Dual Drainage Assessment

Shohan Ahmad, PhD, PENG

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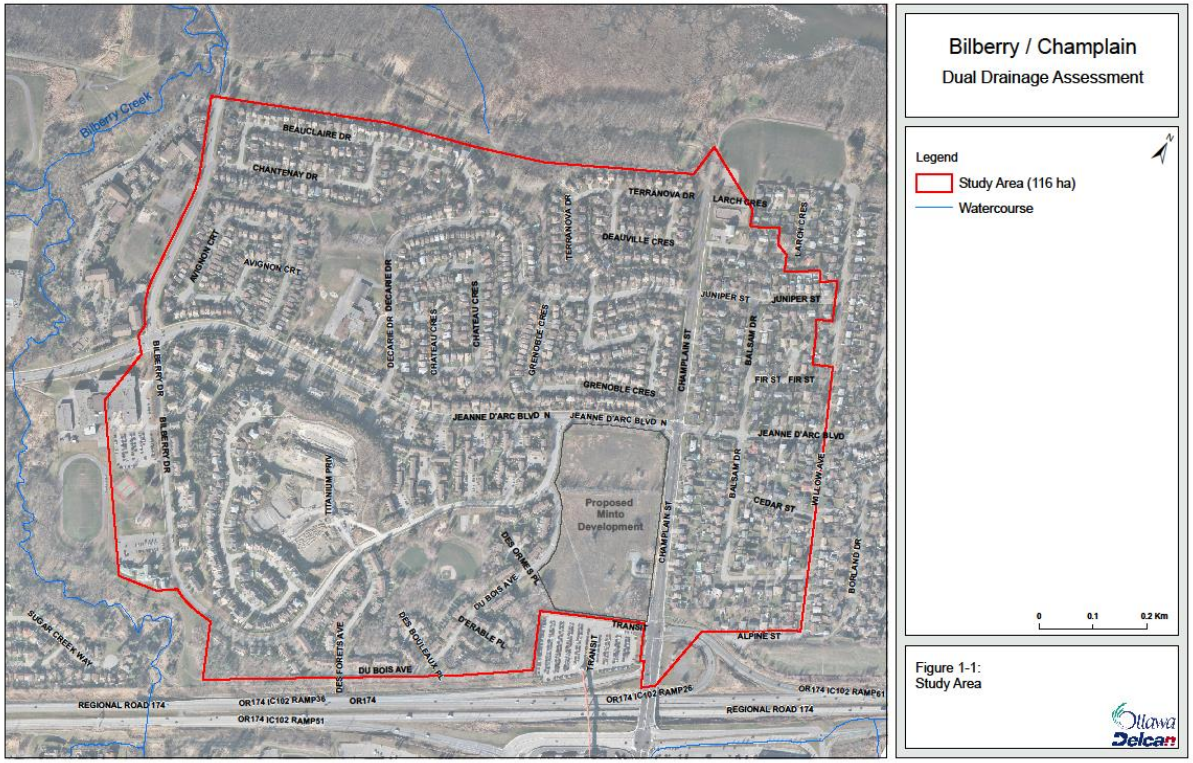
Study Area



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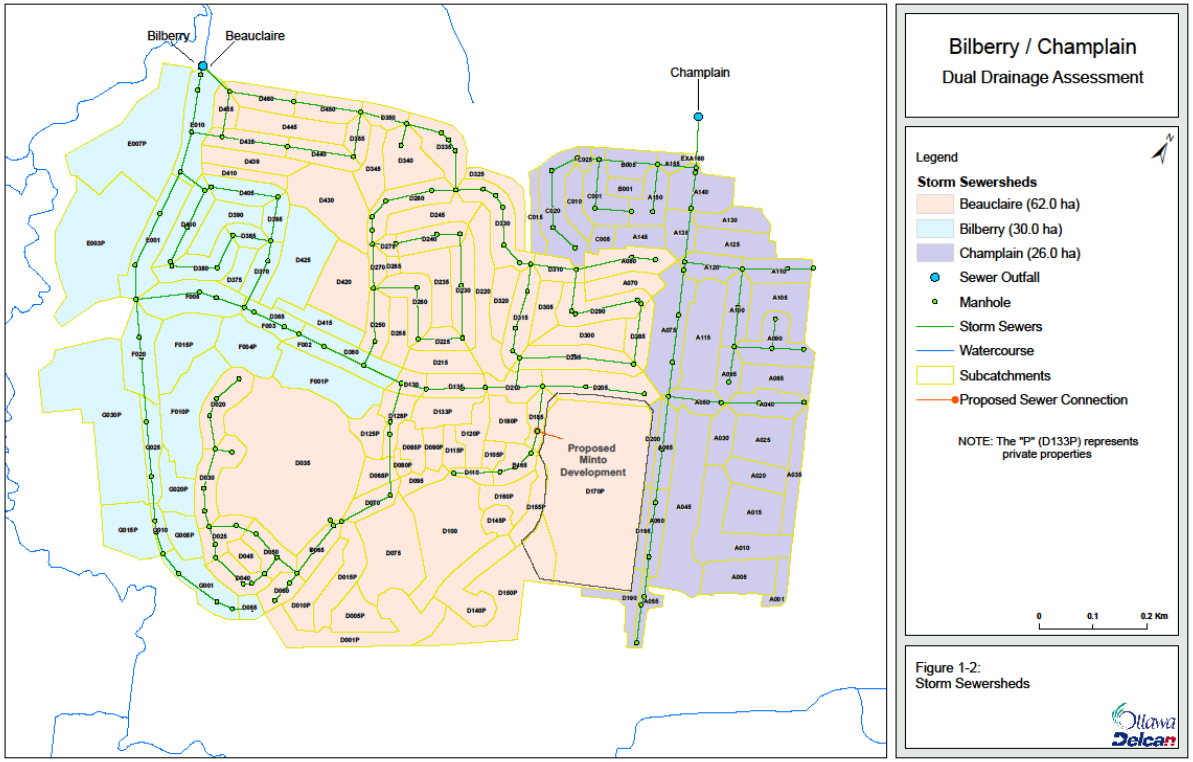
Storm Sewershed



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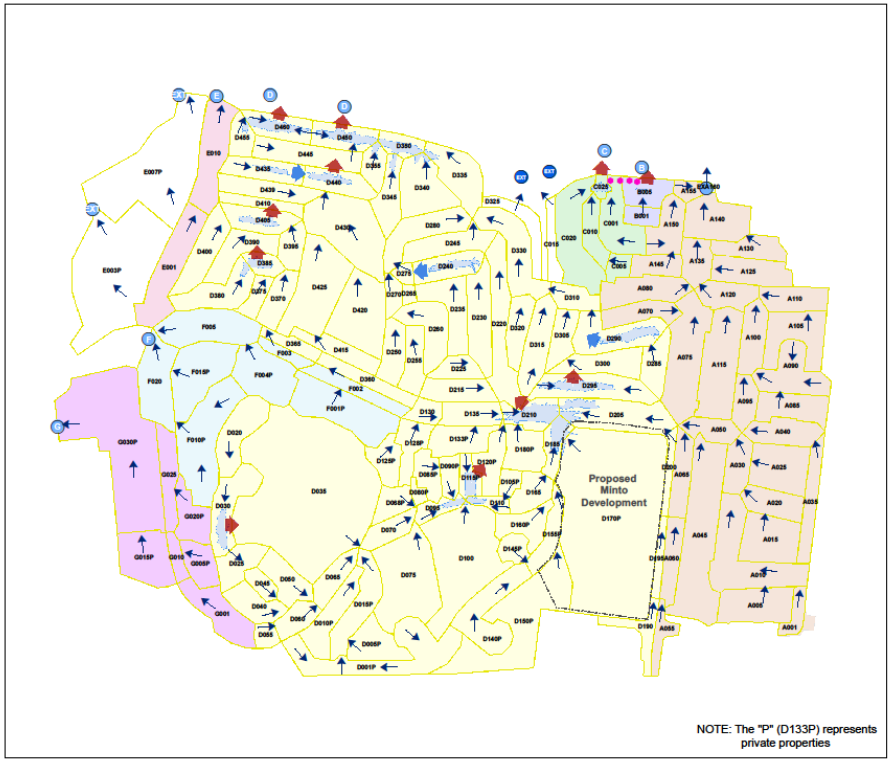
Major Drainage Areas



Bilberry / Champlain

Dual Drainage Assessment

Legend

- Major Flow Direction
- Pond Spilling Discharge
- Pond Spilling Discharge Through Private Property
- Subcatchments
- Major Outlets
- Exterior Sheet Flow-Away from Major System
- Depressed Driveway
- Low Point (Spilling Elevation)

Major Drainage Areas

- A (22.75 ha)
- B (.70 ha)
- C (2.70 ha)
- D (68.25 ha)
- E (2.20 ha)
- F (7.75 ha)
- G (7.0 ha)

0 0.1 0.2 Km

Figure 2-1:
Major Drainage Areas

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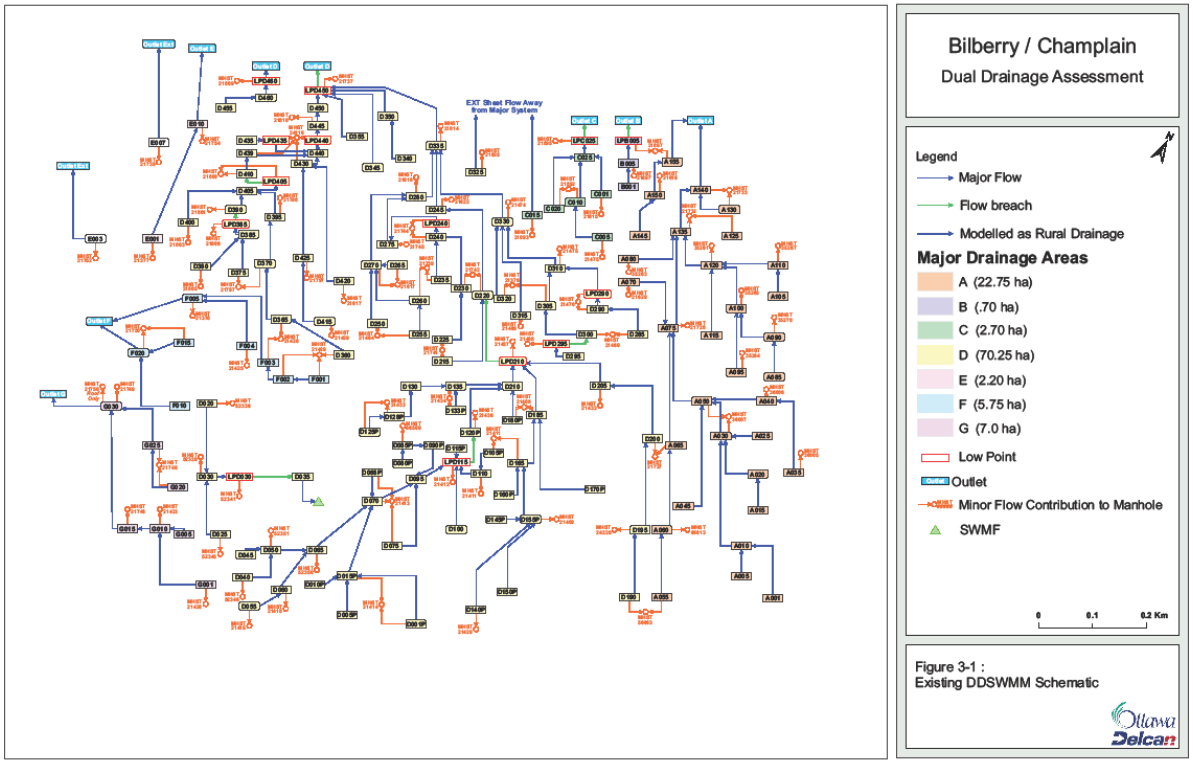
Hydrologic Modelling (DDSWMM)



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Impervious Surfaces

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Inlet Types

Inlet Type	% of Total
Standard	57
Fish Type	18
Curb Inlet	5
Ditch Inlet	2
Private/ Inaccessible	18

Standard

Fish Type

Curb Inlet

Ditch Inlet

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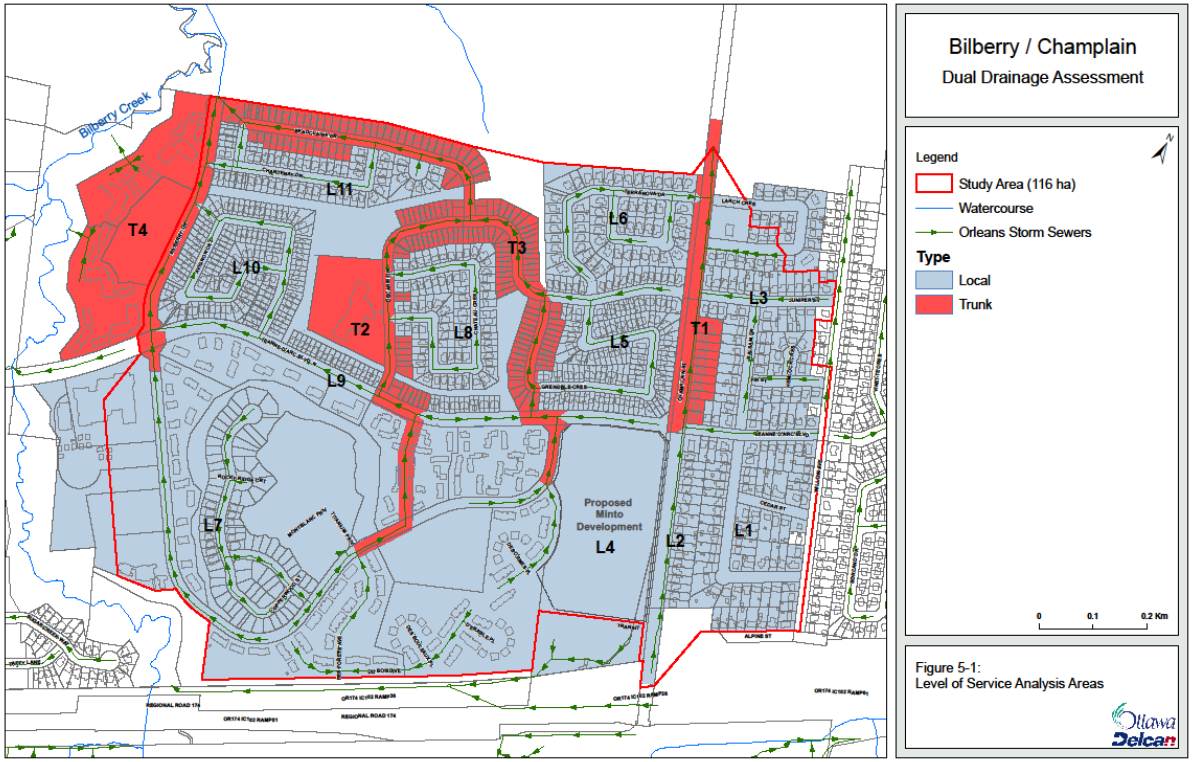
Level of Service Analysis Areas



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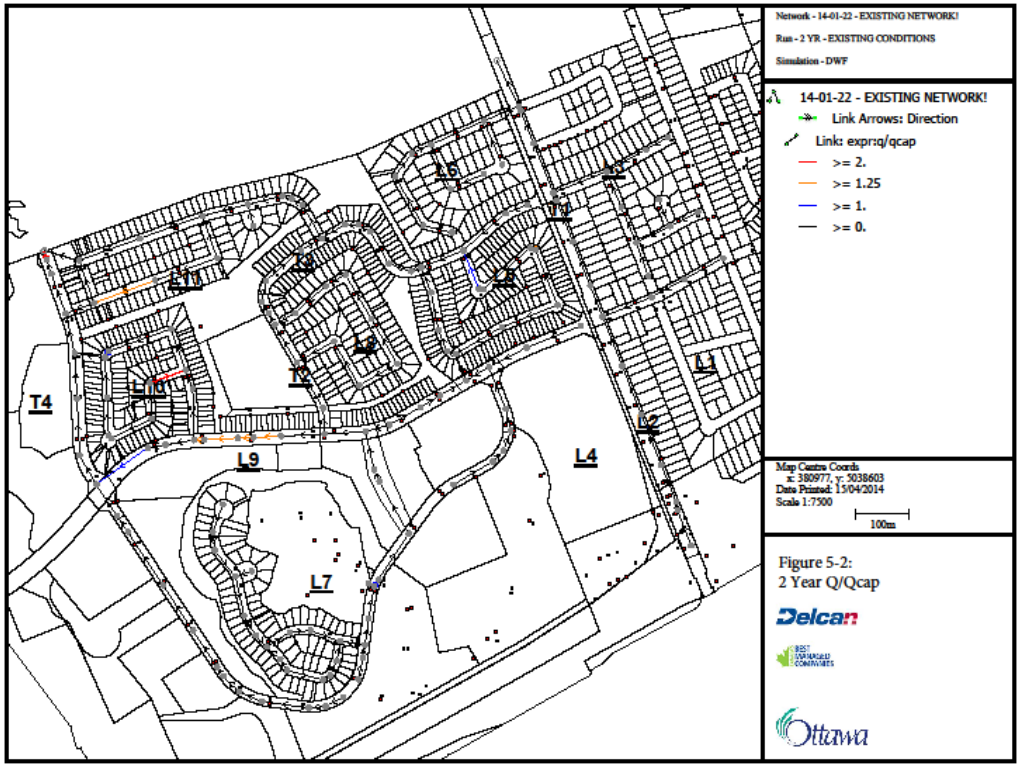
Hydraulic Analysis (Infoworks CS)



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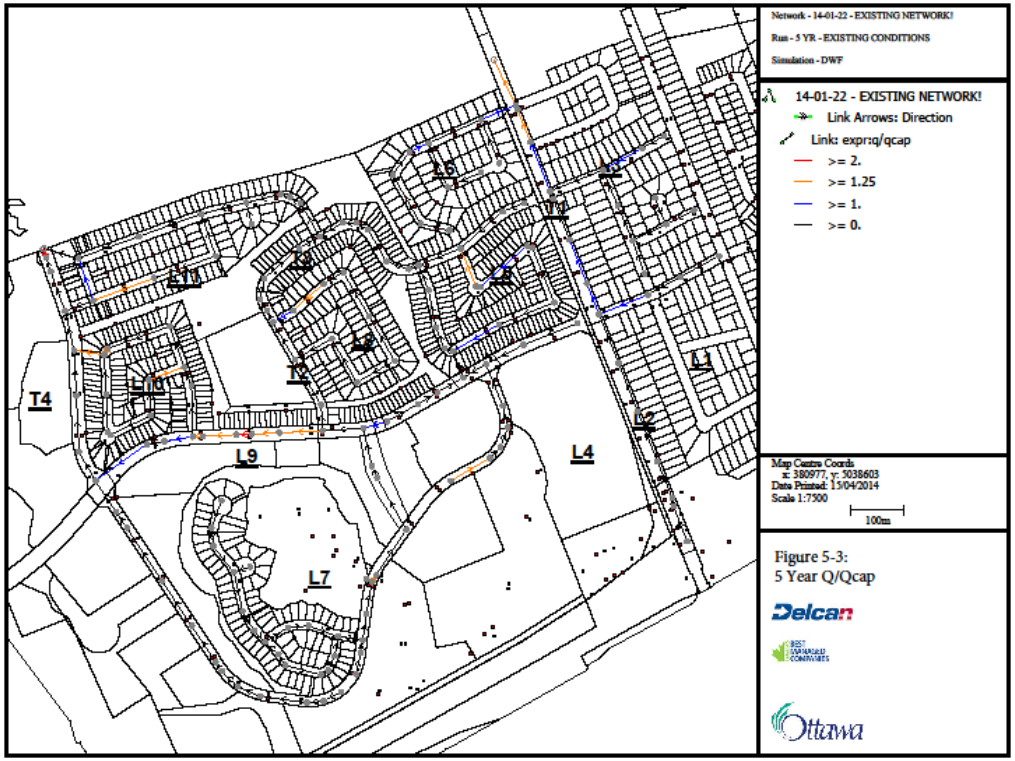

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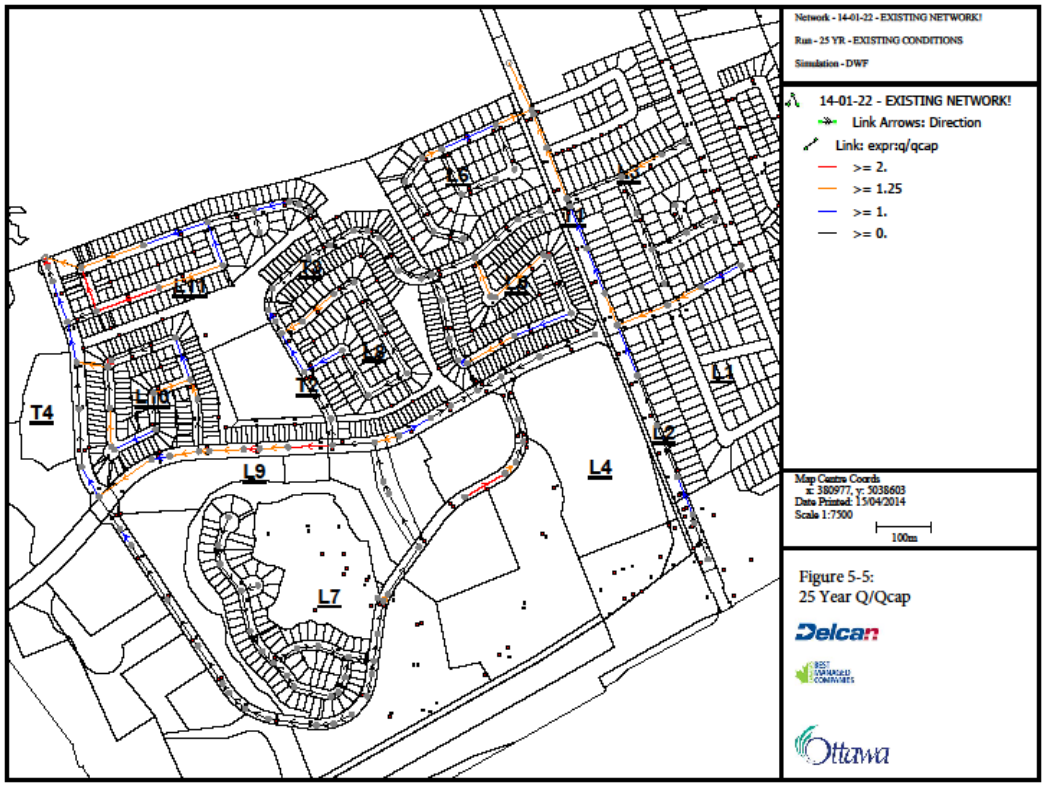

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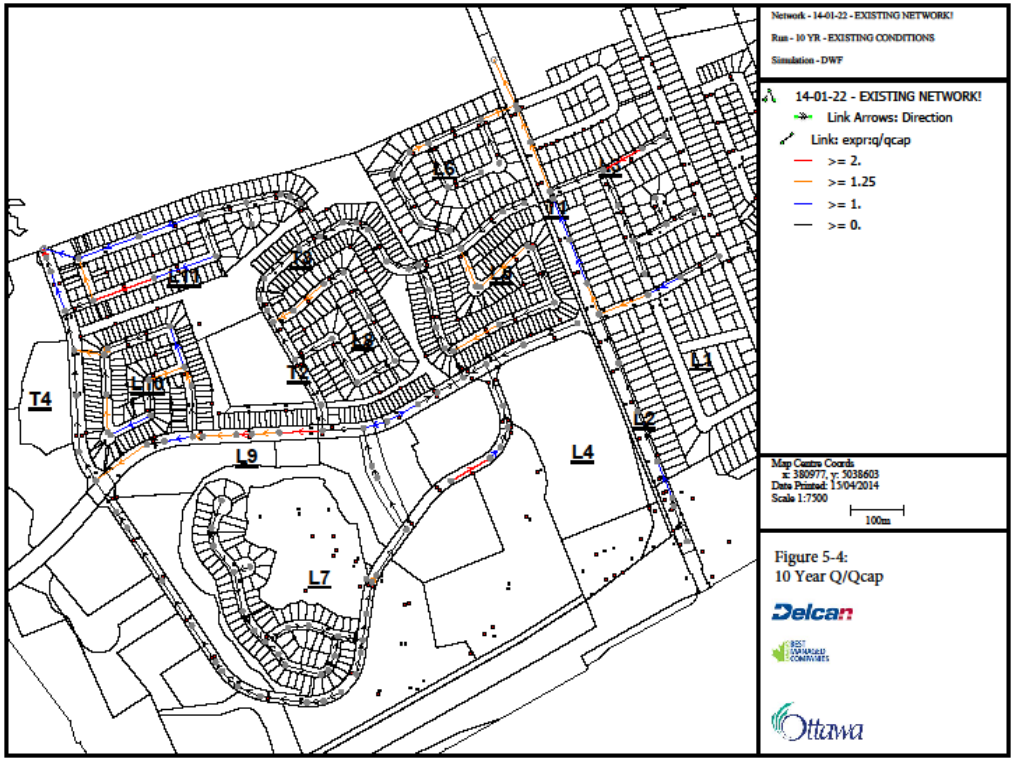
Hydraulic Analysis (Infoworks CS)



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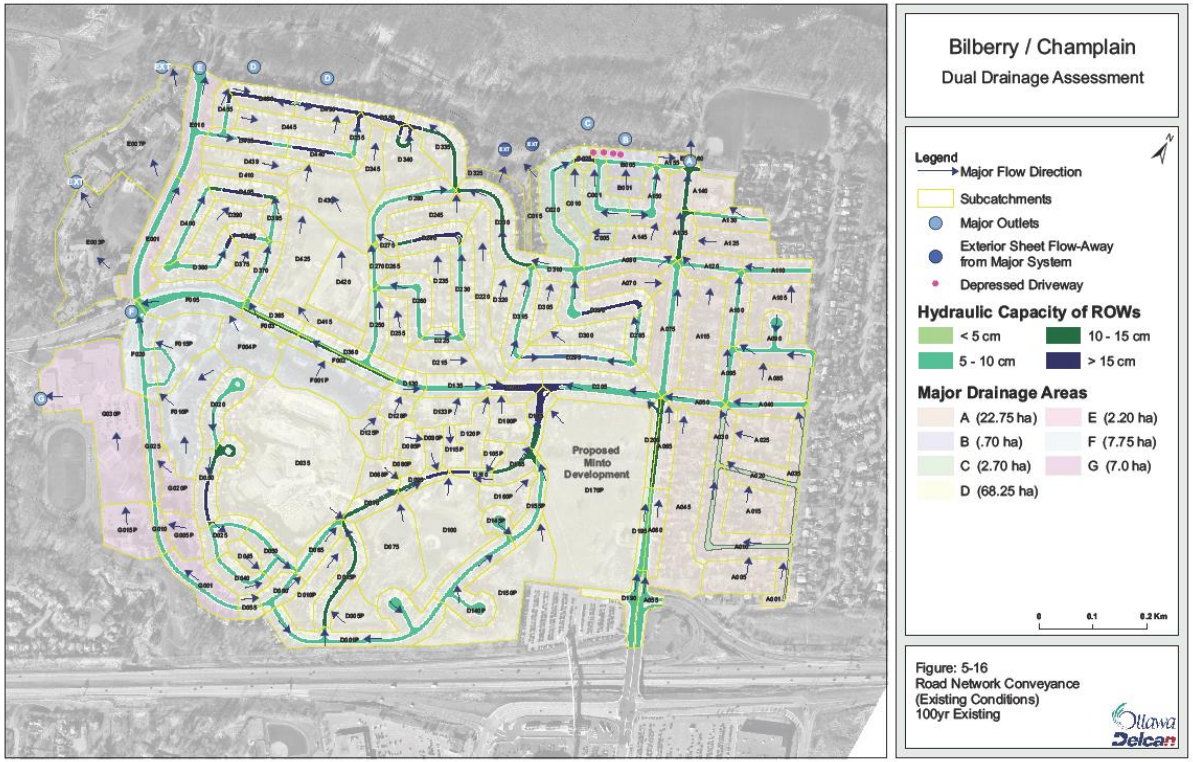
Existing ROW Capacity



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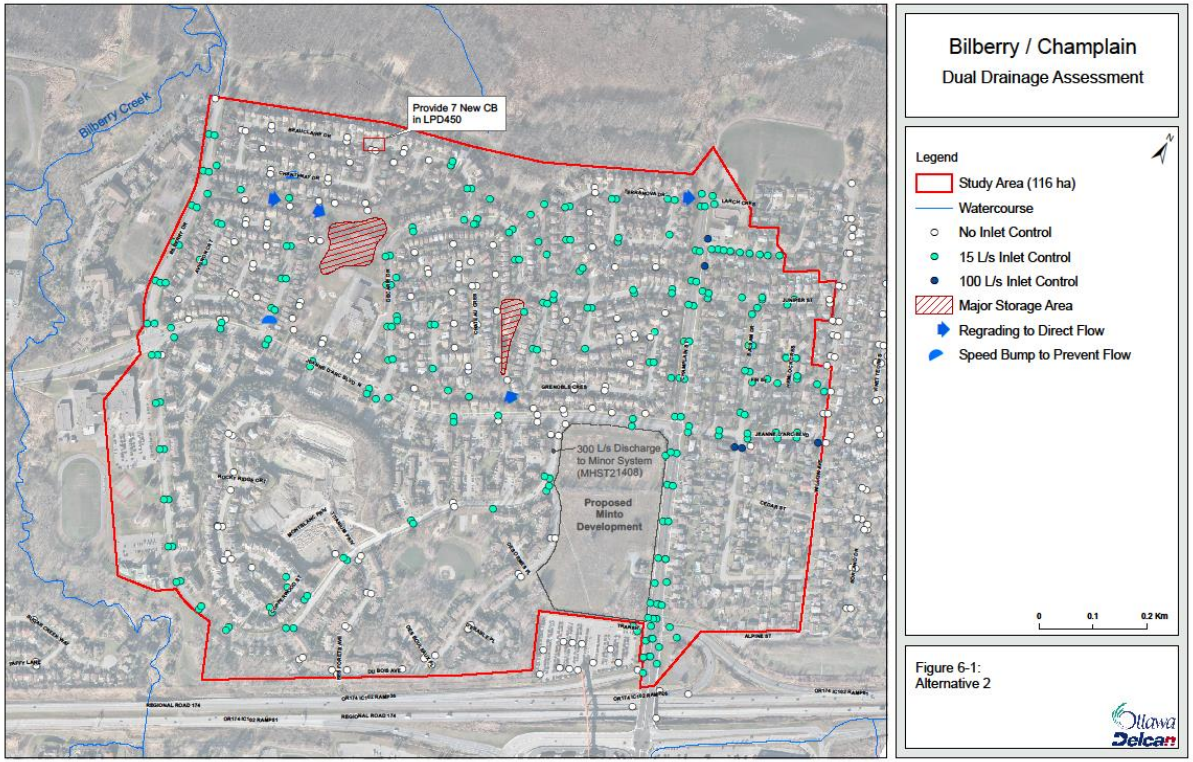
Alternative #2
ICD Program @ 15L/s



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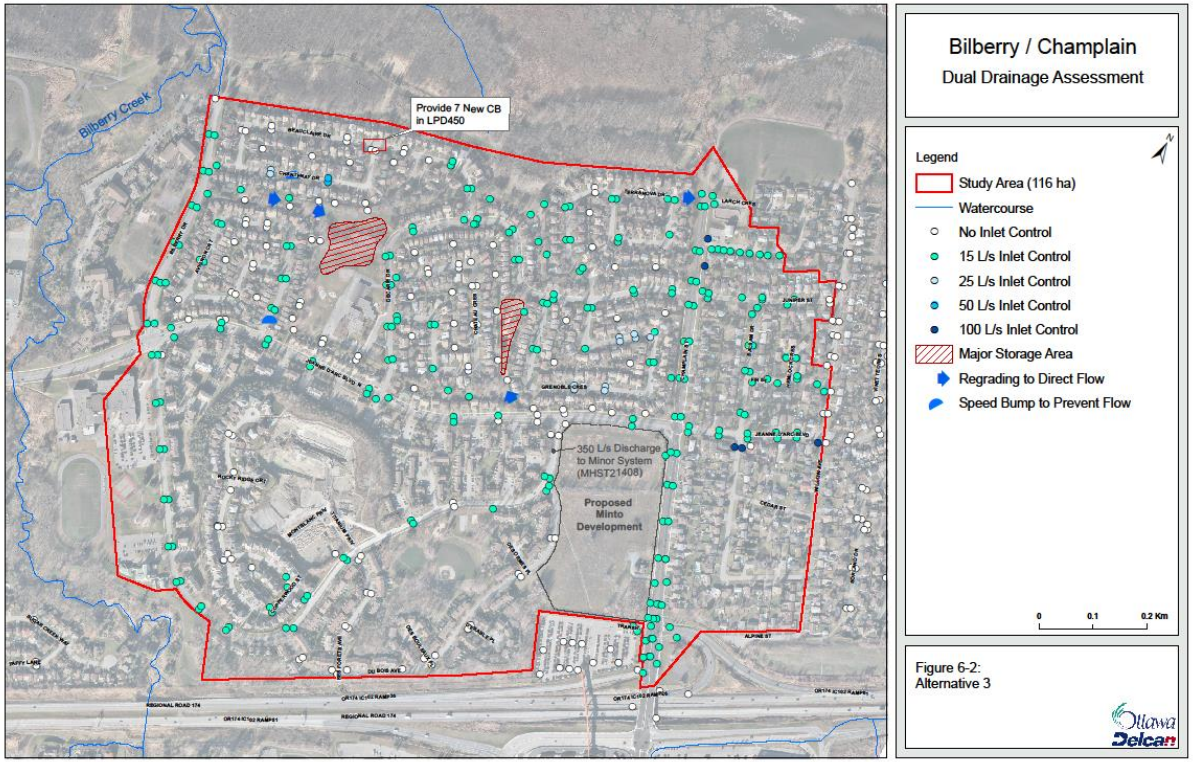
Alternative #3
ICD Program & Selective LPC @ 15L/s



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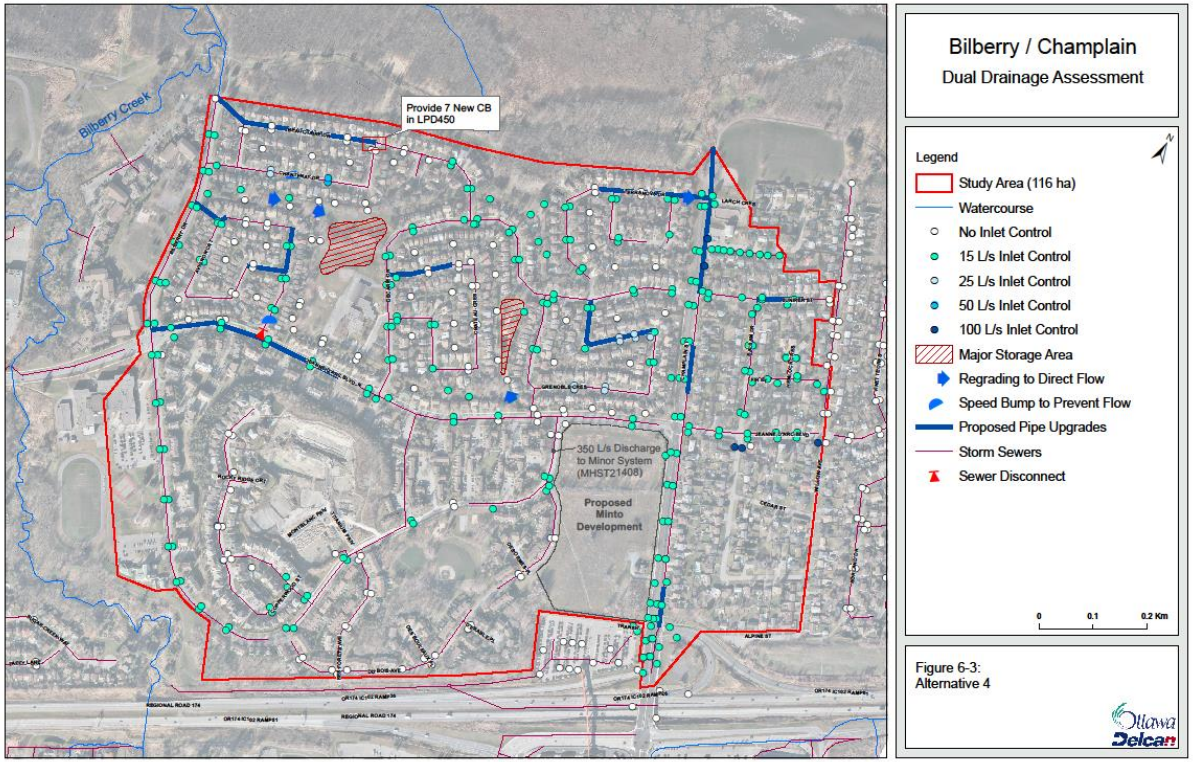
Alternative #4
Pipe Upgrade



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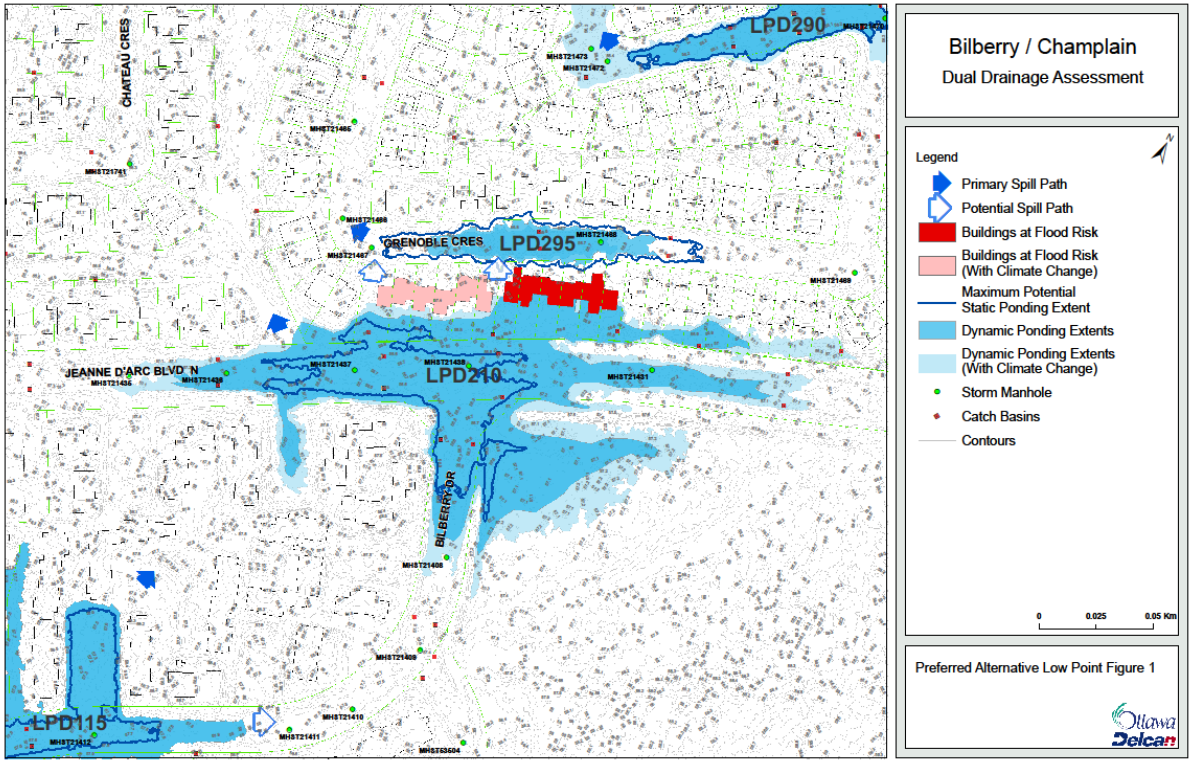
Results: Ponding Areas LP1



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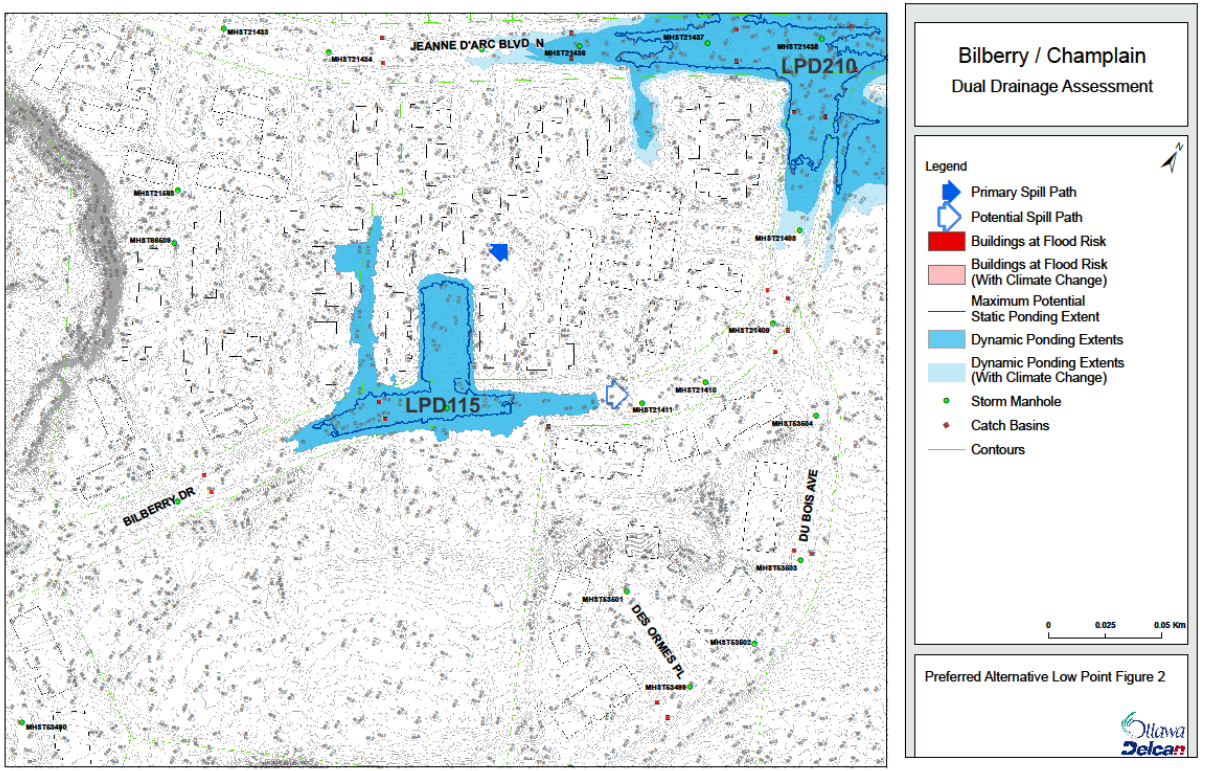
Results: Ponding Areas LP2



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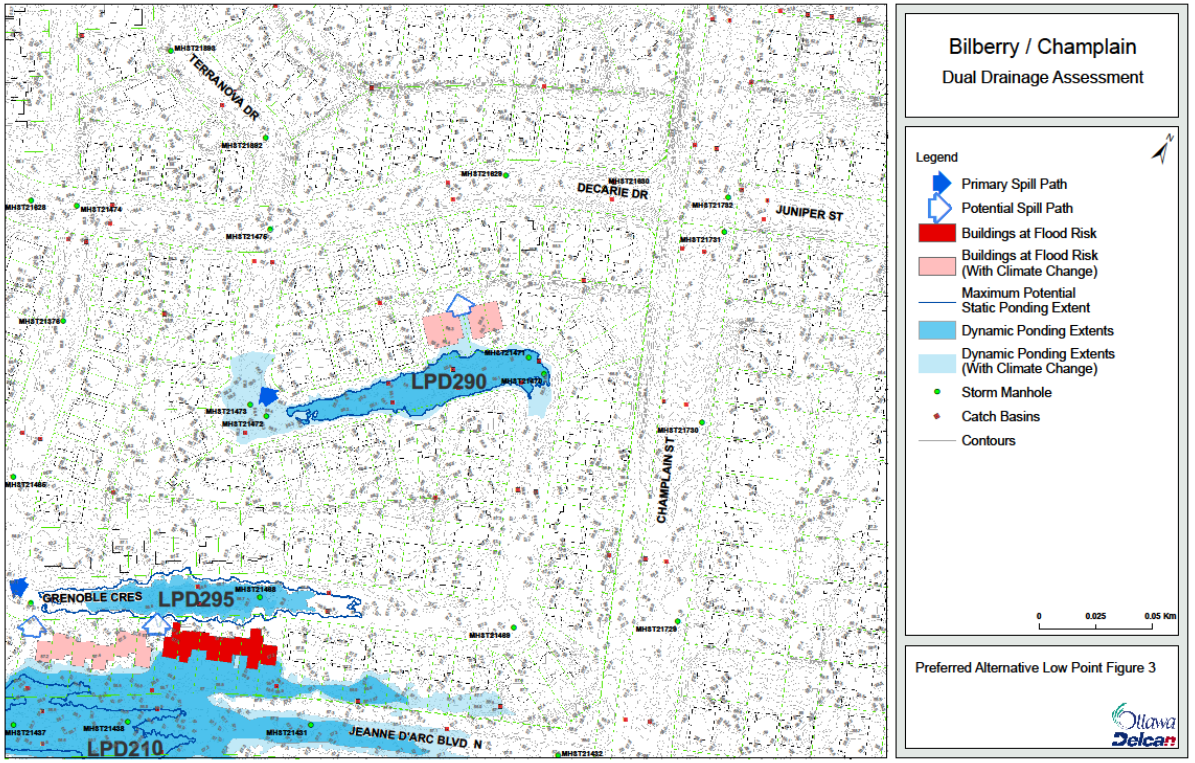
Results: Ponding Areas LP3



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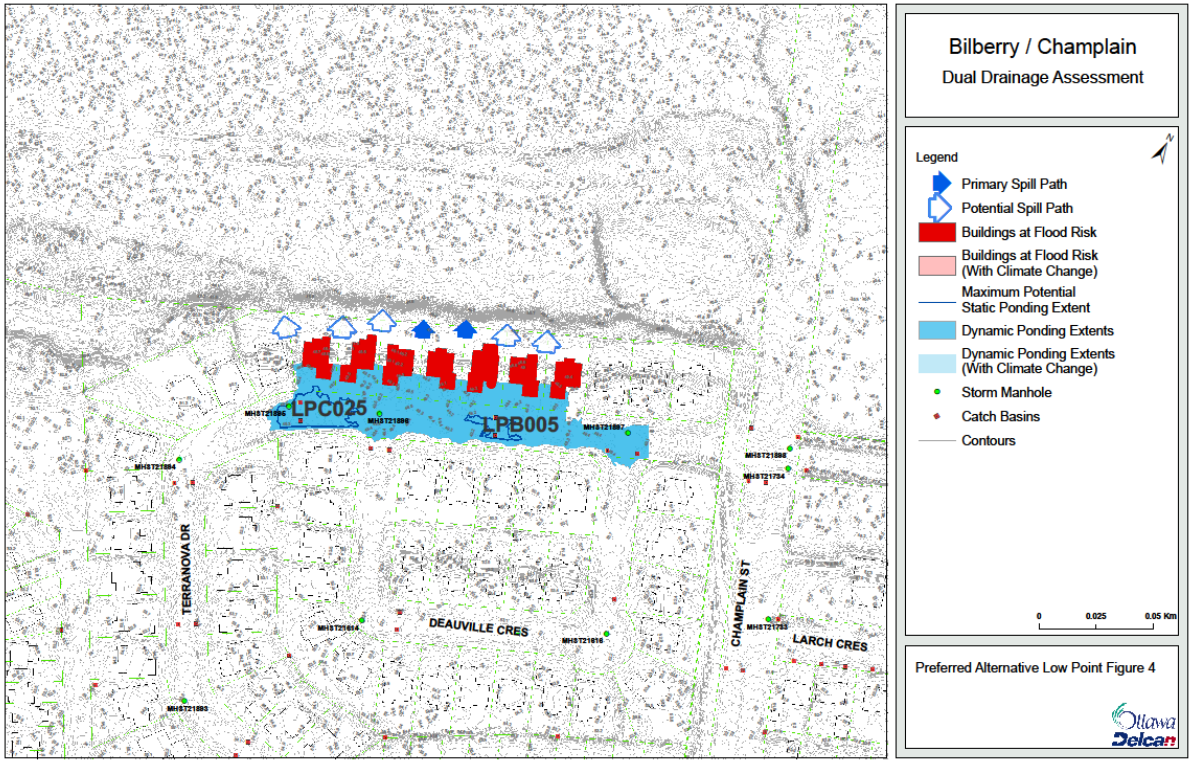
Results: Ponding Areas LP4



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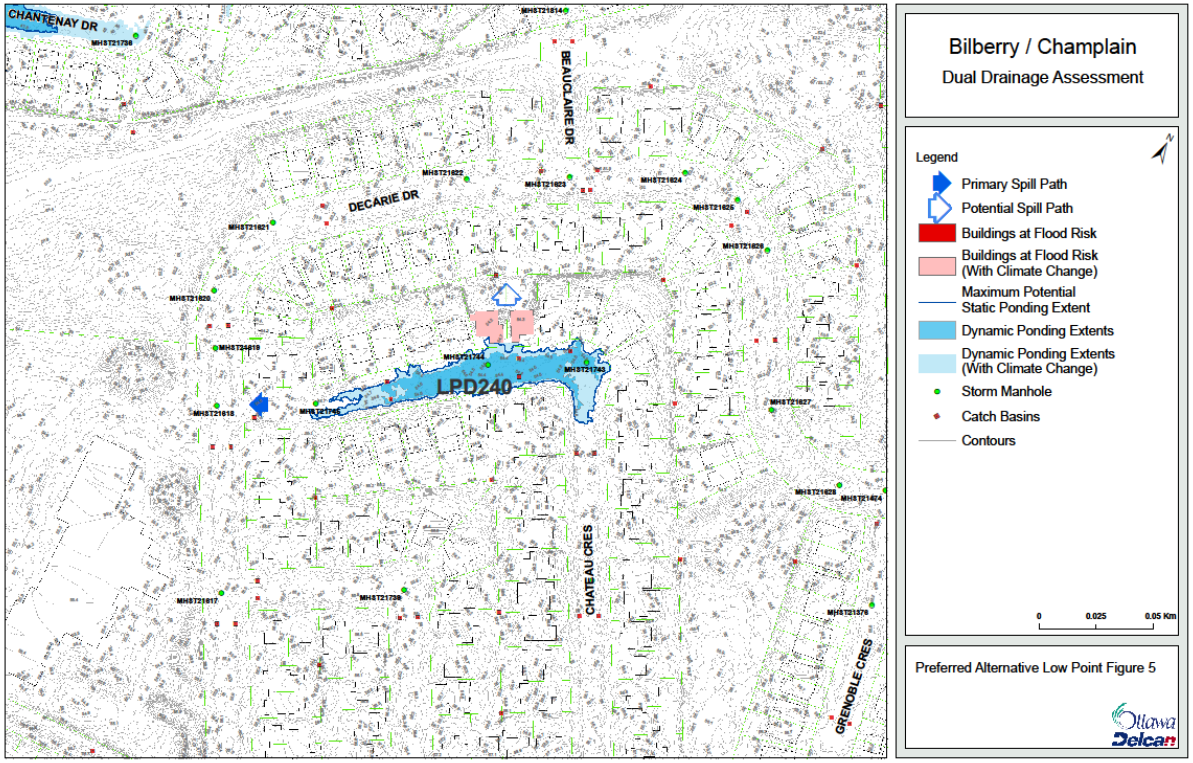
Results: Ponding Areas LP5



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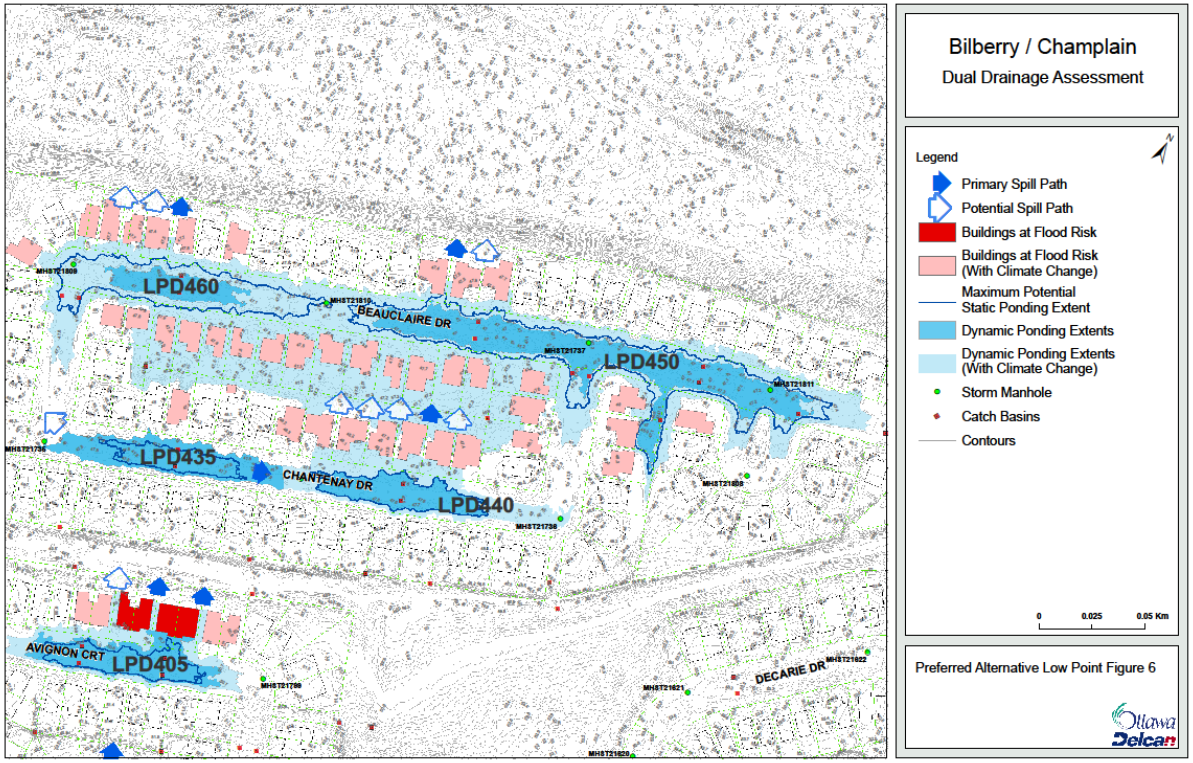
Results: Ponding Areas LP6



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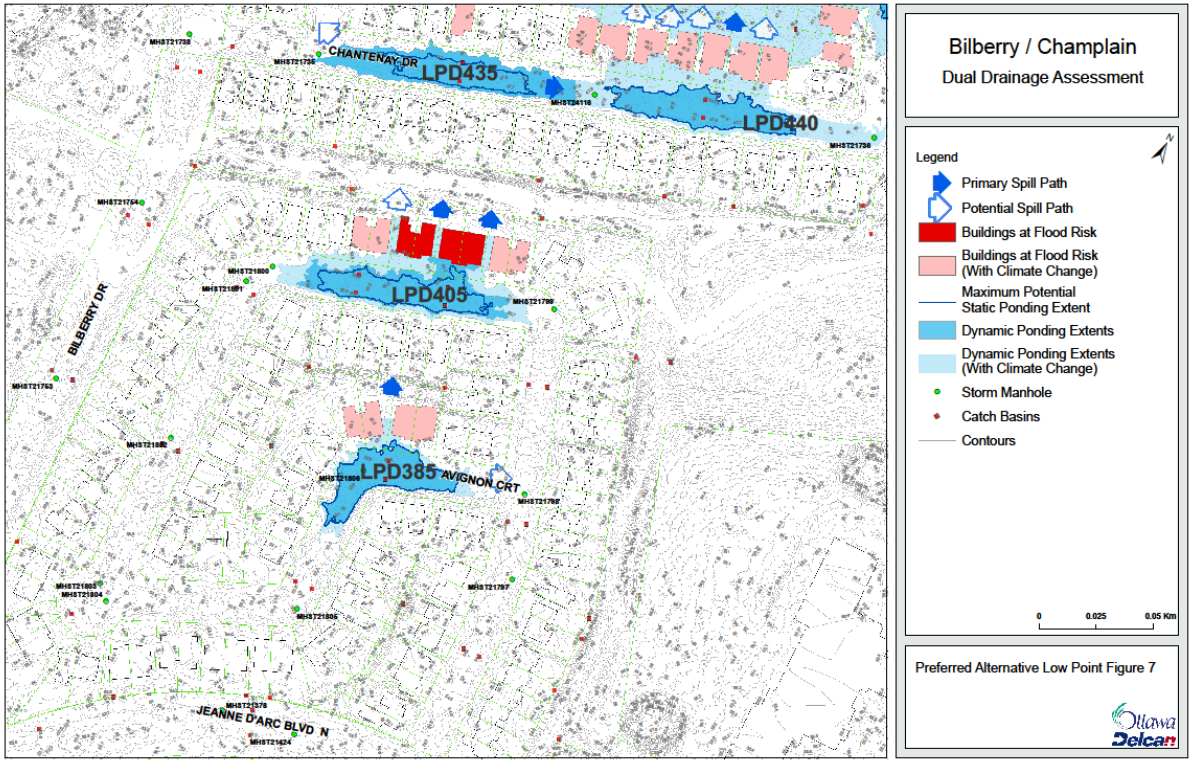
Results: Ponding Areas LP7



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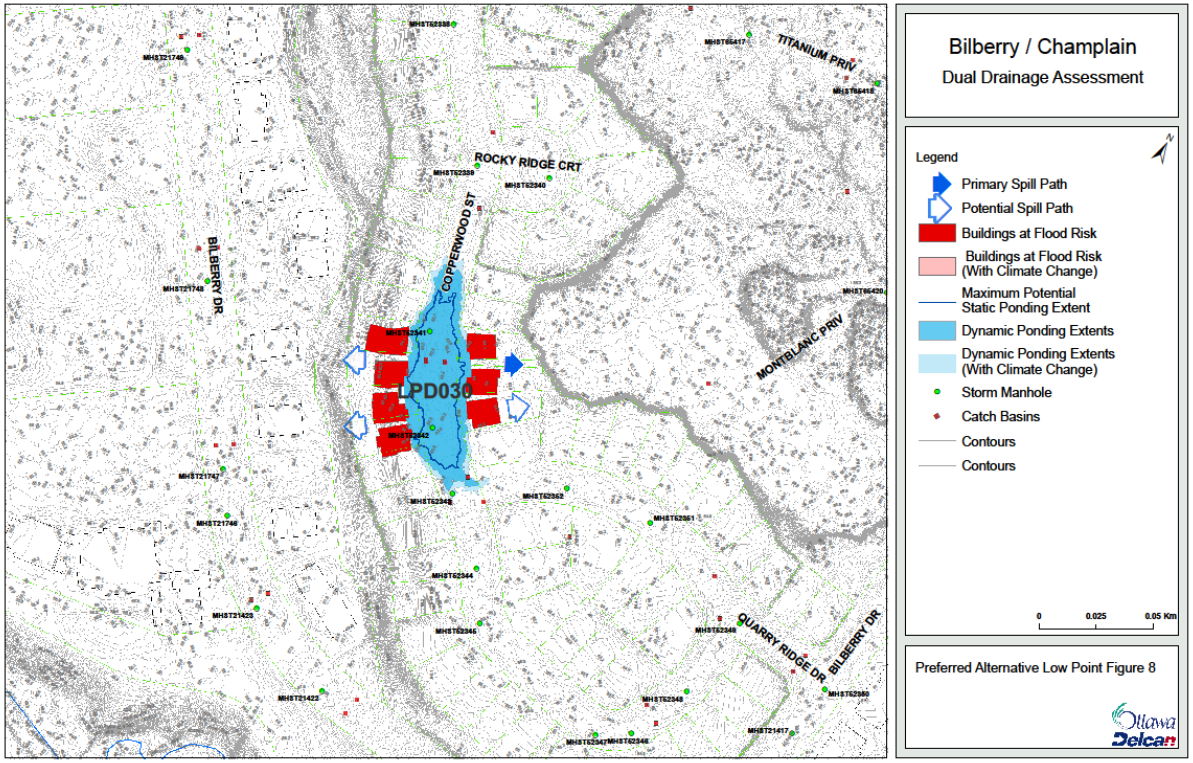
Results: Ponding Areas LP8



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Results: Minor System

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Results: Minor System Level of Service

LEVEL OF SERVICE ANALYSIS

BILBERRY / CHAMPLAIN DUAL DRAINAGE ASSIGNMENT

CITY OF OTTAWA

			IMPLEMENTATION COSTS[4]	TRUNK SEWERS[1]				LOCAL SEWERS[1]										
				T1	T2	T3	T4	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11
				TRUNK SERVICE →				T1	T1	T1	T3	T3	T1	T2	T2	T4	T4	T3
EXISTING CONDITIONS			$ -	2	10	10	100	100	5	2	100	2	2	50	2	0	0	5
EXISTING CONDITIONS - STRESS TEST FOR CLIMATE CHANGE			$ -	2	10	10	< 100	100	5	2	100	2	2	50	2	0	0	5
ALT #1 EXISTING CONDITIONS																		
Minto Release Rate = 100L/s			$ -	2	10	10	100	100	5	2	100	2	2	50	2	0	0	5
ALT #2 ICD PROGRAM @ 15L/s																		
Minto Release Rate = 100L/s				2	25	10	100	100	10	2	100	2	2	100	2	2	0	10
Minto Release Rate = 200L/s				2	25	10	100	100	10	2	100	2	2	100	2	2	0	10
Minto Release Rate = 300L/s			$ 205,427	2	25	10	100	100	10	2	100	2	2	50	2	2	0	10
Minto Release Rate = 350L/s				2	25	5	100	100	10	2	100	2	2	25	2	2	0	10
ALT #3 ICD and SELECTIVE LPC PROGRAM @ 15L/s, 25L/s and 50L/s																		
Minto Release Rate = 300L/s				2	25	10	100	100	10	2	100	5	2	100	2	2	0	10
Minto Release Rate = 350L/s			$ 208,677	2	25	10	100	100	10	2	100	5	2	50	2	2	0	10
Minto Release Rate = 400L/s				2	25	10	100	100	10	2	100	5	2	25	2	2	0	10
ALT #4 MINOR SYSTEM IMPROVEMENTS[2,3]																		
T1		Champlain - 95m Outlet Upgrade	$ 319,827	2				100	10	2			5					
T1		Champlain - 270m Pipe Upgrade	$ 524,577	5				100	25	5			5					
T1		Champlain - 360m Pipe Upgrade	$ 635,727	25				100	25	5			5					
T1		Champlain - 360m (with upgraded outlet)	$ 668,677	100				100	25	5			5					
T1	L2	Champlain - 75m Pipe Upgrade	$ 727,677						100									
T1	L3	Juniper - 84m Pipe Upgrade	$ 760,677							100								
T1	L6	Terranova - 220m Pipe Upgrade	$ 903,677										100					
T2	L8	Chateau - 121m Pipe Upgrade	$ 347,677		25										10			
T3		Beauclaire - 380m Outlet&Pipe Upgrade	$ 1,120,677			10					100	5						100
T3	L5	Grenoble - 215m Pipe Upgrade	$ 1,342,677			10					100	100						100
T4	L9	Jeanne D'Arc - 370m Pipe Upgrade	$ 605,677													50		
T4	L10	Avignon - 145m Pipe Upgrade	$ 368,177														0	
T4	L10	Avignon - 230m Pipe Upgrade	$ 621,177														50	
		TOTAL OF ALL MINOR SYSTEM IMPROVEMENTS	$ 2,977,677	100	25	10	100	100	100	100	100	100	100	50	10	50	50	100
		STRESS TEST FOR CLIMATE CHANGE		< 100	25	10	< 100	100	< 100	100	100	< 100	100	50	10	50	50	< 100

NOTE:
1. Level of service is based on available freeboard within sewer. If freeboard is greater than or equal to 2 mbgs, service is deemed to be adequate.
2. "Minor System Improvements" builds upon the ICD and Selective LPC Program by upgrading pipe sizes to provide additional level of service.
3. A recommended release rate for the Minto Development at 350L/s is carried forward for all subsequent iterations.
4. Major system storage provided in depressed areas within open space land use types. Includes all previous improvements from above.
5. Implementation costs are cumulative to achieve the noted level of service. i.e. All minor system improvement costs incorporate the costs of ICD Programs. Incremental costs are provided in a separate Class D Cost Estimate in the appendices.

Results: Major System Level of Service

LEVEL OF SERVICE ANALYSIS - PONDING AREAS

BILBERRY / CHAMPLAIN DUAL DRAINAGE ASSIGNMENT

CITY OF OTTAWA

	EXISTING LOW POINTS[1]													PROPOSED LOW POINTS[2]	
	B005	C025	D030	D115	D210	D240	D290	D295	D385[5]	D405	D435	D440[5]	D450	D430	D220
SEWER SERVICE →	L6	L6	L7	L7	T3	L8	L5	L5	L10	L10	L11	L11	T2	L11	T3
EXISTING CONDITIONS	10	10	2	100	10	100	100	100	100	10	100	100	25	100	n/a	n/a
ALT #1 EXISTING CONDITIONS Minto Release Rate = 100L/s	10	10	2	100	25	100	100	100	100	10	100	100	25	100	n/a	n/a
ALT #2 ICD PROGRAM @ 15L/s PLUS MAJOR SYSTEM IMPROVEMENTS	100	10	2	100	10	100	100	100	100	10	100	100	100	100	100	100
ALT #3 ICD and SELECTIVE LPC PROGRAM @ 15L/s, 25L/s, and 50L/s PLUS MAJOR SYSTEM IMPROVEMENTS	100	10	2	100	10	100	100	100	100	10	100	100	100	100	100	100
MINOR SYSTEM IMPROVEMENTS[3]	100	10	2	100	10	100	100	100	100	10	100	100	100	100	100	100

LEGEND: 100 Increase in Level of Service compared to existing conditions.
25 Decrease in Level of Service compared to existing conditions.

NOTE:
1. Level of service is based on ponding depths that could increase risk of surface flooding to private property. If no risk to private property exists, service is deemed to be adequate.
2. Level of service within proposed low points is based on available storage and impact on downstream private properties.
   If required storage is less than or equal to storage provided or impact to downstream private properties is reduced, service is deemed to be adequate.
3. Since none of the minor system improvements (in terms of pipe upgrades), will increase the level of major system service, this row is provided for consistency/presentation purposes only.
4. Major system storage provided in depressed areas within open space land use types. Includes all previous improvements from above.
5. When subjected to a stress test for climate change, existing level of service is less than 1:100 years.

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