

**STORMWATER MANAGEMENT DESIGN REPORT  
DRAFT PLAN 23T-96501 AND 23T-99501  
MARTINI/VALERIOTE SUBDIVISION  
CITY OF GUELPH  
Revised: March 19, 2004**

**GAMSBY AND MANNEROW LIMITED  
CONSULTING PROFESSIONAL ENGINEERS  
GUELPH - OWEN SOUND - LISTOWEL**

**Revised: March 2004  
Our File: 03-027**

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**STORMWATER MANAGEMENT DESIGN REPORT  
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**1.0 INTRODUCTION**

Schaeffers Consulting Engineers completed the overall stormwater management analysis and design for the Southern Hadati Creek Watershed in March 1997.

In May 1997, Schaeffers Consulting Engineers submitted a revised report to the City of Guelph titled Final Stormwater Management Design Report for the Southern Hadati Creek Watershed, Upstream of the CN Railway Tracks, City of Guelph.

Approval of the design of the quality and quantity stormwater management systems as outlined in the Final Stormwater Management Design Report for the Southern Hadati Creek Watershed, Upstream of the CN Railway Tracks, City of Guelph (Schaeffers Consulting Engineers, May 1997) was granted.

Construction of the approved stormwater quality facilities to service the Cedarvale Subdivision (Quality Facility No. 3) and the Campus Estates Subdivision (Quality Facility No. 1) and the approved stormwater quantity facility to service the Southern Hadati Creek Watershed were completed as designed.

To address the recommendations presented in the Eastview Secondary Plan and Addendum, 1996 and 1997, the City of Guelph completed an Environmental Assessment (EA) to determine the preferred solution for improvements to Hadati Creek, along Elizabeth Street. The detailed design of the channel improvements are outlined in the Design Report – Hadati Creek Channel Improvements (June 2003), prepared by Gamsby and Mannerow Limited.

Gamsby and Mannerow Limited have prepared this Stormwater Management Design Report to address the detailed final design of Quality Facility No. 2, which will provide stormwater quality control for the Martini/Valeriotte Subdivision (Draft Plan 23T-96501 and 23T-99501) and a future residential development area.

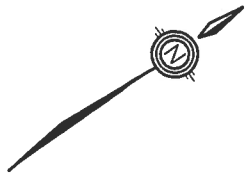
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## 2.0 LOCATION

Figure 1 shows the location of the study area and the surrounding lands. The study area is bounded by existing residential development to the north, future development lands to the east, CN Railway right-of-way to the south and existing residential, commercial and industrial development to the west.

The study area is approximately 73-hectares and includes the Cedarvale Subdivision, Campus Estates Subdivision, Valleyhaven Subdivision Phase II, Martini/Valeriotte Subdivision and a future residential development area to the east of Cityview Drive.

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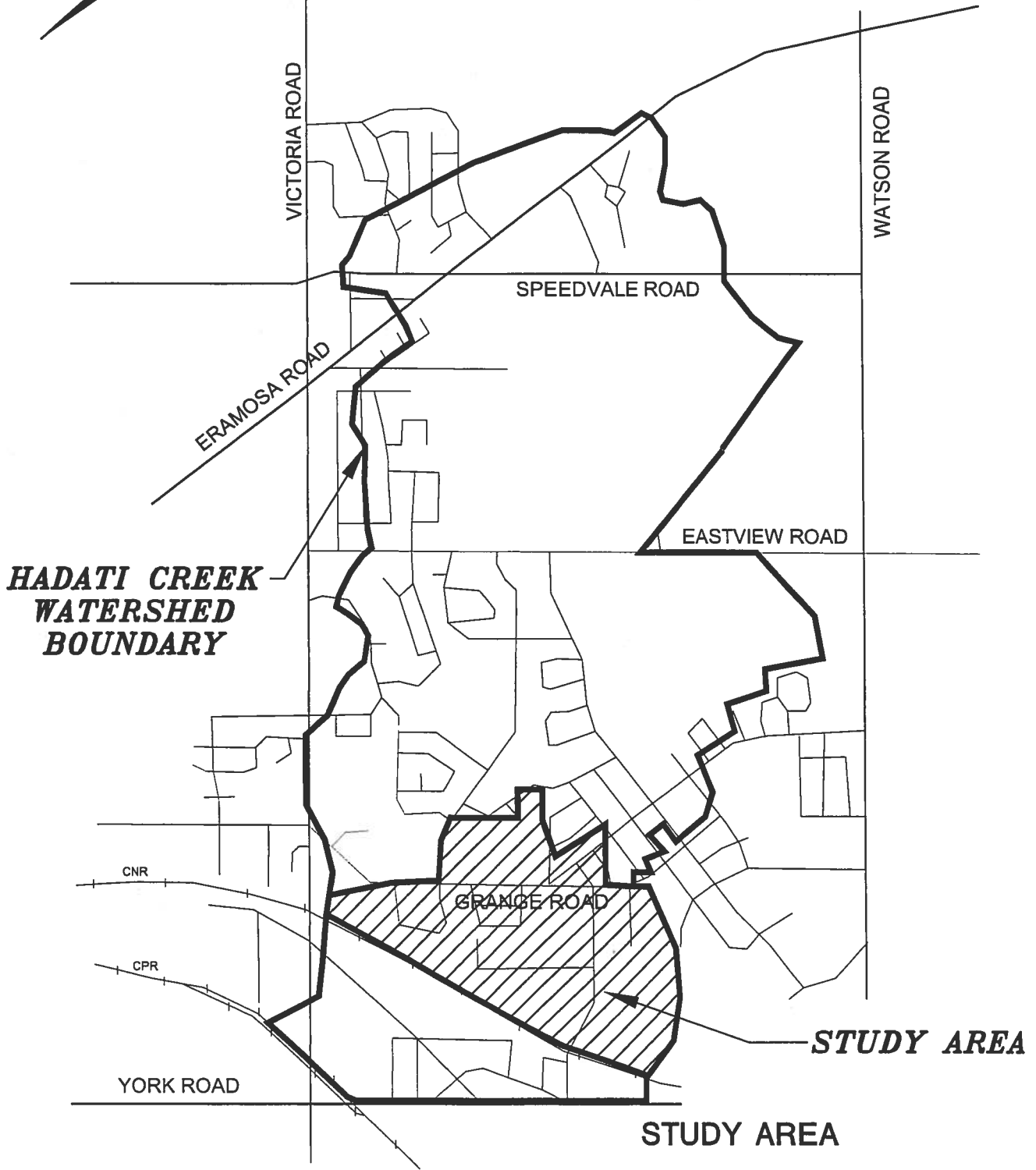


Figure 1

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### 3.0 EXISTING CONDITIONS

#### 3.1 EASTVIEW SECONDARY PLAN AND ADDENDUM (1991 AND 1992)

The recommended peak discharge rates downstream of the CN Railway Culvert from the Eastview Secondary Plan are summarized in Table 1.

**Table 1: Recommended Peak Discharge Rates**

	5 Year	100 Year	Regional
Peak Discharge (m <sup>3</sup> /s)	5.0	7.6	11.9

#### 3.2 APPROVED STORMWATER MANAGEMENT DESIGN (MAY 1997)

In May 1997, Schaeffers Consulting Engineers completed the design of the stormwater management system for the Southern Hadati Creek Watershed. The design included quality and quantity controls. Quality control consisted of three individual wetland type ponds with the ability to meet Level 3 water quality requirements (MOE, 1994). An on-line quantity control pond and berm were included to satisfy the peak discharge requirements recommended in the Eastview Secondary Plan and Addendum.

##### a) Quality Facility No. 1

Quality Facility No. 1 was designed to provide Level 3 stormwater quality control to a maximum treatable drainage area of 31.8 hectares. The design of Quality Facility No. 1 from Schaeffer's Consulting Engineers (May, 1997) was approved and constructed (MOE Certificate No. 3-0628-97-006 issued July 29, 1997).

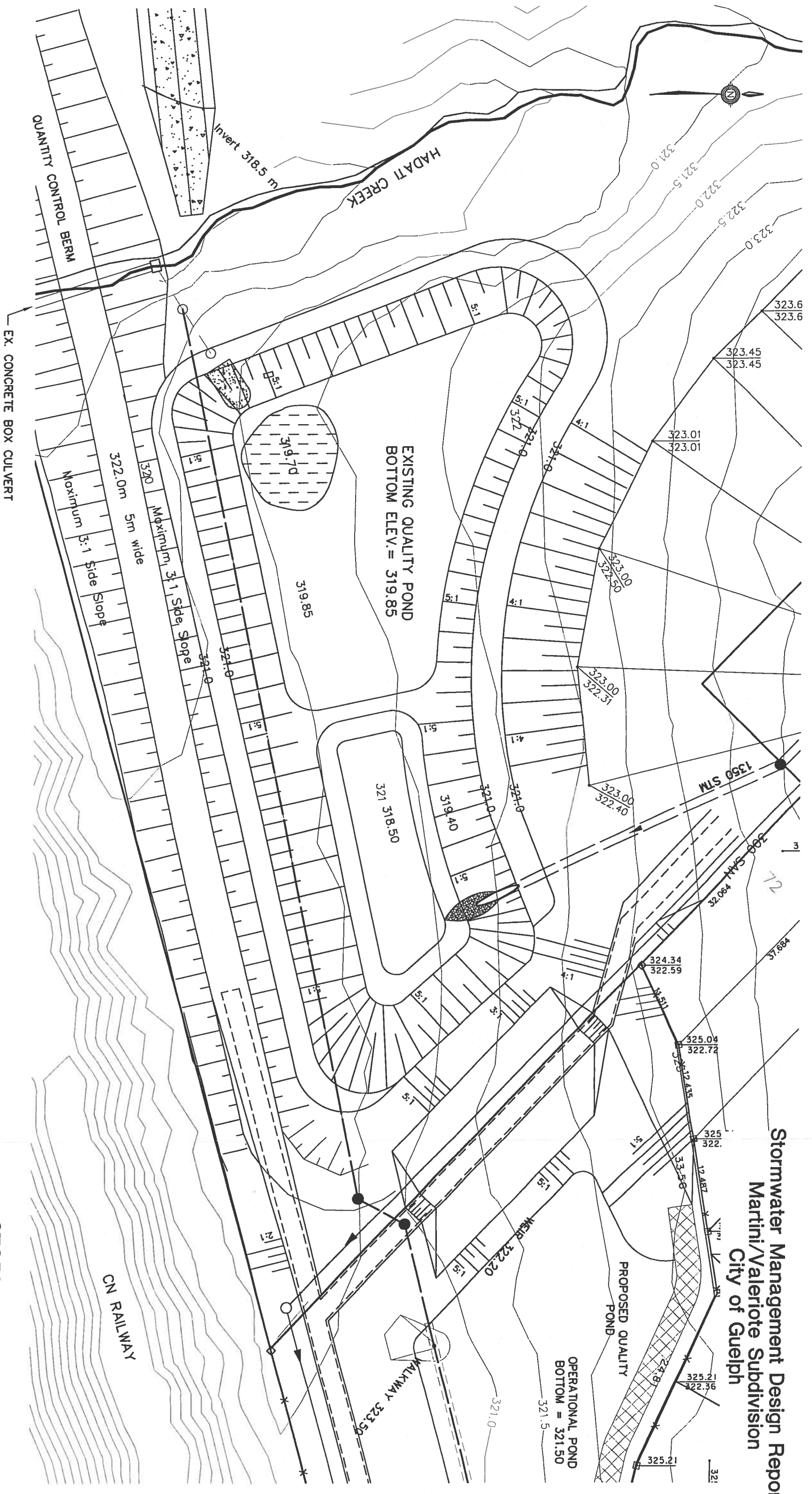
The approved pond provides approximately 1576 m<sup>3</sup> of storage and includes a sediment forebay approximately 40 m in length. The facility has been designed and approved to limit the flow to Hadati Creek to 15.0 L/s (0.015 m<sup>3</sup>/s). Figure 2 illustrates the existing Quality Facility No. 1.

##### b) Quality Facility No. 2

The design of Quality Facility No. 2 also included controls to achieve Level 3 stormwater quality control. The design allowed for a maximum treatable drainage area of 33.9 hectares.

The design of Quality Facility No. 2 as specified in the May 1997 report was approved but has not been constructed to date.

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STORMWATER QUALITY FACILITY #1

Figure 2

SCALE 1:500

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**c) Quality Facility No. 3**

Quality Facility No. 3 was designed to provide Level 3 stormwater quality control to a maximum treatable drainage area 8.0 hectares. The design of Quality Facility No. 3 from Schaeffer's Consulting Engineers (May, 1997) was approved and constructed (MOE Certificate No. 3-0628-97-006 issued July 29, 1997).

The approved pond provides approximately 794 m<sup>3</sup> of storage and includes a sediment forebay approximately 32 m in length. The facility has been designed and approved to limit the flow to the existing quantity control pond to 6.0 L/s (0.006 m<sup>3</sup>/s). Quality Facility No. 3 is shown in Figure 3.

**d) Quantity Facility**

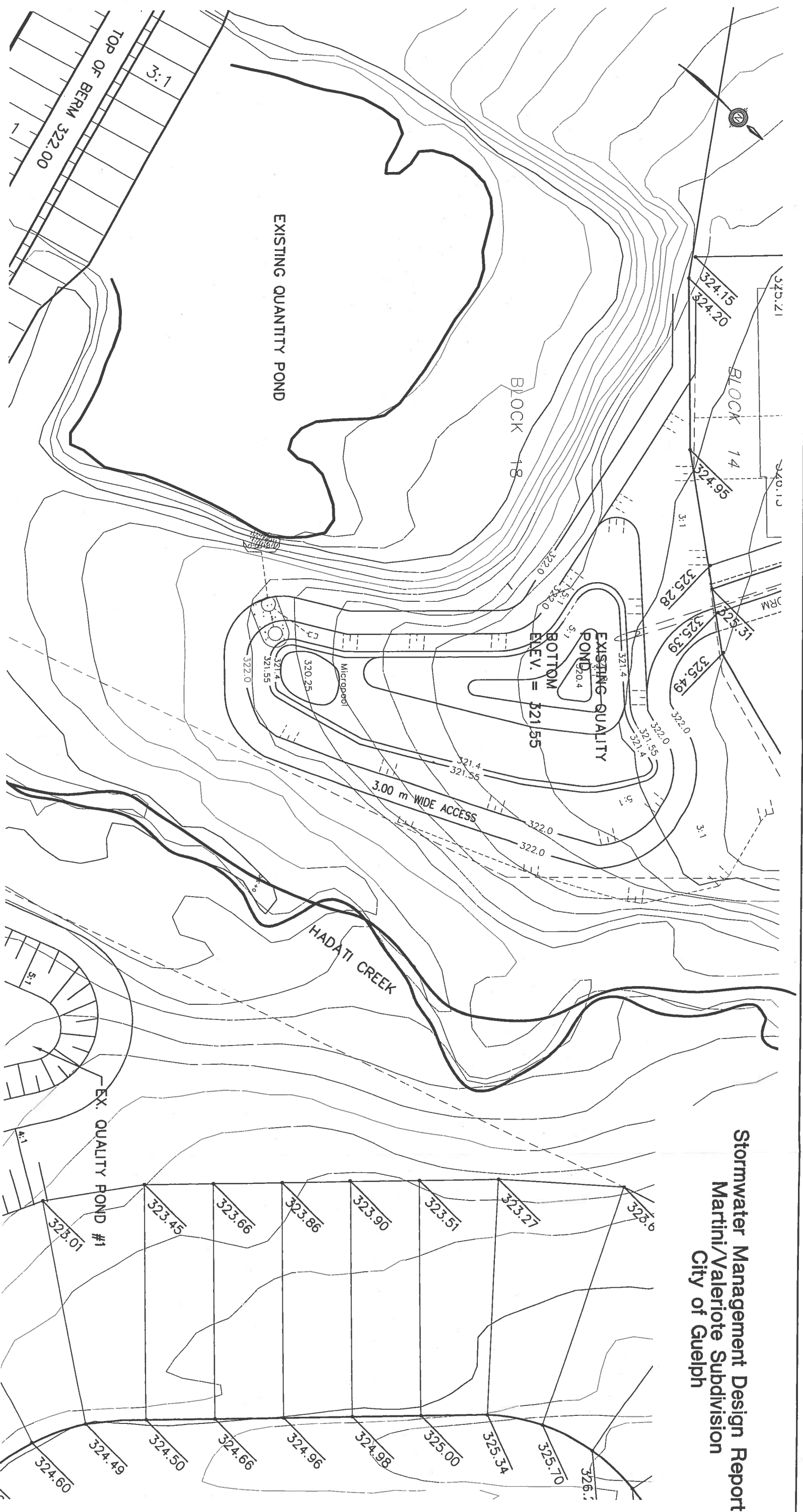
The Quantity Facility was designed to attenuate the peak flows from the study area and the external tributary areas to the recommended release rates identified in the Eastview Secondary Plan. The facility consists of a detention pond located on-line with Hadati Creek, a quantity control berm and an outlet control structure which connects to the existing CN culvert.

The quantity control berm with an elevation of 322.00 is located adjacent to CN Railway berm. The outlet control structure consists of a 1.8m wide by 1.2m high box culvert located under the quantity control berm and a ditch inlet catch basin located between the quantity control and CN Railway berm.

The design of the Quantity Facility from Schaeffer's Consulting Engineers (May, 1997) was approved and constructed (MOE Certificate No. 3-0628-97-006 issued July 29, 1997).

The approved outlet control structure and berm limits the peak flows to Hadati Creek to 4.2 m<sup>3</sup>/s and 7.8 m<sup>3</sup>/s for the 5 and 100-year design storms, respectively. The total storage provided by the on-line quantity control pond is 9,840 m<sup>3</sup> and 26,636 m<sup>3</sup> of storage for the 5 and 100-year design storms, respectively.

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**STORMWATER QUALITY FACILITY #3**

**Figure 3**

SCALE 1:500

Table 2 compares the recommended peak discharges and the results of the hydrologic routing through the stormwater quantity control pond.

**Table 2: Stage/Storage/Discharge Comparison**

	<b>Eastview Secondary Plan and Addendum (1991, 1992)</b>	<b>Stormwater Management Design Report for the Southern Hadati Creek Watershed (Schaeffers Consulting Engineers, May 1997)</b>		
	Recommended Peak Discharge (m <sup>3</sup> /s)	Approved Peak Discharge (m <sup>3</sup> /s)	Approved Storage Volume (m <sup>3</sup> )	Approved Storage Elevation (m)
5 Year	5.0	4.2	9,840	320.34
100 Year	7.6	7.8	26,360	321.51
Regional Storm	11.9	12.4	100,240	322.95

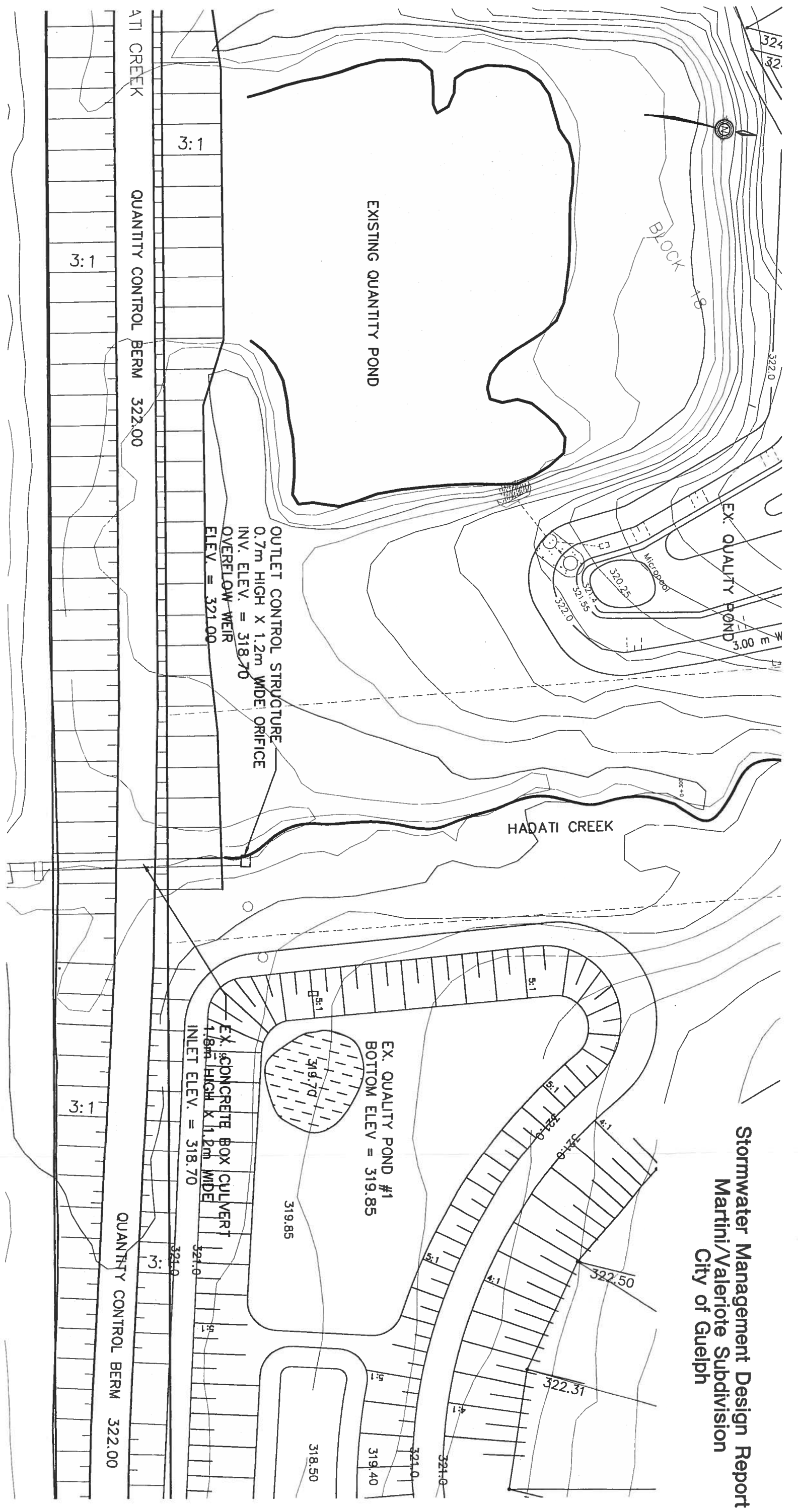
### 3.3 HADATI CREEK CHANNEL IMPROVEMENTS (JUNE 2003)

In June 2003, Gamsby and Mannerow Limited completed the detailed design of the channel improvements for Hadati Creek. The design included over-controlling the minor storm outflow from the existing on-line extended detention facility by 2 m<sup>3</sup>/s, channel reconstruction downstream of the existing Suburban Avenue, Elizabeth Street and Beaumont Crescent culverts and replacement of the existing Elizabeth Street culvert.

To facilitate the proposed channel improvements to Hadati Creek, downstream of the CN Railway, the outflow from the on-line extended detention facility was over-controlled by 2 m<sup>3</sup>/s for the 5-year design storm event. For flows, which exceed the minor design storm event, an overflow weir will convey flows to the downstream reaches. The control structure consists of a 1.2m wide by 0.7m high orifice plate and an overflow weir (elevation 321.00), located upstream of the existing 1.2m wide by 1.8m high concrete box culvert.

The design of the control structure and channel improvements to Hadati Creek received approval under MOE Certificate No. 2973-5Q5RP8 issued on October 8, 2003.

Figure 4 shows the location of the outlet control structure, quantity control berm and pond area.



**STORMWATER QUANTITY FACILITY  
 AND OUTLET STRUCTURE**

Figure 4  
 SCALE 1:500

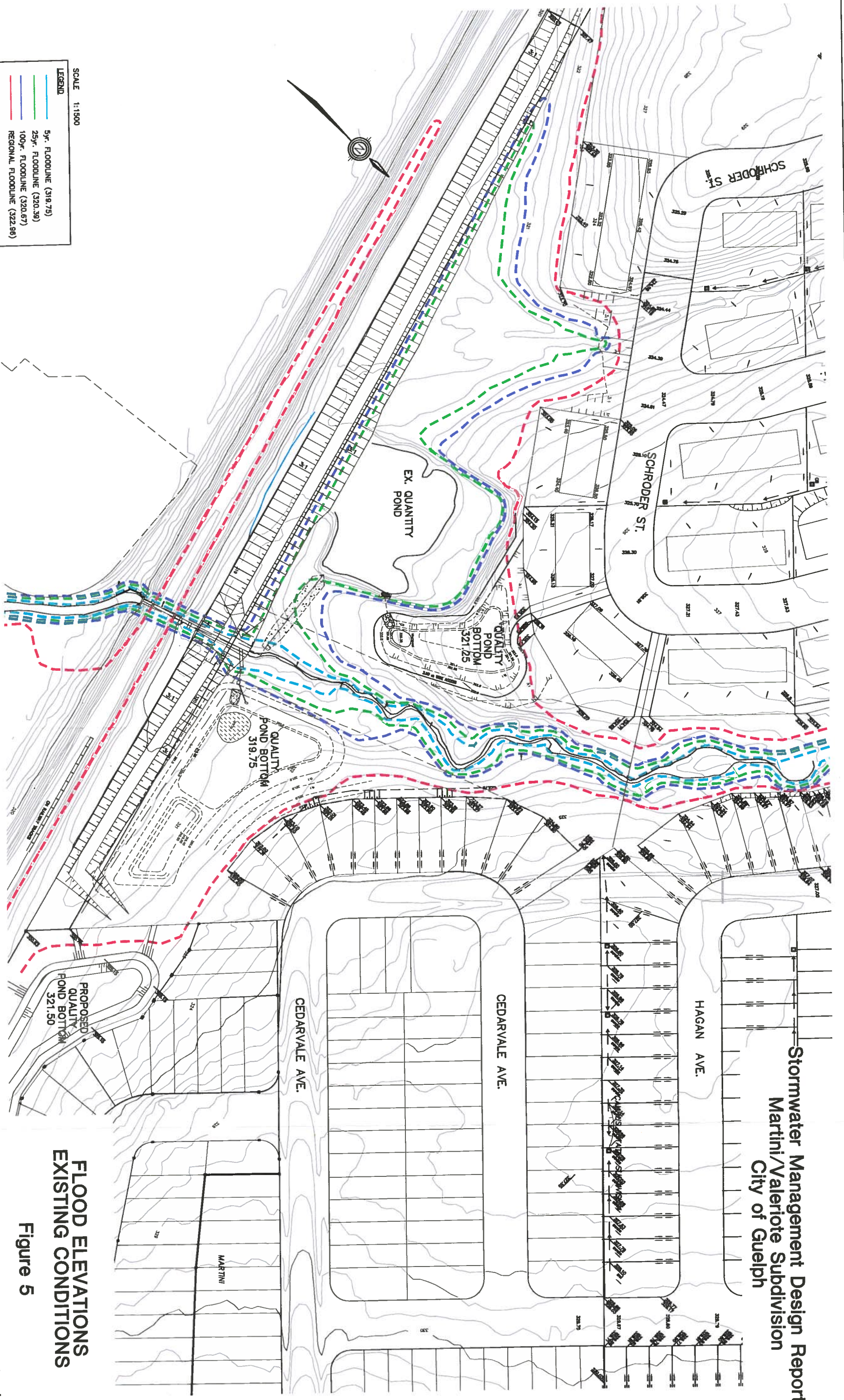
Table 3 compares the peak discharges, storage volumes and storage elevations against those presented in the approved report (Schaeffers Consulting Engineers, May 1997) and the Design Report for the Hadati Creek Channel Improvements (Gamsby and Mannerow Limited, June 2003).

**Table 3: Stage/Storage/Discharge Comparison**

	Stormwater Management Design Report for the Southern Hadati Creek Watershed (Schaeffers Consulting Engineers, May 1997)			Design Report – Hadati Creek Channel Improvements (Gamsby and Mannerow Limited, June 2003)		
	Approved Peak Discharge (m <sup>3</sup> /s)	Approved Storage Volume (m <sup>3</sup> )	Approved Storage Elevation (m)	Peak Discharge (m <sup>3</sup> /s)	Storage Volume (m <sup>3</sup> )	Storage Elevation (m)
5 Year	4.2	9,840	320.34	3.06	16,400	321.00
25 Year	-	-	-	7.23	26,100	321.60
100 Year	7.8	26,360	321.51	8.40	35,600	322.10
Regional Storm	12.4	100,240	322.95	11.75	97,700	323.10

Figure 5 shows the hydraulic (HEC-2) flood elevations relative to the surrounding residential development. The flood elevations were previously presented in the Design Report for the Hadati Creek Channel Improvements (Gamsby and Mannerow Limited, June 2003).

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**FLOOD ELEVATIONS**  
**EXISTING CONDITIONS**

**Figure 5**

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#### 4.0 STORMWATER MANAGEMENT CRITERIA

The studies, policies and guidelines used to develop the stormwater management plan for the Martini/Valeriote Subdivision are as follows:

- 1) The Stormwater Management Planning and Design Manual, 2003
- 2) Design Principles for Stormwater Management Facilities, 1996
- 3) Eastview Secondary Plan and Addendum, 1991 and 1992
- 4) The MTO Drainage Management Technical Guidelines, 1989
- 5) The Ontario Urban Drainage Design Guidelines, 1987
- 6) Final Stormwater Management Design Report for the Southern Hadati Creek Watershed, Upstream of the CN Railway Tracks, 1997
- 7) Design Report Hadati Creek Channel Improvements, 2003

The objectives of the stormwater management plan are as follows:

- 1) Provide quality control by pre-treating the runoff prior to release to the receiving outlet.
- 2) Provide quantity control for a range of design storms to conform to the release rates established in the Eastview Secondary Plan.
- 3) Route the major storm to minimize flood damage to public and private lands.

The methodology previously utilized by Schaeffer's Consulting Engineers (May 1997) has been used in the evaluation and design of the stormwater management plan.

The mass rainfall data for the 25mm design storm was generated using a four-hour duration rainfall event. A twelve-hour duration rainfall event was used to generate the mass rainfall data required to model the 5, 25 and 100-year design storms. The total depths of rainfall for each storm are as follows:

	<b>25mm</b>	<b>5 Year</b>	<b>25 Year</b>	<b>100 Year</b>	<b>Regional</b>
Rainfall depth (mm)	25.00	31.20	73.56	90.18	211.07

The Horton infiltration method was used in the post-development runoff calculations.

From the Wellington County Soils Map, the soils within the study area are described as a Burford Loam and a Guelph Loam. The MTO Drainage Management Manual hydrologic soil classification for a Burford Loam is soil Type A and for a Guelph Loam is soil Type BC.

The typical minimum and maximum infiltration parameters for a type A soil are 25 mm/hr and 250 mm/hr, respectively. The typical parameters for a type B soil are identified as 13 mm/hr and 200 mm/hr for minimum and maximum infiltration rates, respectively. The typical minimum and maximum infiltration parameters for a type C soil are 5 mm/hr and 125 mm/hr, respectively.

To ensure consistency, the Horton infiltration parameters utilized by Schaeffer's Consulting Engineers (May 1997) have been used in the analysis. The parameters used are as follows:

	<b>Impervious Areas</b>	<b>Pervious Areas</b>
Maximum Infiltration	0.0 mm/hr	75.0 mm/hr
Minimum Infiltration	0.0 mm/hr	12.5 mm/hr
Lag Constant	0.0 mm/hr	0.25 mm/hr
Depression Storage	1.5 mm	5.00 mm

The hydrologic model Visual OTTHYMO was used to create the runoff hydrographs and to route the flows through the storage structure.

The analysis considers the impact of the external drainage areas on the southern reach of Hadati Creek, the existing and future development areas and the lands downstream of CN Railway Tracks. The Regional Storm event has been routed through the conveyance system to confirm the targets set in the Eastview Secondary Plan.



## 5.0 STORMWATER MANAGEMENT DESIGN

Figure 6 illustrates the revised drainage area boundaries resulting from additional planning and topographical information.

*Catchment B1 – Hydrograph No. 480 (43.1 hectares)* represents the Campus Estates Subdivision, Cedarvale Subdivision and Valleyhaven Subdivision, Phase II.

Quality Facility No. 1 provides stormwater quality control for both the Campus Estates Subdivision and Valleyhaven Subdivision, Phase II. Quality Facility No. 3 provides stormwater quality control for the Cedarvale Subdivision.

*Catchment B2a – Hydrograph No. 484 (21.8 hectares)* represents the future residential development area to the east of Cityview Drive.

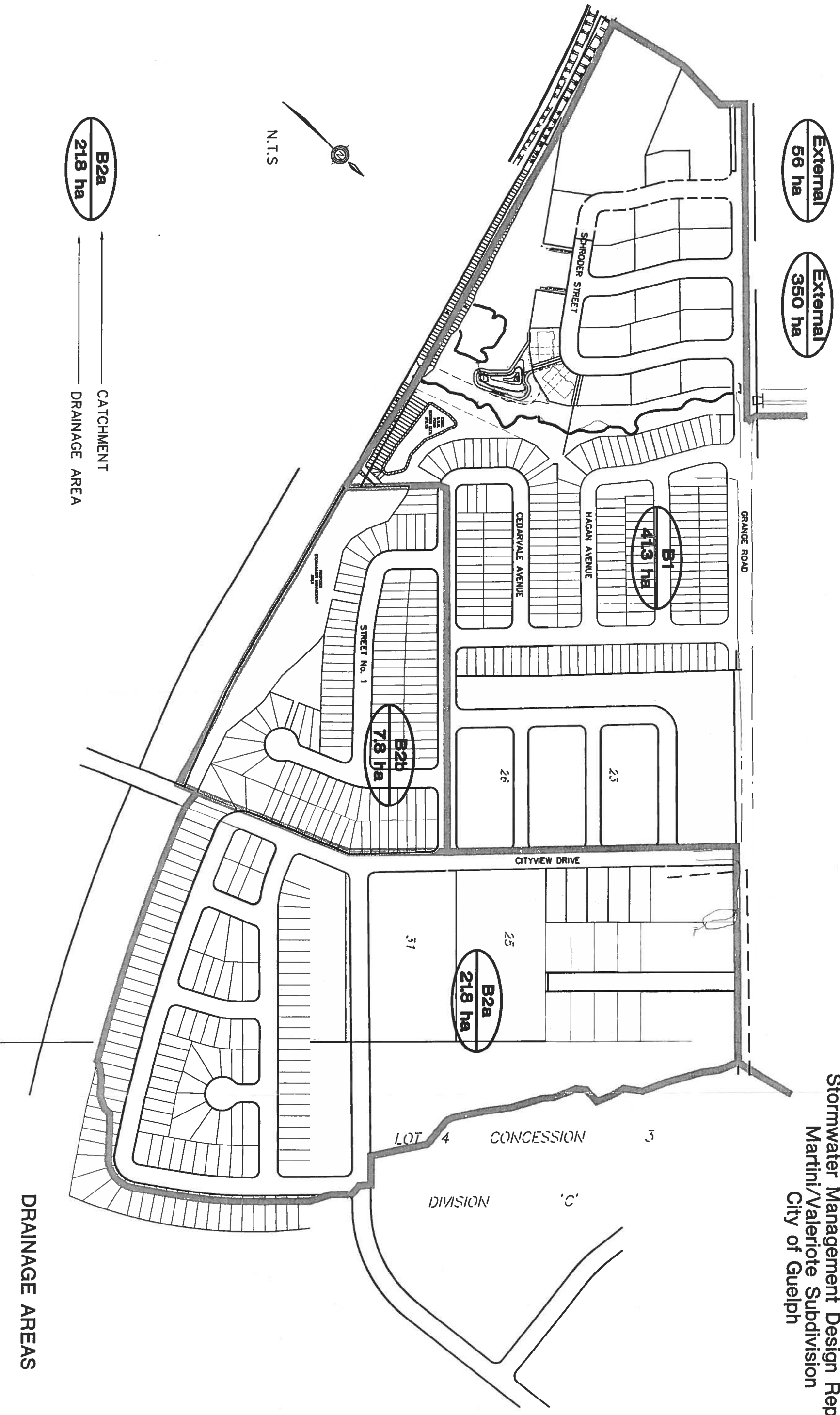
*Catchment B2b – Hydrograph No. 481 (7.8 hectares)* represents the Martini/Valeriotte Subdivision located west of Cityview Drive and south of the Valleyhaven Subdivision Phase II.

Quality Facility No. 2 will provide stormwater quality control for the future residential development area (Catchment B2a) and the Martini/Valeriotte Subdivision (Catchment B2b).

The existing on-line Quantity Facility will provide quantity control for the study area and the external drainage areas discharging to Hadati Creek.

### 5.1 QUALITY FACILITY NO. 1

From the May 1997 report by Schaeffers Consulting Engineers, the maximum treatable drainage area for Quality Facility No. 1 is 31.8 hectares. The proposed drainage area to be control by Quality Facility No. 1 is 31.6 hectares. Therefore, the existing quality control facility will continue to function as designed, approved and constructed.



**DRAINAGE AREAS**

**Figure 6**

## 5.2 QUALITY FACILITY No. 2

The proposed Quality Facility No. 2 will provide sufficient water quality storage volumes to ensure that the requirements for Basic Protection (60% long-term suspended solids removal) are achieved (MOE, 2003).

A “treatment train” approach is proposed to filter and remove sediments and any adsorbed contaminants prior to discharging to Hadati Creek. The “treatment train” will include lot level, conveyance and end-of-pipe management practices.

Lot level controls will include directing roof leaders and sump pumps to grassed rear yard areas. The runoff from the roof and rear yard areas will be filtered through the grassed yards prior to discharging to rear lot catch basins, for conveyance by the storm sewer system to the stormwater quality pond.

A conveyance channel with the capacity to convey the 100 year design storm flow will be constructed along the north side of the CN Railway, to provide a link between the future residential development east of Cityview Drive and the proposed stormwater quality facility.

The end-of-pipe component will consist of a municipally operated stormwater quality facility with sufficient capacity to provide Basic water quality protection for the 25mm design storm event. The active storage component of the facility will hold and release the runoff over an average of 24 to 48 hours, providing the required time to remove sediments.

The quality control facility has been designed with multiple storm sewer discharge locations to accommodate topographical and phasing constraints. This also benefits the facility by minimizing the volume and velocity that will discharge to the pond at any location. At each storm sewer discharge location, a shallow depressed area will be created to allow for the stilling of stormwater runoff and the settlement of sediments.

In light of current health concerns related to standing water, the stormwater quality facility has been designed to function as a dry pond, with an under drainage collection/discharge system to provide the necessary quality controls.

The vegetation in the bottom of the pond system will be selected to minimize the level of municipal maintenance, to maximize nutrient uptake from the runoff contained in the facility. This will create a relatively dry pond bottom following the discharge of a rainfall event while removing nutrients and retaining sediment in the facility.

A 300 mm diameter orifice plate operating under an effective head of 2.0 metres will control the rate of discharge from the 25mm event, to ensure that 24-hour detention time is provided. Flow volumes exceeding the capacity of the quality control facility will discharge to the existing on-line quantity control facility.

Using Table 3.2 (Stormwater Management Planning and Design Manual, 2003) a dry pond requires  $120 \text{ m}^3$  of storage volume per hectare (45% impervious) to provide Basic water quality protection. The drainage area contributing to Quality Facility No. 2 is 29.6-hectares, which corresponds to a required quality control storage volume of  $3,552 \text{ m}^3$ . Quality Facility No. 2 has been designed with an extended detention volume of  $4,901 \text{ m}^3$ .

The hydrologic routing through the quality facility has been incorporated into the proposed conditions modeling.

Table 4 lists the uncontrolled flow rate and runoff volume for each catchment discharging to Quality Facility No. 2

**Table 4: Uncontrolled Flow Rate & Runoff Volume - Quality Facility No. 2**

	25 mm	5 Year	25 Year	100 year	Regional
<b>Catchment B2a – Hydrograph No. 484</b>					
Flow Rate ( $\text{m}^3/\text{s}$ )	0.58	1.83	3.32	4.41	2.64
Runoff Volume ( $\text{m}^3$ )	1,448	4,829	7,868	10,283	28,057
<b>Catchment B2b – Hydrograph No. 481</b>					
Flow Rate ( $\text{m}^3/\text{s}$ )	0.21	0.65	1.19	1.58	0.95
Runoff Volume ( $\text{m}^3$ )	518	1,728	2,815	3,679	10,039
<b>TOTAL</b>					
Flow Rate ( $\text{m}^3/\text{s}$ )	0.81	2.45	4.39	5.77	3.58
Runoff Volume ( $\text{m}^3$ )	1,965	6,556	10,683	13,962	38,095

Table 5 compares the routing results through the quality facility with the available stage/storage/discharge capacities.

**Table 5: Available Stage/Storage/Discharge – Quality Facility No. 2**

	Available Capacities			Actual Capacity Used		
	Peak Flow m <sup>3</sup> /s	Storage Volume m <sup>3</sup>	Storage Elevation m	Peak Flow m <sup>3</sup> /s	Storage Volume m <sup>3</sup>	Storage Elevation m
Pond Bottom	0.000	0	321.50	---	---	---
25mm	---	---	---	0.26	867	321.70
5 Year	---	---	---	0.29	4,082	322.10
Overflow Weir	0.297	4,901	322.20	---	---	---
25 Year	---	---	---	2.22	5,439	322.35
100 Year	---	---	---	4.00	5,996	322.40
Regional	---	---	---	3.55	5,800	322.40
Top of Bank	7.566	7,341	322.50	---	---	---

The “drain down” time for Quality Facility No. 2 is 29 hours for the 25mm design storm event.

**a) Sediment and Erosion Control Plan**

A sediment fence will be installed along the property boundary, prior to the start of construction activity. The sediment fence will serve to eliminate the opportunity for water borne sediments to be washed on to the adjacent properties, and to Hadati Creek. In accordance with standard City practice, an Environmental Inspector will be retained to monitor the construction activities.

Upon completion of the grading, any area not subject to active construction within 30 days will be topsoiled and hydroseeded as per OPSS 572.

The stormwater management quality facility will be graded and shaped at the start of any construction or pre-grading activity. A silt fence will be placed around the outlet structures to restrict the movement of sediment. The discharge structure will restrict the release rate and provide extended detention for a minimum 24-hour period.

Once catch basins have been installed, the grates will be wrapped in filter cloth. This feature will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing and the temporary sediment pond will start after installation is complete. The fence and/or pond will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the facility found to need repair.

An Environmental Inspector will submit monthly reports on the condition of the sediment and erosion control measures to the City of Guelph and the Grand River Conservation Authority.

Once construction and landscaping has been substantially completed, the silt fence will be removed from within the quality facility, any accumulated sediment will be removed and the landscaping and planting of the facility will be completed.

After construction of the complete development, erosion will not occur and sediment transport will be minimal.

**b) Maintenance Plan and Schedule**

A two-phase maintenance plan is recommended. Phase I will address the short-term more intensive maintenance necessary during and immediately after construction. Once all landscaping has been completed and house building is essentially complete, maintenance will shift to Phase II.

Phase I will include weekly inspection of all sediment control devices plus "as needed" inspection after any significant rainfall, with the immediate repair of any damaged works and collection of captured sediment. This work will be managed by the consultant, on behalf of the owner during the construction of the works and house building. A monthly status report will be prepared and distributed to the City of Guelph and the Grand River Conservation Authority.

Phase II will be the maintenance carried out by the City of Guelph after all construction has been completed and house building is essentially complete. This work will involve a yearly visual inspection of the municipal stormwater management ponds to determine the amount of sediment accumulation. Sediment should be removed as required and the recommended vegetation replanted. No special requirements to divert water will be needed to accomplish this work.

**c) Monitoring Plan**

The monitoring program for Quality Facility No. 2 will serve the following purpose:

- i) Evaluate the effectiveness of the stormwater management system through visual observation and water level monitoring;
- ii) Assess the impact of the stormwater management system on surrounding natural areas;
- iii) Identify any adjustments or alterations required in subsequent phases of development.

The monitoring equipment will consist of a staff gauge marked in 1 centimetre increments placed in the stormwater management quality facility.

The gathering of hydraulic performance data will be carried out as follows:

- i) The staff gauge will be measured for six (6) rainfall events plus two (2) spring melt events for each year of the monitoring program. The rainfall events used for monitoring purposes will consist of two spring events (April to June), two summer events (June to September) and two fall events (October to December).
- ii) The measurements will consist of two sets of readings for each event. The first reading will be taken at or near the end of runoff flow to the pond. This reading will be cross-referenced to the Stage/Storage/Discharge Tables, prepared as part to the approved final design for the pond to determine the expected "drain down" time. The second reading will be taken at or near the expected "drain down" time. The comparison of the results will provide the operating hydraulic performance of the ponds relative to the theoretical design performance.

Monitoring will start with the commencement of construction and extend for a period of two (2) years after substantial completion (as defined by 75% completion of the final phase of development).

A yearly report will be prepared for the City of Guelph and the Grand River Conservation Authority, presenting the information gathered in tabular, graphical and text format. The report will compare the information with data collected in preceding years. The report will also recommend the appropriate steps to implement any contingency actions required.

The developer is responsible for ensuring that the monitoring program is completed as outlined above, as well as for the implementation of all contingency actions recommended in the yearly monitoring reports.



#### d) Minor and Major Storm Flows

Minor storm drainage will be conveyed to the stormwater management ponds via storm sewers with the capacity to carry the 5-year design storm.

The major storm flows from the Martini/Valeriotte Subdivision will be conveyed to the stormwater management quantity facility via the street right-of-way. Preliminary analysis indicates that the street right-of-way has the capacity to carry the runoff from a major storm event. The proposed overland drainage swales located between Lots 44/45 and south of Lot 65 will convey the major storm runoff from the street right-of-way to the stormwater management facility.

From the hydrologic modelling, the 100-year uncontrolled flow rates discharging to the overland drainage swales between Lots 44/45 and south of Lot 65 are 0.44 m<sup>3</sup>/s and 0.34 m<sup>3</sup>/s, respectively. A drainage swale with a maximum depth of 0.5 metres, 4:1 side slopes, minimum grade of 2.4% and a minimum capacity of 2.1 m<sup>3</sup>/s will provide sufficient capacity to convey the runoff to the stormwater quality facility, while providing a flow depth of less than 0.3 metres.

The conveyance channel along the north side of the CN Railway will convey the major storm flows from the future development area to the existing on-line extended detention facility.

From the hydrologic modelling, the 100-year uncontrolled flow rate from the future residential development area will be 4.41 m<sup>3</sup>/s. A trapezoidal channel with a depth of 1m, bottom width of 1m, 4:1 side slopes, a minimum grade of 3.4% to a maximum grade of 6.0% and a minimum capacity of 15.2 m<sup>3</sup>/s will provide sufficient capacity to convey the runoff from the 100 year design storm to the stormwater quality facility.

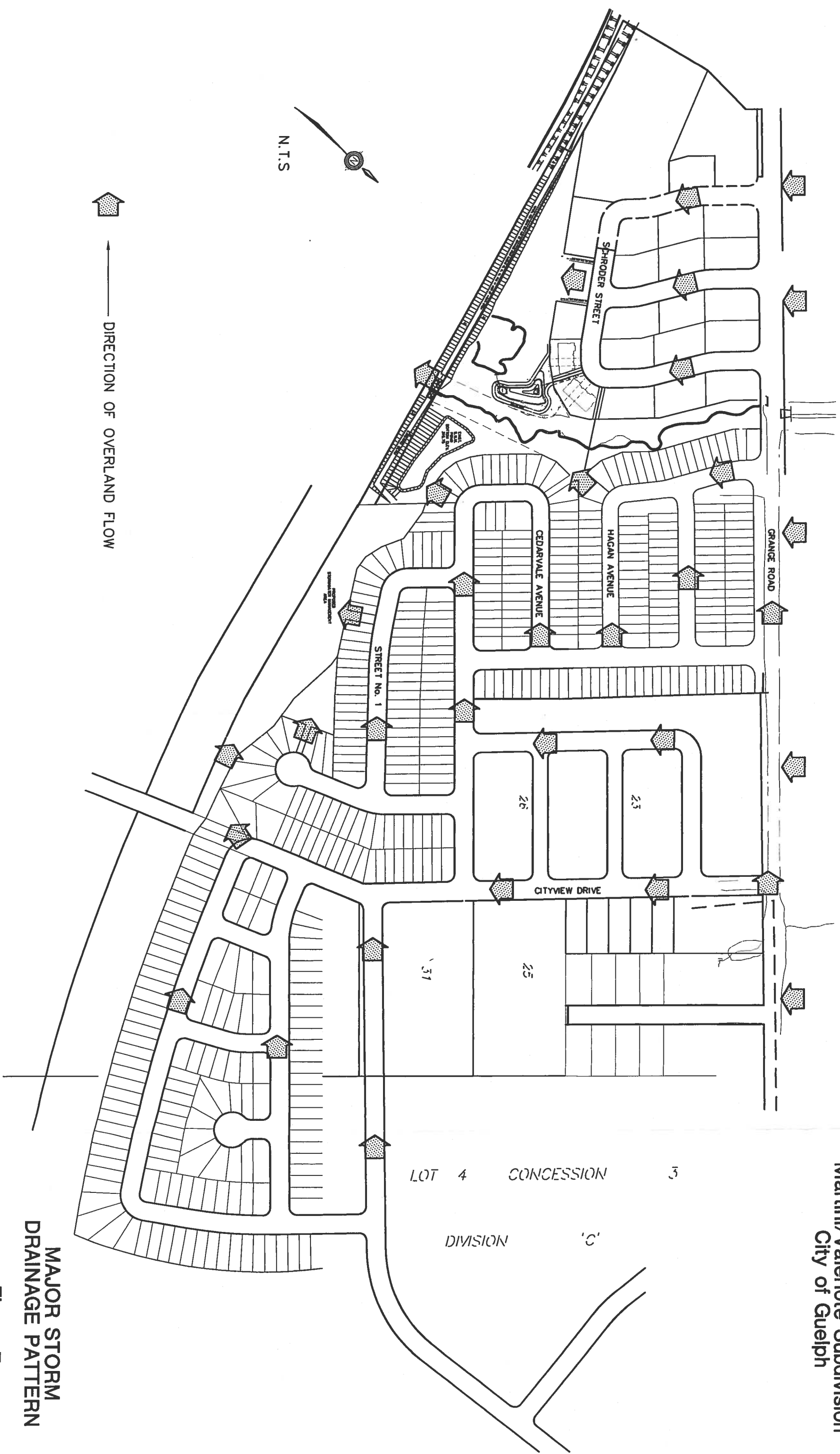
Table 6 summarizes the flow rate, the flow depth and the flow velocity for the conveyance channel.

**Table 6: Conveyance Channel Summary**

	Flow Rate (m <sup>3</sup> /s)	Flow Velocity (m/s)	Flow Depth (m)
25mm	0.60	1.69	0.20
5 Year	1.80	2.16	0.35
25 Year	3.29	2.45	0.47
100 Year	4.31	2.58	0.53
Regional	2.64	2.34	0.42

In our opinion, the drainage channel provides adequate capacity for routing the storm flows to the stormwater management pond.

The major storm drainage patterns expected for the study area are shown on Figure 7.



**MAJOR STORM  
 DRAINAGE PATTERN**

**Figure 7**

### 5.3 QUALITY FACILITY NO. 3

From the May 1997 report by Schaeffers Consulting Engineers, the treatable drainage area for Quality Facility No. 3 must not exceed 8 hectares. The drainage area to be control by Quality Facility No. 3 will continue to be 7.7 hectares. Therefore, the existing quality control facility will continue to function as designed, approved and constructed.

### 5.4 QUANTITY FACILITY

As a result of the proposed improvements to Hadati Creek along Elizabeth Street and the detailed design of Quality Facility No. 2, the quantity control facility has been modified to reflect the reduced storage volumes and outflow rates to the downstream lands under the minor design storm events.

Due to the additional planning and topographical information the pond bottom elevation of Quality Facility No. 2 was raised to 321.50. The May 1997 report by Schaeffer's Engineering Consultants proposed a permanent water elevation of 321.00. As a result the available storage volume in the on-line quantity control facility was reduced.

To facilitate the proposed channel improvements to Hadati Creek, downstream of the CN Railway, the outflow from the on-line extended detention facility was over-controlled by 2 m<sup>3</sup>/s for the 5-year design storm event. For flows, which exceed the minor design storm event, an overflow weir will convey flows to the downstream reaches. The control structure consists of a 1.2m wide by 0.7m high orifice plate and an overflow weir (elevation 321.00), located upstream of the existing 1.2m wide by 1.8m high concrete box culvert.

Table 7 lists the uncontrolled flow rate and runoff volume for each catchment discharging to the Quantity Facility.

**Table 7: Uncontrolled Flow Rate & Runoff Volume - Quantity Facility**

	25 mm	5 Year	25 Year	100 year	Regional
<b>Quality Facility No. 2</b>					
Flow Rate (m <sup>3</sup> /s)	0.26	0.29	1.84	3.74	3.55
Runoff Volume (m <sup>3</sup> )	1,965	6,556	10,683	13,962	38,092
<b>Quality Facility No. 1 and No. 3</b>					
Flow Rate (m <sup>3</sup> /s)	1.14	3.61	6.56	8.72	5.22
Runoff Volume (m <sup>3</sup> )	2,862	9,547	15,555	20,330	55,470
<b>External Area</b>					
Flow Rate (m <sup>3</sup> /s)	1.82	6.64	11.72	15.67	16.12
Runoff Volume (m <sup>3</sup> )	23,800	84,073	139,797	184,392	500,052
<b>TOTAL</b>					
Flow Rate (m <sup>3</sup> /s)	3.13	10.52	18.13	24.35	23.21
Runoff Volume (m <sup>3</sup> )	28,635	100,271	166,017	218,691	593,630

The stage/storage/discharge table for the on-line quantity control pond has been revised to include the additional control structure. Table 8 compares the routing results through the quantity control facility with the available stage/storage/discharge capacities.

**Table 8: Available Stage/Storage/Discharge – Quantity Control Facility**

	Available Capacities			Actual Capacity Used		
	Peak Flow m <sup>3</sup> /s	Storage Volume m <sup>3</sup>	Storage Elevation m	Peak Flow m <sup>3</sup> /s	Storage Volume m <sup>3</sup>	Storage Elevation m
Permanent Water Level	0.000	0	318.70	---	---	---
25mm	---	---	---	1.36	3,923	319.75
5 Year	---	---	---	2.91	14,753	320.75
25 Year	---	---	---	7.12	25,267	321.60
Overflow Weir	8.100	33,240	322.00	---	---	---
100 Year	---	---	---	8.37	35,411	322.10
Regional	---	---	---	11.87	106,132	323.00
Top of Berm	12.348	114,000	323.30	---	---	---

Comparison of the recommended discharge rates from the Eastview Secondary Plan against the proposed conditions discharge rates indicates that the 5-year discharge rate of 2.91 m<sup>3</sup>/s is 58 percent of the recommended discharge rate of 5.0 m<sup>3</sup>/s. The 100-year design storm discharge rate of 8.37 m<sup>3</sup>/s is approximately 10 percent above the recommended discharge rates of 7.6 m<sup>3</sup>/s. The Regional Storm discharge rate of 11.87 m<sup>3</sup>/s is 99 percent of the recommended discharge rate of 11.9 m<sup>3</sup>/s.

Table 9 compares the storage elevations from the approved design against the proposed conditions.

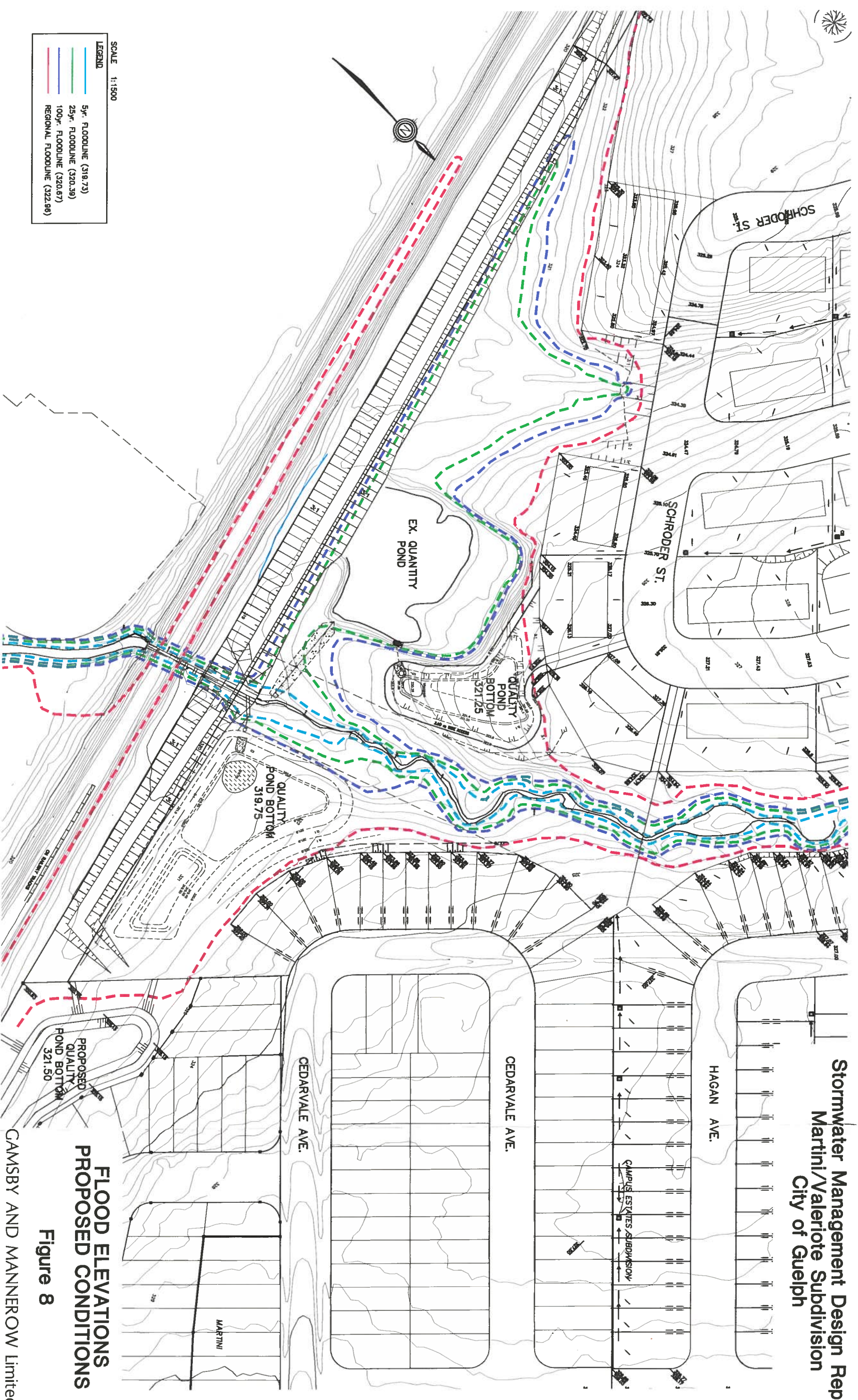
**Table 9: Comparison – Approved Conditions vs. Proposed Conditions**

	<b>Approved Conditions (Schaeffers, May 1997)</b>	<b>Proposed Conditions (G&amp;M, June 2003)</b>
5 Year	320.34	320.75
25 Year	321.60	321.60
100 Year	321.51	322.10
Regional Storm	322.95	323.00

Comparison of the proposed storage elevations for the on-line extended detention pond reveal an increase of 0.41 m and 0.59 m for the 5 and 100-year design storm events, respectively. Under the Regional storm event there is a 0.05 m increase.

Figure 8 shows the flood elevations from the hydraulic (HEC-2) analysis, relative to the surrounding residential development under the proposed conditions. The hydraulic analysis was completed as part of the Design Report for the Hadati Creek Channel Improvements (Gamsby and Mannerow Limited, June 2003).

**Stormwater Management Design Report  
Martini/Valerote Subdivision  
City of Guelph**



**FLOOD ELEVATIONS  
PROPOSED CONDITIONS**  
**Figure 8**

CAMSBY AND MANNEROW Limited

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

The stormwater management system for the Martini/Valeriotte Subdivision has been designed to collect, clean and filter all of the runoff from the 25mm design storm event. Flows, which exceed the 25mm design storm event, will be adequately conveyed to the existing quantity control facility for attenuation, prior to discharge.

From the analysis, the following conclusions are drawn:

1. The stormwater management system has been designed with adequate capacity to provide the necessary quality and quantity controls.
2. The stormwater management systems meet the current Provincial and Municipal guidelines.
3. The principles of "Stormwater Management Practices" have been used in the selection of the stormwater management systems.
4. During the construction phase, Quality Facility No. 2 will be used as part of the erosion and sediment control plan. This in conjunction, with the other erosion control measures, will retain any sediment on-site during the construction period.

All of which is respectfully submitted.



AK/

GAMSBY AND MANNEROW LIMITED  
Per:

A handwritten signature in black ink, appearing to read "Chris Sims".

Christopher R. Sims, P. Eng.

**STORMWATER MANAGEMENT DESIGN REPORT  
DRAFT PLAN 23T-96501 AND 23T-99501  
MARTINI/VALERIOTE SUBDIVISION  
CITY OF GUELPH  
Revised: March 19, 2004**

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**APPENDIX "A"**

**Certificate of Approval No. 3-0628-97-006 (July 29, 1997)  
Certificate of Approval No. 2973-5Q5RP8 (October 8, 2003)**

---





Environment and Energy

l'Environnement et de l'Énergie

RECEIVED  
AUG - 5 1997  
City of Guelph  
WORKS DEPARTMENT

CERTIFICATE OF APPROVAL  
SEWAGE  
NUMBER 3-0628-97-006  
Page 1 of 5

Corporation of the City of Guelph.  
City Hall, 59 Carden Street  
Guelph, Ontario  
N1H 3A1

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Sanitary and storm sewers, stormwater management facilities and appurtenances to be constructed to serve Cedarvale Subdivision and Campus Estates Subdivision located on Lots 15, 16, 17, 18, 19, 21, 22, 28, R.P. 53, Lot 1, Concession 3, Division C, City of Guelph (geographically Township of Puslinch), County of Wellington, as follows:

<u>STREET</u>	<u>FROM</u>	<u>TO</u>
<u>SANITARY AND STORM SEWERS</u>		
Schroder Cresc.	Approx. 50 m W of Thornton Street	Grange Road (east intersection)
Thornton Street	Grange Road	Schroder Cresc.
New Cedarvale Road	Grange Road	Bradson Drive
Trailbrook Lane	New Cedarvale Road	Bradson Drive
Grange Road	New Cedarvale Road	Approx. 41 m E of Bradson Drive
<u>SANITARY SEWERS</u>		
Bradson Drive	Grange Road	Approx. 45 m S of New Cedarvale Road
Easement	Schroder Cresc.	New Cedarvale Road
Easement (existing Cedarvale Road)	New Cedarvale Road	Future Street
<u>STORM SEWERS</u>		
Bradson Drive	Grange Road	Approx. 40 m S of New Cedarvale Road
Easement (existing Cedarvale Road)	New Cedarvale Road	Stormwater Pond No.1
Easement off Schroder Cresc.	Schroder Cresc.	Approx. 45 m E to Stormwater Pond No.2



STORMWATER MANAGEMENT

Stormwater management facilities consisting of two (2) stormwater quality ponds and a quantity pond as follows:

Pond No.1 located east of Hadati Creek, north of CN Railway, with approximately 1576 m<sup>3</sup> storage and having a sediment forebay of approximately 40 m including discharge control facility to limit the flow into the Creek at 15.0 L/s;

Pond No.2 located west of Hadati Creek and south of Schroder Cresc. with approximately 794 m<sup>3</sup> storage and having a sediment forebay of approximately 32 m including discharge control facility to limit the flow into the existing quantity pond at 6.0 L/s;

An inline quantity pond, parallel to the CN Railway, with outlet control facility (box culvert) to limit the flow to Hadati Creek to the following levels:

	<u>1:5 Year</u>	<u>1:100 Year</u>
peak pre-development flow	5.0 m <sup>3</sup> /s	7.6 m <sup>3</sup> /s
peak post-development flow	9.2 m <sup>3</sup> /s	20.9 m <sup>3</sup> /s
peak post-development flow (attenuated)	4.2 m <sup>3</sup> /s	7.8 m <sup>3</sup> /s
total storage provided	9840 m <sup>3</sup>	26636 m <sup>3</sup>

Including a scour basin south of Grange Road and Hadati Creek crossing, temporary silt basins and fences, stub storm sewers, stub sanitary sewers, catchbasin leads and catchbasins, storm and sanitary service drains from the main sewer to the street line, all in accordance with " Final Stormwater Management Design Report for the Southern Hadati Creek Watershed, Upstream of the C.N. Railway Tracks, City of Guelph" dated May 1997, prepared by Schaeffers, Consulting Engineers and final plans and specifications prepared by the Engineering Services Division of the City of Guelph, and all additional stub storm sewers, stub sanitary sewers, catchbasin leads and catchbasins, storm and sanitary service drains from the main sewer to the street line not included in the above final plans and specifications as may be approved by the operating authority in the future in accordance with the conditions of the Certificate of Approval.

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*



TERMS AND CONDITIONS

1. The operating authority shall not approve any additional stub storm sewers, catchbasin leads and catchbasins and storm service drains from the main sewer to the street line not included in the final plans and specifications referred to above unless it has reviewed the hydraulic capacity of the downstream storm sewer collection system and the sanitary sewage treatment works serving them, if any, and has concluded that the additional stub storm sewers, catchbasin leads and catchbasins and storm service drains from the main sewer to the street line together with all existing and previously approved stub storm sewers, catchbasin leads and catchbasins and storm service drains from the main sewer to the street line will not overload either the downstream storm sewer collection system or the sewage treatment works and has recorded its review and conclusion in writing. This record shall be maintained by the operating authority and shall be summarized in a yearly report to be sent to the District Manager of the Ministry's District Office by February 15th of the following calendar year in which the records were collected.
2. The operating authority shall not approve any additional stub sanitary sewers and sanitary service drains from the main sewer not included in the final plans and specifications referred to above unless it has reviewed the hydraulic capacity of the downstream sanitary sewer collection system and the sanitary sewage treatment works serving them and has concluded that the additional stub sanitary sewers and sanitary service drains together with all existing and previously approved stub sanitary sewers and sanitary service drains will not overload either the downstream sanitary sewer collection system or the sanitary sewage treatment works and has recorded its review and conclusion in writing. This record shall be maintained by the operating authority and shall be summarized in a yearly report to be sent to the District Manager of the Ministry's District Office by February 15th of the following calendar year in which the records were collected.
3. The Operating Authority shall initiate a regular maintenance program to clean up accumulated sediment from catchbasins, manholes and stormwater management facilities where it may be deposited.
4. This certificate is conditional upon the owner making all necessary investigations, taking all necessary steps and obtaining all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater management system do not constitute a safety or health hazard to the general public.



*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition No.1 is being imposed to ensure that all proposed storm sewer connections, including future connections, will be serviced adequately by the downstream storm sewer collection system and will be within the treatment capacity of the downstream sewage treatment works both hydraulically and in terms of any effluent requirements.
2. Condition No.2 is being imposed to ensure that all proposed sanitary sewer connections, including future connections, will be serviced adequately by the downstream sanitary sewer collection system and will be within the treatment capacity of the downstream sanitary sewage treatment works, both hydraulically and in terms of any effluent requirements.
3. Condition No. 3 is imposed to ensure the continued optimal operation of the stormwater management facilities.
4. Condition No. 4 is imposed because it is not in the public interest for the Director to approve facilities which, by reason of potential health and safety hazards do not generally comply with legal standards or approval requirements falling outside the purview of this Ministry.

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the sewage works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*



The Secretary,  
Environmental Appeal Board,  
112 St. Clair Avenue West,  
Suite 502,  
Toronto, Ontario.  
M4V 1N3

AND

The Director,  
Section 53, Ontario Water Resources Act,  
Ministry of Environment and Energy,  
250 Davisville Avenue, 3rd Floor,  
Toronto, Ontario.  
M4S 1H2

*The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.*

DATED AT TORONTO this 29th day of July, 1997.

M. Dhalla, P.Eng.,  
Director,  
Section 53,  
Ontario Water Resources Act.

NS/tm

cc:-T.E. Hearn, P.Eng., City of Guelph  
-District Manager, MOEE Cambridge District Office

for Ms. Angella Kraetsch

Ud-244

F. 1-519-824-8089

per her request.

mm  
Oct 22/03



Ontario

Ministry  
of the  
Environment

Ministère  
de  
l'Environnement

AMENDED CERTIFICATE OF APPROVAL  
MUNICIPAL AND PRIVATE SEWAGE WORKS  
NUMBER 2973-5Q5RP8

The Corporation of the City of Guelph  
City Hall, 59 Carden Street  
Guelph, Ontario,  
N1H 3A1

Site Location: Hadati Creek  
Block 18, Registered Plan 872  
Guelph City, County of Wellington

*You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:*

upgrading of the existing in-line stormwater management facility (quantity pond) located upstream of the CN Railway Line to increase storage capacity consisting of the following:

**Proposed Works:**

- deepening of Hadati Creek channel by 500mm between York Road culvert and Beaumont Crescent culvert,
- deepening of channel by 1.5m ( from 1.5m to 3.0m) and widen by 1.9m ( from 1.8m to 3.7m) between Beaumont Crescent culvert to Elizabeth Street culvert,
- replacement of 1.4m high by 3.6m wide Elizabeth Street culvert with a 2.1m high by 3.0m wide culvert,
- deepening of Hadati Creek channel by 500mm between Elizabeth Street culvert and Suburban Avenue culvert, and
- construction of 1.2m deep by 1.2m wide ditch inlet catchbasin manhole (for over control of flows in the existing pond) with a 700mm high by 1.2m wide orifice with 1.2m long weir and grating upstream of the CN Railway box culvert and the 1.8m by 1.2m existing flow control structure,

The revised pattern of the flows from the existing extended detention pond are as follows:

<b>Storm Event</b>	<b>5-year / (storage, cu.m.)</b>	<b>100-year/ (storage, cu.m.)</b>
Previous attenuated flows(cu.m./s.)	4.2 (9,840 cu.m.)	7.8 (26,636 cu.m.)
Proposed attenuated flows (cu.m./s.)	3.06(16,400 cu.m.)	8.4 (35,600 cu.m.)

including permanent and temporary erosion / sedimentation control measures for all phases of construction to minimize the effects on external lands and to reduce the amount of silt carried to the pond and the Hadati Creek;

all in accordance with the Application for the Approval of the Municipal and Private Sewage Works dated June 26, 2003, design report, final drawings and addendum documents prepared and submitted by Gamsby and Mannerow Ltd., Consulting Engineers.

**Existing Works (approved as per previous C of A # 3-0628-97-006):**

Combined Sanitary and Storm Sewers:

- on Schroder Crescent, Thornton Street, New Cedarvale Road, Trailbrook Lane, and on Grange Road

Sanitary Sewers:

- on Bradson Drive, easement between New Cedarvale Road and Hagan Avenue and on easement between Schroder Crescent and New Cedarvale Road,

Storm Sewers:

- on Bradson Drive, easement between New Cedarvale Road and Stormwater Pond #1 and on easement between Schroder Crescent and Stormwater Pond #2,

Stormwater Management:

- pond # 1 located east of Hadati Creek, north of CN Railway, with approximately 1,576cu.m. of storage and a 40m long sediment forebay, including discharge control facility to limit the flow rate into the Creek at 15.0L/s;

- pond # 2 located west of Hadati Creek, south of Schroder Crescent, with approximately 794cu.m. of storage and a 32m long sediment forebay, including discharge control facility to limit the flow rate into the existing quantity pond at a rate of 6.0L/s, including the existing scour basin south of Grange Road and Hadati Creek Crossing and permanent erosion / sedimentation control measures to minimize the effects on external lands and to reduce the amount of silt carried to the pond and the Hadati Creek;

all in accordance with " Final Stormwater Management Design Report for the Southern Hadati

Creek Watershed , Upstream of the C.N.Railway Tracks, City of Guelph" dated May 1997, prepared by Schaeffers Consulting Engineers.

*For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:*

- (1) "Certificate" means this entire Certificate of Approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;
- (2) "Director" means any Ministry employee appointed by the Minister pursuant to Section 53 of the *Ontario Water Resources Act*;
- (3) "Ministry" means the Ontario Ministry of Environment;
- (4) "Regional Director" means the Regional Director of the West Central Region of the Ministry;
- (5) "District Manager" means the District Manager of the Guelph District Office of the Ministry.;
- (6) "Owner" means The Corporation of the City of Guelph.;
- (7) "Municipality" means the City of Guelph; and,
- (8) "Works" means the sewage works described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate.

*You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:*

#### TERMS AND CONDITIONS

1. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater works do not constitute a safety or health hazard to the general public.
2. The Owner shall ensure that sediment and excessive decaying vegetation are removed from the above noted stormwater management system at such a frequency as to prevent the excessive buildup and potential overflow of sediment and/or decaying vegetation into the receiving watercourse.
- 3.1 Except as otherwise provided by these Conditions, the Owner shall design, build, install,



operate and maintain the works in accordance with the description given in this Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

3.2 Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

*The reasons for the imposition of these terms and conditions are as follows:*

1. Condition 1 is imposed because it is not in the public interest for the Director to approve facilities which, by reason of potential health and safety hazards do not generally comply with legal standards or approval requirements falling outside the purview of this Ministry.
2. Condition 2 is included as regular removal of sediment and excessive decaying vegetation from this approved stormwater management system are required to mitigate the impact of sediment and/or decaying vegetation on the downstream receiving watercourse. It is also required to ensure that adequate storage is maintained in the stormwater management facilities at all times as required by the design.
3. Condition 3 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

**This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 3-0628-97-006 issued on July 29, 1997**

*In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:*

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

*The Notice should also include:*

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;

7. The name of the Director;
8. The municipality within which the works are located;

*And the Notice should be signed and dated by the appellant.*

*This Notice must be served upon:*

The Secretary\*  
Environmental Review Tribunal  
2300 Yonge St., 12th Floor  
P.O. Box 2382  
Toronto, Ontario  
M4P 1E4

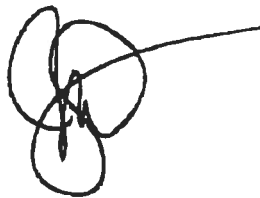
AND

The Director  
Section 53, Ontario Water Resources Act  
Ministry of the Environment  
2 St. Clair Avenue West, Floor 12A  
Toronto, Ontario  
M4V 1L5

\* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or [www.ert.gov.on.ca](http://www.ert.gov.on.ca)

*The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.*

DATED AT TORONTO this 8th day of October, 2003



---

Mohamed Dhalla, P.Eng.  
Director  
Section 53, Ontario Water Resources Act

MN/

c: District Manager, MOE Guelph  
Christopher R. Sims, P.Eng., Gamsby and Mannerow Limited

**STORMWATER MANAGEMENT DESIGN REPORT  
DRAFT PLAN 23T-96501 AND 23T-99501  
MARTINI/VALERIOTE SUBDIVISION  
CITY OF GUELPH  
Revised: March 19, 2004**

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**APPENDIX "B"**

**Overall Drainage Area  
Watershed Schematic  
Stage/Storage/Discharge Table – Quality Facility No. 2  
24 Hour Draindown Calculation  
Stage/Storage/Discharge Table – Quantity Facility  
Stormwater Management Analysis  
Overland Drainage Swale Analysis**

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**STORMWATER MANAGEMENT DESIGN REPORT  
DRAFT PLAN 23T-96501 AND 23T-99501  
MARTINI/VALERIOTE SUBDIVISION  
CITY OF GUELPH  
Revised: March 19, 2004**

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**APPENDIX "B"**

**Overall Drainage Area  
Watershed Schematic  
Stage/Storage/Discharge Table – Quality Facility No. 2  
24 Hour Draindown Calculation  
Stage/Storage/Discharge Table – Quantity Facility  
Stormwater Management Analysis  
Overland Drainage Swale Analysis**

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## APPENDIX "B"

<u>File</u>	<u>Description</u>
25mm4hr.stm	25mm design storm file
5yrSCS12hr.stm	5yr design storm file
25yrSCS12hr.stm	25yr design storm file
100yrSCS12hr.stm	100yr design storm file
RegSCS12hr.stm	Regional design storm file
03-027.mdb	Visual OTTHYMO database
03-027.vop	Visual OTTHYMO data file

Stormwater Management Design Report  
Martini/Valeriote Subdivision  
City of Guelph

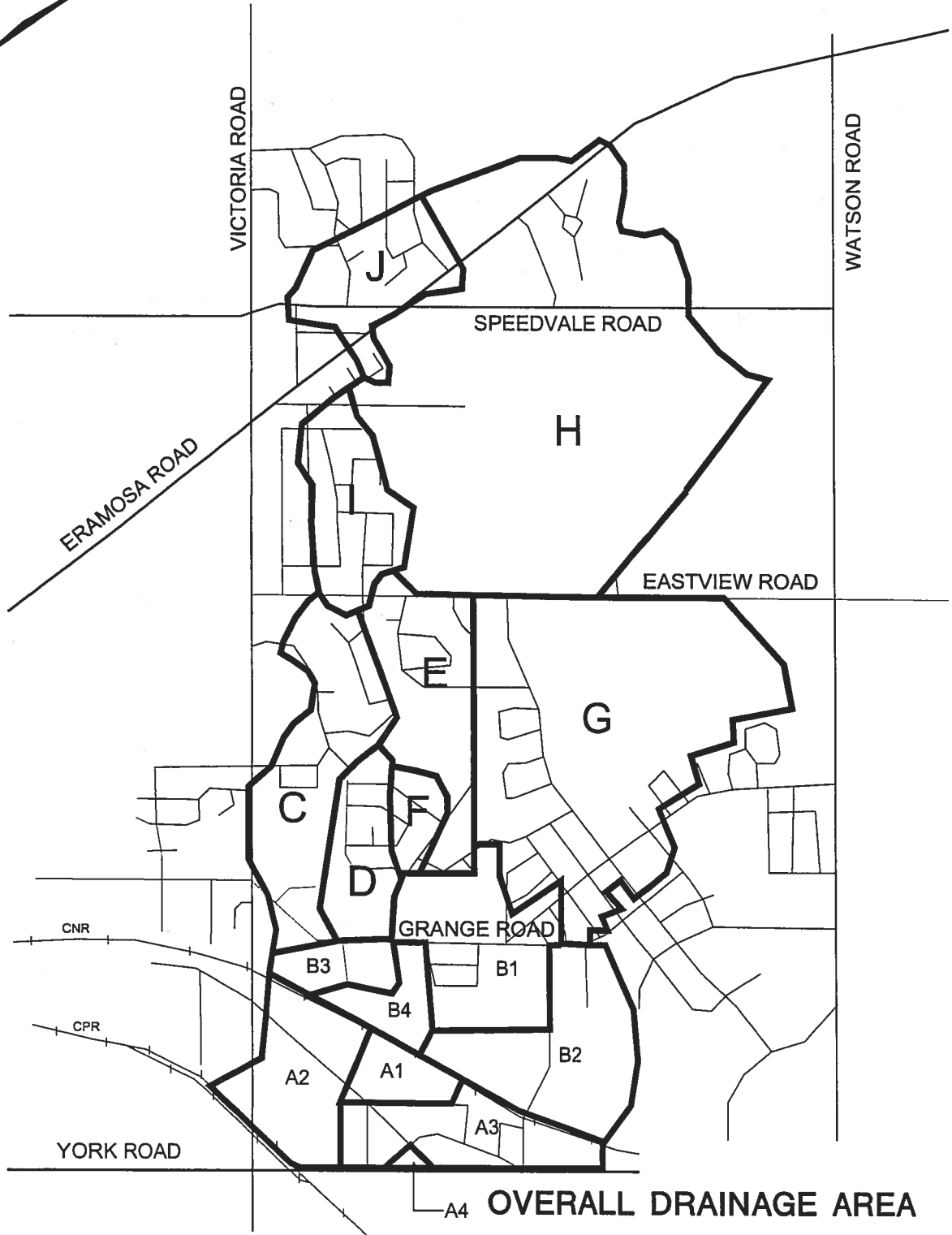
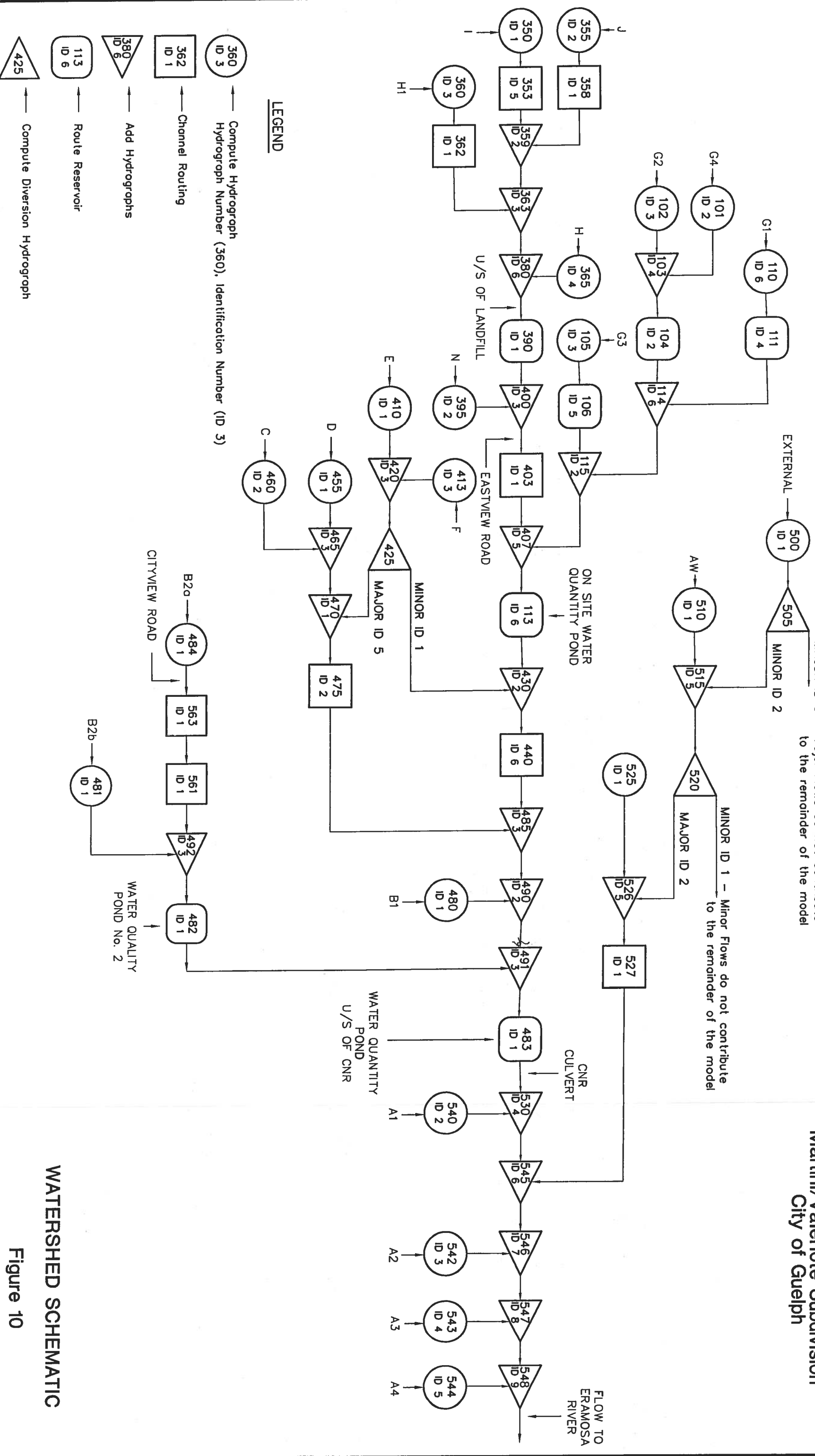


Figure 9

GAMSBY AND MANNEROW Limited

**Stormwater Management Design Report**  
**Martini/Valeriote Subdivision**  
**City of Guelph**



**WATERSHED SCHEMATIC**

**Figure 10**

**Martini / Valeriotte Subdivision  
Stormwater Management Facility  
Stage-Storage -Discharge Calculations  
Revised: March 18, 2004**

Elevation (m)	Depth (m)	Active area (m <sup>2</sup> )	Active Volume (m <sup>3</sup> )	Acc. Active Storage (m <sup>3</sup> )	
321.50	0.00	5688	0.00	0.00	Pond Bottom
321.60	0.10	5900	579.40	579.40	
321.70	0.20	6110	600.50	1179.90	
321.80	0.30	6323	621.65	1801.55	
321.90	0.40	6537	643.00	2444.55	
322.00	0.50	6752	664.45	3109.00	
322.10	0.60	6967	685.95	3794.95	
322.20	0.70	7184	707.55	4502.50	Weir
322.30	0.80	7401	729.25	5231.75	Overflow
322.40	0.90	7619	751.00	5982.75	
322.50	1.00	7839	772.90	6755.65	

**Orifice Control  
(pipe inv. @ 319.55m)**

**Overflow Weir  
(100 Year Control)**

Q =	0.309 cu m/s	d1 =	1.000 m
Cd =	0.600	h =	0.700 m
H =	2.700 m	H =	0.300 m
2g =	19.620	2g =	19.620
A =	0.071 sq m	L =	30.000 m
D =	0.300 m	Q =	7.251 cu m/s

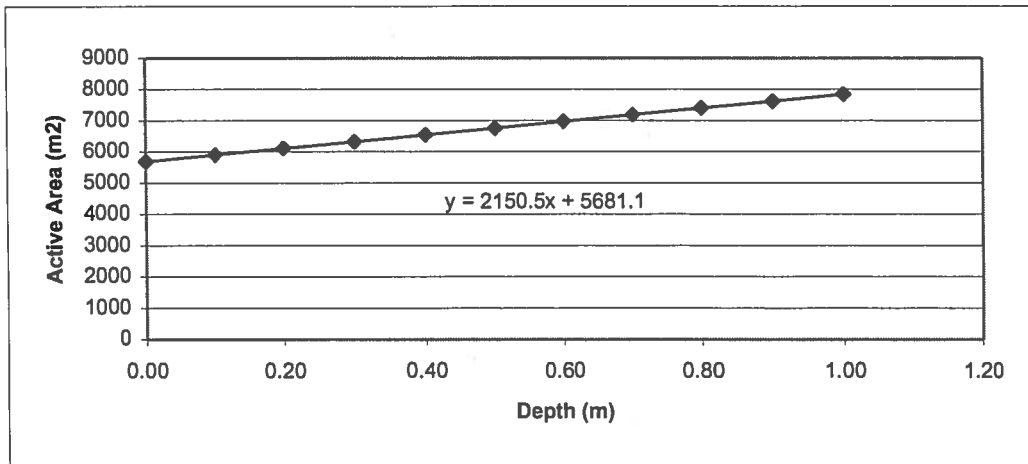
**STAGE-STORAGE-DISCHARGE TABLE**

Elevation (m)	Stage (m)	Storage (m <sup>3</sup> )	Orifice Control (m <sup>3</sup> /s)	Overflow Weir (m <sup>3</sup> /s)	Actual Discharge (m <sup>3</sup> /s)	
321.50	0.00	0	0.0000	0.000	0.000	Pond Bottom
321.60	0.10	579	0.2589	0.000	0.259	
321.70	0.20	1180	0.2657	0.000	0.266	
321.80	0.30	1802	0.2722	0.000	0.272	
321.90	0.40	2445	0.2786	0.000	0.279	
322.00	0.50	3109	0.2849	0.000	0.285	
322.10	0.60	3795	0.2910	0.000	0.291	
322.20	0.70	4503	0.2970	0.000	0.297	Weir
322.30	0.80	5232	0.3029	1.329	1.632	Overflow
322.40	0.90	5983	0.3087	3.860	4.168	
322.50	1.00	6756	0.3143	7.251	7.566	



**Martini / Valeriotte Subdivision  
Stormwater Management Facility  
24 Hour Draindown Calculations  
Revised: March 18, 2004**

Depth (m)	Active area (m <sup>2</sup> )
0.00	5688
0.10	5900
0.20	6110
0.30	6323
0.40	6537
0.50	6752
0.60	6967
0.70	7184
0.80	7401
0.90	7619
1.00	7839



Solve for Area of Orifice (A):

$$A = \frac{0.66(C1)h^{1.5} + 2(C2)h^{0.5}}{2.75(t)}$$

C1 = 2150.5  
C2 = 5681.1  
h = 2.150 m  
t = 86400 s

A = 0.0890 m<sup>2</sup>  
diameter = 0.337 m

Solve for draindown time (t):

$$t = \frac{0.66(C1)h^{1.5} + 2(C2)h^{0.5}}{2.75(A)}$$

C1 = 2150.5  
C2 = 5681.1  
h = 2.000 m  
diameter = 300 mm  
A = 0.0707 m<sup>2</sup>

t = 103315 seconds  
t = 1722 minutes  
t = 29 hours

**ON-LINE EXTENDED DETENTION STORAGE**  
(Proposed Conditions)

**ORIFICE CALCULATIONS**

(Q orifice control)  
(MTO Inlet Control Calculations)  
(Design Chart 5.39)

N = 1  
B = 1.2 m  
D = 0.7 m

**ORIFICE CALCULATIONS**

(Q catchbasin structure orifice)  
(MTO Inlet Control Calculations)  
(Design Chart 5.39)

N = 1  
B = 1.2 m  
D = 1.8 m

**ORIFICE CALCULATIONS**

(DICB between berms)

Q = 1.548 cu m/s  
Cd = 0.5 (projected orifice)  
H = 3.77 m  
2g = 19.62  
A = 0.36 m<sup>2</sup> (50% blocked)

$Q_{total} = Q_{orifice\ control} + Q_{catchbasin\ structure\ orifice} + Q_{DICB}$

Stage (m)	Q <sub>orifice control</sub> (MTO Inlet Control Calculations, Design Chart 5.39)				Q <sub>catchbasin structure orifice</sub> (MTO Inlet Control Calculations, Design Chart 5.39)				Q <sub>DICB</sub> (between Berms) (Q = CA(2gH) <sup>0.5</sup> )		Q <sub>total</sub>	Storage Volume (ha-m)
	HW (m)	HW/D	Q/NB (m <sup>3</sup> /s/m)	Q <sub>orifice</sub> (m <sup>3</sup> /s)	HW (m)	HW/D	Q/NB (m <sup>3</sup> /s/m)	Q <sub>orifice</sub> (m <sup>3</sup> /s)	H (m)	Q <sub>DICB</sub> (m <sup>3</sup> /s)		
318.70	0.00	0	0.00	0.00	0.00	0.00	0	0	0	0	0.000	0.000
319.00	0.30	0.43	0.23	0.28	0.30	0.17	0	0	0	0	0.276	0.060
319.50	0.80	1.14	1.00	1.20	0.80	0.44	0.95	0	0	0	1.200	0.340
320.00	1.30	1.86	1.70	2.04	1.30	0.72	2.10	0	0	0	2.040	0.618
320.50	1.80	2.57	2.20	2.64	1.80	1.00	3.40	0	0	0	2.640	1.163
321.00	2.30	3.29	2.60	3.12	2.30	1.28	4.70	0	0	0	3.120	1.707
321.50	2.80	4.00	4.00	0	2.80	1.56	5.90	7.08	0	0	7.080	2.486
322.00	3.30	4.71	4.40	0	3.30	1.83	6.75	8.10	0	0	8.100	3.324
322.10	3.40	4.86	4.50	0	3.40	1.89	7.10	8.52	2.57	1.278	9.798	4.642
322.50	3.80	5.43	4.75	0	3.80	2.11	7.60	9.12	2.97	1.374	10.494	7.440
323.00	4.30	6.14	5.20	0	4.30	2.39	8.50	10.20	3.47	1.485	11.685	10.300
323.30	4.60	6.57	5.40	0	4.60	2.56	9.00	10.80	3.77	1.548	12.348	11.400