J.F. Sabourin and Associates Inc.
52 Springbrook Drive,
Ottawa, ON K2S 1B9
T 613-836-3884 F 613-836-0332
jfsa.com

February 6, 2019 Project #: P1581

David Schaeffer Engineering
120 Iber Road, Unit 103
Stittsville, ON, K2S 1E9

Attention: **Mr. Steve Pichette, P.Eng.**

Subject: **Kanata Golf & Country Club – 2018 Surface Infiltration Testing**

Testing equipment, site selection and methodology

In the fall of 2018, surface infiltration testing was conducted by JFSA at four sites on the Kanata Golf & Country Club in order to quantify the pre-development surface infiltration rates. Refer to **Figure 1** for site locations and the Test Locations section of this memorandum for a description of site selection. These surface infiltration measurements and observations may be used to inform the subsequent hydrologic modelling of the site, provide a better understanding of the runoff potential and to assess the feasibility to design and implement Low Impact Development (LID) measures for any future development.

Surface infiltration testing at all four sites was conducted at the ground surface using a Double-Ring Infiltrometer (DRI), manufactured by Turf-Tec and shown in **Figure 2**. The DRI setup consisted of a set of concentric rings inserted into the soil connected to a water supply, wherein water is ponded on the soil and Marriotte bottles (also manufactured by Turf-Tec) were used to replenish infiltrated water and maintain a constant water depth in the rings. The volume of water needed to maintain a constant water level in the inner ring indicates the volume of water infiltrated over time. Water in the outer ring acts as a buffer as it infiltrates into the soil, limiting lateral spread of infiltrating water in the inner ring and encouraging vertical infiltration. Climate conditions prior to and during the test are provided on **Table 1**. Results of the DRI tests are provided on **Table 3**.

In addition to the DRI tests, Single-Ring Infiltrometer (SRI) surface infiltration tests were conducted at each of the four sites. See **Figure 3** for an example of the SRI setup. Marriotte bottles were used to maintain a constant head during SRI tests. At sites 1 and 2, constant head SRI tests were successfully run. At sites 3 and 4, field staff were not able to complete constant head SRI tests as a constant head of water could not be sustained. At all 4 sites, falling-head SRI tests were run in the same vicinity as the DRI tests. SRI and falling head tests were completed to provide alternative methods to measure infiltration rates and for comparison with the DRI results. Refer to the Test Methodology section of this memorandum for a more detailed description of how each of the test types was run.

Figure 2: Double-Ring Infiltrometer Setup (15/30 cm rings, two Marriotte bottles)

Figure 3: Single Ring Infiltrometer Setup (12.7 cm diameter steel ring, single Marriotte bottle)

Test locations

Four sites were identified for surface infiltration testing. Site selection was based on an initial field survey conducted by Geofirma on November 5th, 2018 and based on areas assumed to describe the overall behaviour of infiltration that is generally representative across the site. Site selection was also done within the time and weather constraints present at the time of testing. Refer to **Table 2** for information about each of the four sites, including a general description of the soil at each test pit, a list of the tests undertaken at each site, and the soil temperature.

JFSA field crew conducted surface infiltration tests on November 7th and 8th, 2018. As previously discussed, multiple surface infiltration tests were undertaken at each site.

The four sites where field observations were made, and surface infiltration measurements collected are shown in **Figure 1**. The sites are numbered 1 through 4, and all tests at a given site were conducted within a few meters of each other. Due to aeration activities on the golf course fairways, all tests were conducted in the adjacent roughs, where the grasses were longer and the soils were undisturbed. Refer to **Table 1** for more information about climate conditions leading up to and during the testing period.

Table 1: Climate Data During Testing (Testing Days are Shaded in Grey)*

Day	Temperature (°C)			Rain (mm)	Snow (cm)	Precipitation (mm)	Snow on Ground (cm)
	Max	Min	Mean				
4	7.5	0.5	4.0	0.0	0.0	0.0	0
5	6.0	1.5	3.8	0.6	0.0	0.6	0
6	13.0	2.5	7.8	6.2	0.0	6.2	0
7	11.5	8.0	9.8	0.0	0.0	0.0	0
8	8.0	2.0	5.0	0.0	0.0	0.0	0

* Environment Canada Data, Ottawa CDA.

Table 2: Surface Infiltration Test Locations

Date	Testing Site ID	Soil Temperature (°C)	Location	General Description of Soil Observed in Test Pit Adjacent to Test Location
2018-11-07	1	8.3	Golf hole #1, 30 metres southwest of putting green. Testing took place in rough between cart path and fairway.	**0-5 cm:** Grass, roots, clayey soil. **5-15 cm:** Darker colour sand/clay mix. **15-30 cm:** Lighter colour sand /clay mix. Total depth of test pit: **30 cm**
2018-11-08	2	5.6	Golf hole #11, 25 metres southeast of putting green. Testing took place in rough on east side of fairway, between bunker and green.	**0-8 cm:** Grass, roots, high organic content, dark clayey sand. **8-30 cm:** Dark clayey sand. **30-35cm:** Light sandy soil, low clay content. Total depth of test pit: **35 cm**
2018-11-08	3	6.1	Golf hole #5, 55 metres southeast of putting green. Testing took place in rough on northeast side of fairway.	**0-8 cm:** Grass, roots, dark clayey sand. **8-15 cm:** Darker clayey sand. **15-30 cm:** Lighter colour, higher sand content, low clay content. Total depth of test pit: **30 cm**
2018-11-08	4	6.7	Golf hole #6, 150 metres northwest of putting green. Testing took place in rough on northeast side of fairway.	**0-4 cm:** Grass, roots, medium clay content. **4-15 cm:** Darker clayey sand. **15-30 cm:** Grey, tight clays. Total depth of test pit: **30 cm**

Test Methodology

Upon arrival at each site, a test pit was dug using a small spade in order to quantify the character of the soil column. Information about the different soil layers found at each site can be found in **Table 2**. All tests were completed within a few meters of the soil test pit, in order to ensure that the character of the soil underlying each test was known. Measurements of layer depths were completed using handheld tape measures. In preparation for each set of tests, soil temperature was measured using a small field thermometer at a depth of approximately 30 mm.

At each of the four test sites surface infiltration testing was conducted at the ground surface using 2-3 different methods. Metal rings were used for the various surface infiltration tests, and all rings were driven into the soil using a sledge hammer and a block of wood. Primarily, a DRI test was completed at each site. The DRI consists of two concentric galvanized steel rings including a 15.24 cm inner ring and a larger 30 cm diameter outer ring. At all four sites, the DRI was inserted into the ground to a depth of 5 cm. 10 liter Mariotte bottles were connected to each of the two rings by clear polypropylene tubes. Each ring was partially filled with water and then valves on the Mariotte bottles were opened to maintain the water in the rings at a constant level. The volume of water added to the inner ring to maintain the constant water level (constant head) was measured and recorded. In this way, the volume of water that infiltrated the soil could be recorded, and the dimensions of the instrument were used to compute surface infiltration rates. The volume infiltrated is converted to an incremental infiltration velocity which is equivalent to the surface infiltration rate. Refer to **Attachment 1** for details of the DRI tests.

It is noted that the DRI tests conducted by JFSA generally followed the ASTM-D3385-09 standard test method. However, the ASTM-D3385 guideline suggests larger metal rings be used for this type of test with inner and outer ring diameters of approximately 30 cm and 60 cm, respectively. It is JFSA's understanding that the use of smaller ring sizes for DRI tests could produce infiltration rates that are different, when compared to the same test using larger ring sizes. However, it is also understood that due to the variability of infiltration rates over a broad area, it is preferable to complete measurements in as many locations as possible. Making use of the suggested ring sizes per ASTM-D3385, the number of possible surface field measurements would be significantly limited due to the cumbersome size and excessive water requirements of such instruments particularly given the challenging site and weather conditions encountered. JFSA thereby decided to make use of the DRI with smaller ring sizes for field testing at each of the four sites.

Constant-head SRI tests were conducted in much the same way as the DRI tests, but only one ring and Marriotte bottle was used. At testing sites 1 and 2, constant-head SRI tests were successfully completed using a 12.7 cm diameter metal ring. At both of these sites, the single rings were inserted to a depth of 5 cm below ground surface.

Further to the two types of constant-head tests, falling-head single ring tests were completed at all four sites. Falling head tests were conducted using single metal rings, inserted to a depth of 5 cm. Water was ponded on the surface inside the ring, and the changes in depth were recorded at a chosen time interval throughout the duration of the test. Changes in the water level in the ring allow for a calculation of the volume of water infiltrated over a given amount of time. Water levels in the metal rings during falling-head tests were measured using handheld tape measures.

Test Results

Results of the DRI tests can be found in **Table 3**.

Table 3: Surface Infiltration Test Results

Date	Site ID	Test Type*	Ring Insertion Depth (cm)	Final Infiltration Rate (mm/hr)	Field Saturated Hydraulic Conductivity K_{fs} (cm/sec)
2018-11-07	1	Double-Ring Infiltrometer	5	27.4	1.6×10^{-4}
2018-11-08	2	Double-Ring Infiltrometer	5	36.1	2.3×10^{-4}
2018-11-08	3	Double-Ring Infiltrometer	5	121.5	7.6×10^{-4}
2018-11-08	4	Double-Ring Infiltrometer	5	3.0	1.8×10^{-5}

* It is noted that SRI and falling head tests were also completed. These results are not shown as the DRI tests provided on **Table 3** follow a more standardized and robust testing procedure than either the SRI or falling head tests performed. Refer to the Conclusions section of this report for additional information

Conclusions

Based on the soil types observed during the initial field survey of the property on November 5th, 2018 and the soils extracted at each of the four sites during testing on November 7th and 8th, the calculated field saturated hydraulic conductivities shown in **Table 3** are generally consistent with the soil types observed. For silty clay soils, the typical range is between 10^{-3} and 10^{-5} cm/s. Therefore, the DRI test results at surface are in the correct order of magnitude when compared to typical values. It is noted that the field saturated hydraulic conductivities for all SRI and falling head tests performed at the four test sites also fall within the same range of 10^{-3} and 10^{-5} cm/s. Only the results for the DRI tests are presented on **Table 3,** however**,** as those tests follow a more standardized and robust testing procedure than either the SRI or falling head tests performed. It is recommended that these results be considered for inclusion in future hydrologic modelling of pre-development conditions for this site.

Given the range of surface infiltration rates collected in the field as shown in **Table 3**, stormwater runoff appears to have the opportunity to infiltrate at surface under pre-development conditions. For post-development conditions, it may thereby be possible to implement LID measures that include an infiltration function, subject to the depth of the feature,

the associated infiltration potential of underlying soils and appropriate site selection within the property.

This report was prepared, reviewed and approved by the undersigned:

Written by:	Reviewed by:	Approved by:
Paul Wilson, M.Sc.	Bryan Willcott, P.Eng.	J.F.Sabourin, M.Eng., P.Eng.
Hydrologist	Project Engineer	President

Figures:

Figure 1 - Monitoring Locations

Attachments:

Attachment A – Infiltration testing data sheets – Double Ring Infiltrometer

References:

ASTM Standard D3385-09, 2009, “Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer,” ASTM International, West Conshohocken, PA, 2009, DOI: 10.1520/D3385-09.

Reynolds WD and Elrick DE, 1986. “Ponded Infiltration from a Single Ring: I. Analysis of Steady Flow.” Soil Sci. Soc. Am. J. 54: 1233-1241.

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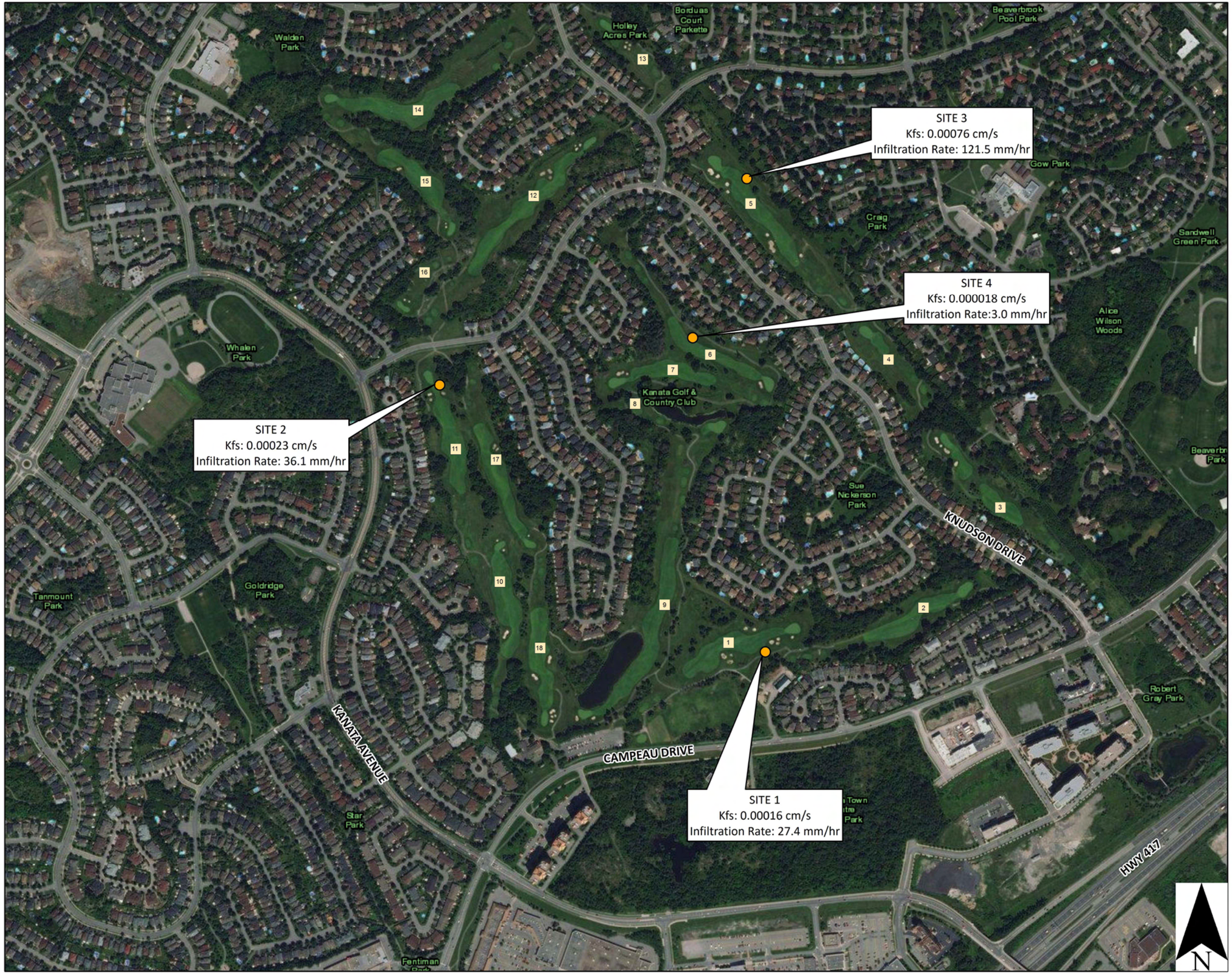

Legend

- Surface Infiltration Testing Sites
- Kanata Golf Course Fairways

NOTES:

Basemap Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Field Saturated Hydraulic Conductivity (Kfs) given in cm/second.

Infiltration Rate given in mm/hour.

Reynolds & Elrick (1990) ring infiltrometer correction, Strong capillarity assumed.

Coordinate System: NAD 1983 MTM Zone 9

J.F. Sabourin and Associates Inc.
WATER RESOURCES
AND ENVIRONMENTAL CONSULTANTS
52 Springbook Drive
Ottawa, ON, K2S 1B9
(613) 836-3884
www.jfsa.com

CLIENT:

DSEL
david schaeffer engineering ltd

SCALE:

0 100 200 300 400 m

LOCATION:

KANATA GOLF & COUNTRY CLUB

TITLE:

SURFACE INFILTRATION TESTING LOCATIONS

FIGURE 1

PROJECT No.	1581-17
DRAWN:	PW
DATE:	06/02/2019

JFSA
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

Project Ref #:P1581
Client: David Schaeffer Engineering

Ottawa
Gatineau
Montréal
Québec City

Attachment A

Infiltration Testing Data Sheets – Double Ring Infiltrometer

February 2019

Turf-Tec International - Record Chart for IN8-W (6 & 12 Inch Infiltration Rings)

Project Identification:	1581 - Kanata Golf & Country Club	**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**	**Marriotte Tube Volume**	
Test Location:	Site 1 (Hole #1)	**Inner Ring**	182	9.0	1	10000 ml	
Liquid Used:	Tap Water **pH: 7.62**	**Annular Space**	547	6.5	2	10000 ml	
Tested By:	JFSA	**Liquid level maintained using:**	( ) Flow Valve ( ) Float Valve (X) Mariotte Tubes				
Depth to water table:	N/A	**Penetration Depth of Outer Ring:** 5 cm					

					Flow Readings					Inner Infiltration Rate		Ground Temperature		Remarks
Trial #	**Start / End**	**Date**	**Time HR:MIN**	**Elapsed Time Chg/(Total) Min**	**Inner Ring Reading cm**	**Maroitte Tube Flow (ml)**	**Annular Space Reading cm**	**Annular Space Marriotte Tube Flow (ml)**	**Liquid Temp C**	**Inner Infiltration Rate mm/h**	**Annular Infiltration Rate mm/h**	**Ground Temp Depth (mm)**	**Temp at Depth (c)**	**Weather conditions Etc...**
1	Start Test	11/07	0:00	0:00	9.7	125	6.5	311.5	10.0	51.4	42.7	30	8.3	Overcast, windy. Intermittent rainfall.
	End Test	11/07	0:08	**0:08**	9.0		6.5		10.0					
2	Start Test	11/07	0:08	0:00	9.0	67.5	6.5	567.5	10.0	13.9	38.9			
	End Test	11/07	0:24	**0:16**	9.0		6.5		10.0					
3	Start Test	11/07	0:24	0:00	9.0	125	6.5	317.5	10.0	45.7	38.7			
	End Test	11/07	0:33	**0:09**	9.0		6.5		10.0					
4	Start Test	11/07	0:33	0:00	9.0	125	6.5	359.25	10.0	29.4	28.1			
	End Test	11/07	0:47	**0:14**	9.0		6.5		10.0					
5	Start Test	11/07	0:47	0:00	9.0	125	6.5	325	10.0	37.4	32.4			
	End Test	11/07	0:58	**0:11**	9.0		6.5		10.0					
6	Start Test	11/07	0:58	0:00	9.0	125	6.5	250	10.0	37.4	24.9			
	End Test	11/07	1:09	**0:11**	9.0		6.5		10.0					
7	Start Test	11/07	1:09	0:00	9.0	125	6.5	325	10.0	37.4	32.4			
	End Test	11/07	1:20	**0:11**	9.0		6.5		10.0					
8	Start Test	11/07	1:20	0:00	9.0	125	6.5	325	10.0	37.4	32.4			
	End Test	11/07	1:31	**0:11**	9.0		6.5		10.0					
9	Start Test	11/07	1:31	0:00	9.0	125	6.5	325	10.0	37.4	32.4			
	End Test	11/07	1:42	**0:11**	9.0		6.5		10.0					
10	Start Test	11/07	1:42	0:00	9.0	125	6.5	317.5	10.0	34.3	29.0			
	End Test	11/07	1:54	**0:12**	9.0		6.5		10.0					
11	Start Test	11/07	1:54	0:00	9.0	125	6.5	325	10.0	31.6	27.4			
	End Test	11/07	2:07	**0:13**	9.0		6.5		10.0					
12	Start Test	11/07	2:07	0:00	9.0	125	6.5	325	10.0	27.4	23.8			
	End Test	11/07	2:22	**0:15**	9.0		6.5		10.0					
13	Start Test	11/07	2:22	0:00	9.0	125	6.5	325	10.0	27.4	23.8			
	End Test	11/07	2:37	**0:15**	9.0		6.5		10.0					

Turf-Tec International - Record Chart for IN8-W (6 & 12 Inch Infiltration Rings)

Project Identification:	1581 - Kanata Golf & Country Club		**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**	**Marriotte Tube Volume**	
Test Location:	Site 2 (Hole #11)		**Inner Ring**	182	6.1	1	10000 ml	
Liquid Used:	Tap Water	**pH: 7.71**	**Annular Space**	547	6.0	2	10000 ml	
Tested By:	JFSA		**Liquid level maintained using:**		( ) Flow Valve ( ) Float Valve (X) Mariotte Tubes			
Depth to water table:	N/A		**Penetration Depth of Outer Ring:** 5 cm					

					Flow Readings					Inner Infiltration Rate		Ground Temperature		Remarks
Trial #	**Start / End**	**Date**	**Time HR:MIN**	**Elapsed Time Chg/(Total) Min**	**Inner Ring Reading cm**	**Maroitte Tube Flow (ml)**	**Annular Space Reading cm**	**Annular Space Marriotte Tube Flow (ml)**	**Liquid Temp C**	**Inner Infiltration Rate mm/h**	**Annular Infiltration Rate mm/h**	**Ground Temp Depth (mm)**	**Temp at Depth (c)**	**Weather conditions Etc...**
1	Start Test	11/08	0:00	0:00	6.1	125	6.0	1125	16.2	33.0	99.1	30	5.6	Sunny, Windy.
	End Test	11/08	0:12	**0:12**	6.1		6.0		16.2					
2	Start Test	11/08	0:12	0:00	6.1	125	6.0	1125	16.2	35.4	106.3			
	End Test	11/08	0:24	**0:12**	6.1		6.0		16.2					
3	Start Test	11/08	0:24	0:00	6.1	125	6.0	625	16.2	45.9	76.6			
	End Test	11/08	0:33	**0:11**	6.1		6.0		16.2					
4	Start Test	11/08	0:33	0:00	6.1	125	6.0	875	16.2	35.8	83.4			
	End Test	11/08	0:44	**0:11**	6.1		6.0		16.2					
5	Start Test	11/08	0:44	0:00	6.1	125	6.0	1125	16.2	33.6	100.7			
	End Test	11/08	0:56	**0:12**	6.1		6.0		16.2					
6	Start Test	11/08	0:56	0:00	6.1	125	6.0	1125	16.2	34.3	102.8			
	End Test	11/08	1:09	**0:13**	6.1		6.0		16.2					
7	Start Test	11/08	1:09	0:00	6.1	125	6.0	875	16.2	38.2	89.2			
	End Test	11/08	1:19	**0:10**	6.1		6.0		16.2					

Turf-Tec International - Record Chart for IN8-W (6 & 12 Inch Infiltration Rings)

Project Identification:	1581 - Kanata Golf & Country Club		**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**	**Marriotte Tube Volume**	
Test Location:	Site 3 (Hole #5)		**Inner Ring**	182	7.0	1	10000 ml	
Liquid Used:	Tap Water	**pH: 7.19**	**Annular Space**	547	7.2	2	10000 ml	
Tested By:	JFSA		**Liquid level maintained using:**		**( ) Flow Valve ( ) Float Valve (X) Mariotte Tubes**			
Depth to water table:	N/A		**Penetration Depth of Outer Ring:** 5 cm					

					Flow Readings					**Inner Infiltration Rate**		**Ground Temperature**		**Remarks**
Trial #	**Start / End**	**Date**	**Time HR:MIN**	**Elapsed Time Chg/(Total) Min**	**Inner Ring Reading cm**	**Maroitte Tube Flow (ml)**	**Annular Space Reading cm**	**Annular Space Marriotte Tube Flow (ml)**	**Liquid Temp C**	**Inner Infiltration Rate mm/h**	**Annular Infiltration Rate mm/h**	**Ground Temp Depth (mm)**	**Temp at Depth (c)**	**Weather conditions Etc...**
1	Start Test	11/08	0:00	0:00	7.0	125	7.0	625	12.7	146.0	243.3	30	6.1	Overcast, windy.
	End Test	11/08	0:03	**0:03**	7.0		7.2		12.7					
2	Start Test	11/08	0:03	0:00	7.0	125	7.2	625	12.7	153.2	255.4			
	End Test	11/08	0:05	**0:02**	7.0		7.2		12.7					
3	Start Test	11/08	0:05	0:00	7.0	125	7.2	657.25	12.7	112.1	196.5			
	End Test	11/08	0:09	**0:04**	7.0		7.2		12.7					
4	Start Test	11/08	0:09	0:00	7.0	125	7.2	657.25	12.7	114.7	201.1			
	End Test	11/08	0:13	**0:04**	7.0		7.2		12.7					
5	Start Test	11/08	0:13	0:00	7.0	125	7.2	625	12.7	120.9	201.5			
	End Test	11/08	0:16	**0:03**	7.0		7.2		12.7					
6	Start Test	11/08	0:16	0:00	7.0	125	7.2	625	12.7	114.2	190.3			
	End Test	11/08	0:20	**0:04**	7.0		7.2		12.7					
7	Start Test	11/08	0:20	0:00	7.0	125	7.2	625	12.7	98.7	164.5			
	End Test	11/08	0:24	**0:04**	7.0		7.2		12.7					
8	Start Test	11/08	0:24	0:00	7.0	125	7.2	625	12.7	147.7	246.2			
	End Test	11/08	0:27	**0:03**	7.0		7.2		12.7					1.75 L used to refill outer ring
9	Start Test	11/08	0:27	0:00	7.0	125	6.8	750	12.7	97.5	195.0			
	End Test	11/08	0:31	**0:04**	7.0		6.8		12.7					
10	Start Test	11/08	0:31	0:00	7.0	125	6.8	625	12.7	133.3	222.2			
	End Test	11/08	0:34	**0:03**	7.0		6.8		12.7					
11	Start Test	11/08	0:34	0:00	7.0	125	6.8	750	12.7	107.3	214.5			
	End Test	11/08	0:38	**0:04**	7.0		6.8		12.7					
12	Start Test	11/08	0:38	0:00	7.0	125	6.8	500	12.7	93.1	124.1			
	End Test	11/08	0:42	**0:04**	7.0		6.8		12.7					
13	Start Test	11/08	0:42	0:00	7.0	125	6.8	500	12.7	98.7	131.6			
	End Test	11/08	0:46	**0:04**	7.0		6.8		12.7					
14	Start Test	11/08	0:46	0:00	7.0	125	6.8	500	12.7	98.7	131.6			
	End Test	11/08	0:50	**0:04**	7.0		6.8		12.7					
15	Start Test	11/08	0:50	0:00	7.0	125	6.8	500	12.7	109.6	146.2			
	End Test	11/08	0:54	**0:04**	7.0		6.8		12.7					
16	Start Test	11/08	0:54	0:00	7.0	125	6.8	625	12.7	108.2	180.3			
	End Test	11/08	0:58	**0:04**	7.0		6.8		12.7					
17	Start Test	11/08	0:58	0:00	7.0	125	6.8	625	12.7	105.0	175.0			
	End Test	11/08	1:02	**0:04**	7.0		5.5		12.7					
18	Start Test	11/08	1:02	0:00	7.0	125	5.5	empty	12.7	103.7				
	End Test	11/08	1:06	**0:04**	7.0		4.8		12.7					
19	Start Test	11/08	1:06	0:00	7.0	125	4.8	empty	12.7	120.3				
	End Test	11/08	1:09	**0:03**	7.0		3.8		12.7					
20	Start Test	11/08	1:09	0:00	7.0	125	3.8	empty	12.7	122.7				
	End Test	11/08	1:13	**0:04**	7.0		3.0		12.7					

Turf-Tec International - Record Chart for IN8-W (6 & 12 Inch Infiltration Rings)

Project Identification:	1581 - Kanata Golf & Country Club		**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**	**Marriotte Tube Volume**	
Test Location:	Site 4 (Hole #6)		**Inner Ring**	182	7.0	1	10000 ml	
Liquid Used:	Tap Water	**pH: 7.30**	**Annular Space**	547	7.2	2	10000 ml	
Tested By:	JFSA		**Liquid level maintained using:**		( ) **Flow Valve** ( ) **Float Valve** (X) **Mariotte Tubes**			
Depth to water table:	N/A		**Penetration Depth of Outer Ring:** 5 cm					

					Flow Readings					**Inner Infiltration Rate**		**Ground Temperature**		**Remarks**
Trial #	**Start / End**	**Date**	**Time HR:MIN**	**Elapsed Time Chg/(Total) Min**	**Inner Ring Reading cm**	**Maroitte Tube Flow (ml)**	**Annular Space Reading cm**	**Annular Space Marriotte Tube Flow (ml)**	**Liquid Temp C**	**Inner Infiltration Rate mm/h**	**Annular Infiltration Rate mm/h**	**Ground Temp Depth (mm)**	**Temp at Depth (c)**	**Weather conditions Etc...**
1	Start Test	11/08	0:00	0:00	9.0	68	6.5	311.5	7.4	3.0	4.6	30	6.7	Overcast, Windy
	End Test	11/08	1:15	**1:15**	9.0		6.5		7.4					