler	*Setophaga virens*	S5B		30-WG	
Black-capped Chickadee	*Poecile atricapillus*	S5		30-WG	
Blue Jay	*Thryothorus ludovicianus*	S4		30-WG	
Brown-headed Cowbird	*Molothrus ater*	S5		30-WG	
Carolina Wren	*Thryothorus ludovicianus*	S4		29-WG 30-WG	
Cedar Waxwing	*Bombycilla cedrorum*	S5		21-WG 29-WG 30-WG	
Chipping Sparrow	*Spizella passerina*	S5B,S3N		30-WG	
Cliff Swallow	*Petrochelidon pyrrhonota*	S4S5B		21-WG	
Common Yellowthroat	*Geothlypis trichas*	S5B,S3N		30-WG	
Eastern Kingbird	*Tyrannus tyrannus*	S4B		21-WG 29-WG	

Common Name	Scientific Name	SRank	ESA	Structure	Comments
Eastern Phoebe	*Sayornis phoebe*	S5B		30-WG	
Grackle	*Quiscalus quiscula*	S5		21-WG	
Great Egret	*Ardea alba*			30-WG	Foraging
Great Crested Flycatcher	*Myiarchus crinitus*	S5B		30-WG	
Hermit Thrush	*Catharus guttatus*	S5B,S4N		30-WG	
House Wren	*Troglodytes aedon*	S5B		30-WG	
Indigo Bunting	*Passerina cyanea*	S5B		21-WG	
Mourning Dove	*Geothlypis philadelphia*	S5B		29-WG	
Mourning Warbler	*Geothlypis philadelphia*	S5B		30-WG	
Northern Cardinal	*Cardinalis cardinalis*	S5		30-WG	
Red-bellied Woodpecker	*Melanerpes carolinus*	S5		30-WG	
Red-winged Blackbird	*Agelaius phoeniceus*	S5		21-WG 29-WG 30-WG	
Song Sparrow	*Melospiza melodia*	S5		29-WG 30-WG	
Warbling Vireo	*Vireo gilvus*	S5B		29-WG	
Willow Flycatcher	*Empidonax traillii*	S4B		30-WG	
Yellow Warbler	*Setophaga petechia*	S5B		29-WG 30-WG	
Green Frog	*Rana clamitans*	S5		29-WG	
Snapping Turtle	*Chelydra serpentina*	S4		30-WG	

Provincial S-Rank: S1 to S3 are provincially tracked (S1-critically imperiled; S2-imperiled; S3-vulnerable), S4 and S5 ranked species are considered to be secure in the province. Breeding (B) status qualifier: Conservation status refers only to the breeding population of the species in the province. Non-breeding (N) status qualifier: Conservation status refers only to the non-breeding population of the species in the province.

4.2 Aquatic Habitat Conditions

A review of the MNRF's ARA data shows that all three structures are located along Irvine Creek a main tributary of the Grand River. The reach of Irvine Creek associated with structures 21-WG and 29-WG possess a cold thermal regime. The reach of Irvine Creek associated with structure 30-WG is classified as having a warm thermal regime before transitioning to a cold thermal regime south of Sideroad 15. Based on Burnside's review, these reaches of Irvine Creek share a common spring and fall-spawning fish community (Table 7), which would restrict in-water works from October 1 - July 14 of any year.

Table 7: Summary of Fish Species Historically Found within Irvine Creek

Species Name	Scientific Name	Thermal Regime
Blacknose Dace	*Rhinichthys atratulus*	Cool
Bluntnose Minnow	*Pimephales notatus*	Warm
Brassy Minnow	*Hybognathus hankinsoni*	Cool
Brook Silverside	*Labidesthes sicculus*	Warm
Brook Stickleback	*Culaea inconstans*	Cool
Brook Trout	*Salvelinus fontinalis*	Cold
Carps and Minnows		
Central Mudminnow	*Umbra limi*	Cool
Central Stoneroller	*Campostoma anomalum*	Cool
Common Shiner	*Luxilus cornutus*	Cool
Creek Chub	*Semotilus atromaculatus*	Cool
Fantail Darter	*Etheostoma flabellare*	Cool
Hornyhead Chub	*Nocomis biguttatus*	Cool
Iowa Darter	*Etheostoma exile*	Cool
Johnny Darter	*Etheostoma nigrum*	Cool
Least Darter	*Etheostoma microperca*	Warm
Longnose Dace	*Rhinichthys cataractae*	Cool
Mottled Sculpin	*Cottus bairdii*	Cool
Northern Pearl Dace	*Margariscus nachtriebi*	Cool
Rainbow Darter	*Etheostoma caeruleum*	Cool
River Chub	*Nocomis micropogon*	Cool
Rock Bass	*Ambloplites rupestris*	Cool
Rosyface Shiner	*Notropis rubellus*	Warm
White Sucker	*Catostomus commersonii*	Cool

The area is considered occupied habitat for Redside Dace, as identified in DFO's Species at Risk (SAR) mapping. Specifically, the area surrounding structure 30-WG is classified by DFO as Redside Dace habitat. Any in- or near-water works (e.g., road widening, structure rehabilitation, vegetation removal) within the regulated habitat for Redside Dace (defined as the meander belt plus 30 m) will require approval under Ontario's *Endangered Species Act* (ESA) and the federal *Species at Risk Act* (SARA), in accordance with standard *Fisheries Act* requirements.

In 2022, Burnside conducted physical fish community surveys approximately 3.3 km downstream of 30-WG (effectively at the same location as 16-WG) but did not capture Redside Dace.

However, in 2019, AECOM (2020) carried out a broader survey using environmental DNA (eDNA), a molecular detection method, conducted alongside physical sampling. Through eDNA analysis, Redside Dace were detected near 21-WG, 29-WG, and approximately 3.3 km downstream of 30-WG, the same site where Burnside's physical survey at 16-WG found no detections. However, consistent with Burnside's findings, AECOM also did not physically capture any Redside Dace during their field program.

4.2.1 Aquatic Natural Heritage Features at Each Structure

Burnside's aquatic ecologist visited the three structures on June 23, 2025, to characterize the existing aquatic features. Weather conditions were sunny with air temperatures averaged around 30°C. Summarized channel dimensions (i.e., information pertaining to morphology, wetted width/depth, substrate etc.) are available in Table 8.

Table 8: Existing Aquatic Habitat Conditions

Structure	Watercourse Names	Morphology	Wetted Width / Depth Upstream (m)	Wetted Width / Depth Downstream (m)	Upstream Dominate Substrates (%)	Downstream Dominate Substrates (%)	Fish Observed	Evidence of Groundwater Upwelling
21-WG	Irvine Creek	Flat	18.2/0.5	-	Cobble (70)	-	Y	N
			-	14.2/0.7	-	Gravel (40)	Y	N
29-WG		Flat	19.5/0.6	-	Cobble (80)	-	Y	N
			-	24.1/0.6	-	Cobble (50)	Y	N
30-WG		Pool	15.0/0.5	-	Sand/Mud (70)	-	Y	N
		Flat	-	14.3/0.4	-	Cobbles (40)	Y	N

Aquatic Natural Features at Each Structure

21-WG

Upstream

The upstream reach flowed north to south along a naturalized corridor surrounded by an agriculturally dominated landscape. Taller riparian trees on the east bank provided limited shading (<30% cover). Both riverbanks were heavily vegetated and generally stable. However, slight undercuts are common, and a large area of erosion has occurred along the west and east banks due to the ditches feeding into the watercourse.

The watercourse was characterized as a flat (18.2 m wide, 0.5 m deep) and appeared nearly uniform in width and depth throughout the observed area.

The dominant substrate was cobble (70% cover), with some sand and gravel interspaced. Scattered boulders were occasionally observed (<5% cover). Beyond rocks, there was little instream habitat complexity. Some instream woody debris (<5% cover) and emergent arrowhead vegetation (<5% cover) were observed along the sides of the riverbanks. Numerous small minnow species were observed throughout the area.

Downstream

The watercourse continues to flow north to south. The surrounding riparian habitat was similar to that observed upstream. However, the downstream reach was noticeably more exposed to sunlight (<10% cover), as there were fewer large trees and mostly overhanging grasses.

The morphological conditions were also characterized by a flat, although slightly wider and deeper than the upstream reach (19.5 m wide, 0.6 m deep). Banks were largely stable and lacked the downcutting from ditches. The substrate was more heterogeneous than upstream, with gravel (40% cover) and sand (30% cover) common near the riverbanks. At the same time, in the central channel, cobbles dominated (30% cover). Instream vegetation was limited to small patches of emergent arrowheads (<5% cover), and larger woody debris complexes were observed along the eastern shore, more than were observed upstream.

Habitat Improvement

Sources of pollution include agricultural lands (e.g., agricultural pesticides and fertilizers) and the roadway (i.e., gravel road source of fine sediments and salts).

29-WG

Upstream

The upstream reach flowed east to west, surrounded by a narrow line of riparian trees on the south bank with a grass-dominated north bank. Despite the vegetation, the watercourse was largely exposed to sunlight, with ~30% covered by overhanging trees. The vegetation helped to protect the banks, as there was minimal erosion. Some undercutting was observed along the north bank from natural processes and increased flows. The morphological condition was a flat (19.5 m wide, 0.6 m deep) with a substrate dominated by cobbles (80% cover) interspaced with gravel (10% cover) and a few small boulders (10% cover). Small patches of emergent macrophytes like arrowhead and grasses (5% cover) and submerged vegetation, likely Elodea spp. (5% cover), were observed within 2 m of either bank. Some large woody material (5% cover) were scattered across the width of the watercourse. Numerous small minnow species were observed throughout the area.

Downstream

The downstream reach was totally exposed, with no large trees within the 30 m observed. The banks were well-vegetated with grasses and riparian shrubs, and as a result, no major signs of erosion were observed. The morphological condition remained a flat, nearly unchanged from the upstream, except for widening (24.1 m wide, 0.6 m deep). The substrate was still dominated by cobbles (~50% cover), but there was noticeably more gravel and sand mixture (30% cover) and boulders (10% cover) than in the upstream reach. In-water vegetation was common, though not dense, within the first 2 m of the riverbanks, comprised exclusively of emergent arrowheads and grasses (10% cover). Some scattered instream woody debris (5% cover) provided additional habitat complexity.

Habitat Improvement

The immediate area was largely undeveloped, except for the roadway (i.e., gravel road source of fine sediments and salts).

30-WG

Upstream

The upstream section flowed west to east and was entirely exposed with no large riparian trees present or high grasses providing no observable cover. The banks were stable except for the minimal erosion observed at the structure's base in the form of undercutting. The morphological condition was a pool (15.0 m wide, 0.5 m deep). The substrates were fine, with mud and sand (70%) dominating, with scattered cobbles and boulders comprising the rest. Instream emergent grasses and arrowheads (30% cover) and submerged *Elodea* spp. (10%) were common. No instream woody debris was observed. Numerous small minnow species were observed throughout the area.

Downstream

The downstream reach continued to flow west to east and was exposed like the upstream section. The banks were well vegetated with high grasses and showed no signs of erosion. The morphological conditions transitioned into a flat (14.3 m wide, 0.4 m deep) and was somewhat channelized with a uniform width and depth. The substrate was heterogeneous, with cobbles (40% cover), gravel (30%), sand (20%), and a few boulders (10% cover) around the structure. There was little instream habitat complexity from woody debris (<5% cover) and emergent vegetation (<5% cover).

Habitat Improvement

The immediate area was largely undeveloped, except for the roadway (i.e., gravel road source of fine sediments and salts).

5.0 Impacts, Mitigation and Monitoring Guidelines

Impacts, mitigation measures and monitoring must be considered when selecting the preferred alternative. Table 9 provides a summary of impacts that are anticipated with bridge replacement, removal or rehabilitation (depending on extent of impact area and workzone), with guidelines for the mitigation measures and monitoring.

Table 9: Summary of Impacts, Mitigation and Monitoring for Natural Features

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Effects on Ecological Features and Functions			
Wildlife (General)	Temporary displacement and disturbance to wildlife and habitat during the construction phase. May include SAR and Species of Special Concern.	The footprint of the proposed disturbed area shall be minimized as much as possible. In the event an animal is encountered during construction and does not move from the construction zone, the Contract Administrator should be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location should temporarily stop and the MNRF or MECP can be contacted for direction. If temporary perimeter exclusion fencing is used at a location, it should be installed to allow wildlife to leave the fenced area during vegetation clearing. Once the work area has been cleared, it can be securely fenced to prevent wildlife from returning. The excluded area should be searched immediately following fencing installation for any wildlife (including SAR) that may have become trapped. Any wildlife should be safely relocated or permitted to escape, to a suitable habitat. All works should stop immediately and MECP should be contacted if SAR is encountered within the area to ensure compliance with the ESA. Avoid vegetation clearing during sensitive times of the year for local wildlife, such as spring and early summer (during breeding and migration seasons). The new structure will allow for wildlife passage below the structure if feasible. Fencing to delineate the work zone will prevent encroachment into adjacent habitat supporting SAR and Species of Special Concern.	The Contractor will conduct regular monitoring of the erosion and sediment control measures to ensure they are acting as intended and are containing the work area.
Migratory Breeding Birds	Disturbance or destruction of migratory breeding bird nests / habitat may occur during construction phase (vegetation clearing)	To reduce the risk of contravening the federal Migratory Bird Convention Act, 1994 (MBCA), timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and/or structure works (construction) during the active window for breeding birds, broadly from April 1 to August 31 for most species. Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, cannot be destroyed at any time of the year. If a nesting migratory bird (or SAR protected under ESA) is identified within or adjacent to the construction site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities should stop and the Contract Administrator (with assistance from an Avian Biologist) should discuss mitigation measures with the Town. If	If construction works occur during the active window for breeding birds, an Environmental Inspector should monitor the tarped or netted structure every two to three days to ensure that no bird nests are established on the bridge (some species such as Barn Swallow or Eastern Phoebe have been reported to attempt nesting on the exterior of the tarp material used for exclusion). Cliff Swallow nests should be removed from bridge 21-WG prior to the core breeding bird window.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
		SAR are identified, all activities should stop and MECP should be contacted to ensure compliance with the ESA. The Contract Administrator can instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the Township, the MECP and/or Environment Canada. To avoid contravention of the MBCA and/or ESA, the bridge structure should be completely excluded with tarping or netting material prior to the next active window for breeding birds (i.e., by end of March) if construction works are to occur during the active window for breeding birds (as noted above). Tarping or netting of the bridge ensures that breeding birds are excluded from nesting on or under the structure while the bridge is being replaced.	
SAR bat maternity-roosting habitat	Tree removals could impact wildlife	Trees that are identified as candidate bat maternal roosting habitat must be taken down outside the active bat window (active window is March 31 to October 1).	Further review is required to confirm the extent of impacts and whether surveys are required to determine absence or presence of SAR bats.
Trees	Loss of woody vegetation and creation of new forest edges causing new growing conditions such as sun exposure and weed invasion.	A tree inventory will be completed during the detailed design to characterize and confirm required removals. Impacts will be minimized to remaining trees by implementing measures such as tree protection or ESC fencing to protect trees from grading impacts near adjacent construction. ESC measures and other specified protection measures must be installed prior to commencement of any construction or vegetation disturbance. No access, storage or stockpile of materials or equipment should occur within the area protected by the ESC and other protection measures. A replanting plan may be required to compensate for tree loss.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Vegetation	Temporary disturbance of meadow, swamp, hedgerow, marsh, forest and plantation vegetation may be required for access and construction.	Tree protection fence and ESC measures will delineate the areas of access and construction to reduce impacts extending unnecessarily into adjacent lands. Seeding of native grasses and wildflowers may be required to revegetate the disturbed areas that will be illustrated in replanting plan.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Fish and Fish Habitat	In-water works may be required, and the proposed works could potentially result in HADD to fish habitat, and the death of fish by means other than fishing.	A qualified professional aquatic ecologist will submit a Request for Review to DFO for any bridge replacements or removals requiring in-water works. It is anticipated that a Letter of Advice will be obtained for the project based on the footprints of the structures and fish community present. During Detailed Design, correspondence shall be maintained with a qualified professional aquatic ecologist to determine appropriate mitigation measures and whether the proposal has potential to pose HADD to fish habitat and/or if the proposal has the potential to kill fish. Preferred mitigation measures include workzone isolation while maintaining flow downstream and fish salvage from the isolated	ESC monitoring during construction. Fish salvage prior to the commencement of any in-water works. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
		work area. Efforts will be made in consultation with the DFO to mitigate should HADD to fish habitat occur. A fish salvage must occur under a License to Collect Fish for a Scientific Purpose obtained from the MNRF. Near-water work and work below the annual high-water mark will adhere to the appropriate in-water work timing window to avoid potential impacts to resident and migratory fish species.	
Redside Dace (END) – Structure WG-30	In-water works may be required, and proposed works could potentially result in alteration to occupied Redside Dace habitat at Structure WG-30.	Approvals under the ESA, Fisheries Act, and SARA will need to be obtained and site specific mitigation measures developed during detailed design.	Monitoring for physical presence of Redside Dace will occur during fish salvage works and document their presence if encountered for ESA/SARA requirements.
Groundwater	Potential for localized groundwater quality impacts as a result of spills. Temporary dewatering in the work area.	Refueling of equipment and fuel storage shall be conducted in designated areas, at least 30 m away from the watercourses and any existing wells, with spill protection provided. The work area shall be dewatered as per recognized provincial standards and pumped into acceptable dewatering traps. These dewatering traps will be placed away from the watercourse to allow for infiltration prior to discharging to the watercourse.	ESC monitoring throughout construction. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.
Surface Water / Hydrology / Stormwater	Potential for sediments to enter the water course due to stockpiling, excavation, and construction. Potential for localized water quality impacts in the case of spills. Potential for invasive species to enter the environment	The footprint of the disturbed area shall be minimized as much as possible, for example, vegetated buffers/setbacks will remain untouched adjacent to the watercourse, wherever possible. An ESC Plan shall be developed during the detailed design phase of the project, prior to construction. Implementation of the erosion and sediment control measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS), and the requirements of the GRCA. A permit from the GRCA under the Prohibited Activities, Exemptions and Permits Regulation (Ontario Regulation 41/24) will be required prior to conducting the proposed works as work is proposed within a flood Regulated Area. In-water operation of heavy equipment shall be prevented, as well as minimizing the operation of any equipment on the banks of the watercourse. Stockpiled material will be stored and stabilized a minimum of 30 m from the watercourse. All materials and equipment used for the purpose of site preparation and project completion will be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water. ESC measures (silt curtains, silt fence, rock check dams, etc.) shall be installed and maintained during the work phase, until the site has been stabilized. ESC measures will	Monitoring of surface water quality will be completed along with regular ESC monitoring as outlined above. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
		be inspected daily to ensure they are functioning and maintained as required. If ESC measures are not functioning properly, no further work will occur until the problem is resolved. Temporary mitigation measures shall be installed prior to the commencement of any clearing, grubbing, excavation, filling, or grading works and must be maintained on a regular basis, prior to, and after precipitation events. Water quality impacts related to surface water runoff shall be mitigated to avoid downstream impacts by controlling surface water run off within the boundaries of the site. All disturbed areas of the work site shall be stabilized immediately and revegetated as soon as conditions allow. All equipment fueling and maintenance shall be done at least 30 m from the watercourse to ensure that no deleterious substances enter the waterway. The Contractor shall be required to develop Spill Prevention and Contingency Plans for construction and operational phases of the project. Personnel will be trained in how to apply the Plans, and the Plans will be reviewed to strengthen their effectiveness and ensure continuous improvement. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Center at 1-800-268-6060. All equipment and personal protective equipment must arrive on-site clean to prevent the potential transfer of invasive species (i.e., phragmites) to the local environment.	

6.0 Future Commitments

The following future commitments are recommended to be addressed following the selection of the preferred alternative, as detailed design is being carried out. Many of these commitments have been provided by Six Nations of the Grand River Elected Council from a previous, similar project and are applicable here.

- The wetland limits determined with GRCA for Bridge 30-WG should be avoided for temporary construction work (access or laydown), or permanent impacts (grading or structures).
- A review of preliminary grading areas of each site for SAR wildlife habitats such as bat roost trees and snake hibernacula should be completed.
- Agency permits, licenses and approvals should be determined that are required to carry out the work, including a GRCA permit to do work in regulated areas, Letter of Advice from the Department of Fisheries and Oceans, License to Collect Fish for a Scientific Purpose from the Ministry of Natural Resources and a Permit from Wellington County to remove trees under By-Law 5515-09.
- A tree inventory will be completed to determine and characterize required removals. The Six Nations of the Grand River Elected Council (SNGREC)'s list of plant species of interest and importance shall be reviewed to identify if vegetation proposed for removal is of interest to the SNGREC. Impacts to trees shall be minimized by implementing a tree protection plan in areas adjacent to construction or grading.
- If any Provincial SAR are identified during the tree inventory and/or associated detailed design studies, potential impacts will be mitigated to the extent possible and the MECP will be consulted with as needed to determine next steps and permitting requirements.
- A Request for Project Review to DFO and an Information Gathering Form (IGF) is required to be submitted to MECP to begin the permitting process under the ESA, Fisheries Act. The Submissions will include an aquatic habitat assessment memo, respective forms, site photos, and design drawings. Site specific mitigation measures will be developed during detailed design for Redside Dace avoidance measures.
- Plant species loss should be minimized where possible, and a re-vegetation plan using native species and seed mix should be created. A re-planting ratio of ten replanted trees per one removed tree shall be used for quantifying replacements, as per the request of the Six Nations of the Grand River Elected Council (SNGREC). Re-planting should be completed on-site to the extent possible. Where the required re-planting quantities are unable to be achieved within the Township right-of-way, the preference is for the Township to strive to reach an agreement with the immediately adjacent landowners to allow for replanting on-site, beyond the Township right-of-way. If on-site planting is not achievable, off-site plantings to reach the desired ratios are acceptable to the SNGREC.

- Plant species identified for replanting shall be selected from the SNGREC's list of species of Interest / Importance which are suitable for the proposed planting locations. The Kayanase Greenhouse is available for consultation regarding replanting initiatives during detailed design.
- Although not anticipated, any impacted wetland communities should be restored post-construction to ensure no net loss of wetlands.
- Near-bank cover plantings along the watercourse shall be included in the re-planting landscaping plan where possible, while considering the required offset of plantings from structures.
- Detailed Hydrologic and hydraulic modelling shall be completed to verify compliance of the proposed works with GRCA policies 8.1.15-8.1.16. The GRCA shall be consulted early in the detailed design stage to determine the scope of work for this exercise.
- An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project in consultation with the GRCA and will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specification (OPSS).
- Further investigations should be undertaken to ensure the proposed alternatives will not impact potential erosion hazards that may be present due to riverine slopes and/or the meander belt of the creek. The requirement for engineering assessments such as geotechnical or fluvial geomorphology should be confirmed with the GRCA at the detailed design stage.
- The geometry and alignment of structures should be reviewed during the detailed design stage.
- All bridge and SWM-related components of the projected shall be designed with consideration for increased precipitation due to Climate Change.
- Where erosion protection, channel regrading / stabilization or earth retaining structures are determined to be required, the use of "softer" means of protection shall be preferred over the use of hard surfaces unless it is unfeasible to do so.
- All Indigenous communities previously engaged shall be contacted, if there are any substantial changes to the project / process or if the Owner applies for subsequent permits from the Ministry (MECP) that may be of interest or concern to communities.
- The required erosion and sediment control measures shall be determined during detailed design to limit sediment migration and protect receiving watercourses. All disturbed areas of the construction site shall be stabilized and re-vegetated as soon as conditions allow.

7.0 References

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