

9.0 DISCUSSION OF STORM WATER MANAGEMENT PROPOSALS

9.1 WATERSHED AREA NORTH OF THE CANADIAN NATIONAL RAILWAY

The watershed area north of the CNR tracks is proposed to become industrial/commercial development. Thus all developments must control their post development conditions to pre-development levels on site. Care must also be given during storm water system design to ensure that natural storage is also maintained within the area. This does not mean that the existing floodlines must remain the same, but that the storage capacity of the watershed sub-basins must be equal to or exceed the natural pre-development storage volume. Care must be taken to maintain adequate storage at the Highway 401 culvert and a change in culvert size must not be considered without the approval of the Moira River Conservation Authority, the Ministry of Natural Resources, and the Ministry of Transportation of Ontario.

Should a change occur in the floodline location, approval must be obtained from the Moira River Conservation Authority and the Ministry of Natural Resources prior to development proceeding.

To allow flexibility in design of on-site storm water management systems for this area no potential storm water controls have been examined. Each proponent shall present his storm water management scheme, utilizing approved controls and each scheme must be examined on an individual basis or as a part of a development group.

9.2 EXISTING STORM WATER CONTROLS

The three CNR culverts provide an interface between Upper and Lower Bell Creek drainage areas. In order that flows do not increase downstream, the culverts on the East Tributary, Tributary #2 and the main channel must not be changed in grade, size, or hydraulic capacity. Results of the pre- and post-development modelling indicate that these culverts play a significant role in attenuation flows (see Table 7.2) for all storm events. If changes are proposed the proponent must obtain review and approval of design from the Moira River Conservation Authority, the Ministry of Natural Resources, the City of Belleville, and/or the Township of Thurlow, and the Canadian National Railway. The proponent must also show, through revised hydraulic modelling, the upstream and downstream effects of such change.

The Lower Bell Creek Watershed also has a restrictive crossing. The CPR culvert on the main channel (flow Point 107) also serves to attenuate peak flows. Similar care and approvals must be obtained to substantiate hydraulic changes at this crossing.

9.3 WATERSHED AREA SOUTH OF THE CANADIAN NATIONAL RAILWAY

It is most likely that development in the residential areas will incorporate the use of detention or retention facilities. It should be noted that the use of storm water management ponds generally indicates that there will be a need for channelization and erosion control due to the increases in volume resulting from sustained flows. Proposed and/or potential pond locations are shown on Figure 9.1.

Tributary #1 and East Tributary

Development runoff along the two tributaries in Lower Bell Creek could be accommodated through the use of an on-line detention facility. Maintaining a green-belt, that can act as a detention area during intense storm events, along the floodway is a viable alternative provided that homes are located outside the floodplain. Any changes to the location of the floodlines must meet with the approval of the Moira River Conservation Authority and the Ministry of Natural Resources and the governing municipality.

Care should be taken to ensure that all road crossings meet these storm water criteria under new floodline conditions and that the regenerated floodlines adequately model the effects of the crossing.

Erosion control, bank stability and water quality must also be considered as important design aspects of a storm water pond on the tributaries. It is assumed that runoff must travel some distance either through the storm sewer system, overland, or down the channel to reach the storm water pond. Therefore the proponent must submit an erosion control and bank stability plan outlining remedial measures at storm sewer outlets, overland flow outfalls, and channelization measures required to ensure that erosive velocities and higher peaks upstream of the pond will not inadvertently damage the existing channel. Water quality initiatives must be addressed by the proponent for conditions during and after construction.

Main Channel

Development along the main channel requires careful design considerations.

Sub-basins 320 and 312 are small and the creek and floodplain meander through the centre of them. It is unlikely that there is sufficient land to accommodate storm water ponds on site.

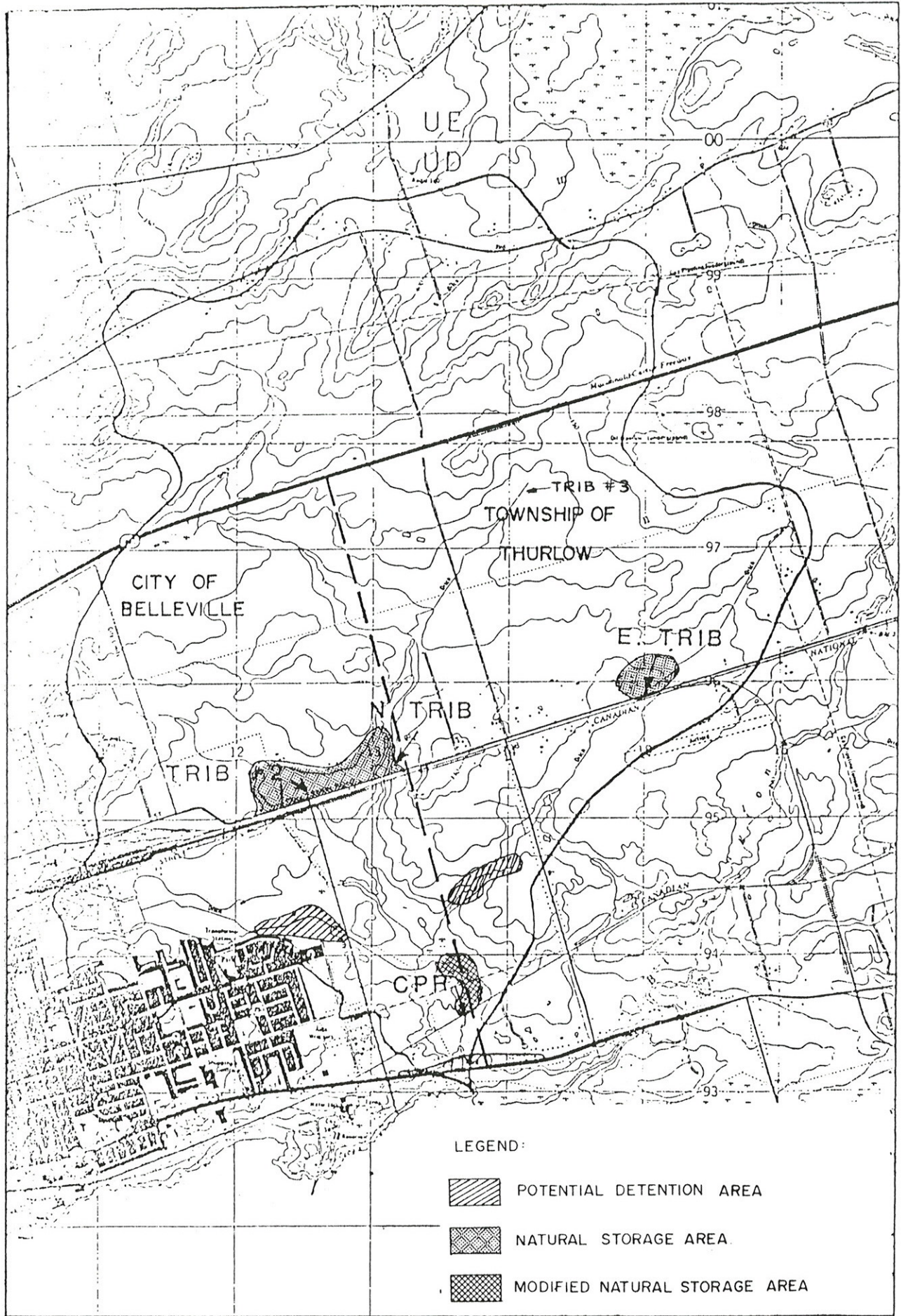
Potential does exist to utilize and enhance the natural storage capacity generated by the CPR culvert. Care must be taken to ensure that this pond has sufficient volume to accommodate the increase in runoff volume for the watershed area upstream of the CPR. Although peak flows are attenuated to pre-development conditions the increase of imperviousness of the watershed has increased the total volume of runoff.

Land adjacent to the railroad tracks could perhaps provide an economical green space. This proposal is valid provided that channelization and sufficient storage be provided to accommodate 100 year flows. The channel could be designed to convey the 25 year or more frequent storms provided that the floodplain is protected from the erosive velocities and higher peaks of the more intense events. Related backwater effects must be considered on the East Tributary and Tributary #1 to determine the requirement for associated remedial measures on the tributaries. Any alterations in the floodline locations are subject to the approval of the Moira River Conservation Authority and the Ministry of Natural Resources.

Erosion control and bank stability measures may be required along the downstream reach below the CPR tracks based on the increased runoff volumes produced by development in the main channel area.

Below the CPR Tracks

Channelization is perhaps the most cost effective alternative to handle the peak flows through this area. The reach is relatively short and the land base is too small to support on-site detention facilities. The effects of urbanization on the sub-watershed (Sub-Basin 318) increases the peak flow from 0.4 to 1.09 cms, which if left uncontrolled would be approximately 4% of the entire pre-development flow at the Bay of Quinte.



POTENTIAL DETENTION AREAS

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 GENERAL

It is recommended that the Moira River Conservation Authority, City of Belleville, surrounding Municipalities and Local Developers adopt a planning procedure that requires the preparation of Master Drainage Plans.

Storm Water Management Policies, Criteria and Guidelines

It is recommended that the Moira River Conservation Authority, in conjunction with the City of Belleville and surrounding Municipalities, develop specific policies, criteria and guidelines for the implementation of Storm Water Management practices. Since many of the watersheds overlap municipal boundaries, the policies, criteria and guidelines should be prepared jointly to ensure consistency in their application.

Master Drainage Plans

In conjunction with an adopted planning procedure, appropriate storm water management policies, criteria and guidelines, and along with approved Official/Secondary Planning Documents, it is recommended that the Municipalities, in association with developers, prepare Master Drainage Plans for those watersheds experiencing significant development pressures. The preparation of the Master Drainage Plans should be carried out by qualified consultants, in conjunction with the Conservation Authority.

Storm Water Management Plans

It is recommended that a Storm Water Management Study be required for all proposed developments. The studies should be carried out in accordance with established planning procedures, adopted storm water policies, criteria and guidelines, and if applicable, approved Master Drainage Plans.

The study should address a specific storm water management plan and generally follow the Recommended Table of Contents provided in Appendix J.

The cost of these undertakings, which can be substantial, should be paid by the proponents of the land developments. Several methods of payment have been used by various municipalities and as such, it is sufficient at this time to be aware that the burden of cost for such work is being transferred to the developers of the land.

Once the Master Drainage Plan has been prepared, reviewed and accepted by all parties, then developers should retain a qualified consultant to prepare specific Storm Water Management Plans. The Authorities should again retain a qualified consultant to review individual Storm Water Management Plans. As in the case of the Master Drainage Plan, the cost of any review should be paid by the participating proponents of the land developments.

10.2 BELL CREEK

10.2.1 General

The Bell Creek watershed is under extreme development pressure. Several land developments have been proposed and are in various stages of the planning and review process.

Because there are no specific requirements to undertake Master Drainage Plans within the context of the planning process and no Municipality approved Storm Water Management Policies and Criteria have been adopted, land developers do not totally appreciate the complex nature of addressing drainage concerns as well as the value of an overall collective approach for the effective management of runoff within the Bell Creek watershed.

In 1984 the Conservation Authority undertook Flood Plain Mapping for the Lower Bell Creek watershed. The study established Regulatory Floodlines for the main channel to the south of the CNR Railway and along Tributary #1. Since development pressure was being experienced on Tributary #1, the study did prepare a Master Drainage Plan for the tributary. The proposed storm water facility on Tributary #1 has been considered a valid approach to control runoff from the surrounding proposed developments.

This study has resulted in a Master Drainage Plan for the entire Bell Creek Watershed. The Plan identifies sufficient guidelines and criteria to enable the proponents of land developers to address drainage, water quality, and erosion control concerns within the context of the development of the watershed.

10.2.2 Storm Water Drainage Controls

It is recommended that:

Storm water runoff be controlled according to the following criteria:

- (a) facilities for the major drainage system be required to maintain pre-development runoff for the 5, 10, 25, 50, and 100 year design storm events.
- (b) residential storm water runoff facilities and controls for the associated major system can be located on-site, off-line, or on-line. Any proposal for an on-line facility should be incorporated into a park like setting, account for any increased volume of runoff from upstream areas, and be justifiable relative to the preferred options of on-site or off-line.
- (c) industrial and commercial storm water runoff facilities and controls for the associated major system be located off-line or on-site.

Construction of a storm water pond on Tributary #1 will help abate erosion due to the increase in runoff created by development. A similar pond on the East Tributary could aid in development runoff and associated erosion control on the East Tributary of Bell Creek.

Modification of the natural storage upstream of the CPR culvert crossing could provide storm water management potential for development of the Main Channel residential area located upstream of the confluence with the tributaries (Sub-Basins 312 and 320).

10.2.3 Water Quality Measures

The provision for water quality maintenance and enhancement are primarily based upon the installation of water quality holding ponds at major outfall points. The size of the water quality ponds be weighed against potential vegetation and habitat destruction in each outfall area. Wherever possible, these ponds would be located off-line relative to the main watercourse.

In addition to storm water ponds, storm drainage facilities be installed with specific components that encourage the settling out of pollutants and particulate matter. Deepened sumps in manholes, "bottomless" or "pervious" catchbasins or manholes, and draining roof areas to pervious surfaces to promote infiltration aid in storm water quality improvement.

10.2.4 Erosion Control Measures

The potential for increased erosion through increased flows should not be a concern due to the storm water controls imposed on the watershed up to the 100 year storm frequency. However, the extended duration of peak flows could be a factor in increasing erosion.

It is important therefore that all erosion sensitive areas and unstable banks be identified prior to development so that remedial measures can be undertaken to impede the creek decay.

Channelization measures be incorporated in all reaches where the flows are in exceedance of the existing pre-development level.

Protection measures be provided at all major system outfall locations along the main watercourse.

Protection measures be provided for all storm sewer outlets at their entry points into the major system.