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City of Ottawa Catch Basin Performance Study

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Abstract

This report provides catch basin inflows for four catch basin inlet configurations at four grades ranging from 0.5 - 5.0% and cross-slopes of 0.0, 2.0 and 4.0%. The curves relating the incident water depth to the catch basin inflows were developed from a series of tests with a mock-up of a roadway conducted at the Ocean, Coastal and River Engineering Research Centre of the National Research Council of Canada in Ottawa. Water flows ranging from 0.001 - 0.41 m³/s were delivered to a model roadway to quantify the conveyance of the catch basin inlets for various roadway grades and cross-slopes.

The report covers a review of the model roadway used and the experimental setup. A review of the instrumentation used and the measurements performed in this work follows. The four catch basin inlet combinations used in the study were examined. A preliminary analysis including an assessment of experimental uncertainties was performed. The detailed results from each of the four catch basin inlet combinations were provided. Finally, a comparison of the performance of the four catch basin inlets covered in this report is performed.

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1. Introduction

The National Research Council of Canada's Ocean, Coastal and River Engineering Research Centre (NRC-OCRE) has prepared this report for the City of Ottawa summarizing a collection of experiments conducted to determine the performance of catch basin covers and inlets over a broad range of conditions for different catch basin covers and inlets commonly used in the City of Ottawa.

The NRC is Canada's leading research and technology organization and, through its Ocean, Coastal and River Engineering Research Centre, operates some of the world's largest and most advanced hydraulics laboratories dedicated to applied research in coastal and river engineering.

The City of Ottawa follows the practices defined in MTO (1997). The city also uses hydrodynamic (computer) models to model urban flooding throughout the city for their Basement Flooding Protection Program. One of the key input parameters in these hydrodynamic models is the catch basin rating curve. These rating curves relate the hydraulic head above the catch basin cover or inlet to the inflow capacity. The rating curves play a crucial role in the accuracy of the hydrodynamic model predictions because they govern the inflow through each catch basin cover or inlet in the model. Many of the existing rating curves currently in use have been adopted from a series of experimental tests completed for the Ontario Ministry of Transportation such as (Burgi and Gober, 1978; Marsalek, 1982, 1986) or the City of Laval (Bouchard and Townsend, 1983). The current work is an extension of the work recently reported in Poirier and Provan (2021, 2022) for the City of Toronto and Infrastructure Canada. The selection of grate covers and inlets for the current work is different from those performed in previous studies. Specifically, the focus of this work is to examine curb mounted inlets, used for three of the four combinations examined, which provide a clear path near the side of the road which is preferred by cyclists.

A series of 519 tests has been undertaken in an effort to better understand the performance (conveyance) of catch basin covers and inlets in order to improve the capacity to design, analyze and predict the flows through stormwater systems during flood events. The results will help the City of Ottawa to improve the resiliency of their stormwater systems in the face of a changing climate. A total of four catch basin cover configurations were examined at four road grades ranging from 0.5 - 5.0% and cross-slopes of 0.0, 2.0 and 4.0% and for each setup 13 water flows from 0.001 – 0.41 m³/s were sent onto the model roadway.

2. Experimental Setup

The experiments were carried out in the National Research Council's (NRC's) Coastal Wave Basin (CWB) test facility. The facility is located in the NRC-OCRE in Ottawa, Canada. The experimental setup consisted of a model roadway, the water supply system and the measurement tank. A sketch of the experimental setup is provided in Figure 1.

The full scale model roadway was 10.70 m long and 2.60 m wide and was supported at six locations. The model was constructed from lumber and the surface was covered with a water-proof material (WeatherWatch) which has a similar manning's roughness coefficient to asphalt (0.013 s/m^{1/3}). Two hinged roadway supports at the upstream end of the road were situated on an I-beam which was supported by a pair of hinges (see Figure 1). The six supports of the roadway were adjusted to provide the road grades of 0.5, 1.0, 2.5 and 5.0% and the cross-slopes of 0.0, 2.0 and 4.0%. For further details of the road model and the adjustments see Poirier and Provan (2021).

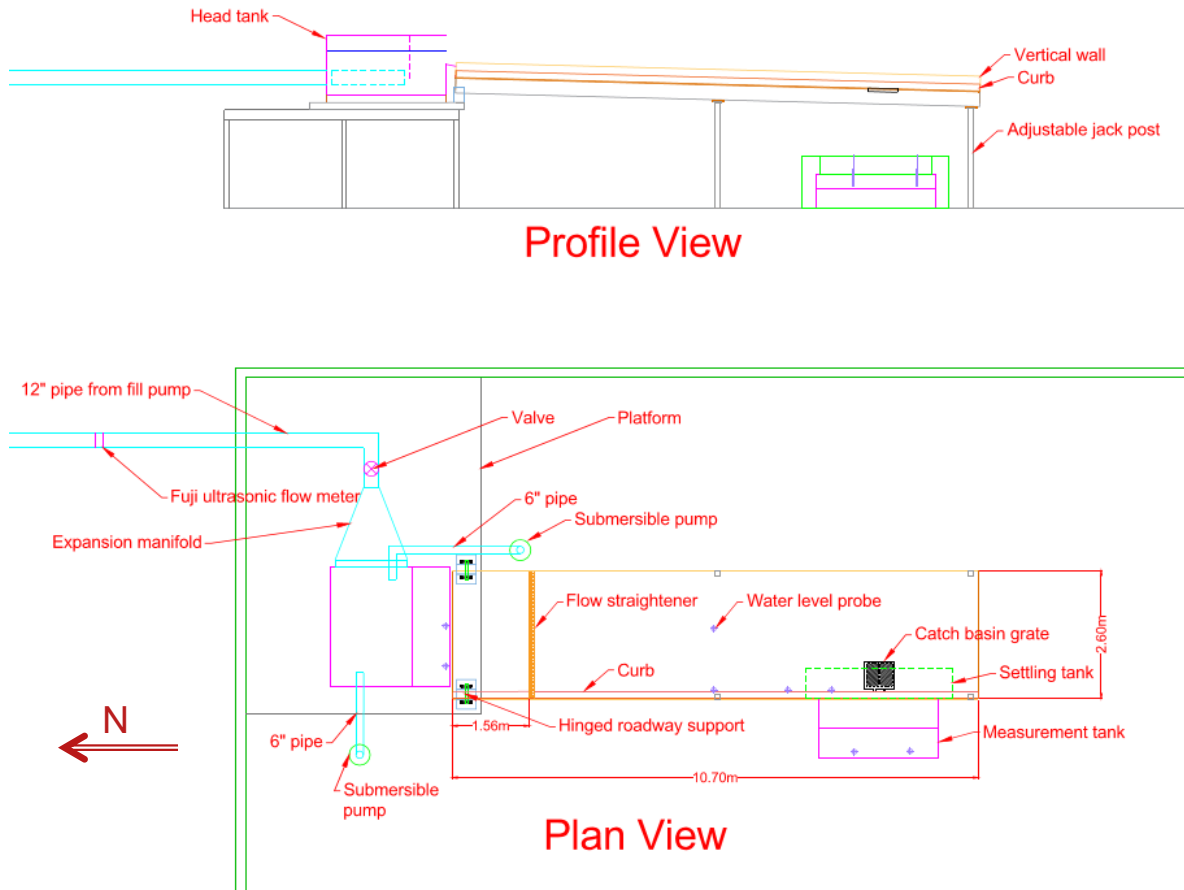


Figure 1. Model roadway sketch for catch basin cover or grate

Four catch basin cover and inlet combinations were tested during this test series. The setup in Figure 1 is identical to that used in Poirier and Provan (2021) and it was used only for the first studied catch basin cover (S19). The three subsequent configurations examined curb mounted inlets. To accommodate these inlets a sidewalk was constructed along one side of the model roadway resulting in a narrower road surface in the model (1.55 m) as shown in Figure 2. The width of the road surface in Figure 1 is 2.46 m wide when accounting for the width of the curb.

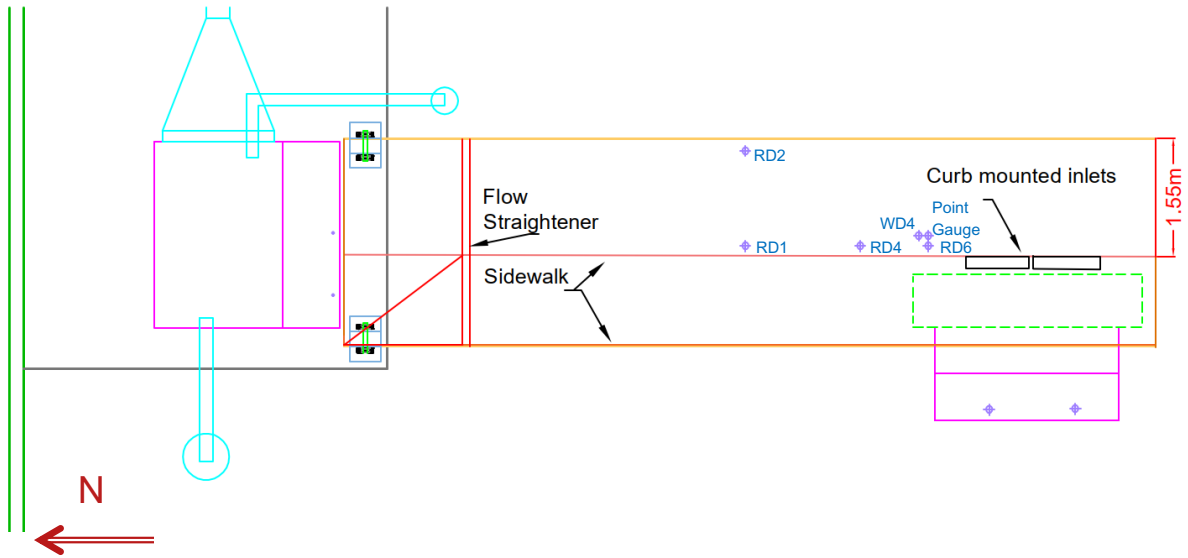


Figure 2. Model roadway sketch with sidewalk for curb inlets

Water was supplied to the model via a large pump that pumped water from the laboratory sump using a 12 inch pipe into a head tank located at the upstream end of the roadway as illustrated in the Profile View of Figure 1 and shown in Figure 3. Two submersible pumps provided additional flow to the head tank via two 6 inch pipes. This allowed for the model to be supplied with a variable flow rate up to a maximum of 0.41 m³/s.

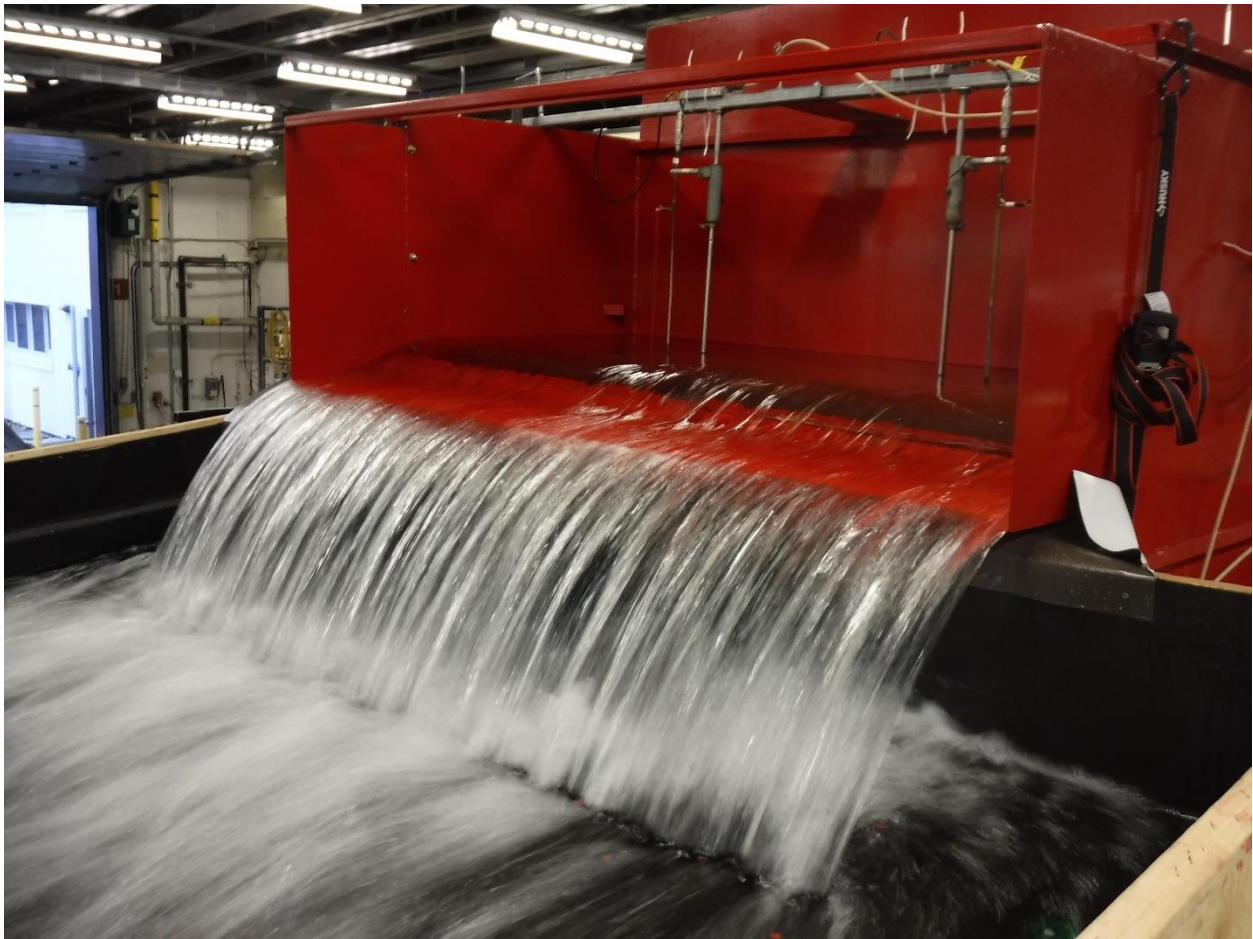


Figure 3. Head tank

The water supplied to the head tank flowed over the head tank outlet weir, onto the roadway and for most tests was allowed to freely flow down the road. Some of the water would flow through the catch basin inlet and into the measurement tank while any water that bypassed the inlet flowed over the end of the roadway and onto the Coastal Wave Basin (CWB) floor. All of the water eventually flowed into the CWB and was drained to the sump for reuse.

A ponding test was also performed. For this test series the road was set to a grade of 0.5% with a cross-slope of 0.0% and the south end of the roadway (the right-hand-side of Figure 1 and Figure 2) was blocked forcing all of the water through the cover or inlet. The end of the roadway was blocked with a sheet of plywood which was reinforced with pieces of 2" x 4" and 2" x 6" lumber. Both foam gaskets and caulking were used to limit leaking. An image of the blocked roadway is included in Figure 4 for one of the highest incident water depths.



Figure 4. Blocked roadway for ponding test

The experimental setup also included a flow straightener 1.56 m from the upstream end of the model roadway where the head tank was located. The flow straightener is illustrated in the Plan View of Figure 1 and shown in Figure 5. In Figure 5a the roadway is shown in the original configuration used for testing catch basin covers. In Figure 5b the roadway is shown in the modified configuration used for testing curb mounted inlets which includes the model sidewalk. A flow diverter was added to the top of the sidewalk, which is partially shown in the bottom right corner of Figure 5b, in order to avoid excessive water flow onto the sidewalk. Figure 5 shows how the installation of the sidewalk for the curb inlets has reduced the road surface width when compared to the catch basin covers.

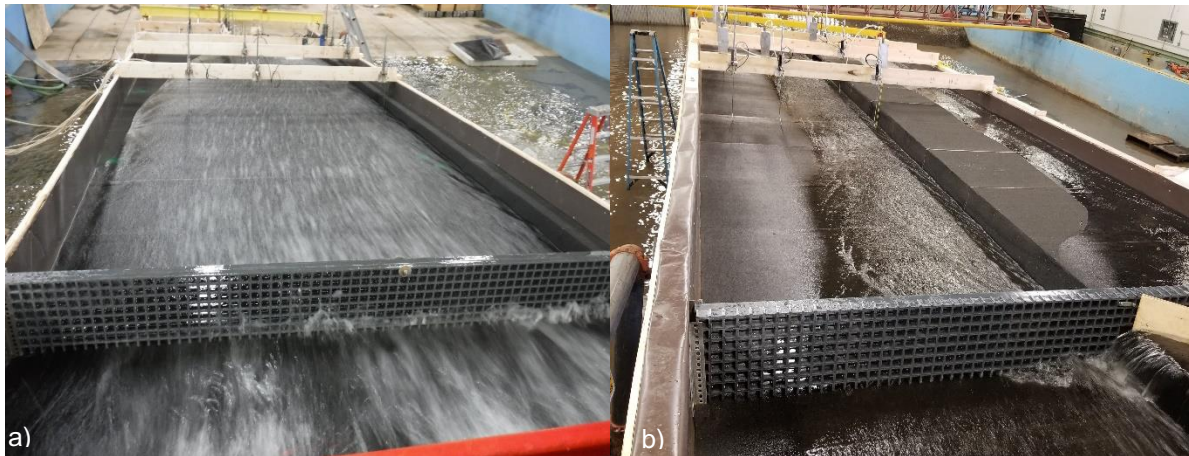


Figure 5. Photo of the model roadway setup with flow straightener for; a) the catch basin cover tests, and b) the curb inlet tests

2.1. Instrumentation

2.1.1. Water Depth Measurements

The main objective of the experiment was to measure the flow through the catch basin inlets for various water depths upstream of the opening. The water depth upstream of the catch basin inlets was measured using seven capacitance wire water level gauges (by Akamina Technologies), an UltraLab ULS water level sensor and a point gauge. The three different types of sensors are shown in Figure 6.

The UltraLab ULS-40D acoustic sensor (see Figure 6a) is optimized for measuring water surfaces in ship basins and flumes. The distance to the water surface is determined by measuring the flight time for a 320 kHz acoustic ping. The accuracy is 1 mm and the data is acquired at 25 Hz.

In still water, or a calm flow, the height of the point gauge (see Figure 6b) was adjusted so that it formed a meniscus with the water. The resolution of the probe was 0.5 mm for a single measurement. For higher flows the surface of the water oscillated and the height of the probe was adjusted so that half the time it was contacting the water and half the time it did not in an effort to measure the average water height.

The capacitance wire water level probes (see Figure 6c) operated by sensing the change in capacitance that occurs as a portion of the insulated wire become wetted. The output was directly proportional to the percentage of the wire that was wetted, regardless of whether the wetting was continuous or intermittent (as in the case of splash or spray). The water level probes were calibrated by changing their elevation with respect to a fixed water level. The probes feature a highly linear response, with calibration errors typically less than 0.5% over a 0.2 m calibration range. This error represents an accuracy of ± 1 mm and the data was acquired at 50 Hz.

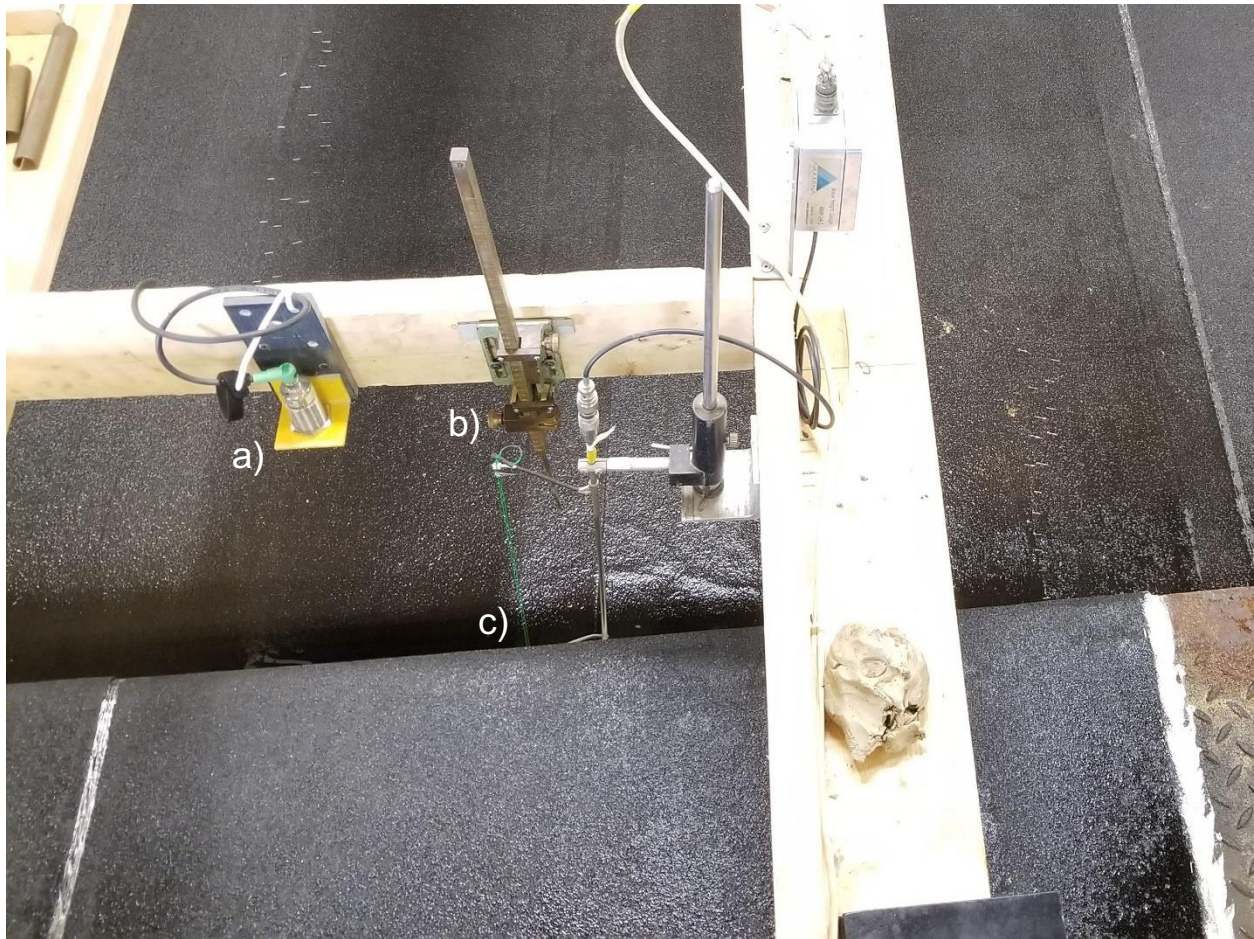


Figure 6. Water level gauges; a) UltraLab ULS, b) point gauge and c) capacitance wire gauge

The water depth measurements used in this study were defined as the water depth normal to the road surface at the location of the capacitance wire water level gauge (RD6), 0.04 m from the curb and 2.98 m from the end of the model roadway. The point gauge and the UltraLab ULS were both situated near RD6 and used to validate the results from the capacitance wire gauge. Six more capacitance wire water level gauges were also installed in advance (up-stream) of the catch basin covers to better understand the incoming flow. The locations of the water level gauges relative to the curb and the end of the model roadway are provided in Table 1.

Table 1. Probe locations to measure road water depths

	Covers		Curb Inlets	
	From Curb (m)	From End (m)	From Curb (m)	From End (m)
RD1	0.03	5.43	0.04	5.48
RD2	1.27	5.42	1.27	5.48
RD3	1.92	5.39	0.87	5.50
RD4	0.03	3.87	0.04	3.85
RD5	1.28	3.87	1.26	3.84
RD6	0.04	2.98	0.04	2.98
RD7	1.28	2.98	1.26	2.96
WD4	0.07	3.13	0.13	3.14
Point Gauge	0.11	2.96	0.16	2.93

It should be noted that the wave probes RD1-5 and RD7 were supplementary and are not used for any analysis in this work. The baseline water level was obtained by leveling the roadway and placing a 0.03 mm thick shim underneath the point gauge to determine the height of the road surface. The point gauge has a resolution of 0.5 mm. It is acknowledged that the WeatherWatch layer on the surface of the model roadway has a roughness and this methodology is setting the zero above the top of this surface roughness. Once the zero point was determined, the end of the roadway was blocked and the roadway was filled with 50 – 100 mm of water. A low but constant flow of water was maintained to ensure that the water level was maintained calm and level while the data from the capacitance wire gauges and the UltraLab ULS was recorded and averaged over a three minute (180 second) period. The point gauge was also used to measure the water level at this time. The difference between the point gauge reading at the road surface and the water surface was used to establish the zero level for all of the other gauges.

2.1.2. Flow Measurements

The flow onto the model was measured by two different methods; either through flow meters or a sharp crested weir. The flow meters used were Fuji Electric Portable type ultrasonic flow meters (FLCS1012) with FSSC extendable type transit time detectors. The flow meters were previously calibrated using a 3" pipe with flows ranging from 0.004 - 0.04 m³/s and were found to have an accuracy of 0.5%. In this study one flow meter (FM1) was attached to a 12" diameter supply line which was fed by the main pump. The second flow meter (FM2) attached to a 6" diameter supply line which was fed by a secondary submersible pump. Both lines feed water to the head tank behind the baffle wall as shown in Figure 1. No flow meter was available to monitor the flow from the second 6" diameter supply line.

The second method to measure flow in these experiments was done using a sharp crested weir. The flow in cubic meters per second supplied to the roadway was determined by measuring the height of the water level in meters above the knife edge on the head tank outlet weir, H_i . The measurement was the average of the two capacitance wire water level gauges (HT1 and HT2). The width of the rectangular weir is $L = 1.83$ m. From Mott (1979) we can calculate the flow over the weir Q in equation (1). In equation (2) the

weir discharge coefficient C was calculated using the depth of the head tank $H_c = 0.614$ m to the weir height and the water level above the weir, H_t .

$$Q = CLH_t^{3/2} \tag{1}$$

$$C = \frac{3.27 + 0.40 H_t / H_c}{\sqrt{3.2808}} \tag{2}$$

2.2. Catchment Flow Measurements

2.2.1. Measurement Tank Weir Calibration

The water flowing through the catch basin covers flowed into a stainless steel settlement tank shown in Figure 7, or as indicated by the green dashed line in Figure 1 and Figure 2. Curtains were installed to ensure that all of the water fell directly into the settlement tank. The water from the settlement tank flowed into a measurement tank (red colour in Figure 7) which was 2.44 m wide and equipped with a baffle wall at the back and a sharp-crested weir at the outlet.



Figure 7. Settlement and Measurement Tanks

The height of the water level above the weir’s knife edge was measured using two Akamina wave gauges, MT1 and MT2, as discussed in section 2.1.1. The measurement tank was calibrated by connecting the 12” pipe directly to the settlement tank as described in Poirier and Provan (2021). The calibration was repeated prior to these tests and the results were equivalent within the measurement uncertainty. As shown in Figure 8, all of the points corresponding to a height over the weir (M_t) of less than 0.106 m were fitted to a quadratic curve while those above 0.104 m were fitted to a linear curve.

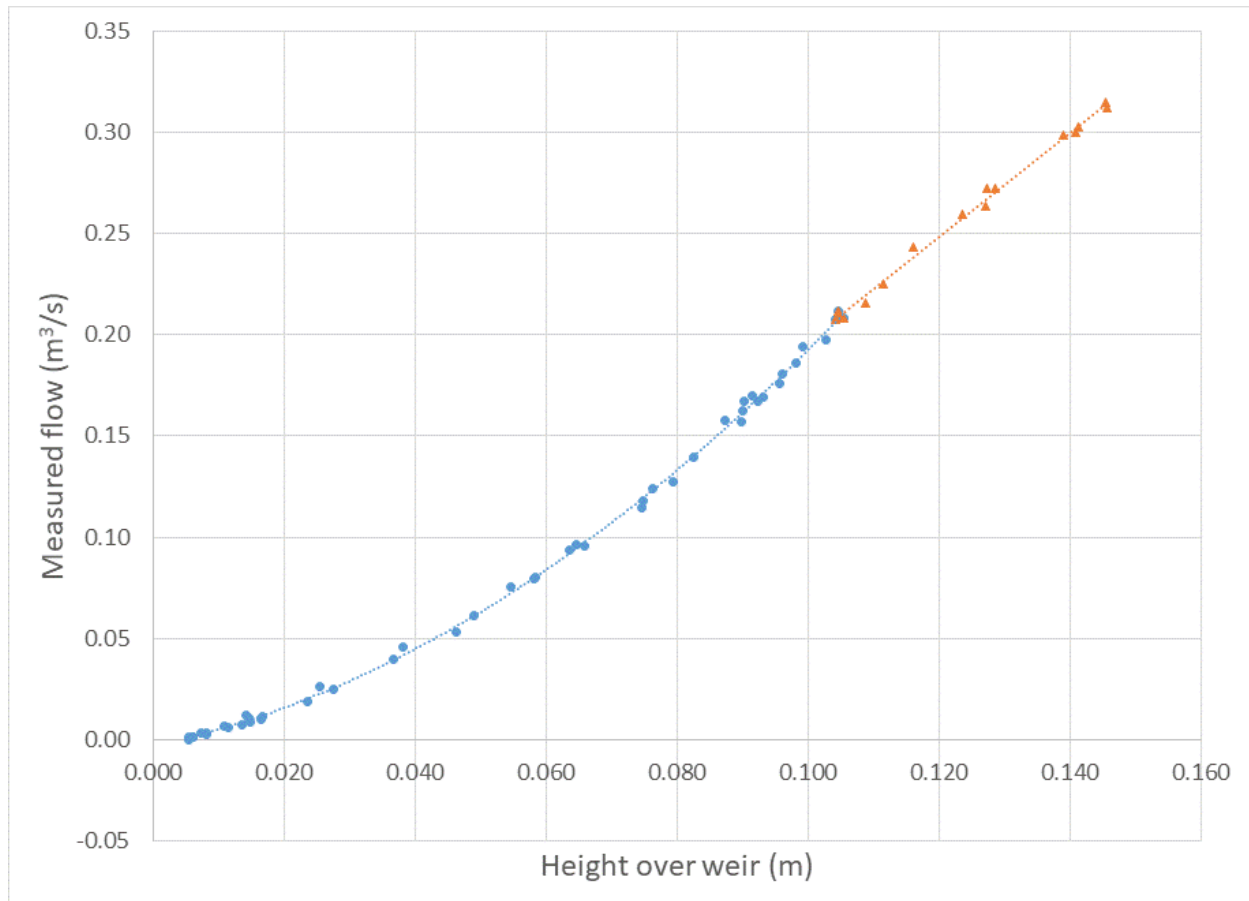


Figure 8. Measurement tank calibration curves. Blue points ($M_t < 0.106$ m) are fitted to a quadratic curve and orange triangles ($M_t > 0.104$ m) are fitted to a linear curve

The updated calibration coefficients for the measurement tank with their uncertainties are found in equations (3), where $FM1$ describes the flow measured for water depths M_t between 0.015 – 0.106 m above the knife edge and in equation (4), where $FM2$ describes the flow measured for water depths from 0.107 – 0.282 m above the knife edge.

$$FM1 = \left(12.6 \pm 0.4 \frac{M_t^2}{m^2} + 0.69 \pm 0.04 \frac{M_t}{m} - 0.0031 \pm 0.0008 \right) m^3/s \quad M_t \leq 0.1063 \quad (3)$$

$$FM2 = \left(2.57 \pm 0.05 \frac{M_t}{m} - 0.060 \pm 0.006\right) m^3/s \quad M_t > 0.1063 \quad (4)$$

2.2.2. Low Flow Measurements

At low flows, less than 0.001 m³/s or 0.015 m of water above the weir, the uncertainty using the flow values obtained from section 2.2.1 became more important. At these low flows another strategy was used to measure the flow through the catch basin. The water from the previous test was pumped out of the measurement tank and the capacitance wire water level gauges (MT1 and MT2) were used to measure the fill rate of the tank. The acquisition system acquired water level measurements at 50 Hz and an example of the fill rate analysis is show in Figure 9.

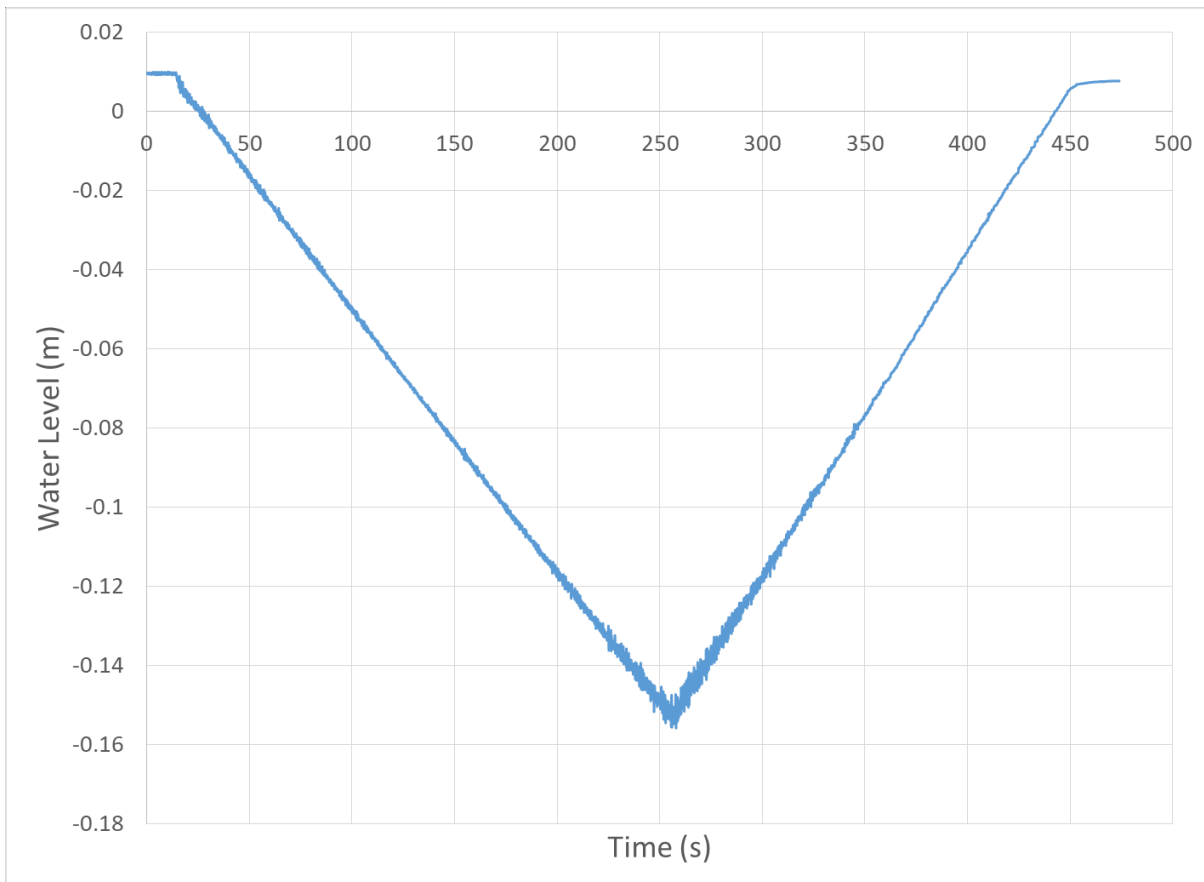


Figure 9. Example of a measurement tank fill rate time series, 2022-6-13_test012

In Figure 9, the water was pumped out of the tank from approximately 20 to 260 seconds at which time the pump was turned off. The tank was then allowed to fill until 450s when the water flowed over the weir. In this case the slope of the curve in Figure 9, or the fill rate from 300 to 440 seconds, was used with the width

of the tank, 2.435 m and the length of the tank, 1.225 m to calculate the flow rate through the catch basin inlet.

2.3. Covers and Inlets

A total of four catch basin inlets were studied in the course of this project. The four inlets are described in Table 2. All of the catch basin inlets were installed in the SW corner of the roadway as illustrated in Figure 1 and Figure 2. Because the dimensions for each configuration are different the limits in distance of each cover from the end of the roadway and from the curb are also included in Table 2. The distance from the curb is not applicable to the curb mounted inlets. Images for each of the four catch basin cover combinations are shown from Figure 10 to Figure 13.

Table 2. Catch basin cover combinations

	Type of Catch Basin Grate	Catch Basin Grate Specifications	From curb (m)		From end of road (m)	
			min	max	min	max
1	"FISH" Type Round Catch Basin Cover	DWG. No.: S19	0.05	0.68	1.70	2.32
2	Curb Inlet "FISH" Type Catch Basin Frame	DWG. No.: S22	N/A	N/A	1.55	2.32
3	Double Curb Inlet "FISH" Type Catch Basin Frame	DWG. No.: S22	N/A	N/A	1.55	2.32
			N/A	N/A	0.72	1.49
4	Curb Inlet "FISH" Type Catch Basin Frame and Cover for CBMH	DWG. No.: S28	N/A	N/A	1.49	2.28

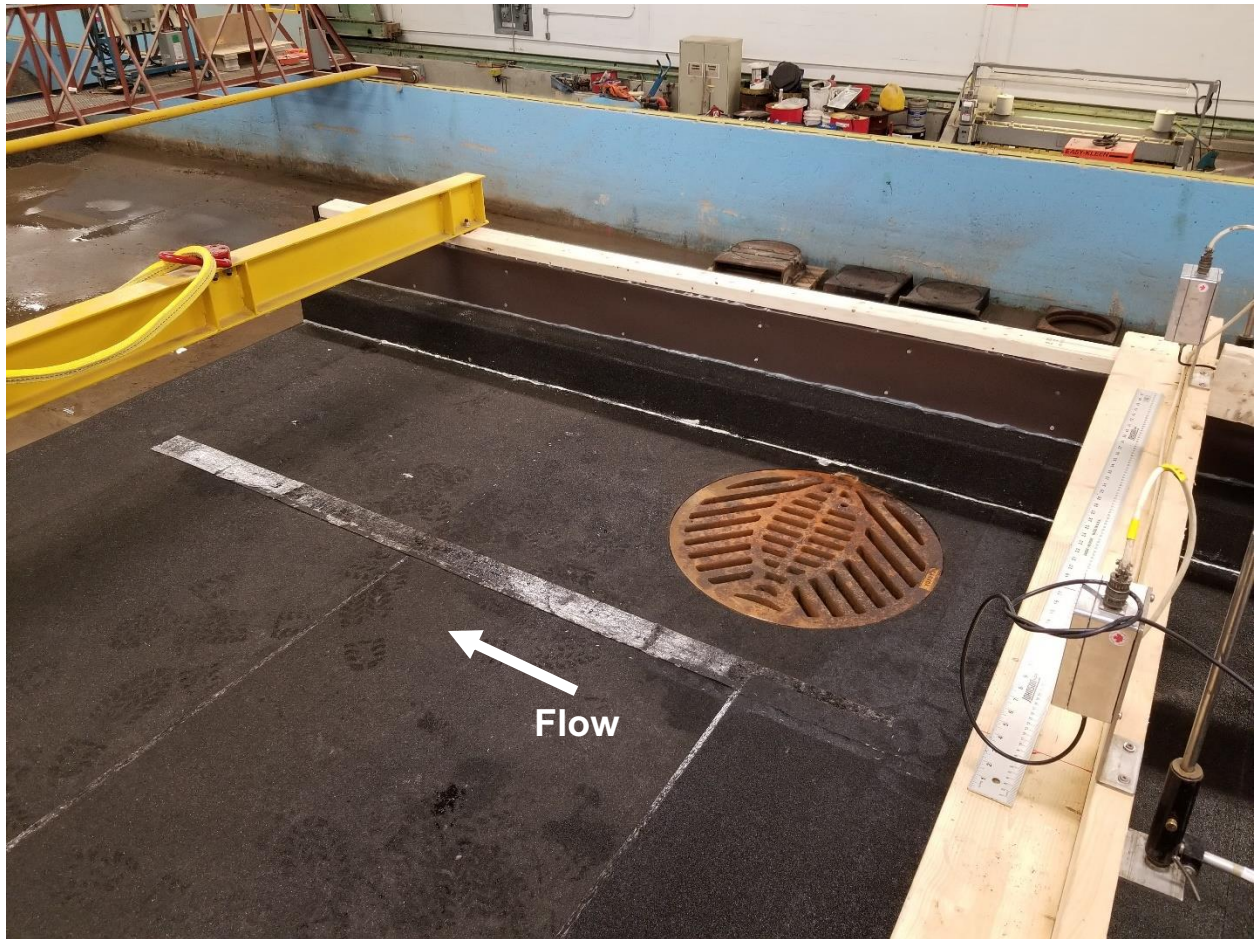


Figure 10. "FISH" Type Round Catch Basin Cover (S19)

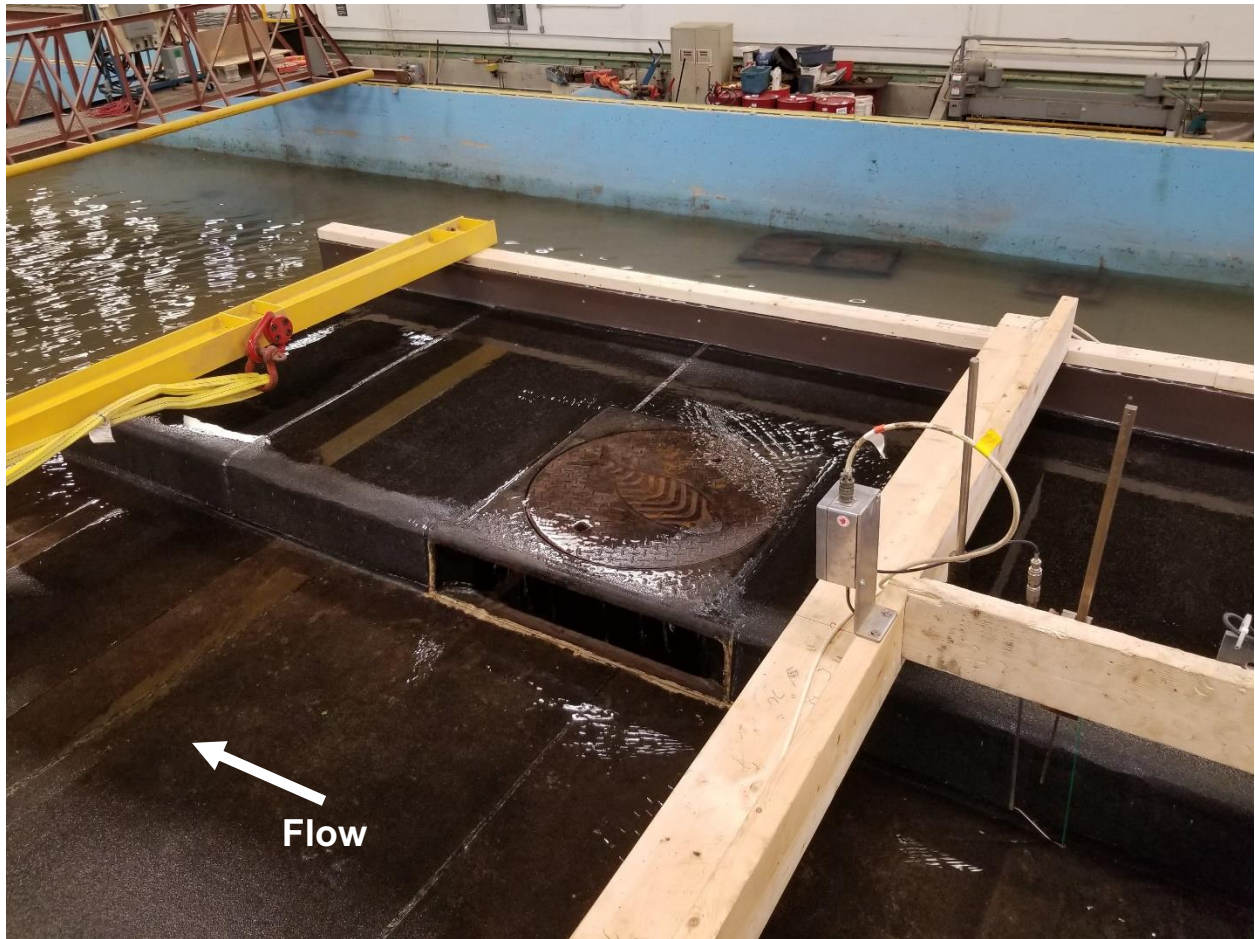


Figure 11. Curb Inlet "FISH" Type Catch Basin Frame (S22)

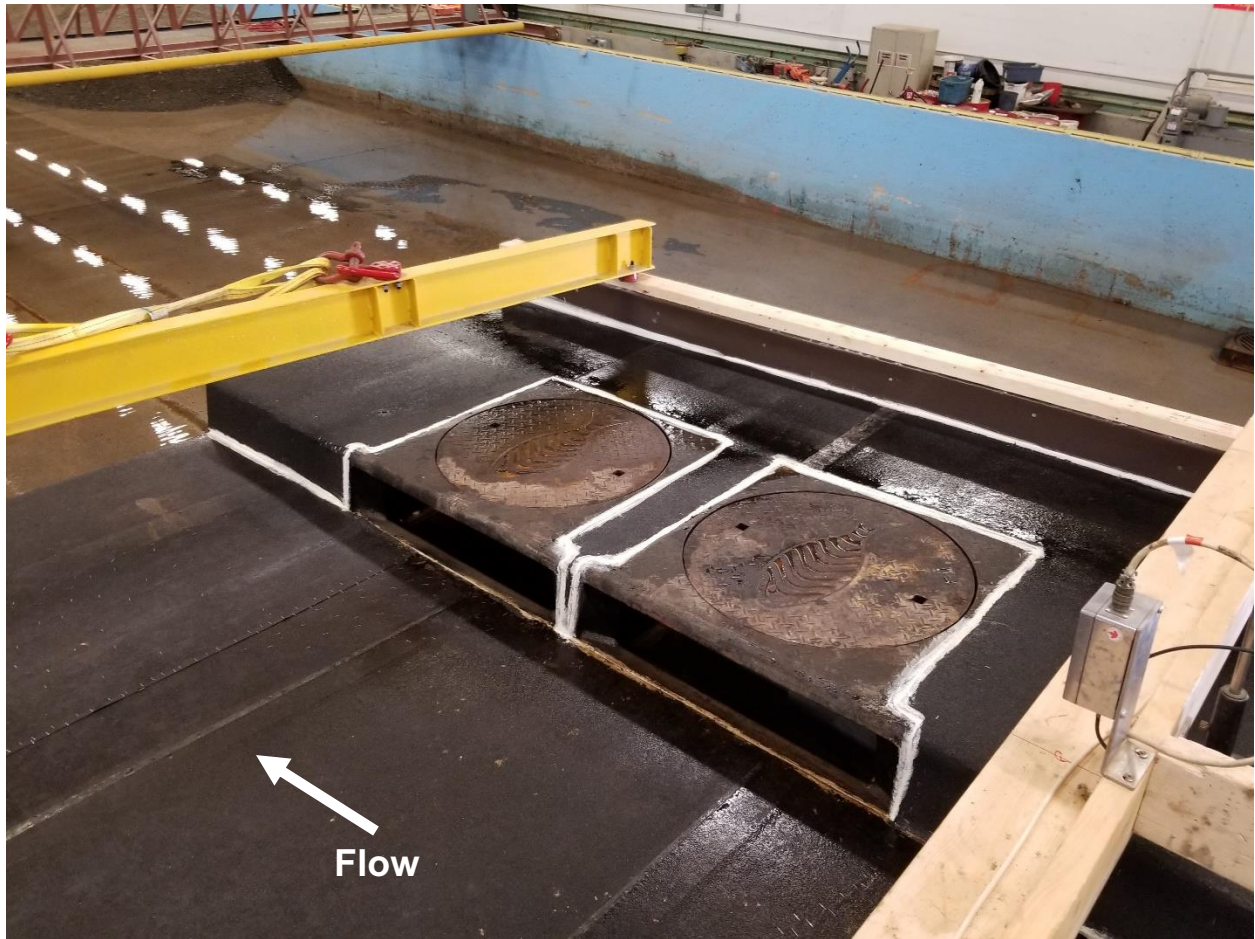


Figure 12. Double Curb Inlet "FISH" Type Catch Basin Frame (S22x2)

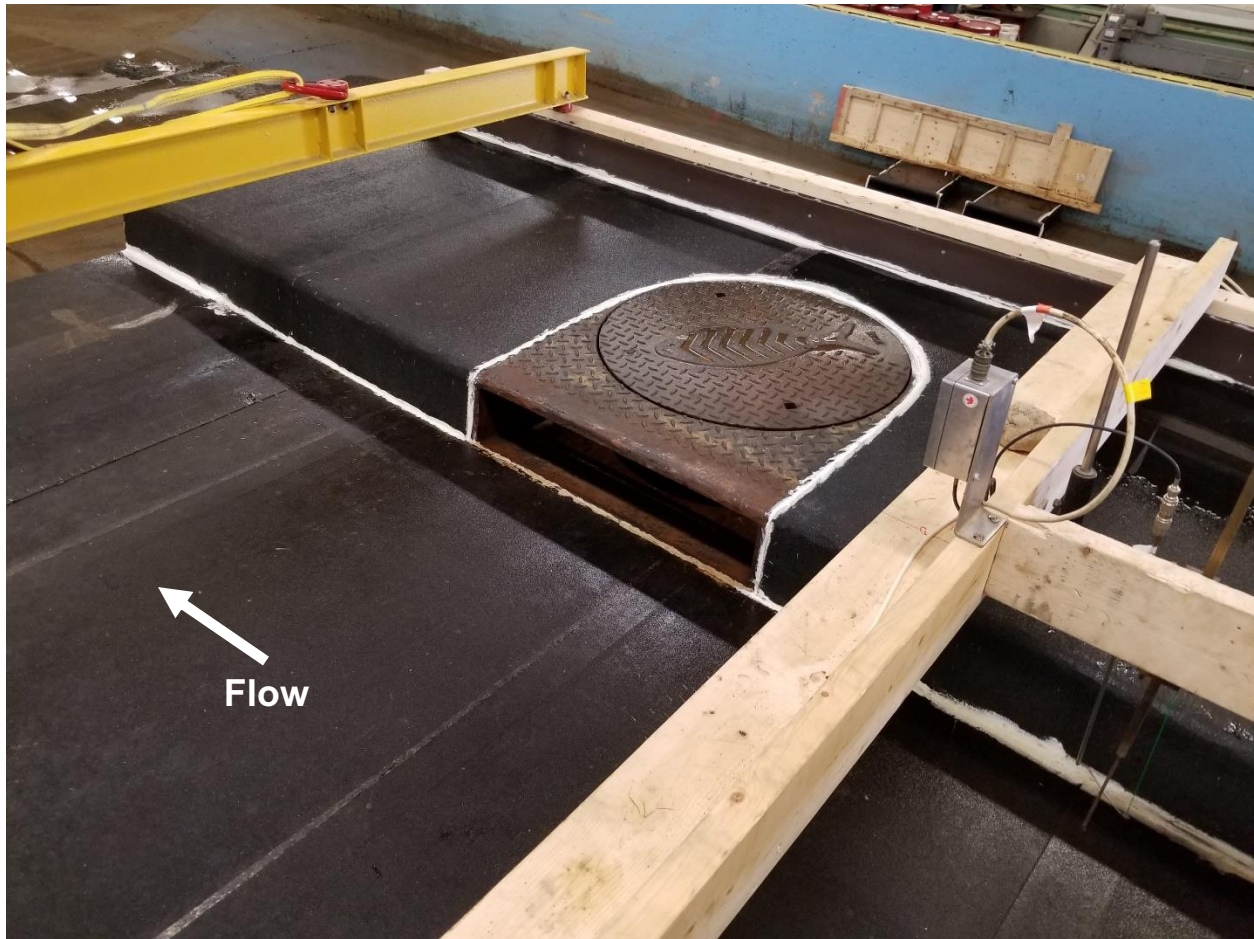


Figure 13. Curb Inlet "FISH" Type Catch Basin Frame and Cover for CBMH (S28)

2.3.1. Comparison of the Curb Mounted Inlets

At first glance the S22 curb mounted inlet with an opening at the curb of 780 mm wide and 150 mm high appears very similar to the S28 with an opening at the curb of 800 mm wide and 150 mm high. A close up of one corner of each inlet installed in the field is shown in Figure 14. We note in Figure 14a that the entrance to the S22 inlet is tapered inwards at an angle of 45 degrees to a 650 mm wide opening while in Figure 14b the S28 inlet has no taper, the opening is the full 800 mm wide. Because the S28 has no taper the opening for the S28 is significantly larger than the S22. Both inlets slope downwards and have a minimum height of 130 mm at the bottom. The S22 inlet rests on a square riser with an opening which is 610 mm wide while the S28 inlet rests on a round opening 685 mm in diameter. It should be noted that during our limited survey in the field most of the S28 inlets visited were not installed to the specifications tested in the lab. They were often installed on a square riser similar to that used with the S22 inlet.



Figure 14. Curb mounted inlets installed in the City of Ottawa; a) S22 and b) S28

The differences between the two curb mounted inlets affect the flow near the inlets. Figure 15a shows the S22 inlet in a high flow condition. The flow near the inlet is primarily parallel to the curb with a small perpendicular component towards the curb resulting in water falling into the inlet. Much of the water does not make it into the inlet, it strikes the taper at the downhill edge of the inlet and is projected outwards in the violent spray shown in Figure 15a. Figure 15b shows inlet S28 in a high flow condition. The incident water depth is not as high as Figure 15a as identical photos were not obtained. The spray from S28 was never as high as what is shown in Figure 15a but the spray for S22 was much higher for greater flows and higher grades. The flow at the entrance of the S28 inlet is different. The plateau caused by the opening in the riser being much further back at the corners for the S28 inlet appears to cause the flow in the downhill corner to have a much greater component perpendicular to the curb and toward the inlet. This inward flow is so strong that for high flows the water tends to wrap around the back of the inlet cover.

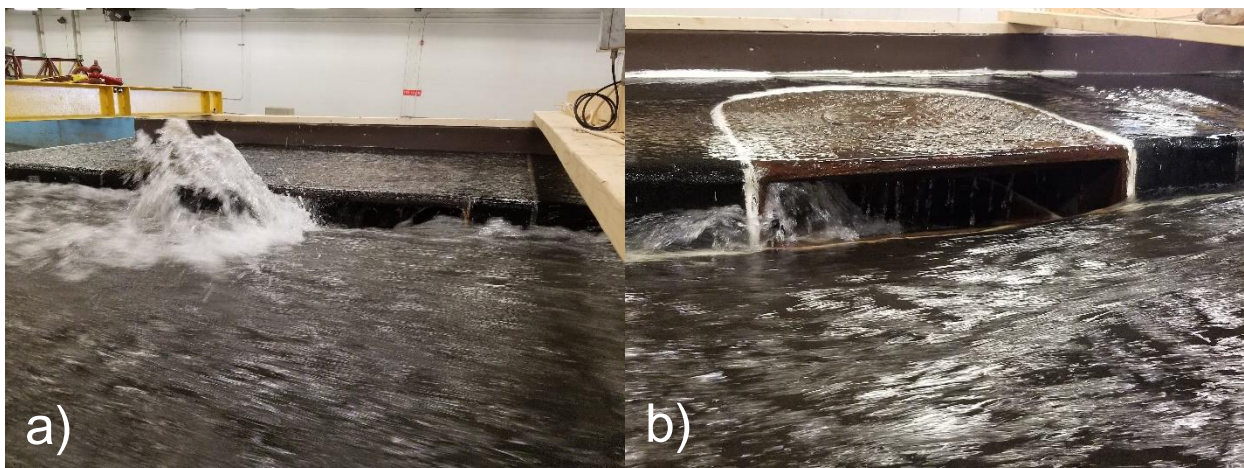


Figure 15. Spray from curb mounted inlets at high flows a) S22 and b) S28

3. Analysis

3.1. Comparison of Water Depth Probes

As shown in Figure 2 and Figure 6 there are three probes just upstream of the catch basin covers. The three probes reflect the water depth at the RD6 probe location. According to Table 1, the capacitance wire gauge (RD6) is 0.04 m from the curb, the acoustic probe (WD4) is 0.13 m from the curb and the point gauge is 0.16 m from the curb. This means that for a cross-slope of 2.0% the measured water depth by the capacitance wire gauge is reported as is, the water depth measured by the point gauge is adjusted to the RD6 location and increased by $2.0\% * (0.16 \text{ m} - 0.04 \text{ m}) = 0.0024 \text{ m}$ and the water depth measured by the acoustic gauge is also adjusted and increased by $2.0\% * (0.13 \text{ m} - 0.04 \text{ m}) = 0.0018 \text{ m}$. These adjustments are made to accommodate the fact that there is a cross-slope and the roadway is lower near the curb therefore we assume that the water will level and be deeper nearest to the curb.

Despite the corrections to project the results of all three probes to the location of the RD6 capacitance wire gauge location it was noticed in Poirier and Provan (2021) that for steeper grades and higher flows the point gauge and the capacitance wire gauge did not agree. At that time, it was decided that the capacitance wire gauge may be biased due to water running up the back of the wire. For this reason, the point gauge was accepted as correct but adjusted to the RD6 location. During the series of tests presented herein the acoustic gauge was used much more consistently and it was not as close to the point gauge as the past tests from 2021. The results triggered further examination. The S28 curb inlet was installed and the road set to a grade of 2.5% and a cross-slope of 2.0%. Two different incident water depths were used and the results from the capacitance wire gauge (RD6), installed 0.04 m from the curb and 2.98 m from the end of the roadway, and the acoustic gauge (WD4), installed 0.13 m from the curb and 3.14 m from the end of the roadway, were compared to a point gauge which moved parallel to the curb. The setup can be seen in Figure 6. The acoustic sensor (a) and the wave probe (c) were not moved for this test but the point gauge (b) was moved all along the 2" x 4" support on both sides of the acoustic sensor (a). The results are shown in Figure 16 and Figure 17.

Three successive experiments were made with nominally the same flow onto the roadway. The point gauge was consistently placed 0.16 m from the curb but the distance from the end of the roadway, and the inlet, increased from 2.93 m to 3.07 m and finally 3.33 m. As the distance from the inlet increased the water depth measured by the point gauge increased. There was little variation noted in the stationary capacitance wire and acoustic gauges. At these high incident water depths there were significant oscillations in the water and the uncertainties in measuring water depth were several millimeters. As such it would appear that the point gauge was reading very near what the acoustic gauge was reading when it crossed 3.14 m where the acoustic sensor was installed. It was also reading very near what the capacitance wire gauge was reading at 3.33 m.

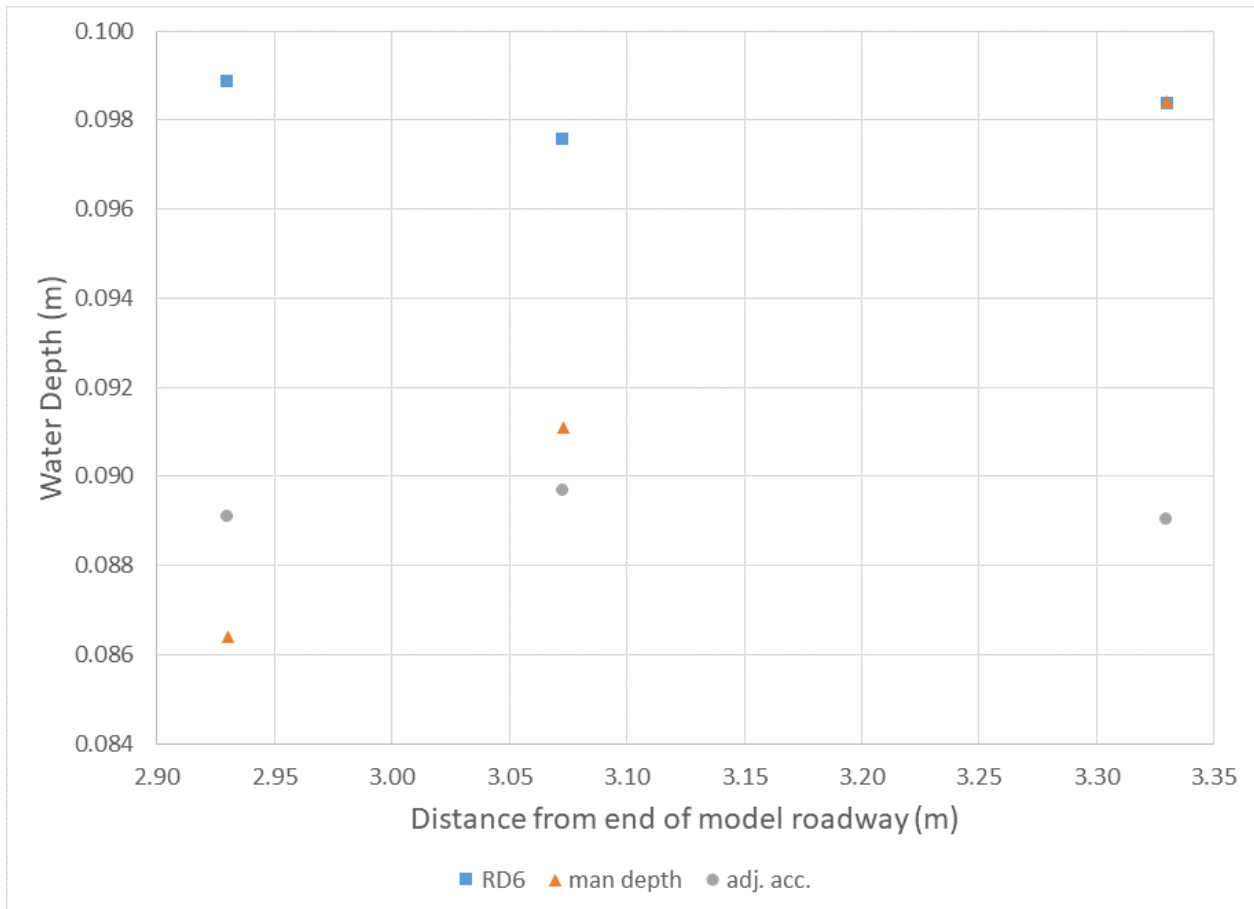


Figure 16. Measured incident water depths near RD6 sensor at a high incident water depth. Capacitance wire gauge (RD6) in blue squares, point gauge in orange triangles and adjusted acoustic sensor in grey circles. All values adjusted to RD6 position. The distance from the end of the roadway is for the moving point gauge, the other probes are stationary. Grade 2.5%, Cross-slope 2.0% maximum flow from 12” pump.

The variation in water depth increasing as the point gauge is moved further from the inlet shows that the difference in results between the point gauge and the capacitance wire gauge was not caused by water on the back of the probe. It reflects an actual variation in water level captured by the probes. For this reason, in this report the results from the RD6 capacitance wire gauge are considered the primary results and the point gauge and acoustic gauge (WD4) are only used for comparison and when the RD6 probe is unavailable. For example, the RD6 probe was not reliable for certain low flow conditions as there was insufficient water depth for a reliable measurement. In those cases, the variation in the WD4 measurements are used to extrapolate the RD6 results. This correction was also made in Poirier and Provan (2022) as these observations had already been made.

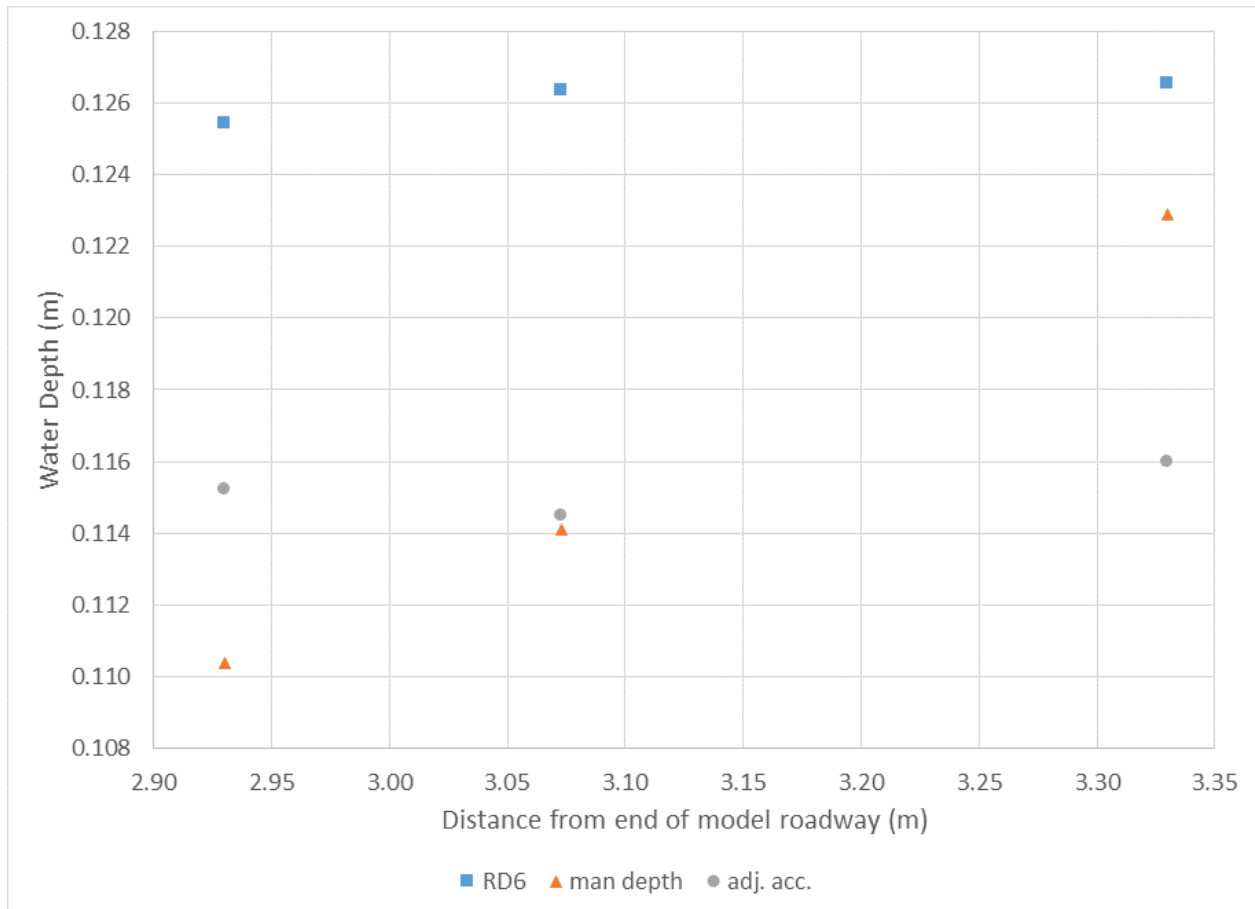


Figure 17. Measured incident water depths near RD6 sensor at maximum incident water depth. Capacitance wire gauge (RD6) in blue squares, point gauge in orange triangles and adjusted acoustic sensor in grey circles. All values adjusted to RD6 position. The distance from the end of the roadway is for the moving point gauge, the other probes are stationary. Grade 2.5%, Cross-slope 2.0% maximum flow from all three pumps.

It should be noted that the position of the RD6 gauge was chosen such that the water depth was not sensitive to the distance from the inlet. The sensitivity test was however only performed at a grade of 0.5% and the water depth was not sensitive to the distance from the inlet at that road grade. The effect was more noticeable for higher road grades and greater flow rates.

3.2. Uncertainty Analysis

The primary data of interest from these experiments is the incident water depth and the catchment flow. These data correspond to the second and third columns of the data tables included in Appendix A. Because of the importance of this data an uncertainty analysis was conducted to better understand the confidence in these data. The primary source for the incident water depth data was the RD6 water level gauge. The

baseline for the water level gauges was determined with two measurements of the point gauge as discussed in section 2.1.1. Specifically, one measurement was on top of a 0.03 mm thick shim on the road surface and the second at the surface of still water on a level roadway. The point gauge had a precision of 0.0005 m and as a result the uncertainty on the RD6 measurement is 0.001 m plus the standard deviation of the three minute average. That was the third from last column in the Appendix A data tables.

The uncertainty on the catchment flow was determined using multivariate measurement uncertainties. In section 2.2.1 it was shown that the catchment flow was calculated using either equation (3) or (4). Equation (3) is of the form $y_1 = aM_t^2 + bM_t + c$ and used for values of $M_t \leq 0.1063$ m, where a , Δa , b , Δb , c and Δc are parameters obtained from the measurement tank calibration discussed in section 2.2.1 and the total uncertainty will be described by equation (5).

$$\Delta(flow) = \frac{\partial y_1}{\partial a} \Delta a + \frac{\partial y_1}{\partial b} \Delta b + \frac{\partial y_1}{\partial c} \Delta c + \frac{\partial y_1}{\partial M_t} \Delta M_t \quad (5)$$

Which can be simplified to equation (6),

$$\Delta(flow) = M_t^2 \Delta a + M_t \Delta b + \Delta c + (2aM_t + b) \Delta M_t \quad (6)$$

And given the values $a = 12.6 \pm 0.4$, $b = 0.69 \pm 0.04$ and $c = -0.0031 \pm 0.0008$ obtained in section 2.2.1, (6) was expanded to equation (7),

$$\Delta(flow) = \left(0.4M_t^2/m^2 + 0.04M_t/m + 0.0008 + (2 \cdot 12.6M_t/m + 0.69) \Delta M_t/m \right) m^3/s \quad (7)$$

The height above the weir, M_t , was the average of the two measurement water level probes (MT1 & MT2) and the uncertainty on that measurement, ΔM_t , included the uncertainty of setting the baseline for both the calibration and the measurement tank with the point gauge (0.002 m) plus the standard deviation of the measurement tank reading.

In a similar manner if the height of water above the weir was greater than 0.1063 m equation (4), which is of the form $y_2 = dM_t + e$, where d , Δd , e and Δe are obtained from the measurement tank calibration and are used to calculate the flow into the inlet. In that case multivariate measurement uncertainties were still used resulting in equation (8).

$$\Delta(flow) = \frac{\partial y_2}{\partial d} \Delta d + \frac{\partial y_2}{\partial e} \Delta e + \frac{\partial y_2}{\partial M_t} \Delta M_t \quad (8)$$

Which can be simplified to equation (9),

$$\Delta(flow) = M_t \Delta d + \Delta e + d \Delta M_t \quad (9)$$

And given the values $d = 2.57 \pm 0.05$ and $e = -0.060 \pm 0.006$ obtained in section 2.1.3, (9) was expanded to equation (10) where M_t and ΔM_t were defined as they are for equation (7),

$$\Delta(flow) = \left(0.05 M_t / m + 0.006 + 2.57 \Delta M_t / m\right) m^3 / s \quad (10)$$

In section 2.2 it was stated that the preferred method for measuring low flow was to empty the measurement tank and measure the fill rate r . In that case the catchment flow was $y_3 = l \cdot w \cdot r$, where $l = 1.225 \pm 0.005$ m and $w = 2.435 \pm 0.005$ m were the length and width of the measurement tank. The uncertainty analysis for the low flow testing used multivariate measurement uncertainties. It also added three additional terms to account for additional elements in the measurement tank. Specifically, the baffle, the pump and three pieces of 2" x 4" lumber in the measurement tank and they displaced water differently at different water levels. Because they were small the effect was ignored in calculating the flow and their maximum cross-section was added to the uncertainty. The low flow measurement uncertainty from filling the measurement tank is described in equation (11).

$$\Delta(flow) = \frac{\partial y_3}{\partial l} \Delta l + \frac{\partial y_3}{\partial w} \Delta w + \frac{\partial y_3}{\partial r} \Delta r + \Delta(baffle) + \Delta(pump) + \Delta(wood) \quad (11)$$

The baffle was a piece of wood, $t = 0.019$ m thick at an angle of $\theta = 45$ degrees and covered the width of the tank. When submerged the maximum cross section at the water line multiplied by Δr was described in equation (12)

$$\Delta(baffle) = w \frac{t}{\sin \theta} \Delta r = 2.435 \text{ m} \frac{2 \cdot 0.019 \text{ m}}{\sqrt{2}} \Delta r = 0.066 \text{ m}^2 \Delta r \quad (12)$$

The pump had a maximum diameter, $D = 0.165$ m, when submerged the maximum cross-section multiplied by Δr was described in equation (13).

$$\Delta(pump) = \pi \frac{D^2}{4} \Delta r = \pi \frac{(0.165 \text{ m})^2}{4} \Delta r = 0.021 \text{ m}^2 \Delta r \quad (13)$$

Each of the 3 pieces of 2" x 4" was 1.5" thick by 3.5" wide resulting in a total maximum cross section multiplied by Δr described in equation (14).

$$\Delta(wood) = 3(1.5")(3.5") \left(\frac{0.0254 \text{ m}}{"}\right)^2 \Delta r = 0.010 \text{ m}^2 \Delta r \quad (14)$$

As a result, it was possible to simplify equation (11) into equation (15),

$$\Delta(flow) = wr\Delta l + lr\Delta w + lw\Delta r + 0.097 m^2\Delta r \quad (15)$$

Which can be simplified to equation (16),

$$\Delta(flow) = r(w\Delta l + l\Delta w) + (wl + 0.097 m^2)\Delta r \quad (16)$$

And developed into equation (17),

$$\Delta(flow) = r(w\Delta l + l\Delta w) + (wl + 0.097 m^2)\Delta r \quad (17)$$

Using the values and uncertainties for w and l included above and a nominal value of $\Delta r/r = 5.3 \times 10^{-4}$ taken from a typical curve (specifically 2022-6-13_test011A, taken on June 13, 2022); the equation (17) was simplified to equation (18).

$$\Delta(flow) = r \cdot 0.020 m^2 \quad (18)$$

3.3. Other Sources of Uncertainty

One of the main differences between the work performed in the laboratory and what is observed in the field is how the catch basin cover sits in the roadway. An image of a typical catch basin cover is shown in Figure 18a with a typical curb mounted inlet in Figure 18b. The pictures were taken in neighbourhoods near the National Research Council's laboratory facilities in Ottawa. In Figure 18a we note that the catch basin cover is set higher than the road surface and there appears to be uneven settling of the roadway. This results in a situation where the drainage is not as efficient and a greater depth of water is required on the roadway to access the catch basin. The opposite can be seen in Figure 18b where road resurfacing has resulted in the bottom of the inlet being set beneath the surface of the roadway. When the inlet is not set at the surface of the roadway the water depth above the catch basin will not be the same as that on the roadway or the inlet will not have the same height or capacity. In the experiments performed in this work every effort was made to align the inlet with the roadway surface however the inlets do not have a perfect edge so the transition was not perfectly level.



Figure 18. Catch basin a) cover and b) curb mounted inlet installed in a roadway

Another challenging situation is when debris contacts the water level probes. Figure 19 shows an extreme example of this phenomenon where a large piece of plastic debris was tangled on a probe. The experiments were completed in a large open laboratory and with very large volumes of water. As a result debris were occasionally observed on the capacitance wire gauges. The data from RD6 was very closely monitored during testing and if there was something odd with the data the probe was inspected. The debris was often not visible to the naked eye and as fine as a hair but it could impact the experimental measurements on the capacitance wire gauges.

Just upstream from the wire gauge in Figure 19 four staples are visible in the curb. Given the large volume of water we did occasionally encounter issues with the WeatherWatch product peeling, lifting and affecting the water flow around some of our sensors or inlets. As a result, some tests had to be repeated after the problems were identified and the product was reattached using staples. Regular inspections of the model were conducted in an effort to identify any irregularities that could impact the results. It should be noted that debris and irregularities in the roadway would also be present in the field. Those elements would impact results as they did impact the lab results. For this reason, the most extreme example of debris impacting a test was flagged but not omitted from our results. Specifically, during one ponding test (2022-6-2_test005) with the S19 inlet, a piece of foam drifted onto the catch basin blocking a portion of the opening. These data were not used in our analysis but they were kept as they could be useful for future work. The aim throughout the test program was to provide repeatable results so efforts were made to keep the model road surface consistent and free of debris as much as possible.

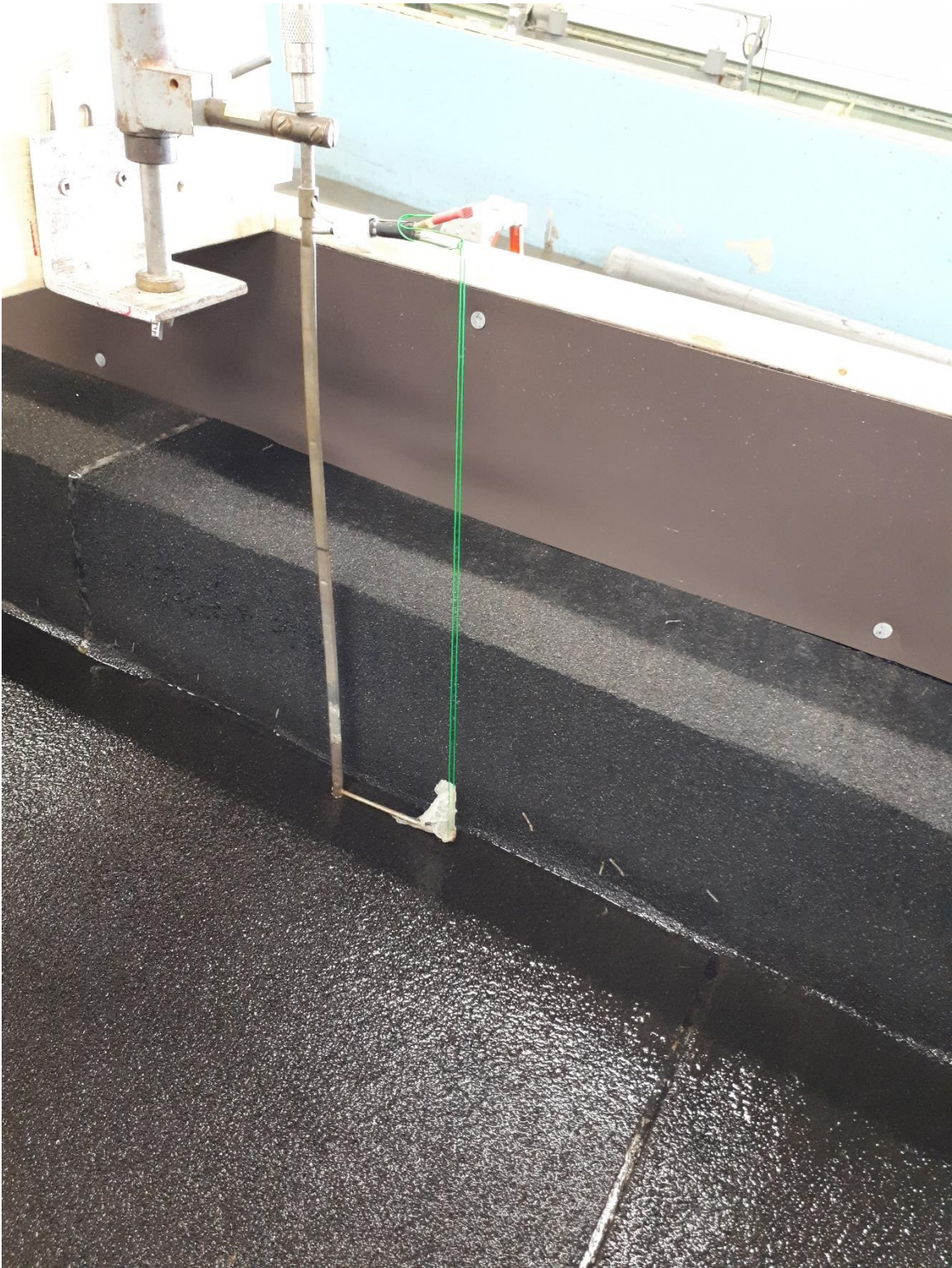


Figure 19. Plastic debris on the capacitance wire water level probe

Another source of uncertainty would be water losses in the roadway (leaks). The roadway was well constructed and these losses were minimal, on the order of 10^{-5} m³/s.

3.4. Example Data

The following example was for a road grade of 2.5% and a cross-slope of 2.0% and the single curb mounted inlet (S22) shown in Figure 11. For 2022-7-11_test001, the main pump was set to 6 PSI with the valve open to 100%. The water was allowed to run until all the signals had stabilized. The water levels recorded during the three minute sampling interval were shown in Figure 20. The water levels were recorded at 50 Hz except for the acoustic sensor WD4 which was acquired at 25 Hz. The figure includes the four water levels from the roadway (RD1, RD2, RD4 & RD6) which were located as described in Table 1, followed by the flows calculated from the average water depth of the two probes in the head tank (HT) and the average of the two probes in the measurement tank (MT) and finally the water depth from the acoustic sensor (WD4). At the end of each series of data the average, standard deviation maximum and minimum for the three minute interval were included.

In Figure 21 the water flows were examined more closely. The first four lines of data show the 3 minute samples of the water depth measurement for the head tank (HT1 and HT2) and the measurement tank (MT1 and MT2). These are followed by the flow meter readings into the head tank (FM1 and for the tests where the NRC pump was operating a second FM2 will be included as well). Finally, the last two lines include the flows calculated from the averages of the two probes in both the head tank and measurement tank. These are identical to those in Figure 20.

All of the printouts, similar to Figure 20 and Figure 21, for each series of tests can be found in the hard drive which accompanied this report in the 'Printout' directory. The files are categorized in folders for each of the catch basin covers and the flow data printouts are identified with a filename which begins with an 'F'. All of the three minute average and standard deviation data from these printouts can also be found in the 'DAT' directory of the hard drive and they are summarized in the Data_Summary.xlsx summary file of the test program which is located in the main directory. To find the correct tab the naming follows Sum_(cover#)_(roadgrade)_(xslope) so in this case we are looking at the data from Sum_S22_2p5_2. For the ponding tests the term 'Sum' is replaced by 'End' in the tab name as the end of the roadway has been blocked. The three minute averages are found in the N through AB 'eta' columns and the standard deviations are found in the AC through AR 'sigma' columns. These summary data tables are also all included in Appendix A of this report. The data in Figure 20 and Figure 21 provide the data for the first line of the Table A.13 and one point in Figure 22.

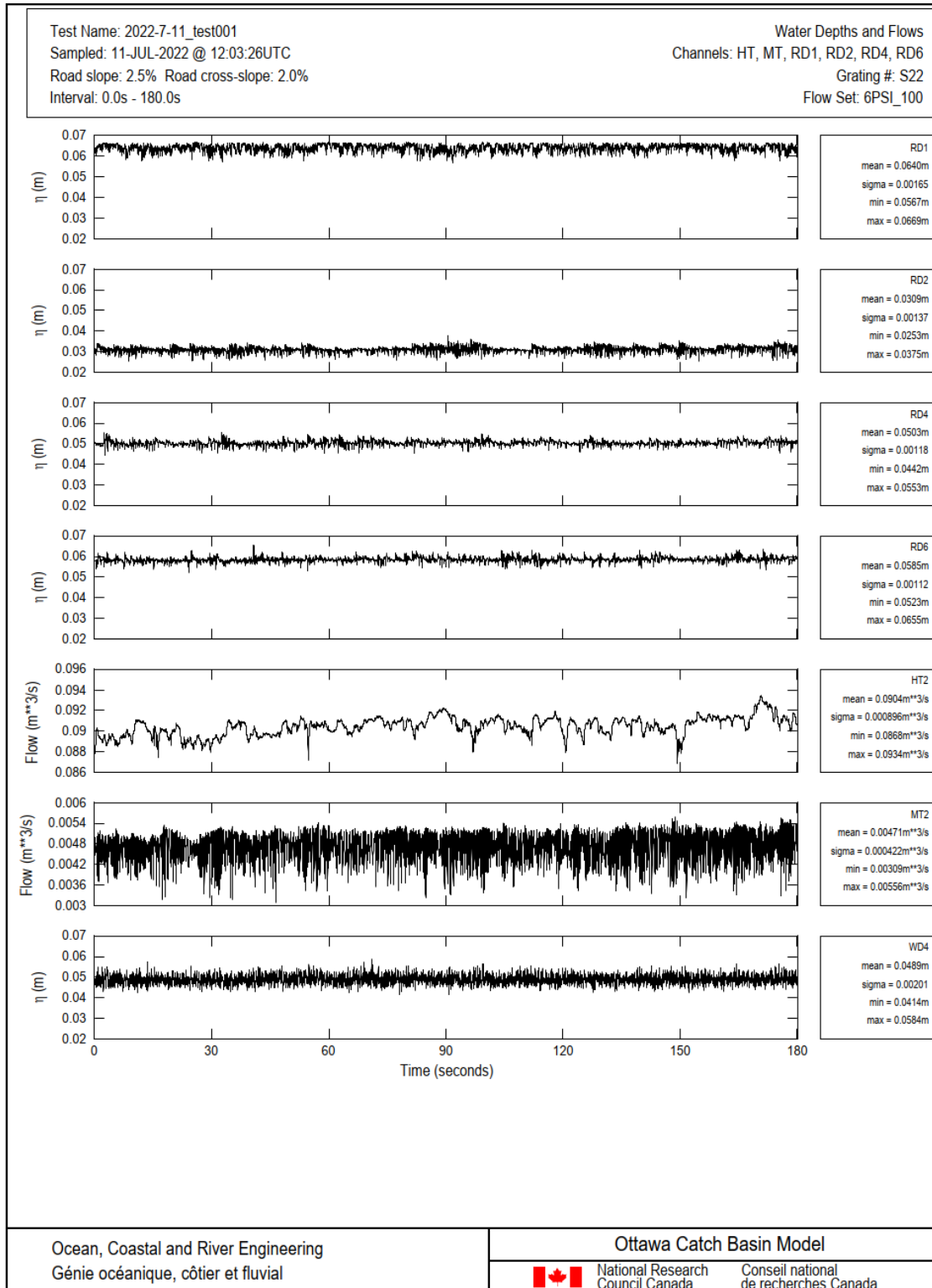


Figure 20. Water levels and flows during the 3 minute sampling interval

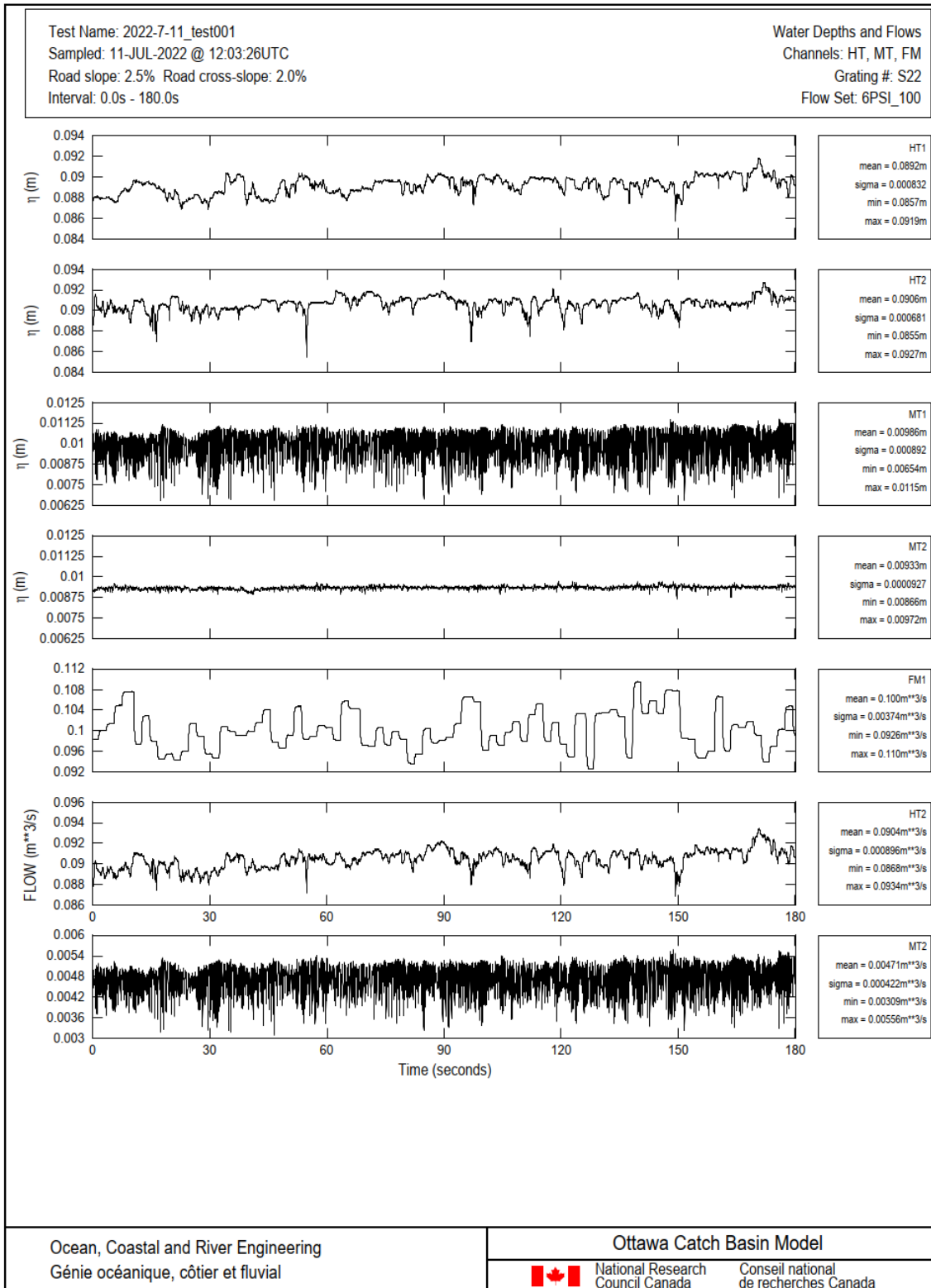


Figure 21. Water flows during the 3 minute sampling interval

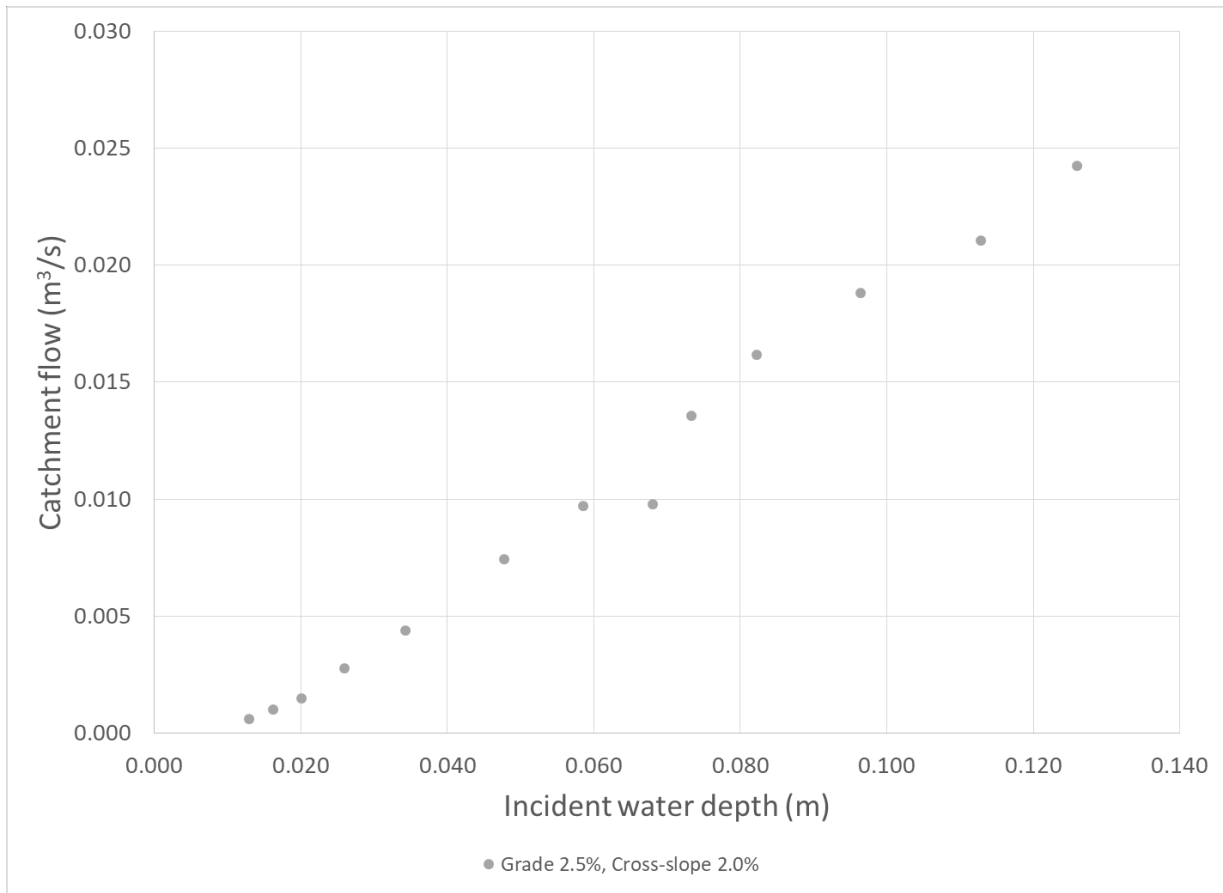


Figure 22. Measurements of catch basin inflow 2.5% Grade, 2.0% cross-slope, single curb inlet (S22)

Videos are also available for each test performed during the test series. A screen shot of 2022-7-11_test001, the test discussed throughout this section, is included in Figure 23. The videos can be found in the hard drive which accompanied this report in the 'Videos' directory. The video file names follow the format 'Ottawa_CB_Ddd Mmm DD hh mm ss YYYY.ps' corresponding to the date and time that the video was acquired. In order to match a video to a given test the user must refer to the log file 'YOW_log.xlsx' in the main directory of the hard drive.



Figure 23. Image capture from the test videos for 2022-7-11_test001, 2.5% Grade, 2.0% cross-slope, single curb inlet (S22)

4. Test Parameters

A summary of the controlled test parameters (water flow, catch basin cover, road grade and cross-slope) is included in Table 3.

The head tank water flow was controlled by adjusting the pump settings. For each road configuration 13 flows ranging from 0.001 – 0.41 m³/s were sent onto the roadway. This produced upstream water depths ranging from 0.007 - 0.35 m. Three pumps were used and a minimum pressure of 6 PSI was required on the main pump to deliver water up onto the model roadway. The seven lowest pump settings use only the main pump at 6 PSI and open the main valve from 5 to 100%. The next four flows were obtained by increasing the pressure on the main pump up to 15 PSI with the main valve 100% open. Finally, the two highest flow settings were obtained by adding the flow from two additional 6” submersible pumps. The 6” NRC and RENT pumps only had one setting. A moderate flow condition is shown in Figure 3 while a high flow condition is shown in Figure 24.

Table 3. Test parameters

Pump Settings	Type of Catch Basin Grate	Road Grade	Cross Slope
6PSI_05	S19 - "FISH" Round Catch Basin Cover	0.50%	2.00%
6PSI_10	S22 - Single Curb Inlet Frame	1.00%	4.00%
6PSI_15	S22x2 - Double Curb Inlet Frame	2.50%	0.00%
6PSI_25	S28 - Single Curb Inlet Frame for CBMH	5.00%	
6PSI_35			
6PSI_50			
6PSI_100			
7PSI			
8PSI			
11PSI			
15PSI			
15PSI_NRC_100			
15PSI_RENT_NRC_100			

For every road configuration;

- For each of the flow conditions the flow and water levels were allowed to stabilize for several minutes prior to initiating the data recording,
- The test series started with a midrange flow (6 PSI),
- A second test was completed (15 PSI),
- The subsequent test was completed with the maximum flow (15 PSI + 2 additional 6" pumps),
- We worked back down in flow from the highest to lowest remaining.

This methodology allowed us to 1) have two reference points for discontinuity in the data which could suggest a problem and 2) finish on lower flows which allowed the basin to drain so that the roadway could be moved to the next configuration after the series was completed.

As discussed in section 2.3, a total of four catch basin inlet combinations were studied for this work. For each inlet the flow through the catchment was measured for four road grades (0.5, 1.0, 2.5 and 5.0%) and two cross-slopes, 2.0 and 4.0%. For each inlet one ponding test was also performed at a road grade of 0.5% and a cross-slope of 0.0% with the end of the roadway blocked. On a typical test day two test series or road configurations were tested with a total of 13 water flows for each configuration. Each test has a name with the format: year, month, day followed by a three digit test number in the following form, YYYY_M_DD_test####. If a test needed to be repeated for any reason the test name was generally maintained but a letter was included after the test number. The most common reason to repeat a test is that the water levels and flows had not sufficiently stabilized in which case the test was replaced. Occasionally, there were simply questions about the result and an additional test is performed to improve confidence and both tests may have been retained.



Figure 24. Water flowing from the head tank to the roadway, high flow conditions

5. Results

This section includes an analysis of the catch basin flow tests performed in the National Research Council’s Coastal Wave Basin from May 27th to August 8th 2022. The section below contains the results from all four (4) catch basin inlets studied. A daily test log of the experiments performed is included in the main directory of the hard drive that was provided along with this report. Best fit curves for the data from this section were provided in Poirier and Provan (2023) for entry into numerical models.

5.1. S19 Inlet – “FISH” Round Catch Basin Cover

The first four summary tables in Appendix A correspond to the “FISH” round catch basin cover (S19) oriented at a cross-slope of 2.0% provide the data for Figure 25. The 56 points from Figure 25 are also provided in Appendix B (Table B.1).

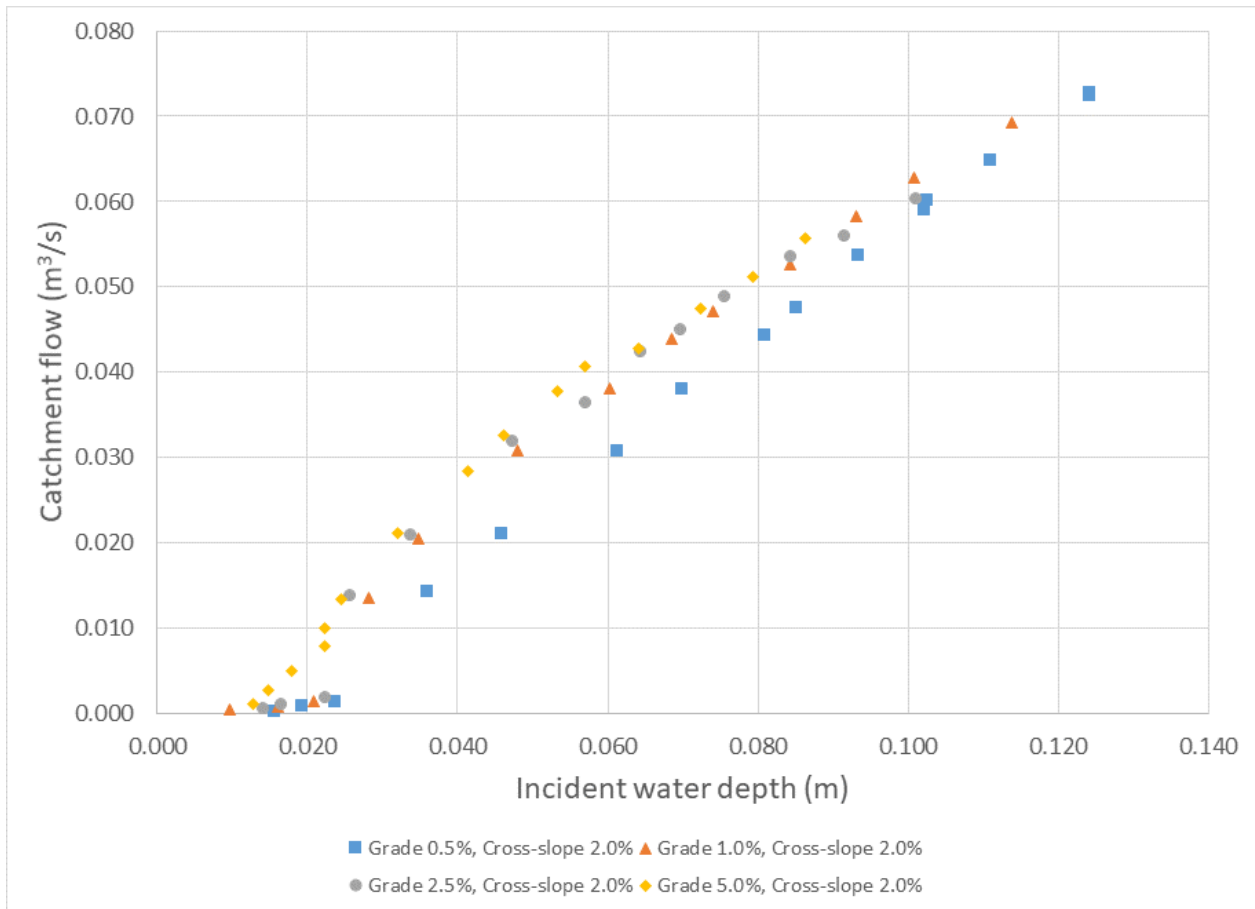


Figure 25. Measurements of catch basin inflow 2.0% cross-slope, single curb inlet (S19)

Examining Figure 25 we note that the highest inflow values were recorded for the lowest grades and the deepest incident water depths. For a similar incident water depth an increasing grade appears to result in an increase in inflow however the three largest grades were very similar, almost overlapping. Finally, the higher grades had lower maximum inflows recorded. These results were very similar to those found in Figure 17 and Table B.1 from Poirier and Provan (2022) for the single round herringbone inlet (OPSD 400.070) at a 2.0% cross-slope.

Figure 26 was the result of 52 experiments very similar to those described in Figure 25 but with a cross-slope of 4.0%. The 52 data points for this figure are summarized in Table B.2 or in greater detail in Appendix A. The overall behaviour was very similar to the 2.0% cross-slope. The main difference was that with the increased cross-slope more water was directed to the curb and as a result the water depths were higher in general for the 4.0% cross-slope. These results were very similar to those found in Figure 18 and Table B.1 from Poirier and Provan (2022) for the single round herringbone inlet (OPSD 400.070) at a 4.0% cross-slope.

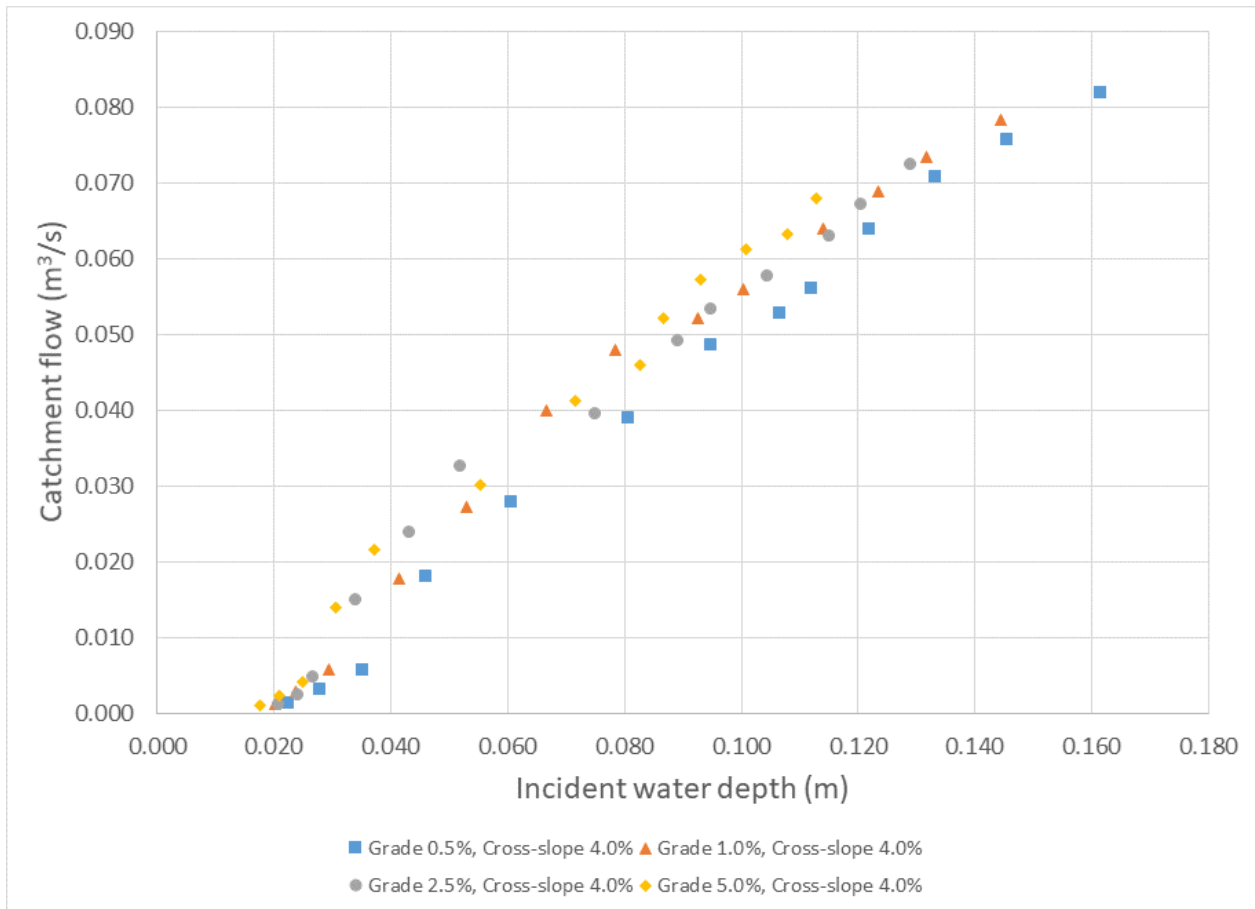


Figure 26. Measurements of catch basin inflow 4.0% cross-slope, single curb inlet (S19)

Figure 27 was the result of the 17 experiments performed in our first ponding test series. The data for the 17 points included in Figure 27 can be found in Table B.1 and more detailed results from the tests were included in Table A.10. For these experiments the road was set to a grade of 0.5% and a cross-slope of 0.0%. The end of the model roadway was blocked forcing all of the water through the catch basin inlet. Beyond those points the experiments were very similar to those performed in Figure 25 and Figure 26. Blocking the end of the roadway resulted in much greater water depths and inlet flows. The experiments were continued until the water overflowed beyond the barrier at the end of the roadway resulting in a water depth of approximately 35 cm upstream of the inlet. The results from Figure 27 show two distinct linear trends. At lower incident water depths up to 13-14 cm, which was equivalent to the curb height, the inflow increased more with increasing incident water depth. As the incident water depth surpassed the height of the curb, ~ 13.5 cm, the inflow continued to increase with increasing incident water depth but at a lower rate.

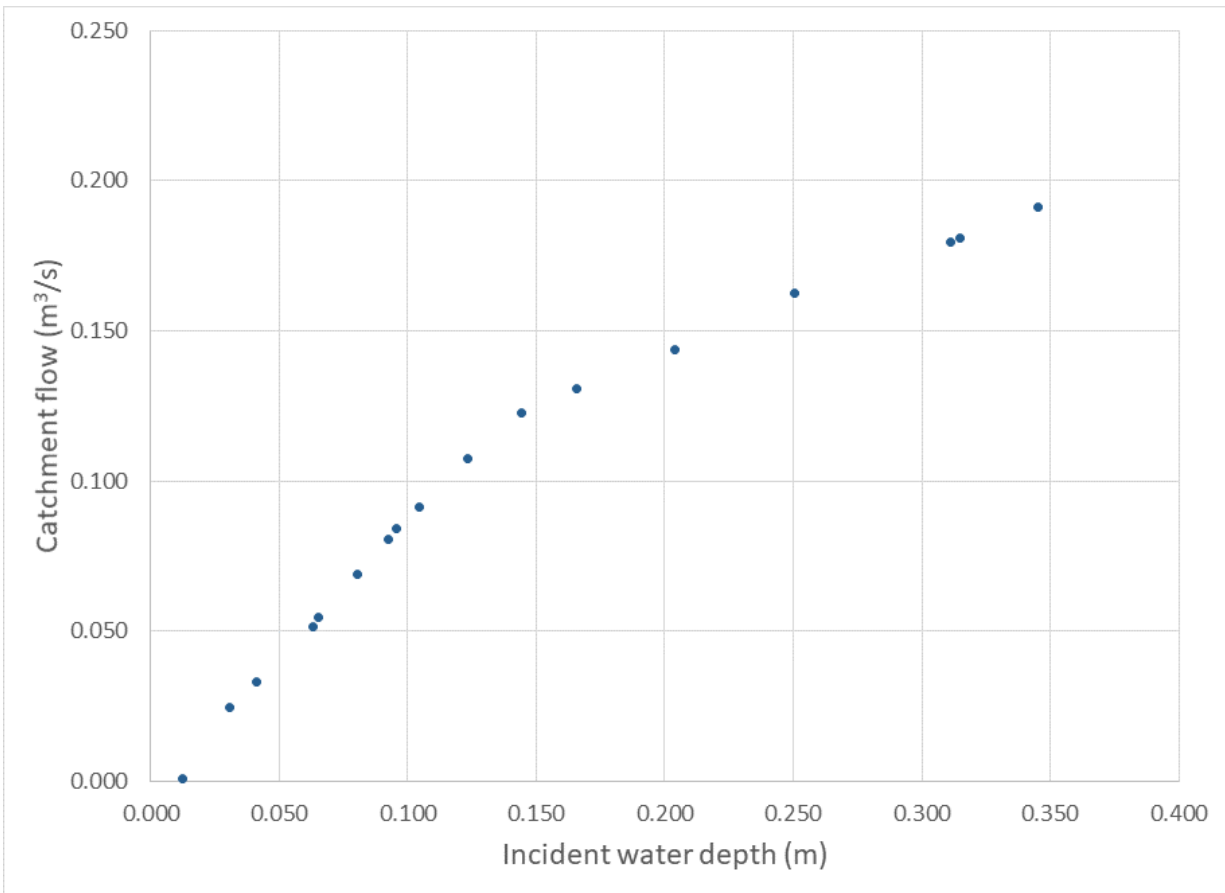


Figure 27. Measurements of catch basin inflow for ponding test series, single curb inlet (S19)

At the lowest water depths the openings of the catch basin cover were generally free of water. As the water level increased, more of the surface of the opening was covered with water as shown in Figure 28a (6.5 cm). In Figure 28b we see that as the water continued to increase (10.5 cm) the entire opening appeared to be covered but there was a great deal of turbulence, openings were regularly exposed and multiple vortexes were regularly formed. As the incident water level (14.4 cm) passed the height of the curb in Figure 28c we see that larger more stable vortexes started to appear. At this point they still moved over the surface of the cover and appeared/disappeared. As the water level continued to increase (16.6 cm) the vortex became larger and much more stable as shown in Figure 28d. The appearance of the vortex did not change for the tests at greater water depths.

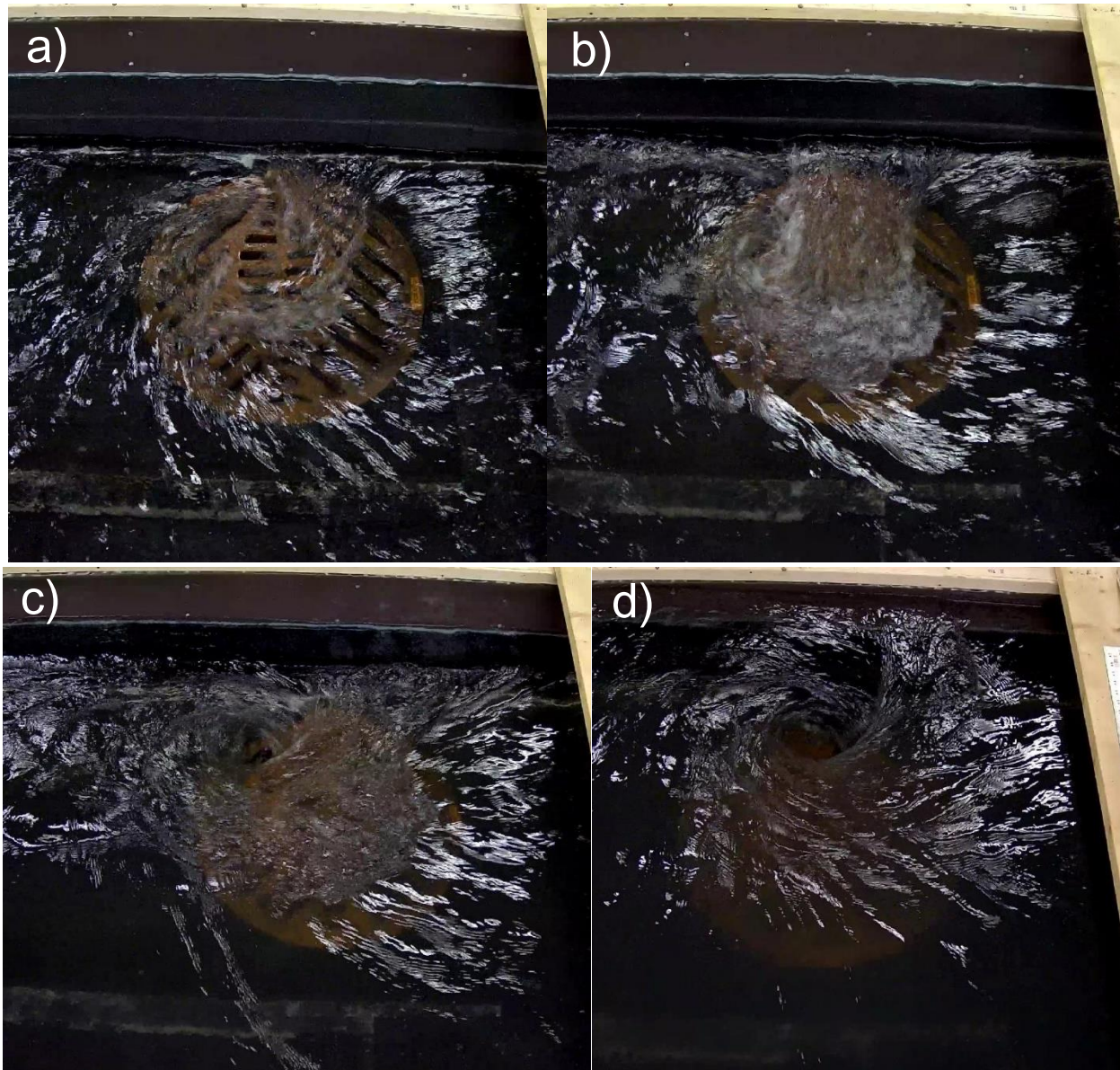


Figure 28. Still images captured from videos acquired of the ponding test (S19). The incident water depths are a) 6.5 cm, b) 10.5 cm, c) 14.4 cm and d) 16.6 cm

5.2. S22 Inlet – Single Curb Inlet Frame

The catchment flows for the single curb inlet frame (S22) oriented with a cross-slope of 2.0% are shown in Figure 29. The data for the 57 points included in Figure 29 can be found in Table B.3 and more detailed results from the tests are included in Appendix A.

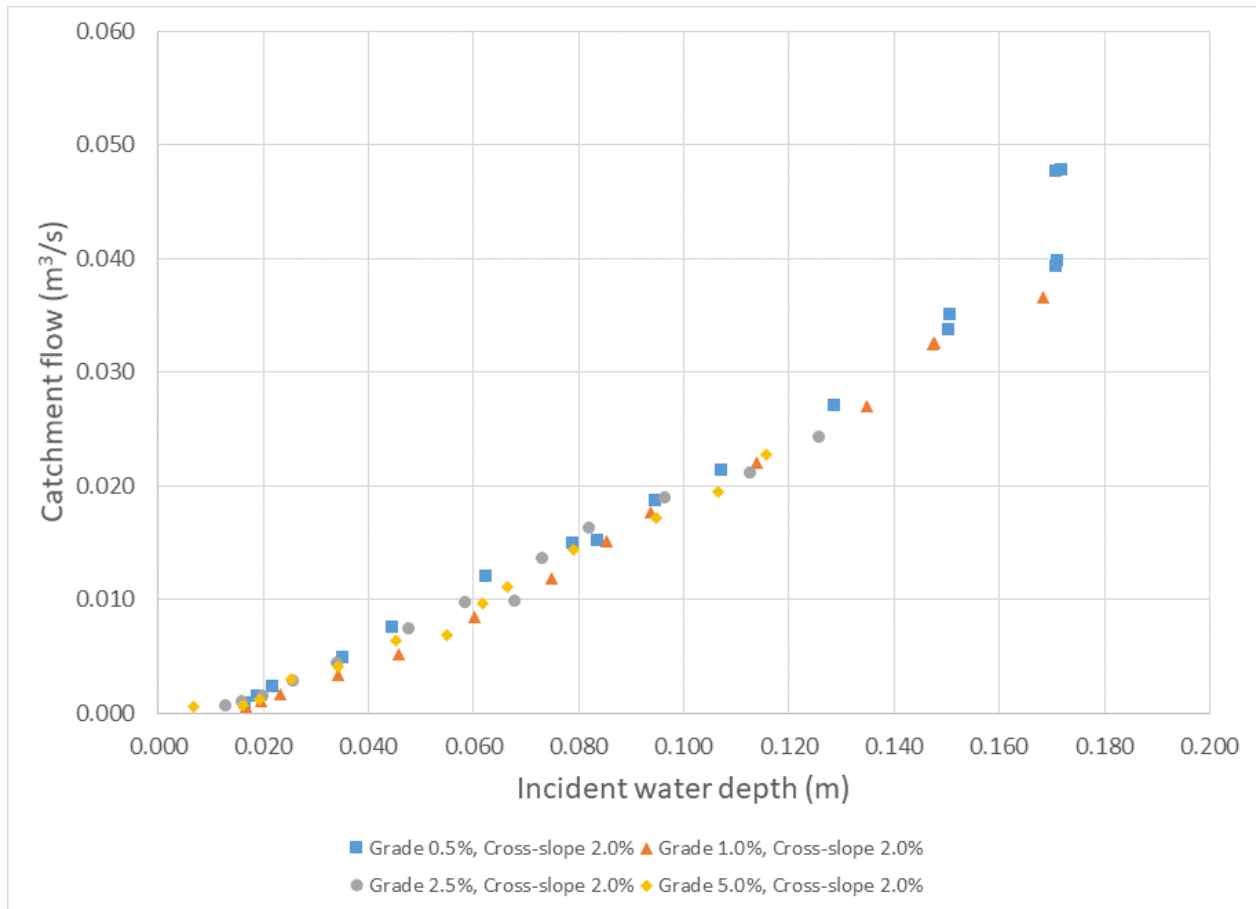


Figure 29. Measurements of catch basin inflow 2.0% cross-slope, single curb inlet (S22)

Examining Figure 29 we note that the highest inflow values were recorded for the lowest grades and the deepest incident water depths. For a similar incident water depth there was little difference in the inflow for the four different road grades and the higher grades recorded lower maximum inflows. One interesting observation was the apparent asymptote at an incident water depth of 17.1 cm for the road grade of 0.5%. This test was repeated and this was a real observation for this experimental setup. It should be noted that with the installation of the curb mounted inlets there was a rebuild of the model roadway. For the S19 test series the curb was constructed with a standard piece of 6" x 6" pressure treated lumber resulting in a curb height of ~ 13.5 cm. After the rebuild the curb height was set to match the inlet frame and the new height was ~ 17.5 cm for all remaining tests. For the two highest pump settings in this test series the last increase in water flow onto the roadway resulted in greater flow through the inlet without increasing the incident water depth upstream of the inlet because that small increase was spread over the rather larger sidewalk. It should be noted that the asymptote may not occur at precisely the same height as the curb. In Figure 30 a photo was taken of water surface at an incident water depth of 17.1 cm. The water is very turbulent. If the turbulence spilling over the curb is generally occurring away from the RD6 wave probe the asymptote will occur at an incident water depth below the curb height.



Figure 30. Photo taken during 2022-7-8_test005A, 0.5% grade, 2.0% cross-slope, single curb inlet (S22), incident water depth of 17.1 cm.

Figure 31 was the result of 59 experiments very similar to those described in Figure 29 but with a cross-slope of 4.0%. The 59 data points for this figure were summarized in Table B.4 or in greater detail in Appendix A. The overall behaviour was very similar to the 2.0% cross-slope. The main difference was that with the increased cross-slope more water was directed into the inlet resulting in higher inflows for the 4.0% cross-slope.

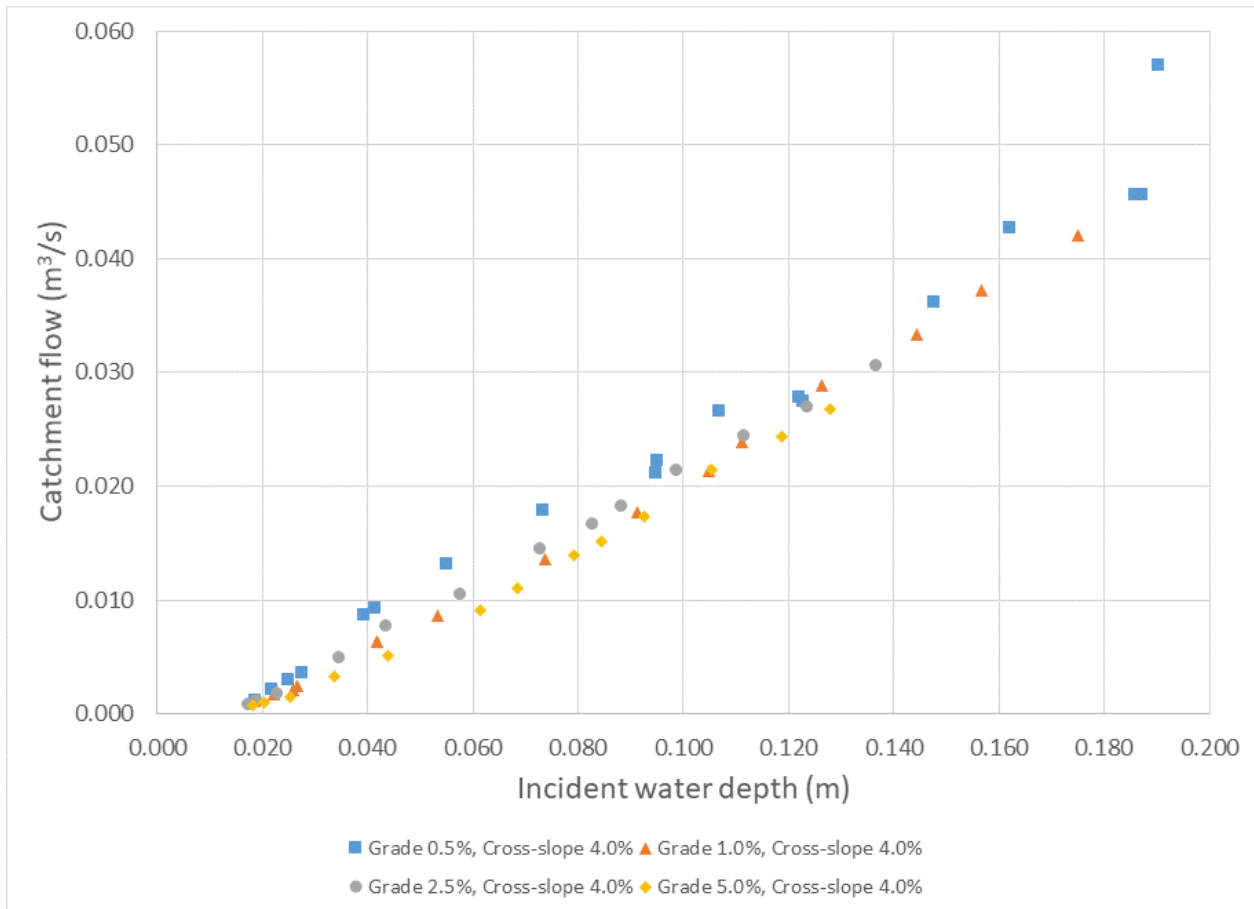


Figure 31. Measurements of catch basin inflow 4.0% cross-slope, single curb inlet (S22)

Figure 32 was the result of the 18 experiments performed in our S22 ponding test series. The data for the 18 points included in Figure 32 can be found in Table B.3 and more detailed results from the tests were included in Table A.19. For these experiments the road was set to a grade of 0.5% and a cross-slope of 0.0%. The end of the model roadway was blocked forcing all of the water through the catch basin inlet. Blocking the end of the roadway resulted in much greater water depths and inlet flows. The experiments were continued until the water overflowed beyond the barrier at the end of the roadway resulting in a water depth of approximately 35 cm upstream of the inlet. The results from Figure 32 show a more or less linear trend for incident water depths less than ~ 23 cm. While the curb was only ~ 17.5 cm high a vortex into the inlet was maintained which allowed continual airflow up to an incident water depth of ~ 23 cm. Figure 33 shows an image of the vortex for the leading half of the inlet for an incident water depth of 20.9 cm. At greater incident water depths the vortex disappeared and the inflow appeared to reduce slightly up to an incident water depth of ~ 25 cm and then increased only slightly up to an incident water depth of 35 cm. It should be noted that this small reduction or increase in inflow at incident water depths greater than 23 cm was less than the standard deviation of our measurements for these very high inflows and therefore beyond our ability to measure with confidence.

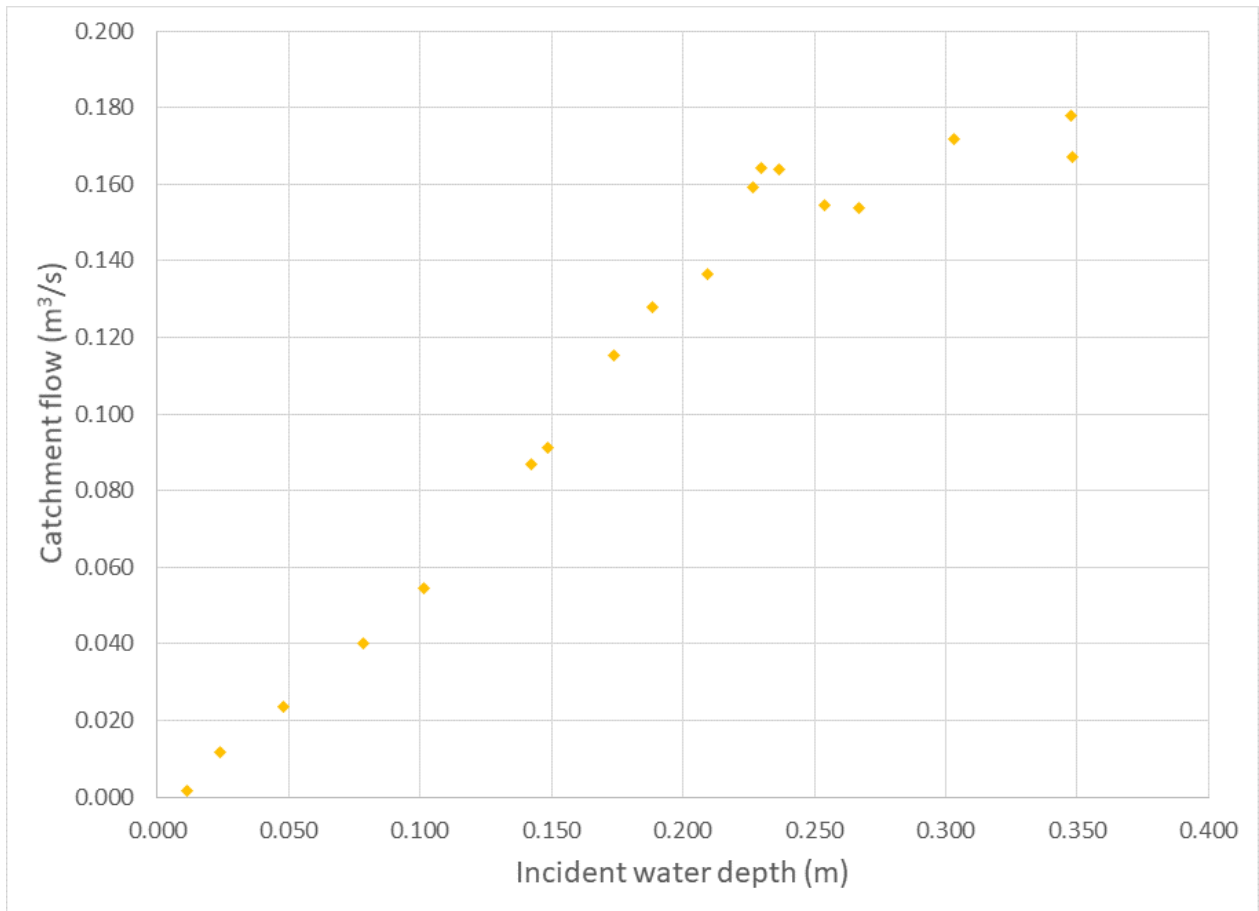


Figure 32. Measurements of catch basin inflow for ponding test series, single curb inlet (S22)

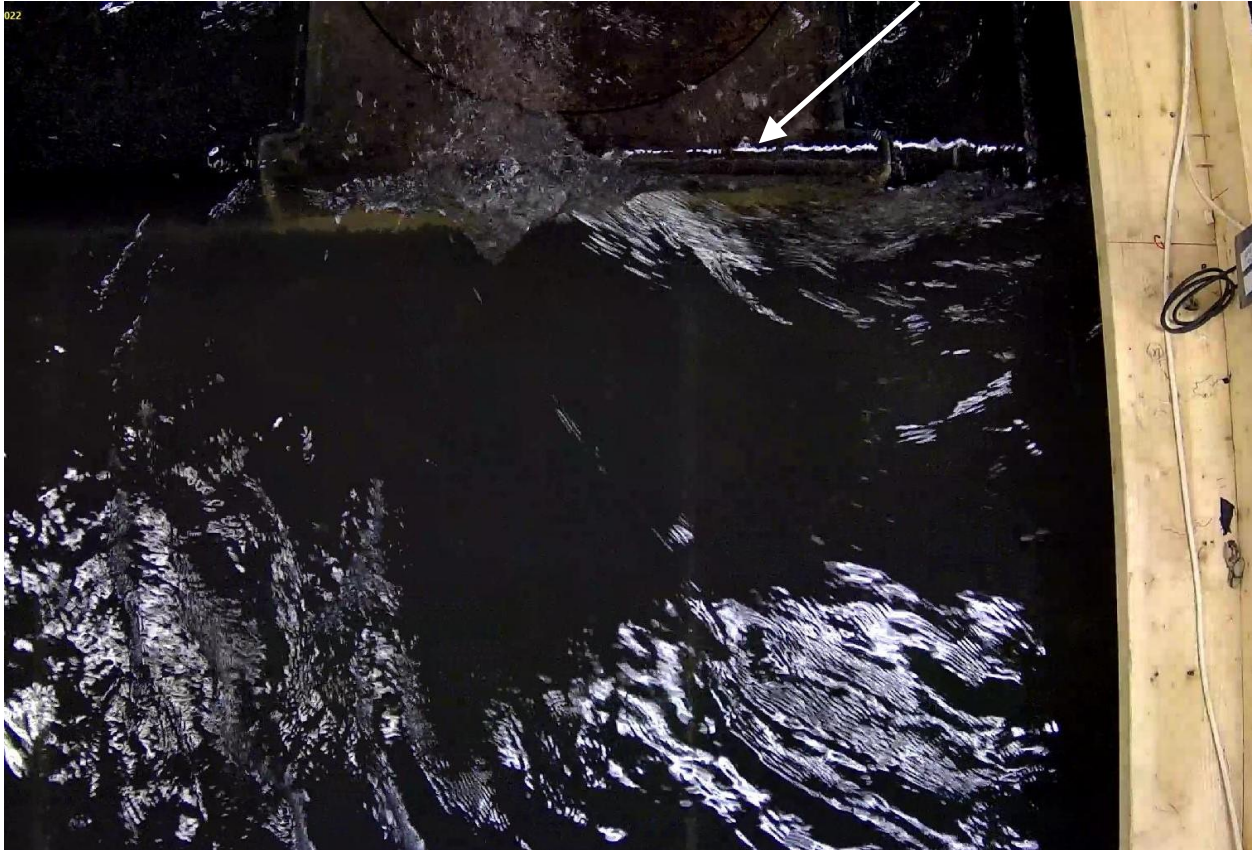


Figure 33. Still image captured from videos acquired of the ponding test (S22). The incident water depth was 20.9 cm. Vortex indicated by the arrow.

5.3. S22(x2) Inlet – Double Curb Inlet Frame

The catchment flows for the double curb inlet frame (S22x2) oriented with a cross-slope of 2.0% are shown in Figure 34. The data for the 58 points included in Figure 34 can be found in Table B.5 and more detailed results from the tests were included in Appendix A. Similar to the previous two inlets in Figure 34 we noted that the highest inflow values were recorded for the lowest grades and the deepest incident water depths. There appears to be one anomaly in that the highest inflow was recorded at a grade of 0.5% and the deepest incident water depth was recorded at a grade of 1.0%. It should be noted that at these very high flows the water surface was very turbulent and the uncertainties increase. By examining the uncertainties from Table A.20 and Table A.21 we note that these two points have overlapping uncertainties. For a similar incident water depth there was little difference in the inflow for the four different road grades and the higher grades recorded lower maximum inflows.

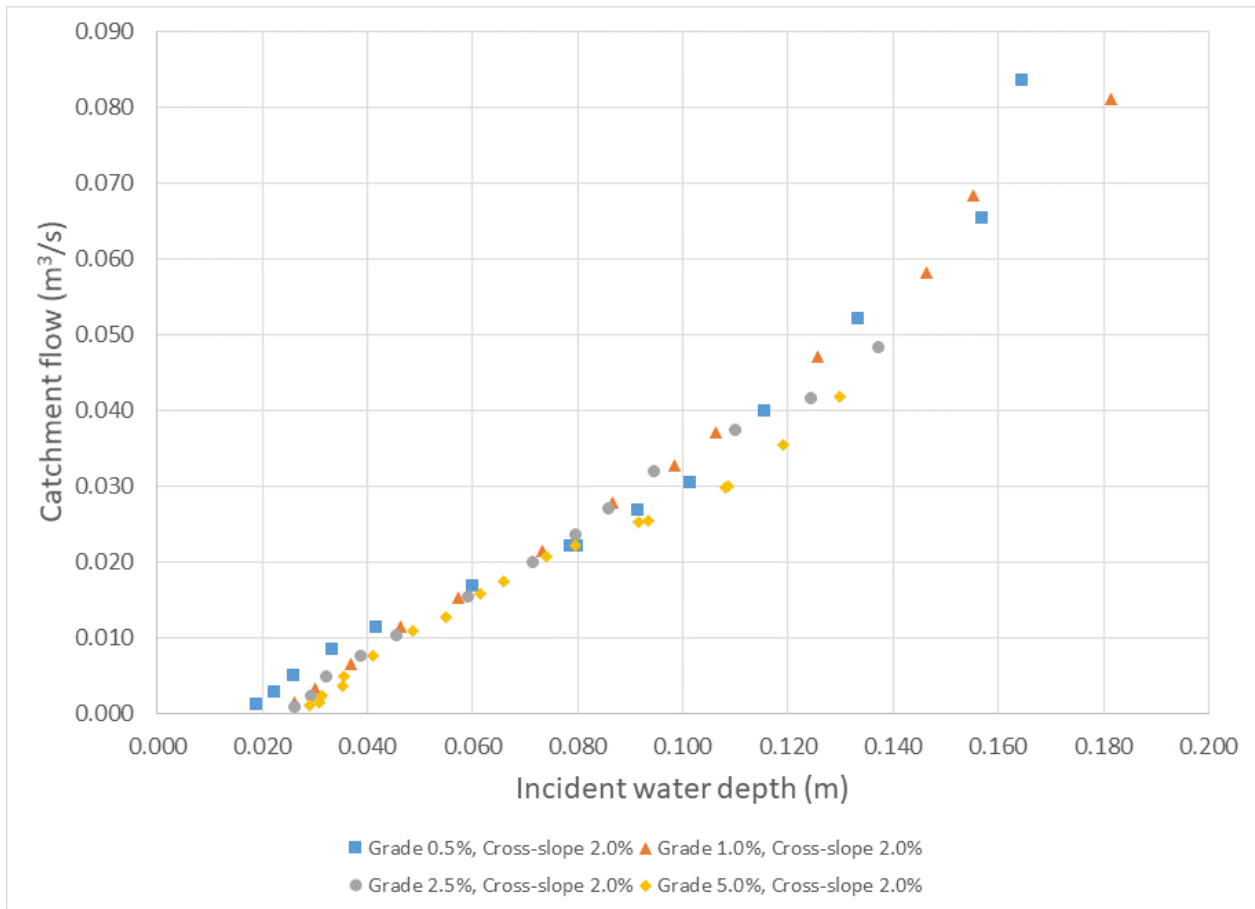


Figure 34. Measurements of catch basin inflow 2.0% cross-slope, double curb inlet (S22x2)

Figure 35 was the result of 52 experiments very similar to those described in Figure 34 but with a cross-slope of 4.0%. The 52 data points for this figure were summarized in Table B.6 or in greater detail in Appendix A. The overall behaviour was very similar to the 2.0% cross-slope, especially at the 5.0% grade. For the other three road grades the main difference was that with the increased cross-slope more water was directed into the inlet resulting in deeper incident water depths and higher inflows for the 4.0% cross-slope.

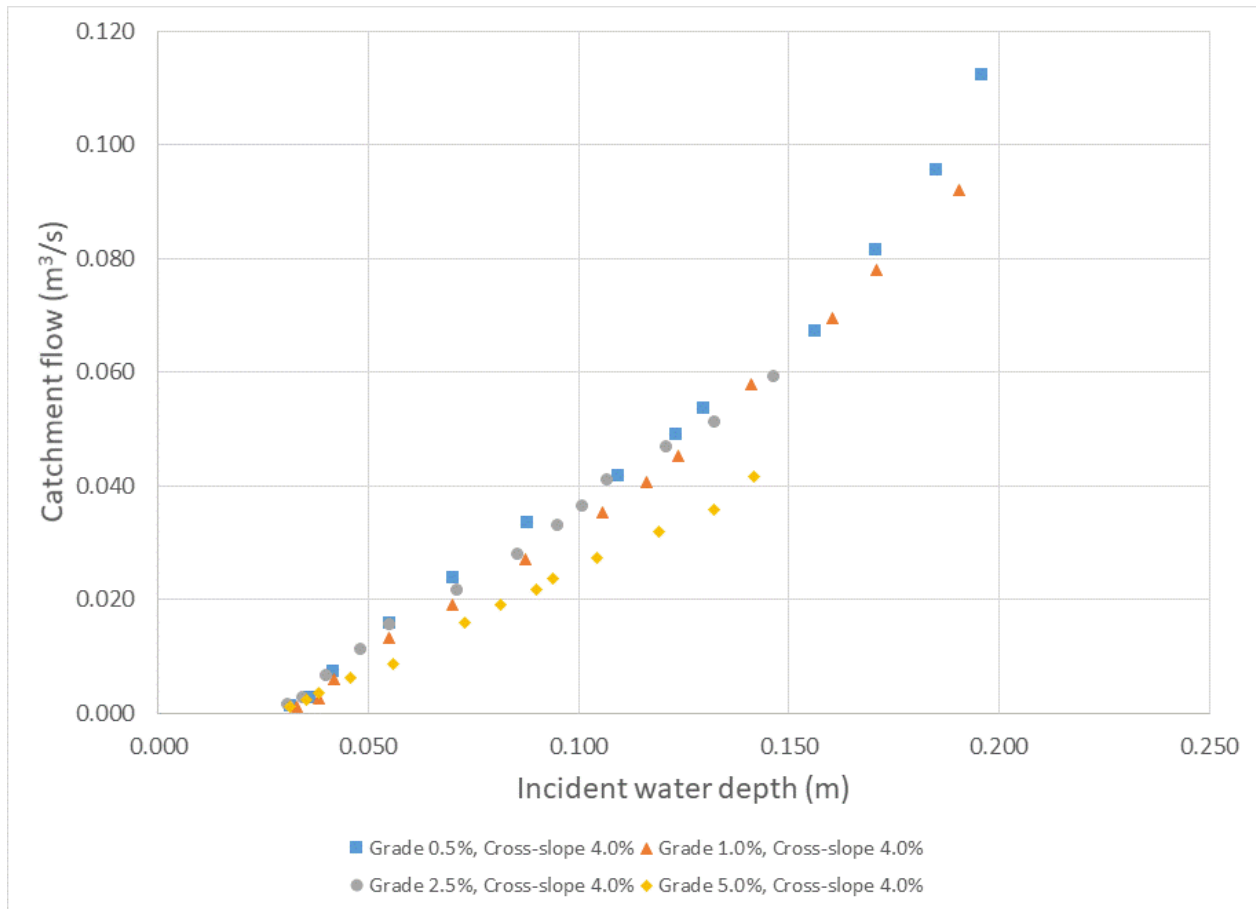


Figure 35. Measurements of catch basin inflow 4.0% cross-slope, double curb inlet (S22x2)

Figure 36 is the result of the 17 experiments performed in our S22 (x2) ponding test series. The data for the 17 points included in Figure 36 can be found in Table B.5 and more detailed results from the tests were included in Table A.28. For these experiments the road was set to a grade of 0.5% and a cross-slope of 0.0%. The end of the model roadway was blocked forcing all of the water through the catch basin inlet. Blocking the end of the roadway resulted in much greater water depths and inlet flows. The experiments were continued until the maximum capacity of the pumps was achieved; resulting in a water depth of approximately 34 cm upstream of the inlet. At this water depth there was only minimal spilling of water both over the top of the walls of the model roadway and through any possible cracks when compared to the water captured through the two inlets. The inflow into the two inlets increases monotonically with increasing incident water depth and the rate of increase did not decrease over the examined test conditions. At the maximum incident water depth achieved (33.8 cm) a vortex, shown in Figure 37, into the inlets was mostly maintained allowing for efficient drainage, 0.41 m³/s. The highest recorded during the test program.

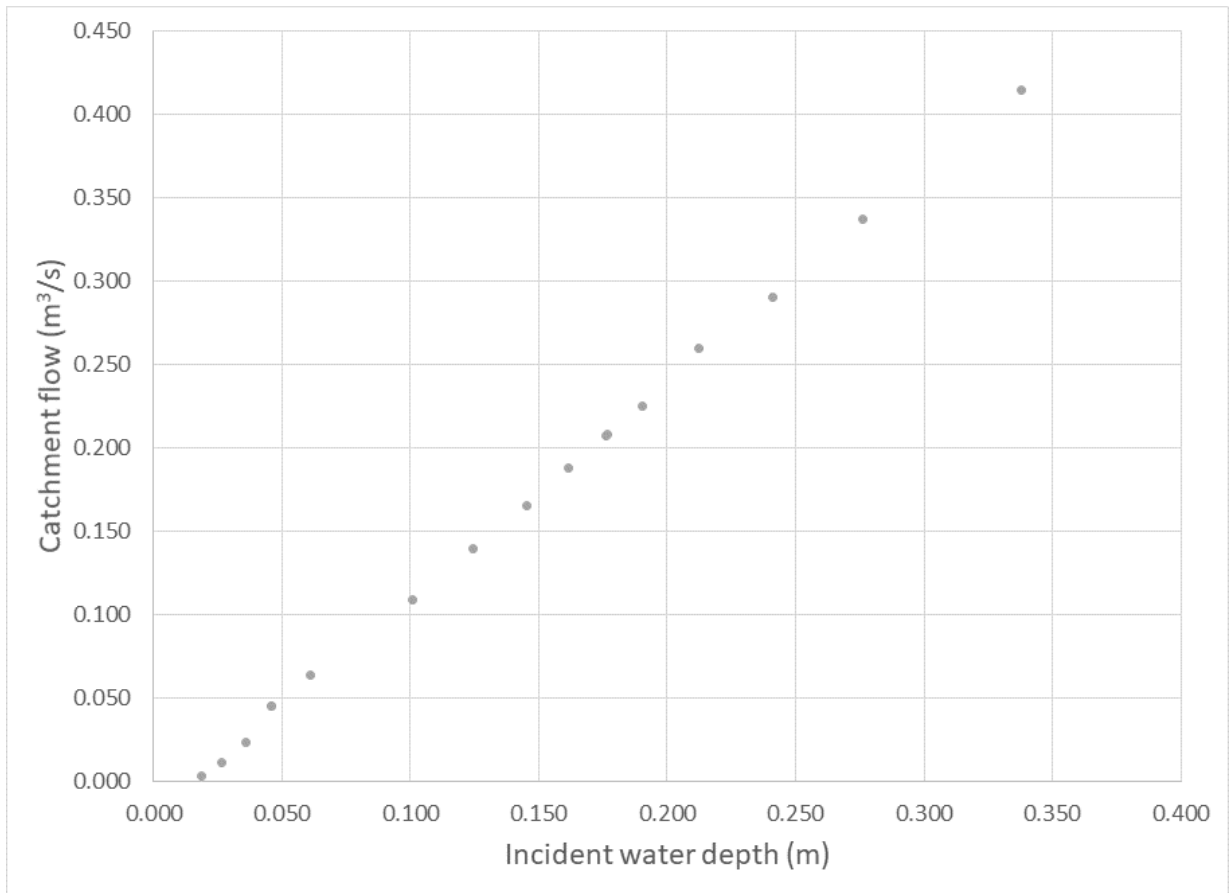


Figure 36. Measurements of catch basin inflow for ponding test series, double curb inlet (S22x2)

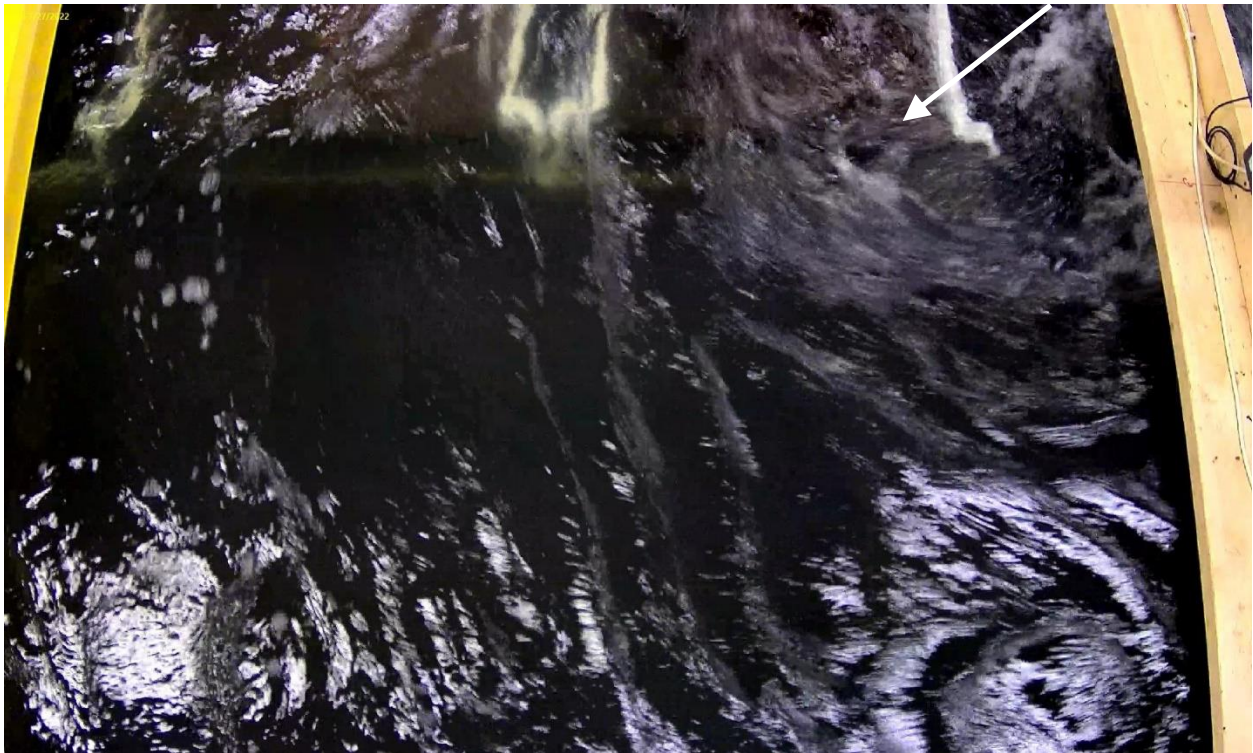


Figure 37. Still image captured from videos acquired of the ponding test (S22x2). The incident water depth was 33.8 cm. Vortex indicated by the arrow.

5.4. S28 Inlet – Single Curb Inlet Frame for CBMH

The catchment flows for the single curb inlet frame for CBMH (S28) oriented with a cross-slope of 2.0% were shown in Figure 38. The data for the 67 points included in Figure 38 can be found in Table B.7 and more detailed results from the tests were included in Appendix A. In Figure 38 we noted that the highest inflow values were recorded for the lowest grades and the deepest incident water depths and the higher grades recorded lower maximum inflows.

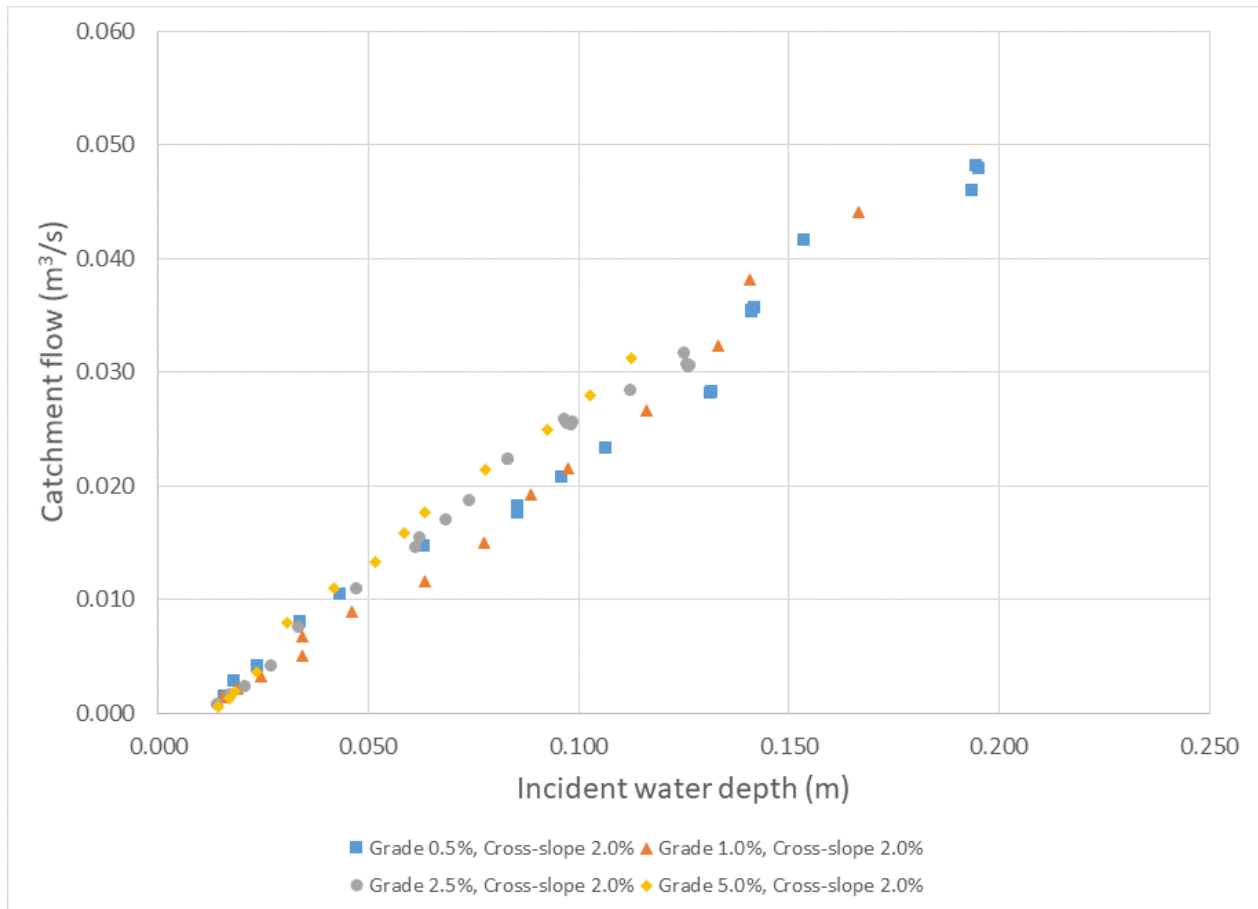


Figure 38. Measurements of catch basin inflow 2.0% cross-slope, single curb inlet (S28)

Figure 39 was the result of 53 experiments very similar to those described in Figure 38 but with a cross-slope of 4.0%. The 53 data points for this figure were summarized in Table B.8 or in greater detail in Appendix A. The overall behaviour was very similar to the 2.0% cross-slope. The main difference was that with the increased cross-slope more water was directed into the inlet resulting in deeper incident water depths and higher inflows for the 4.0% cross-slope.

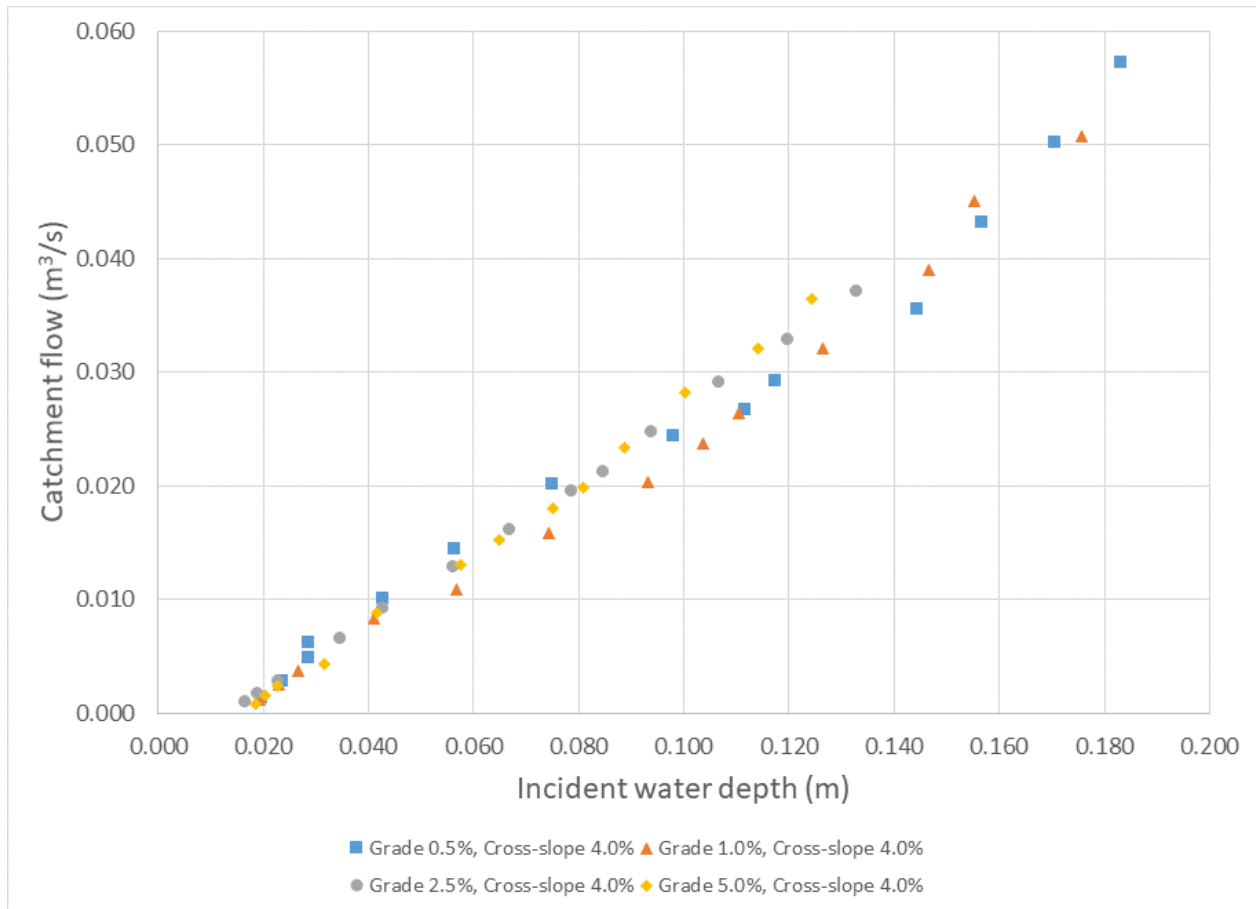


Figure 39. Measurements of catch basin inflow 4.0% cross-slope, single curb inlet (S28)

Figure 40 was the result of the 13 experiments performed in our S28 ponding test series. The data for the 13 points included in Figure 40 can be found in Table B.7 and more detailed results from the tests were included in Table A.37. For these experiments the road was set to a grade of 0.5% and a cross-slope of 0.0%. The end of the model roadway was blocked forcing all of the water through the catch basin inlet. Blocking the end of the roadway resulted in much greater water depths and inlet flows. The experiments were continued until the water overflowed beyond the barrier at the end of the roadway resulting in a water depth of approximately 35 cm upstream of the inlet. The results from Figure 40 show a more or less linear trend for incident water depths less than ~ 29 cm. While the curb was only ~ 17.5 cm high a consistent vortex into the inlet was maintained which allowed continual airflow up to an incident water depth of ~ 25 cm. Figure 41a shows an image of the vortex for the leading edge of the inlet for an incident water depth of 25.2 cm. For incident water depths from 25 – 30 cm the vortex became less stable, appearing and disappearing. At incident water depths greater than 30 cm the vortex disappeared, as shown in Figure 41b, and the inflow appeared to continue to increase at a reduced rate up to the maximum observed incident water depth of 35 cm. It should be noted that at incident water depths of 29 cm or greater the uncertainties on the measurements are greater. The results from Figure 40 appear to be consistent with those from Figure 32 however the large uncertainties make drawing conclusions difficult.

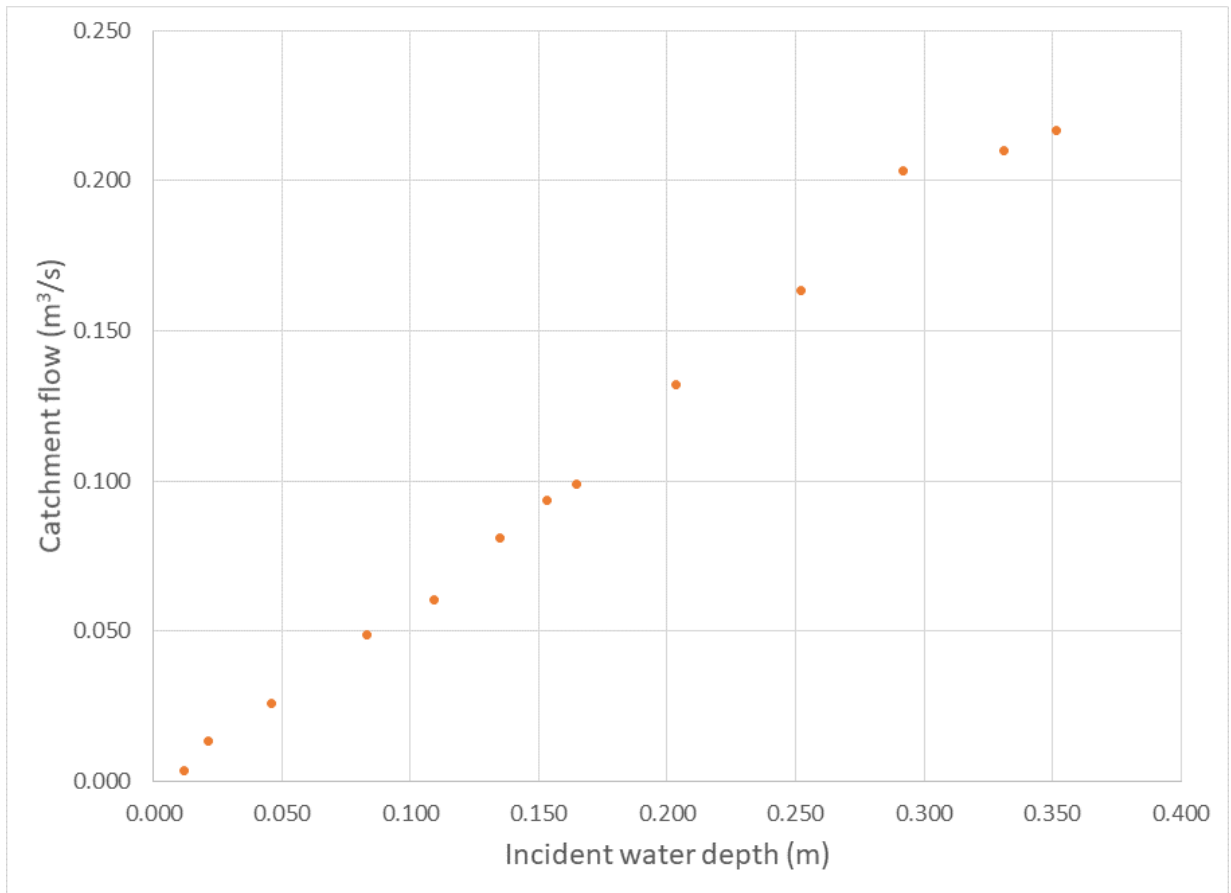


Figure 40. Measurements of catch basin inflow for ponding test series, single curb inlet (S28)

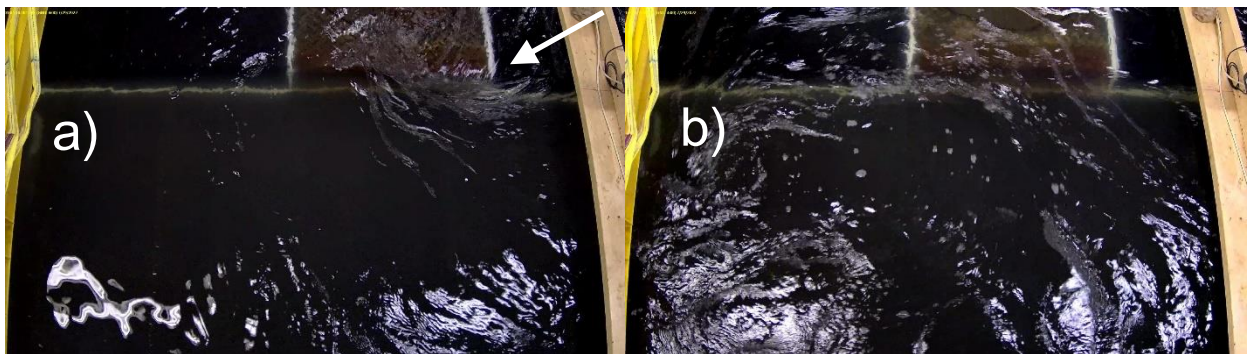


Figure 41. Still images captured from videos acquired of the ponding test (S28). The incident water depths are a) 25.2 cm, b) 33.1 cm. Vortex indicated by the arrow.

6. Comparative Analysis

A single road orientation of 1.0% grade and 2.0% cross-slope was used in Figure 42 in order to illustrate the differences between the four different catch basin inlets studied in this experimental test program. In most conditions the smallest inlet, S22 permitted the least inflow followed by S28 and the double S22 and the S19 allowed the greatest inflow in most conditions tested. The double S22 did however permit the greatest inflow for high incident water depths. In general, as the cross-slope was increased from 2.0% to 4.0% the incident water depths and the inflows were greater. This impact was greater for the curb inlets as shown in Figure 43. Similarly, as the road grade was increased from 0.5% to 5.0% the incident water depths and inflows were less and once again the impact was greater for the curb inlets as shown in Figure 44.

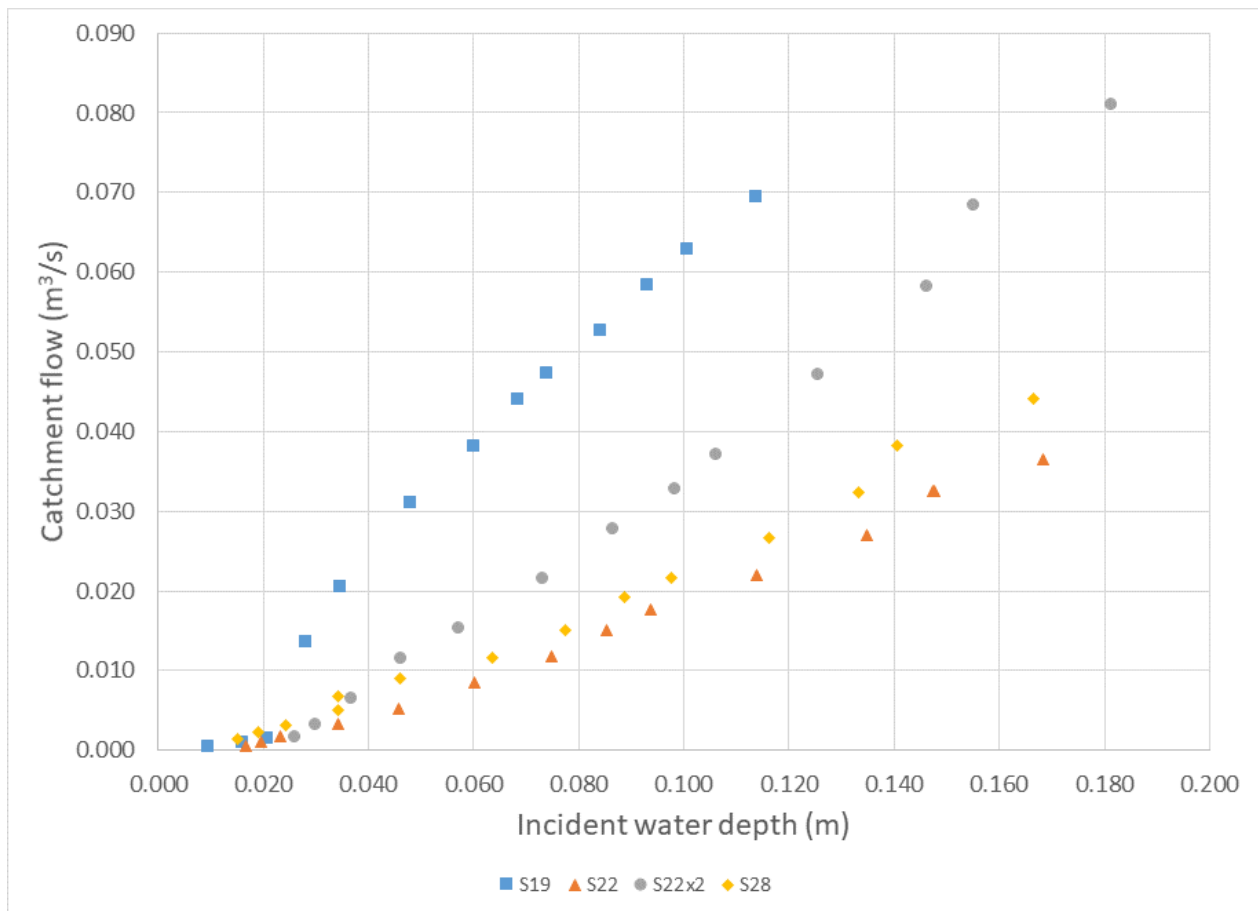


Figure 42. Measurements of catch basin inflow for a 1.0% grade and a 2.0% cross-slope, all inlets

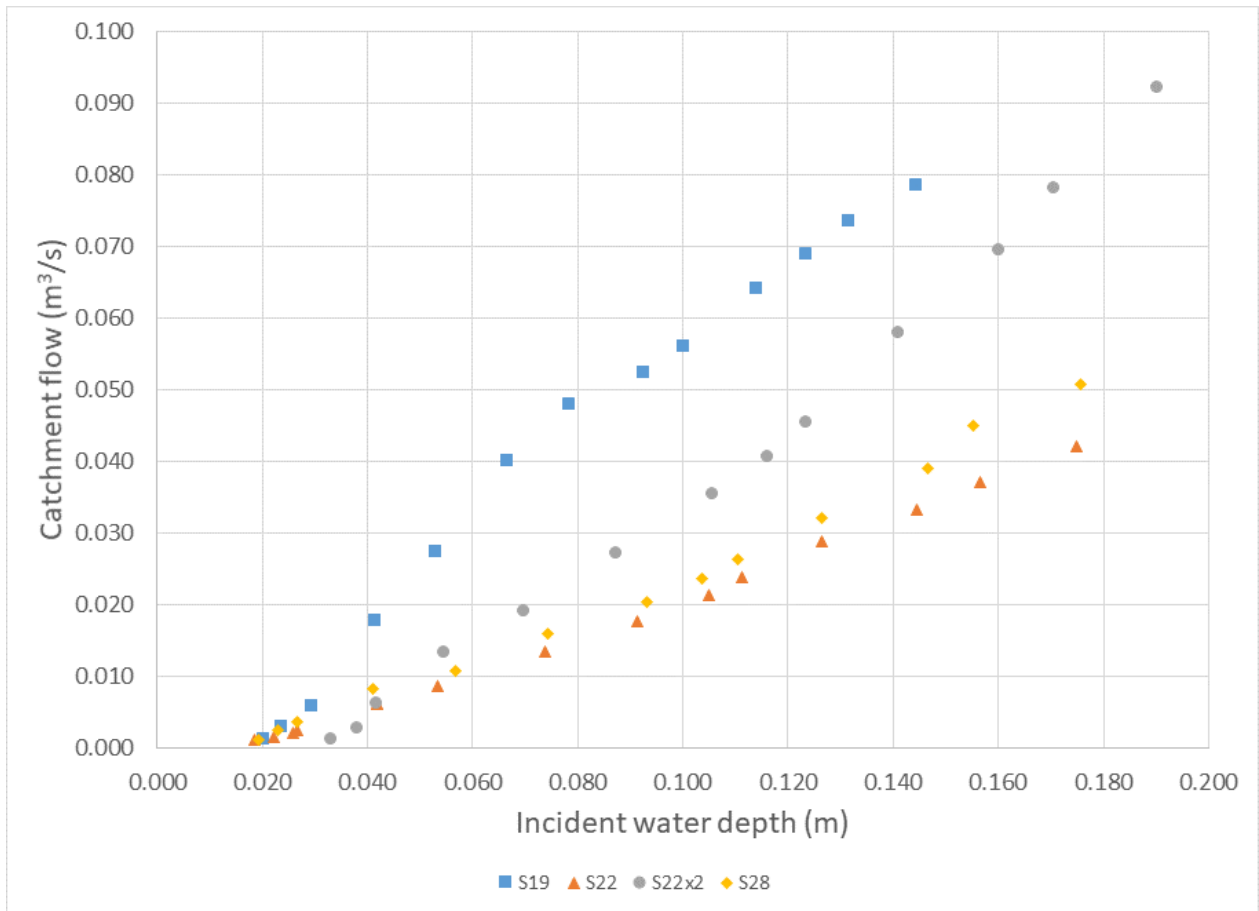


Figure 43. Measurements of catch basin inflow for a 1.0% grade and a 4.0% cross-slope, all inlets

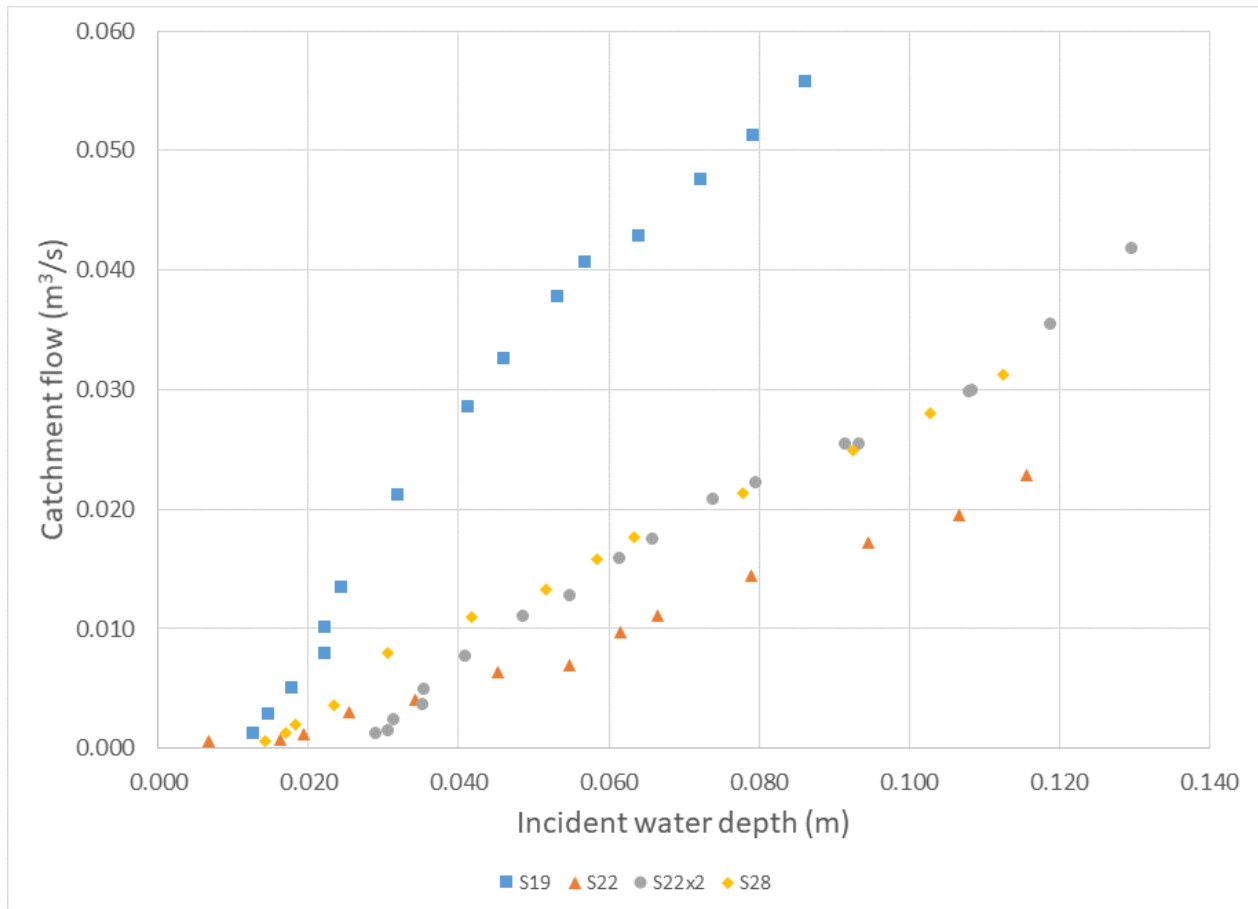


Figure 44. Measurements of catch basin inflow for a 5.0% grade and a 2.0% cross-slope, all inlets

In Figure 45 we compared the performance of the four inlets in ponding conditions. In these conditions the double S22 configuration outperformed the other three inlets. At incident water depths up to ~ 20 cm the S19 inlet performed better than the S22 or S28 which both perform similarly at the lower water depths. At an incident water depth between 20 and 25 cm the S19, S22 and S28 inlets perform similarly in ponding situations. At 23 cm incident water depth for the S22 inlet and 29 cm for the S28 inlet the vortex allowing the inlet to drain efficiently is covered by the ponding water and performance is reduced. Although due to measurement uncertainties the reduction in performance for S28 is not conclusive. For an incident water depth from 25 to 35 cm the S19 inlet appeared to perform between the S22 and S28 inlets and the vortex was well maintained at these water levels.

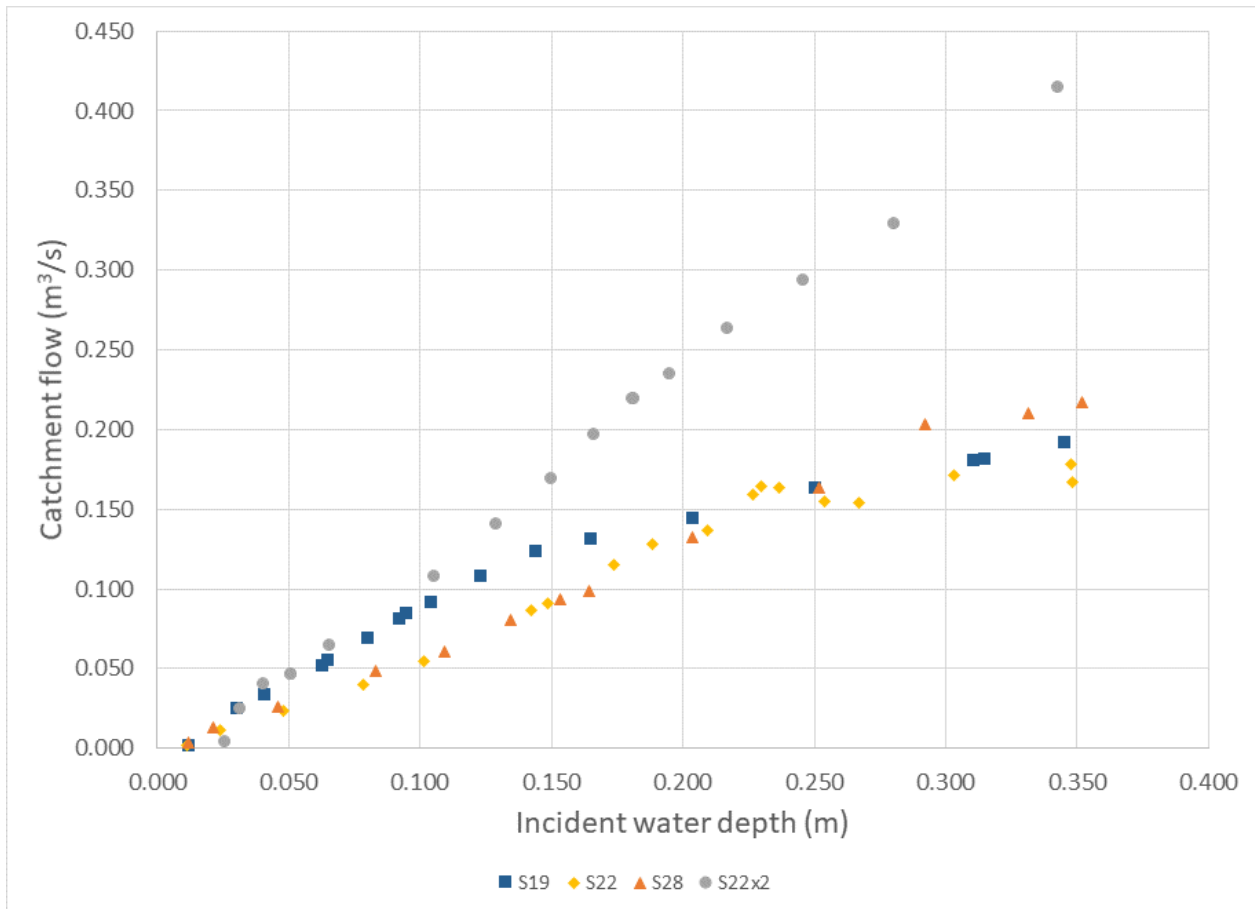


Figure 45. Measurements of catch basin inflow for ponding test series, all inlets

Overall the single curb inlet frame (S22) performs similarly to the double curb inlet frame (S22x2) up to an incident water depth of 0.03 - 0.04 m where the advantage of the second inlet becomes evident. The performance of the double inlet is never twice that of a single inlet except in the ponding test. For the ponding test the performance of the double inlet is generally 70% - 90% more effective than the single inlet for incident water depths from 0.05 - 0.23 m. At greater depths the vortex disappears for the single inlet and the slope flattens; as seen in Figure 45. The double inlet continues to perform at the same rate therefore, at the maximum incident water depth a double inlet has an inflow 140% greater than a single inlet.

7. Conclusions and Recommendations

A series of 519 tests was completed at the National Research Council of Canada’s Ocean, Coastal and River Engineering Research Centre’s Coastal Wave Basin of a full scale model roadway to study the conveyance of catch basin inlets. A total of four catch basin inlet configurations were examined at four road grades ranging from 0.5 - 5.0% and cross-slopes of 0.0, 2.0 and 4.0% and for each setup 13 water flows

from 0.001 – 0.41 m³/s were sent onto the model roadway. Inflows through the covers as high as 0.41 m³/s were measured through the double curb inlet (S22x2) during the ponding tests with the end of the roadway blocked. At the low end, inflows of 0.00011 m³/s were measured on the 'FISH' type round catch basin cover (S19) at a grade of 0.5% and a cross-slope of 2.0%.

The main output from this work are the data tables in Appendix B which relate the incident water depth to the conveyance through the four catch basin inlets. The City of Ottawa uses hydrodynamic models to assess urban flooding throughout the city for their Basement Flooding Protection Program. The new rating curves will improve the confidence of the hydrodynamic model predictions by providing direct measurements for the inlets in question with a detailed uncertainty analysis. The new data will govern the inflow through each inlet. The rating curves currently in use are the result of a series of experimental tests completed in 1982 for the Ontario Ministry of Transportation. The series of experiments performed here does not repeat the previous series of experiments however the testing of a round catch basin cover allows for meaningful comparison as the results for the 'FISH' type round catch basin cover (S19) inlet tested in this test program are similar to those for the single round herringbone inlet (OPSD 400.070) tested in Poirier and Provan (2022).

The results suggest that the performance of the curb mounted inlets is reduced once the vortex into the inlet is overwhelmed by the incident water flow. For a single curb inlet this occurs around 23 cm of incident water depth for the smaller S22 inlet and 29 cm for the larger S28 inlet. The addition of successive inlets is effective at maintaining the vortex and efficient operation of the inlet to greater incident water depths as shown in the ponding tests with the double curb inlets (S22x2).

8. Acknowledgements

The authors would like to acknowledge the financial support for this work from the City of Ottawa as well as the input and feedback from Ryan Cooke and Hiran Sandanyake. The authors would also like to acknowledge Infrastructure Canada for funding the construction of the full scale road model and the City of Toronto for funding previous catch basin work and providing the NRC with contacts at the City of Ottawa and other municipalities with interest in this work.

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A. Appendix – Measurement data tables

This appendix includes all of the measurement data tables from the YOW_Data_Summary.xlsx file. The Excel file which can be found in the main directory of the hard drive accompanying this report is an alternative option to review the data. One summary table is provided for each of the catch basin curves. There are a total of 36 of these tables, one for each catch basin cover and inlet, road grade and cross-section combination. There are 9 each for the covers S19, S22, S22 (x2) and S28.

A description for the headers of the tables in this appendix are included in Table A.1. Further details on these measurements are provided in Section 2.

Table A.1: Appendix tables header descriptions

Header	Description
test	Test name
depth	Water depth upstream of the inlet
Catchment	Inlet capture flow rate
HT	Water flow from the head tank to the model roadway (calculated from HT1 and HT2)
MT	Water flow through the inlet (calculated from MT1 and MT2)
RD6	Capacitance wire water level gauge reading upstream of the catch basin
Pump_Set	Pump pressure setting in PSI and valve opening in percentage (valve set to 100 if not indicated)
D(depth)	Uncertainty on the water depth upstream of the inlet
D(flow)	Uncertainty on the inlet capture flow rate
man depth	Point gauge water level reading upstream of the inlet, adjusted to RD6 position
adj. acc.	Acoustic gauge water level reading upstream of the inlet, adjusted to RD6 position
Q_fill	Measured fill rate for the measurement tank
eta	Three minute average values for the measurement
sigma	Standard deviation for the three minute interval of the measurement
FM1	Flow meter reading from the main pump into the head tank (Does not capture NRC or RENT)
FM2	Flow meter reading from the RENT pump into the head tank (Does not capture Main or NRC)
HT1-2	Capacitance wire water level readings above the head tank knife edge
MT1-2	Capacitance wire water level readings above the measurement tank knife edge
RD1-7	Capacitance wire water level readings normal to the model roadway surface
WD4	Acoustic water level reading upstream of the inlet

Erroneous data has been flagged in this section by colouring the cell in question red. For example in the low flow cases where the measurement tank was emptied and the fill rate was measured the average measurement from the measurement tank water level gauges provides no useful data and could be confusing. For this reason those cells are left blank and coloured red. In those cases the fill rate was measured using those gauges as described in section 2.2.2. Other examples of erroneous data may be the result of a sensor which has been knocked out of position, or that had debris tangled on the sensor.

Table A.2: Inlet cover S19, Grade 0.5%, Cross slope 2.0%

Grade 0.5%, Cross-slope 2.0%																																													
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)		
2022-6-3_test001	0.070	0.038	0.09	0.038	0.070	6PSI_100	0.004	0.005		0.069		0.094		0.09	0.038	0.087	0.087	0.035	0.036	0.071	0.053	0.035	0.063	0.033	0.070	0.049	0.068	0.0029		0.001	0.001	0.001	0.001	0.001	0.000	0.004	0.004	0.003	0.003	0.001	0.003	0.002	0.003		
2022-6-3_test003	0.102	0.059	0.28	0.059	0.102	15PSI_100	0.008	0.008		0.101		0.282		0.28	0.059	0.187	0.193	0.047	0.048	0.106	0.084	0.064	0.101	0.069	0.102	0.088	0.099	0.0064		0.011	0.002	0.007	0.007	0.002	0.001	0.009	0.007	0.006	0.008	0.006	0.008	0.006	0.007		
2022-6-3_test004	0.111	0.065	0.35	0.065	0.111	15PSI_RENT_100	0.009	0.009		0.110		0.282	0.050	0.35	0.065	0.217	0.216	0.050	0.051	0.114	0.095	0.072	0.111	0.081	0.111	0.097	0.108	0.0065	0.0002	0.014	0.002	0.010	0.007	0.002	0.001	0.009	0.007	0.006	0.008	0.006	0.008	0.006	0.007		
2022-6-3_test005	0.124	0.073	0.42	0.073	0.124	15PSI_RENT_NRC_100	0.010	0.010		0.123		0.281	0.050	0.42	0.073	0.241	0.246	0.054	0.055	0.127	0.109	0.089	0.125	0.095	0.124	0.109	0.121	0.0065	0.0003	0.019	0.002	0.012	0.011	0.002	0.001	0.011	0.008	0.007	0.010	0.007	0.009	0.007	0.009		
2022-6-3_test008	0.061	0.031	0.05	0.031	0.061	6PSI_50	0.003	0.005		0.062		0.059		0.05	0.031	0.063	0.063	0.031	0.032	0.060	0.037	0.031	0.059	0.024	0.061	0.036	0.060	0.0021		0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.003	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
2022-6-3_test005A	0.124	0.072	0.42	0.072	0.124	15PSI_RENT_NRC_100	0.010	0.010		0.123		0.280	0.050	0.42	0.072	0.240	0.247	0.054	0.055	0.127	0.110	0.089	0.125	0.095	0.124	0.110	0.121	0.0070	0.0002	0.019	0.002	0.012	0.010	0.002	0.001	0.011	0.008	0.007	0.010	0.007	0.009	0.007	0.009		
2022-6-3_test003A	0.103	0.060	0.28	0.060	0.103	15PSI_100	0.008	0.008		0.101		0.282		0.28	0.060	0.187	0.192	0.048	0.049	0.106	0.085	0.065	0.102	0.069	0.103	0.089	0.099	0.0066		0.010	0.002	0.007	0.006	0.001	0.001	0.009	0.006	0.005	0.008	0.005	0.007	0.005	0.006		
2022-6-3_test006	0.085	0.047	0.15	0.047	0.085	8PSI_100	0.006	0.007		0.084		0.158		0.15	0.047	0.126	0.126	0.041	0.042	0.083	0.066	0.046	0.080	0.048	0.085	0.069	0.082	0.0043		0.003	0.001	0.002	0.002	0.001	0.001	0.007	0.004	0.004	0.005	0.003	0.005	0.004	0.004		
2022-6-3_test007	0.081	0.044	0.12	0.044	0.081	7PSI_100	0.005	0.007		0.080		0.133		0.12	0.044	0.111	0.111	0.039	0.040	0.078	0.061	0.051	0.075	0.042	0.081	0.066	0.078	0.0042		0.002	0.001	0.001	0.001	0.001	0.001	0.006	0.004	0.005	0.004	0.002	0.004	0.003	0.004		
2022-6-3_test009	0.046	0.021	0.02	0.021	0.046	6PSI_35	0.001	0.004		0.047		0.027		0.02	0.021	0.036	0.036	0.024	0.025	0.048	0.023	0.010	0.046	0.018	0.046	0.019	0.045	0.0008		0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.001	
2022-6-3_test010	0.036	0.014	0.01	0.014	0.036	6PSI_25	0.001	0.004		0.037		0.014		0.01	0.014	0.023	0.023	0.018	0.019	0.039	0.016	0.005	0.035	0.010	0.036	0.012	0.035	0.0006		0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
2022-6-3_test002A	0.093	0.054	0.22	0.054	0.093	11PSI_100	0.007	0.007		0.092		0.220		0.22	0.054	0.159	0.160	0.045	0.045	0.096	0.075	0.052	0.092	0.058	0.093	0.076	0.090	0.0065		0.006	0.001	0.004	0.004	0.001	0.001	0.009	0.005	0.004	0.007	0.004	0.006	0.004	0.005		
2022-6-3_test013A	0.016	1.13E-04	0.001		0.016	6PSI_5	0.001	2.3E-06		0.018	1.13E-04	0.001		0.001		0.006	0.006			0.020	0.006	0.004	0.016	-0.001	0.016	0.009	0.015	0.0001		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
2022-6-3_test011A	0.024	1.33E-03	0.003		0.024	6PSI_15	0.001	2.7E-05		0.025	1.33E-03	0.004		0.003		0.010	0.009			0.028	0.006	0.004	0.025	0.001	0.024	0.009	0.022	0.0002		0.000		0.000	0.000			0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-3_test012B	0.019	7.38E-04	0.002		0.019	6PSI_10	0.001	1.5E-05		0.021	7.38E-04	0.002		0.002		0.008	0.007			0.023	0.006	0.004	0.020	0.000	0.019	0.009	0.018	0.0001		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
erroneous data For certain test conditions the RD wave probes are not submerged in water																																													

Table A.3: Inlet cover S19, Grade 1.0%, Cross slope 2.0%

Grade 1.0%, Cross-slope 2.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-6-13_test001	0.060	0.038	0.08	0.038	0.060	6PSI_100	0.003	0.005	0.054	0.057		0.092		0.08	0.038	0.085	0.085	0.035	0.037	0.068	0.040	0.023	0.065	0.028	0.060	0.041	0.056	0.0029		0.001	0.001	0.001	0.001	0.001	0.000	0.003	0.002	0.001	0.003	0.001	0.002	0.001	0.002
2022-6-13_test002	0.084	0.053	0.21	0.053	0.084	11PSI_100	0.006	0.006		0.084		0.218		0.21	0.053	0.157	0.159	0.044	0.045	0.091	0.064	0.047	0.089	0.056	0.084	0.066	0.081	0.0060		0.005	0.000	0.004	0.003	0.000	0.000	0.007	0.005	0.004	0.006	0.004	0.005	0.004	0.005
2022-6-13_test003	0.093	0.058	0.28	0.058	0.093	15PSI_100	0.007	0.007	0.087	0.093		0.282		0.28	0.058	0.186	0.191	0.047	0.048	0.099	0.075	0.056	0.098	0.065	0.093	0.075	0.090	0.0062		0.010	0.001	0.006	0.007	0.000	0.001	0.008	0.006	0.005	0.007	0.004	0.006	0.005	0.006
2022-6-13_test005	0.101	0.063	0.34	0.063	0.101	15PSI_RENT_100	0.008	0.008		0.102		0.281	0.050	0.34	0.063	0.214	0.214	0.049	0.051	0.109	0.082	0.064	0.105	0.073	0.101	0.083	0.100	0.0059	0.0003	0.015	0.001	0.010	0.008	0.001	0.001	0.009	0.006	0.005	0.007	0.005	0.007	0.005	0.007
2022-6-13_test004	0.114	0.069	0.41	0.069	0.114	15PSI_RENT_NRC_100	0.009	0.009	0.106	0.116		0.281	0.050	0.41	0.069	0.239	0.246	0.052	0.054	0.121	0.094	0.078	0.117	0.090	0.114	0.097	0.113	0.0067	0.0002	0.020	0.002	0.013	0.011	0.001	0.001	0.011	0.008	0.006	0.009	0.006	0.008	0.006	0.008
2022-6-13_test006	0.074	0.047	0.15	0.047	0.074	8PSI_100	0.005	0.006		0.073		0.156		0.15	0.047	0.124	0.126	0.041	0.042	0.081	0.054	0.037	0.078	0.048	0.074	0.058	0.071	0.0046		0.002	0.001	0.002	0.002	0.001	0.001	0.006	0.004	0.002	0.005	0.002	0.004	0.003	0.003
2022-6-13_test007	0.069	0.044	0.12	0.044	0.069	7PSI_100	0.004	0.006		0.068		0.129		0.12	0.044	0.108	0.109	0.039	0.040	0.077	0.049	0.032	0.074	0.042	0.069	0.051	0.066	0.0038		0.002	0.001	0.001	0.001	0.001	0.001	0.005	0.003	0.001	0.004	0.002	0.003	0.002	0.003
2022-6-13_test008	0.048	0.031	0.05	0.031	0.048	6PSI_50	0.002	0.005		0.048		0.056		0.05	0.031	0.060	0.061	0.030	0.032	0.059	0.041	0.018	0.054	0.023	0.048	0.030	0.046	0.0021		0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.003	0.002	0.001	0.000	0.001	0.001	0.001
2022-6-13_test009	0.035	0.021	0.02	0.021	0.035	6PSI_35	0.001	0.005	0.033	0.036		0.027		0.02	0.021	0.037	0.037	0.023	0.024	0.053	0.020	0.006	0.039	0.010	0.035	0.018	0.034	0.0009		0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001
2022-6-13_test010	0.028	0.014	0.01	0.014	0.028	6PSI_25	0.001	0.003		0.030		0.014		0.01	0.014	0.023	0.023	0.018	0.018	0.041	0.011	0.005	0.0																				

Table A.4: Inlet cover S19, Grade 2.5%, Cross slope 2.0%

Grade 2.5%, Cross-slope 2.0%																																																
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																						
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)					
2022-6-13_test014	0.057	0.036	0.08	0.036	0.057	6PSI_100	0.002	0.006	0.049	0.054	0.092	0.092	0.050	0.08	0.036	0.084	0.085	0.034	0.035	0.056	0.030	0.021	0.058	0.021	0.057	0.034	0.053	0.0030	0.0030	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.001	0.001	0.001	0.002	0.002					
2022-6-13_test015	0.076	0.049	0.21	0.049	0.076	11PSI_100	0.005	0.007	0.074	0.074	0.219	0.219	0.050	0.21	0.049	0.156	0.160	0.042	0.043	0.076	0.049	0.043	0.076	0.046	0.076	0.053	0.072	0.0056	0.0056	0.005	0.001	0.004	0.003	0.001	0.001	0.006	0.004	0.003	0.004	0.003	0.004	0.004	0.004					
2022-6-13_test016	0.084	0.053	0.28	0.053	0.084	15PSI_100	0.006	0.007	0.075	0.083	0.281	0.281	0.050	0.28	0.053	0.184	0.192	0.044	0.045	0.086	0.058	0.051	0.084	0.054	0.084	0.062	0.081	0.0071	0.0071	0.009	0.002	0.006	0.006	0.001	0.001	0.006	0.004	0.004	0.005	0.004	0.005	0.004	0.005					
2022-6-13_test017	0.101	0.060	0.41	0.060	0.101	15PSI_100	0.007	0.009	0.090	0.099	0.281	0.281	0.050	0.41	0.060	0.236	0.245	0.048	0.049	0.112	0.076	0.067	0.098	0.071	0.101	0.081	0.097	0.0067	0.0067	0.019	0.002	0.012	0.011	0.002	0.001	0.008	0.006	0.005	0.006	0.006	0.006	0.006	0.006					
2022-6-13_test018	0.092	0.056	0.34	0.056	0.092	15PSI_100	0.006	0.008	0.090	0.090	0.282	0.282	0.050	0.34	0.056	0.215	0.215	0.046	0.047	0.100	0.066	0.059	0.092	0.060	0.092	0.072	0.088	0.0059	0.0059	0.014	0.002	0.010	0.007	0.002	0.001	0.007	0.004	0.004	0.005	0.005	0.005	0.004	0.005					
2022-6-13_test019	0.070	0.045	0.15	0.045	0.070	8PSI_100	0.004	0.007	0.066	0.066	0.158	0.158	0.050	0.15	0.045	0.124	0.126	0.040	0.041	0.067	0.042	0.035	0.070	0.037	0.070	0.047	0.064	0.0045	0.0045	0.002	0.001	0.002	0.002	0.001	0.001	0.003	0.003	0.001	0.003	0.003	0.003	0.003	0.003					
2022-6-13_test020	0.064	0.042	0.12	0.042	0.064	7PSI_100	0.003	0.007	0.062	0.062	0.129	0.129	0.050	0.12	0.042	0.107	0.109	0.038	0.039	0.061	0.038	0.028	0.066	0.031	0.064	0.042	0.059	0.0040	0.0040	0.002	0.001	0.001	0.001	0.001	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.002	0.002					
2022-6-13_test021	0.047	0.032	0.05	0.032	0.047	6PSI_50	0.001	0.005	0.047	0.047	0.059	0.059	0.050	0.05	0.032	0.061	0.062	0.031	0.032	0.050	0.023	0.013	0.051	0.013	0.047	0.027	0.044	0.0022	0.0022	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001					
2022-6-13_test022	0.034	0.021	0.02	0.021	0.034	6PSI_35	0.001	0.004	0.033	0.033	0.028	0.028	0.050	0.02	0.021	0.036	0.038	0.024	0.024	0.039	0.012	0.005	0.038	0.005	0.034	0.015	0.031	0.0008	0.0008	0.000	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001				
2022-6-13_test023	0.026	0.014	0.01	0.014	0.026	6PSI_25	0.001	0.004	0.025	0.025	0.015	0.015	0.050	0.01	0.014	0.023	0.024	0.018	0.019	0.030	0.009	0.005	0.032	0.002	0.026	0.010	0.022	0.0003	0.0003	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001		
2022-6-13_test024	0.022	1.71E-03	0.005	0.022	6PSI_15	0.001	3.4E-05	0.018	0.019	1.71E-03	0.006	0.006	0.050	0.005	0.012	0.013	0.018	0.019	0.021	0.006	0.005	0.026	0.001	0.022	0.009	0.017	0.0002	0.0002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001		
2022-6-13_test025	0.017	9.25E-04	0.003	0.017	6PSI_10	0.001	1.8E-05	0.015	0.015	9.25E-04	0.003	0.003	0.050	0.003	0.008	0.009	0.015	0.015	0.017	0.006	0.005	0.022	0.001	0.017	0.009	0.013	0.0001	0.0001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001		
2022-6-13_test026	0.014	4.04E-04	0.002	0.014	6PSI_5	0.001	8.1E-06	0.009	0.013	4.04E-04	0.001	0.001	0.050	0.002	0.006	0.006	0.015	0.015	0.017	0.006	0.005	0.020	0.001	0.014	0.009	0.011	0.0001	0.0001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001		
erroneous data																																																

Table A.5: Inlet cover S19, Grade 5.0%, Cross slope 2.0%

Grade 5.0%, Cross-slope 2.0%																																																
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																						
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)					
2022-6-14_test001	0.046	0.033	0.08	0.033	0.046	6PSI_100	0.002	0.005	0.041	0.044	0.092	0.092	0.050	0.08	0.033	0.084	0.085	0.033	0.032	0.043	0.028	0.023	0.047	0.019	0.046	0.028	0.043	0.0027	0.0027	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	
2022-6-14_test002	0.064	0.043	0.21	0.043	0.064	11PSI_100	0.005	0.005	0.063	0.063	0.217	0.217	0.050	0.21	0.043	0.156	0.160	0.039	0.038	0.065	0.043	0.038	0.064	0.036	0.064	0.042	0.061	0.0055	0.0055	0.006	0.000	0.004	0.004	0.001	0.000	0.005	0.003	0.002	0.003	0.003	0.004	0.003	0.004	0.004	0.004			
2022-6-14_test003	0.072	0.048	0.28	0.048	0.072	15PSI_100	0.005	0.006	0.063	0.071	0.282	0.282	0.050	0.28	0.048	0.185	0.191	0.041	0.042	0.074	0.050	0.046	0.072	0.043	0.072	0.051	0.069	0.0060	0.0060	0.011	0.000	0.007	0.006	0.000	0.000	0.005	0.003	0.003	0.004	0.003	0.004	0.004	0.004	0.004	0.004			
2022-6-14_test004	0.086	0.056	0.41	0.056	0.086	15PSI_RENT_NRC_100	0.007	0.007	0.078	0.087	0.280	0.280	0.050	0.41	0.056	0.238	0.247	0.046	0.046	0.089	0.061	0.062	0.084	0.054	0.086	0.063	0.085	0.0067	0.0067	0.018	0.001	0.012	0.010	0.001	0.000	0.006	0.004	0.005	0.006	0.004	0.006	0.004	0.005	0.005				
2022-6-14_test005	0.079	0.051	0.34	0.051	0.079	15PSI_RENT_100	0.006	0.006	0.078	0.078	0.281	0.281	0.050	0.34	0.051	0.213	0.215	0.043	0.044	0.080	0.054	0.054	0.076	0.048	0.079	0.057	0.075	0.0067	0.0067	0.015	0.001	0.010	0.009	0.001	0.001	0.005	0.004	0.003	0.004	0.003	0.005	0.004	0.004	0.004				
2022-6-14_test006	0.057	0.041	0.15	0.041	0.057	8PSI_100	0.003	0.006	0.055	0.055	0.157	0.157	0.050	0.15	0.041	0.124	0.125	0.037	0.038	0.058	0.036	0.031	0.057	0.029	0.057	0.036	0.052	0.0050	0.0050	0.002	0.001	0.002	0.002	0.000	0.001	0.004	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003		
2022-6-14_test007	0.053	0.038	0.12	0.038	0.053	7PSI_100	0.003	0.005	0.051	0.051	0.130	0.130	0.050	0.12	0.038	0.107	0.109	0.036	0.036	0.053	0.033	0.028	0.053	0.026	0.053	0.033	0.048	0.0034	0.0034	0.001	0.001	0.001	0.001	0.000	0.001	0.003	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003			
2022-6-14_test008	0.041	0.028	0.05	0.028	0.041	6PSI_50	0.001	0.004	0.040	0.040	0.058	0.058	0.050	0.05	0.028	0.060	0.061	0.030	0.030	0.039	0.022	0.014	0.043	0.015	0.041	0.020	0.038	0.0023	0.0023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002
2022-6-14_test009	0.032	0.021	0.02	0.021	0.032	6PSI_35	0.001	0.004	0.031	0.031	0.029	0.029	0.050	0.02	0.021	0.037	0.038	0.024	0.024	0.033	0.014	0.005	0.035	0.007	0.032	0.014	0.029	0.0011	0.0011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	
2022-6-14_test010	0.024	0.013	0.01	0																																												

Table A.6: Inlet cover S19, Grade 0.5%, Cross slope 4.0%

Grade 0.5%, Cross-slope 4.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-6-17_test001	0.095	0.049	0.09	0.049	0.095	6PSI_100	0.004	0.006		0.099	0.102		0.09	0.049	0.091	0.093	0.042	0.043	0.097	0.057	0.022	0.097	0.033	0.095	0.051	0.096	0.0033		0.001	0.000	0.001	0.001	0.000	0.000	0.004	0.004	0.003	0.003	0.002	0.003	0.002	0.003	
2022-6-17_test002	0.122	0.064	0.22	0.064	0.122	11PSI_100	0.006	0.008		0.125	0.220		0.22	0.064	0.158	0.162	0.050	0.051	0.124	0.080	0.055	0.123	0.059	0.122	0.085	0.123	0.0051		0.006	0.002	0.004	0.004	0.001	0.001	0.008	0.005	0.005	0.006	0.004	0.005	0.005	0.005	
2022-6-17_test003	0.133	0.071	0.28	0.071	0.133	15PSI_100	0.007	0.009		0.137	0.282		0.28	0.071	0.186	0.192	0.053	0.054	0.136	0.096	0.061	0.134	0.072	0.133	0.094	0.134	0.0061		0.010	0.002	0.007	0.006	0.001	0.001	0.008	0.007	0.005	0.006	0.004	0.006	0.005	0.005	
2022-6-17_test004	0.162	0.082	0.41	0.082	0.162	15PSI_RENT_NRC_100	0.007	0.010		0.164	0.281	0.050	0.41	0.082	0.238	0.247	0.058	0.060	0.164	0.120	0.082	0.160	0.103	0.162	0.121	0.162	0.0057	0.0003	0.020	0.002	0.013	0.012	0.001	0.002	0.008	0.008	0.006	0.007	0.006	0.006	0.006	0.006	
2022-6-17_test005	0.146	0.076	0.34	0.076	0.146	15PSI_RENT_100	0.007	0.010		0.149	0.282	0.051	0.34	0.076	0.213	0.216	0.055	0.057	0.148	0.106	0.070	0.146	0.085	0.146	0.105	0.146	0.0068	0.0002	0.015	0.002	0.010	0.008	0.001	0.002	0.007	0.007	0.005	0.007	0.005	0.006	0.006	0.005	
2022-6-17_test006	0.112	0.056	0.15	0.056	0.112	8PSI_100	0.005	0.008		0.115	0.160		0.15	0.056	0.127	0.128	0.046	0.047	0.113	0.073	0.036	0.111	0.051	0.112	0.077	0.113	0.0049		0.003	0.002	0.002	0.002	0.001	0.001	0.006	0.005	0.004	0.004	0.003	0.004	0.003	0.004	
2022-6-17_test007	0.107	0.053	0.13	0.053	0.107	7PSI_100	0.004	0.007		0.110	0.135		0.13	0.053	0.111	0.113	0.044	0.045	0.106	0.066	0.032	0.105	0.043	0.107	0.065	0.107	0.0043		0.002	0.001	0.001	0.001	0.001	0.001	0.005	0.005	0.003	0.004	0.002	0.003	0.003	0.003	
2022-6-17_test008	0.081	0.039	0.06	0.039	0.081	6PSI_50	0.002	0.006		0.082	0.062		0.06	0.039	0.064	0.066	0.036	0.037	0.085	0.045	0.008	0.083	0.025	0.081	0.030	0.080	0.0020		0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.003	0.001	0.002	0.002	0.001	0.001	0.002	
2022-6-17_test009	0.061	0.028	0.03	0.028	0.061	6PSI_35	0.002	0.005		0.063	0.031		0.03	0.028	0.039	0.040	0.029	0.029	0.067	0.014	0.005	0.064	0.007	0.061	0.012	0.061	0.0012		0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001
2022-6-17_test010	0.046	0.018	0.01	0.018	0.046	6PSI_25	0.001	0.004		0.049	0.016		0.01	0.018	0.024	0.025	0.022	0.022	0.054	0.008	0.005	0.052	0.002	0.046	0.008	0.047	0.0005		0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-6-17_test011	0.035	5.65E-03	0.005		0.035	6PSI_15	0.001	1.1E-04		0.038	5.65E-03		0.005		0.012	0.013			0.040	0.006	0.005	0.039	0.001	0.035	0.008	0.036	0.0002		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-17_test012	0.028	3.04E-03	0.003		0.028	6PSI_10	0.001	6.1E-05		0.032	3.04E-03		0.003		0.008	0.009			0.034	0.006	0.005	0.032	0.001	0.028	0.008	0.029	0.0001		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-17_test013	0.023	1.34E-03	0.002		0.023	6PSI_5	0.002	2.7E-05		0.025	1.34E-03		0.001		0.006	0.007			0.026	0.006	0.004	0.026	-0.001	0.023	0.008	0.023	0.0001		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
erroneous data																																											

Table A.7: Inlet cover S19, Grade 1.0%, Cross slope 4.0%

Grade 1.0%, Cross-slope 4.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-6-16_test001	0.079	0.048	0.09	0.048	0.079	6PSI_100	0.002	0.006	0.070	0.080	0.101		0.09	0.048	0.090	0.091	0.042	0.042	0.098	0.043	0.006	0.090	0.023	0.079	0.036	0.078	0.0035		0.001	0.001	0.001	0.001	0.000	0.001	0.004	0.005	0.000	0.002	0.001	0.001	0.001	0.002	
2022-6-16_test002	0.114	0.064	0.22	0.064	0.114	11PSI_100	0.006	0.008		0.115	0.219		0.22	0.064	0.157	0.161	0.050	0.051	0.123	0.069	0.034	0.120	0.059	0.114	0.069	0.112	0.0048		0.006	0.001	0.004	0.004	0.001	0.001	0.007	0.005	0.003	0.006	0.004	0.005	0.004	0.004	
2022-6-16_test003	0.123	0.069	0.28	0.069	0.123	15PSI_100	0.006	0.009	0.113	0.125	0.284		0.28	0.069	0.186	0.193	0.052	0.054	0.135	0.080	0.043	0.130	0.070	0.123	0.077	0.123	0.0057		0.010	0.002	0.007	0.006	0.001	0.001	0.008	0.006	0.004	0.007	0.005	0.005	0.004	0.005	
2022-6-16_test004	0.145	0.078	0.41	0.078	0.145	15PSI_RENT_NRC_100	0.007	0.010	0.133	0.146	0.280	0.050	0.41	0.078	0.239	0.246	0.057	0.058	0.162	0.107	0.065	0.153	0.091	0.145	0.097	0.144	0.0059	0.0002	0.019	0.002	0.012	0.010	0.001	0.002	0.007	0.009	0.006	0.007	0.006	0.006	0.005	0.006	
2022-6-16_test005	0.132	0.073	0.35	0.073	0.132	15PSI_RENT_100	0.006	0.010		0.134	0.282	0.050	0.35	0.073	0.216	0.217	0.055	0.056	0.145	0.091	0.048	0.138	0.080	0.132	0.086	0.132	0.0066	0.0002	0.015	0.002	0.009	0.007	0.002	0.001	0.008	0.008	0.004	0.007	0.005	0.005	0.005	0.005	
2022-6-16_test006	0.100	0.056	0.15	0.056	0.100	8PSI_100	0.004	0.008		0.101	0.159		0.15	0.056	0.126	0.128	0.046	0.047	0.110	0.063	0.023	0.108	0.041	0.100	0.054	0.099	0.0040		0.003	0.001	0.002	0.002	0.001	0.001	0.005	0.006	0.002	0.004	0.002	0.003	0.002	0.003	
2022-6-16_test007	0.093	0.052	0.12	0.052	0.093	7PSI_100	0.003	0.008		0.093	0.133		0.12	0.052	0.110	0.112	0.044	0.044	0.104	0.055	0.016	0.102	0.034	0.093	0.046	0.091	0.0038		0.002	0.002	0.001	0.001	0.001	0.001	0.004	0.006	0.001	0.003	0.002	0.002	0.002	0.003	
2022-6-16_test008	0.067	0.040	0.06	0.040	0.067	6PSI_50	0.002	0.006		0.068	0.063		0.06	0.040	0.065	0.065	0.037	0.037	0.084	0.021	0.007	0.073	0.015	0.067	0.024	0.066	0.0025		0.000	0.001	0.000	0.000	0.001	0.001	0.002	0.002	0.000	0.001	0.001	0.001	0.001	0.001	0.002
2022-6-16_test009	0.053	0.027	0.03	0.027	0.053	6PSI_35	0.001	0.005		0.055	0.030		0.03	0.027	0.039	0.040	0.029	0.029	0.064	0.008	0.006	0.057	0.007	0.053	0.011	0.052	0.0009		0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-16_test010	0.041	0.018	0.01	0.018	0.041	6PSI_25	0.001	0.004	0.036	0.046	0.015		0.01	0.018	0.024	0.024	0.022	0.022	0.052	0.006	0.006	0.049	0.005	0.041	0.009	0.043	0.0005		0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-16_test011A	0.029	5.81E-03	0.005		0.029	6PSI_15	0.001	1.2E-04		0.038	5.81E-03		0.005		0.013	0.013			0.042	0.006	0.006	0.035	0.003	0.029	0.008	0.036	0.0002		0.000		0.000	0.000			0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-16_test012	0.024	2.87E-03	0.003		0.024	6PSI_10	0.001	5.7E-05	0.018	0.029	2.87E-03		0.003		0.008	0.009			0.034	0.006	0.005	0.032	0.002	0.024	0.008	0.027	0.0001		0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-6-16_test013	0.020	1.26E-03	0																																								

Table A.10: Ponding test, Inlet cover S19, Grade 0.5%, Cross slope 0.0%

Grade 0.5%, Cross-slope 0%																																																									
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)														
2022-5-27_test001	0.063	0.052	0.05	0.052	0.063	6PSI_50	0.005	0.008			0.063	0.053	0.05	0.052	0.058	0.058	0.044	0.043	0.049	0.051	0.051	0.061	0.062	0.063	0.064	0.062	0.0022	0.000	0.002	0.000	0.000	0.002	0.001	0.003	0.003	0.003	0.004	0.003	0.004	0.003	0.004																
2022-6-2_test001	0.065	0.054	0.05	0.054	0.065	6PSI_50	0.005	0.008	0.065		0.068	0.056	0.05	0.054	0.059	0.059	0.047	0.044	0.054	0.055	0.055	0.065	0.066	0.065	0.067	0.066	0.0022	0.000	0.002	0.000	0.000	0.001	0.001	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.004															
2022-6-2_test002	0.144	0.123	0.12	0.123	0.144	7PSI_100	0.007	0.018			0.148	0.129	0.12	0.123	0.109	0.109	0.077	0.075	0.137	0.136	0.134	0.146	0.146	0.144	0.148	0.147	0.0041	0.002	0.008	0.000	0.002	0.004	0.003	0.008	0.009	0.010	0.008	0.007	0.006	0.007	0.006																
2022-6-2_test003	0.251	0.163	0.17	0.163	0.251	9PSI_100	0.005	0.023	0.243		0.176	0.180	0.17	0.163	0.137	0.138	0.091	0.090	0.238	0.239	0.242	0.246	0.248	0.251	0.254	0.175	0.0059	0.003	0.009	0.002	0.002	0.004	0.004	0.005	0.004	0.004	0.005	0.004	0.004	0.005	0.000																
2022-6-2_test004	0.311	0.180	0.20	0.180	0.311	10PSI_100	0.005	0.028				0.200	0.20	0.180	0.148	0.150	0.096	0.096	0.298	0.299	0.302	0.307	0.308	0.311	0.313	0.0052	0.005	0.012	0.004	0.003	0.006	0.005	0.004	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.000															
2022-6-2_test005	0.360		0.21	0.186	0.360	11PSI_100	0.004	0.031				0.218	0.21	0.186	0.157	0.160	0.097	0.099	0.346	0.348	0.352	0.356	0.358	0.360	0.362	0.0043	0.005	0.014	0.004	0.004	0.006	0.006	0.003	0.003	0.002	0.003	0.002	0.003	0.003	0.003	0.000																
2022-6-2_test006	0.095	0.084	0.08	0.084	0.095	6PSI_80	0.007	0.013				0.092	0.08	0.084	0.085	0.084	0.061	0.059	0.090	0.089	0.087	0.098	0.095	0.095	0.098	0.0032	0.001	0.005	0.001	0.001	0.002	0.003	0.006	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.000																
2022-6-2_test007	0.166	0.131	0.13	0.131	0.166	8PSI_70	0.006	0.017				0.140	0.13	0.131	0.115	0.116	0.080	0.078	0.161	0.157	0.157	0.166	0.164	0.166	0.169	0.0044	0.002	0.006	0.002	0.002	0.003	0.003	0.005	0.006	0.007	0.005	0.006	0.005	0.005	0.000																	
2022-6-2_test004A	0.315	0.181	0.20	0.181	0.315	10PSI_100	0.005	0.028				0.202	0.20	0.181	0.149	0.151	0.095	0.098	0.301	0.302	0.306	0.310	0.310	0.315	0.317	0.0056	0.005	0.012	0.003	0.003	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.000																	
2022-6-2_test005A	0.345	0.191	0.22	0.191	0.345	11PSI_100	0.005	0.031				0.219	0.22	0.191	0.158	0.160	0.098	0.101	0.335	0.337	0.340	0.342	0.343	0.345	0.349	0.0053	0.006	0.014	0.004	0.004	0.006	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.000																
2022-6-2_test008	0.204	0.144	0.15	0.144	0.204	8PSI_100	0.006	0.020				0.157	0.15	0.144	0.125	0.126	0.084	0.083	0.197	0.196	0.196	0.203	0.203	0.204	0.207	0.0037	0.002	0.008	0.002	0.002	0.004	0.003	0.006	0.006	0.006	0.005	0.005	0.005	0.004	0.000																	
2022-6-2_test009	0.105	0.091	0.09	0.091	0.105	6PSI_100	0.007	0.013				0.100	0.09	0.091	0.090	0.090	0.064	0.062	0.100	0.099	0.098	0.108	0.105	0.105	0.107	0.0030	0.001	0.005	0.001	0.001	0.002	0.003	0.007	0.008	0.006	0.006	0.007	0.006	0.006	0.000																	
2022-6-2_test010	0.093	0.081	0.08	0.081	0.093	6PSI_70	0.007	0.012				0.088	0.08	0.081	0.083	0.083	0.059	0.058	0.088	0.088	0.086	0.095	0.093	0.093	0.095	0.0034	0.001	0.004	0.001	0.001	0.002	0.002	0.006	0.006	0.005	0.005	0.006	0.006	0.005	0.000																	
2022-6-2_test011	0.031	0.025	0.03	0.025	0.031	6PSI_35	0.002	0.005				0.029	0.03	0.025	0.038	0.039	0.028	0.026	0.025	0.028	0.025	0.029	0.031	0.031	0.032	0.0008	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.000																	
2022-6-2_test012	0.124	0.107	0.11	0.107	0.124	7PSI_70	0.008	0.016				0.115	0.11	0.107	0.100	0.100	0.071	0.069	0.118	0.116	0.115	0.126	0.124	0.124	0.127	0.0037	0.001	0.007	0.001	0.001	0.003	0.003	0.007	0.009	0.008	0.008	0.009	0.007	0.007	0.000																	
2022-6-2_test013	0.080	0.069	0.07	0.069	0.080	6PSI_60	0.005	0.010				0.076	0.07	0.069	0.075	0.075	0.054	0.052	0.074	0.074	0.074	0.083	0.082	0.080	0.083	0.0032	0.000	0.003	0.000	0.001	0.002	0.002	0.005	0.005	0.004	0.004	0.005	0.004	0.004	0.000																	
2022-6-2_test014	0.041	0.033	0.03	0.033	0.041	6PSI_40	0.002	0.005				0.040	0.03	0.033	0.046	0.046	0.034	0.032	0.031	0.031	0.033	0.041	0.044	0.041	0.043	0.0019	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.001	0.003	0.001	0.002	0.000																	
2022-6-2_test015	0.012	9.90E-04	0.002		0.012	6PSI_10	0.001	2.0E-05	0.004		9.90E-04	0.003	0.002	0.033	0.046	0.008		0.008	0.007	0.007	0.013	0.004	0.012	0.008	0.0001	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020																		
erroneous data	2022-6-2_test003	The water level is too close to the WD4 sensor for an accurate reading.																																																							
flagged data	2022-6-2_test005	Is an unintended debris test. A piece of foam drifted onto the catch basin cover.																																																							

Table A.11: Inlet cover S22, Grade 0.5%, Cross slope 2.0%

Grade 0.5%, Cross-slope 2.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-7-7_test001	0.079	0.015	0.08	0.015	0.079	6PSI_100	0.004	0.004			0.078	0.093	0.08	0.015	0.084	0.086	0.019	0.019	0.091	0.052	0.062	0.071	0.046	0.079	0.053	0.077	0.0031	0.001	0.001	0.001	0.001	0.002	0.000	0.003	0.003	0.004	0.003	0.001	0.003	0.003	0.003		
2022-7-8_test003	0.150	0.034	0.28	0.034	0.150	15PSI_100	0.008	0.005	0.28		0.144	0.283	0.28	0.034	0.186	0.193	0.034	0.033	0.154	0.126	0.146	0.123	0.114	0.150	0.113	0.143	0.0066	0.010	0.001	0.007	0.006	0.001	0.000	0.010	0.006	0.008	0.008	0.004	0.007	0.005	0.007		
2022-7-8_test004	0.171	0.048	0.41	0.048	0.171	15PSI_RENT_NRC_100	0.009	0.006			0.164	0.282	0.050	0.41	0.048	0.238	0.246	0.042	0.041	0.215	0.162	0.152	0.185	0.144	0.171	0.159	0.163	0.0064	0.0002	0.018	0.001	0.012	0.011	0.001	0.001	0.005	0.008	0.009	0.009	0.006	0.008	0.007	0.006
2022-7-8_test005	0.171	0.039	0.34	0.039	0.171	15PSI_RENT_100	0.008	0.005			0.172	0.283	0.051	0.34	0.039	0.215	0.216	0.037	0.036	0.154	0.140	0.154	0.141	0.136	0.171	0.134	0.171	0.0059	0.0002	0.015	0.001	0.010	0.008	0.000	0.001	0.008	0.006	0.007	0.007	0.005	0.007	0.005	0.007
2022-7-8_test006	0.107	0.021	0.15	0.021	0.107	8PSI_100	0.005	0.004			0.101	0.158	0.15	0.021	0.125	0.127	0.025	0.024	0.136	0.083	0.100	0.097	0.073	0.107	0.079	0.100	0.0042	0.002	0.000	0.002	0.002	0.001	0.000	0.007	0.004	0.005	0.005	0.003	0.004	0.004	0.004		
2022-7-8_test007	0.095	0.019	0.12	0.019	0.095	7PSI_100	0.004	0.004			0.092	0.131	0.12	0.019	0.109	0.111	0.023	0.022	0.114	0.071	0.081	0.086	0.062	0.095	0.070	0.091	0.0039	0.002	0.001	0.001	0.001	0.001	0.000	0.004	0.004	0.005	0.004	0.002	0.003	0.004	0.004		
2022-7-8_test008	0.063	0.012	0.05	0.012	0.063	6PSI_50	0.003	0.003			0.058	0.058	0.05	0.012	0.062	0.062	0.017	0.016	0.068	0.036	0.048	0.060	0.032	0.063	0.036	0.056	0.0021	0.000															

Table A.12: Inlet cover S22, Grade 1.0%, Cross slope 2.0%

Grade 1.0%, Cross-slope 2.0%																																												
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma																
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	
2022-7-8_test014	0.075	0.012	0.09	0.012	0.075	6PSI_100	0.003	0.003				0.097	0.09	0.012	0.088	0.089	0.016	0.017	0.070	0.036	0.050	0.060	0.041	0.075	0.042	0.064	0.0031	0.001	0.000	0.001	0.001	0.001	0.000	0.002	0.001	0.002	0.001	0.001	0.002	0.001	0.002			
2022-7-8_test015	0.114	0.022	0.22	0.022	0.114	11PSI_100	0.006	0.004				0.222	0.22	0.022	0.157	0.162	0.024	0.025	0.111	0.068	0.086	0.091	0.081	0.114	0.079	0.098	0.0062	0.006	0.001	0.004	0.004	0.001	0.000	0.004	0.004	0.004	0.005	0.003	0.005	0.004	0.005			
2022-7-8_test016	0.135	0.027	0.28	0.027	0.135	15PSI_100	0.008	0.005				0.284	0.28	0.027	0.187	0.193	0.028	0.029	0.137	0.082	0.105	0.110	0.098	0.135	0.095	0.121	0.0062	0.010	0.001	0.007	0.006	0.001	0.000	0.007	0.005	0.005	0.006	0.004	0.007	0.004	0.006			
2022-7-8_test017	0.168	0.037	0.41	0.037	0.168	15PSI_RENT_NRC_100	0.010	0.006				0.283	0.050	0.41	0.037	0.233	0.248	0.034	0.036	0.168	0.102	0.138	0.141	0.127	0.168	0.127	0.155	0.0061	0.0003	0.023	0.001	0.013	0.011	0.001	0.001	0.009	0.007	0.008	0.008	0.006	0.005	0.007	0.008	
2022-7-8_test018	0.147	0.033	0.35	0.033	0.147	15PSI_RENT_100	0.008	0.005				0.284	0.050	0.35	0.033	0.215	0.217	0.032	0.033	0.150	0.092	0.123	0.124	0.114	0.147	0.108	0.136	0.0063	0.0002	0.015	0.001	0.010	0.008	0.001	0.000	0.007	0.005	0.006	0.006	0.005	0.007	0.004	0.006	
2022-7-8_test018A	0.148	0.033	0.34	0.033	0.148	15PSI_RENT_100	0.008	0.005				0.283	0.34	0.033	0.212	0.216	0.032	0.033	0.149	0.091	0.123	0.124	0.114	0.148	0.108	0.136	0.0073	0.015	0.000	0.010	0.008	0.001	0.000	0.007	0.005	0.006	0.006	0.005	0.007	0.004	0.006			
2022-7-8_test019	0.094	0.018	0.15	0.018	0.094	8PSI_100	0.005	0.004				0.159	0.15	0.018	0.125	0.127	0.021	0.022	0.093	0.055	0.068	0.080	0.064	0.094	0.062	0.079	0.0047	0.002	0.001	0.002	0.002	0.001	0.000	0.003	0.003	0.004	0.004	0.002	0.004	0.002	0.004			
2022-7-8_test020	0.085	0.015	0.12	0.015	0.085	7PSI_100	0.004	0.004				0.132	0.12	0.015	0.109	0.111	0.019	0.020	0.086	0.047	0.062	0.071	0.053	0.085	0.054	0.072	0.0041	0.001	0.001	0.001	0.001	0.001	0.000	0.003	0.002	0.003	0.002	0.001	0.003	0.002	0.003			
2022-7-8_test021	0.060	0.008	0.05	0.008	0.060	6PSI_50	0.002	0.003				0.058	0.05	0.008	0.062	0.063	0.013	0.014	0.058	0.025	0.037	0.046	0.028	0.060	0.029	0.054	0.0021	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001		
2022-7-8_test022	0.046	0.005	0.02	0.005	0.046	6PSI_35	0.002	0.002				0.028	0.02	0.005	0.037	0.037	0.009	0.011	0.044	0.014	0.019	0.033	0.017	0.046	0.016	0.040	0.0009	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001
2022-7-8_test023	0.034	0.003	0.01	0.003	0.034	6PSI_25	0.001	0.002				0.014	0.01	0.003	0.022	0.022	0.007	0.009	0.034	0.005	0.013	0.026	0.009	0.034	0.011	0.029	0.0004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-7-8_test024	0.023	1.73E-03	0.004		0.023	6PSI_15	0.001	3.5E-05				1.73E-03	0.005	0.004		0.011	0.012		0.022	0.003	0.004	0.020	0.008	0.023	0.011	0.017	0.0002	0.000		0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-7-8_test025	0.020	1.12E-03	0.002		0.020	6PSI_10	0.001	2.2E-05				1.12E-03	0.002	0.002		0.007	0.008		0.016	0.002	0.004	0.017	0.007	0.020	0.011	0.021	0.0001	0.000		0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005		
2022-7-8_test026	0.017	6.19E-04	0.001		0.017	6PSI_5	0.001	1.2E-05	0.011			6.19E-04	0.001	0.001		0.005	0.006		0.014	0.001	0.003	0.013	0.007	0.017	0.011	0.025	0.0001	0.000		0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006		
erroneous data																																												

Table A.13: Inlet cover S22, Grade 2.5%, Cross slope 2.0%

Grade 2.5%, Cross-slope 2.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-7-11_test001	0.059	0.010	0.09	0.010	0.059	6PSI_100	0.002	0.003				0.100	0.09	0.010	0.089	0.091	0.015	0.014	0.064	0.031	0.038	0.050	0.030	0.059	0.033	0.049	0.0037	0.001	0.000	0.001	0.001	0.001	0.000	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	
2022-7-11_test002	0.082	0.016	0.22	0.016	0.082	11PSI_100	0.006	0.004				0.221	0.22	0.016	0.157	0.162	0.021	0.020	0.096	0.059	0.070	0.085	0.054	0.082	0.058	0.078	0.0055	0.006	0.001	0.004	0.004	0.001	0.000	0.004	0.004	0.005	0.005	0.002	0.005	0.003	0.004		
2022-7-11_test003	0.096	0.019	0.28	0.019	0.096	15PSI_100	0.007	0.004				0.286	0.28	0.019	0.186	0.193	0.023	0.022	0.117	0.072	0.081	0.096	0.064	0.096	0.072	0.091	0.0067	0.011	0.001	0.007	0.006	0.001	0.000	0.006	0.004	0.005	0.006	0.003	0.006	0.004	0.004		
2022-7-11_test004	0.126	0.024	0.41	0.024	0.126	15PSI_RENT_NRC_100	0.008	0.004				0.283	0.050	0.41	0.024	0.237	0.248	0.027	0.026	0.153	0.097	0.101	0.129	0.086	0.126	0.097	0.118	0.0064	0.0003	0.020	0.000	0.012	0.011	0.001	0.000	0.010	0.006	0.007	0.007	0.006	0.007	0.006	0.005
2022-7-11_test005	0.113	0.021	0.34	0.021	0.113	15PSI_RENT_100	0.007	0.004				0.285	0.050	0.34	0.021	0.214	0.217	0.024	0.024	0.140	0.082	0.089	0.110	0.073	0.113	0.085	0.103	0.0068	0.0002	0.015	0.000	0.010	0.009	0.001	0.000	0.008	0.005	0.006	0.006	0.004	0.006	0.005	0.004
2022-7-11_test006	0.073	0.014	0.15	0.014	0.073	8PSI_100	0.004	0.003				0.160	0.15	0.014	0.125	0.127	0.018	0.018	0.082	0.047	0.058	0.073	0.044	0.073	0.047	0.064	0.0047	0.002	0.000	0.002	0.002	0.001	0.000	0.003	0.003	0.004	0.004	0.002	0.003	0.003	0.003		
2022-7-11_test007	0.068	0.010	0.12	0.010	0.068	7PSI_100	0.004	0.003				0.134	0.12	0.010	0.110	0.112	0.017	0.012	0.074	0.040	0.051	0.064	0.038	0.068	0.042	0.058	0.0037	0.002	0.000	0.002	0.002	0.001	0.000	0.002	0.002	0.004	0.003	0.001	0.003	0.002	0.002		
2022-7-11_test008	0.048	0.007	0.05	0.007	0.048	6PSI_50	0.002	0.003				0.061	0.05	0.007	0.064	0.065	0.013	0.012	0.053	0.020	0.030	0.042	0.021	0.048	0.022	0.039	0.0021	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.001	
2022-7-11_test009	0.034	0.004	0.02	0.004	0.034	6PSI_35	0.001	0.002				0.030	0.02	0.004	0.038	0.038	0.009	0.009	0.042	0.009	0.018	0.029	0.011	0.034	0.011	0.027	0.0009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-7-11_test010	0.026	0.003	0.01	0.003	0.026	6PSI_25	0.001	0.002				0.015	0.01	0.003	0.023	0.024	0.007	0.008	0.033	0.003	0.007	0.020	-0.001	0.026	0.011	0.019	0.0005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	
2022-7-11_test011	0.020	1.48E-03	0.005		0.020	6PSI_15	0.001	3.0E-05				1.48E-03	0.006	0.005		0.012	0.013		0.023	0.002	0.004	0.014	-0.001	0.020	0.011	0.013	0.0001	0.000		0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-7-11_test012	0.016	1.01E-03	0.002		0.016	6PSI_10	0.001	2.0E-05				1.																															

Table A.20: Inlet cover S22 (x2), Grade 0.5%, Cross slope 2.0%

Grade 0.5%, Cross-slope 2.0%																																													
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)		
2022-7-21_test001	0.079	0.022	0.13	0.022	0.079	6PSI_100	0.005	0.004			0.076	0.112		0.133	0.022	0.098	0.096	0.026	0.024	0.084	0.074	0.073	0.072	0.077	0.079	0.075	0.074	0.004	0.004		0.001	0.000	0.001	0.001	0.000	0.000	0.004	0.002	0.003	0.003	0.001	0.004	0.001	0.003	
2022-7-21_test001A	0.080	0.022	0.13	0.022	0.080	6PSI_100	0.005	0.004			0.075	0.112		0.133	0.022	0.098	0.096	0.026	0.024	0.083	0.064	0.073	0.072	0.078	0.080	0.076	0.073	0.003	0.001	0.000	0.001	0.001	0.000	0.000	0.004	0.002	0.003	0.004	0.001	0.004	0.001	0.003			
2022-7-21_test002	0.116	0.040	0.29	0.040	0.116	11PSI_100	0.008	0.005			0.109	0.226		0.285	0.040	0.161	0.162	0.037	0.036	0.116	0.097	0.112	0.106	0.115	0.116	0.110	0.107	0.006	0.004	0.000	0.004	0.004	0.000	0.000	0.006	0.003	0.005	0.006	0.004	0.007	0.004	0.005			
2022-7-21_test003	0.133	0.052	0.37	0.052	0.133	15PSI_100	0.008	0.007			0.120	0.287		0.365	0.052	0.188	0.192	0.044	0.044	0.138	0.124	0.129	0.132	0.135	0.133	0.128	0.118	0.007	0.008	0.001	0.007	0.006	0.001	0.001	0.007	0.005	0.006	0.007	0.004	0.007	0.004	0.006			
2022-7-21_test004	0.165	0.083	0.52	0.083	0.165	15PSI_RENT_NRC_100	0.009	0.010			0.153	0.286	0.050	0.524	0.083	0.237	0.246	0.060	0.060	0.176	0.161	0.173	0.174	0.176	0.165	0.168	0.151	0.006	0.000	0.015	0.002	0.011	0.011	0.002	0.001	0.009	0.009	0.009	0.008	0.007	0.008	0.006	0.006		
2022-7-21_test005	0.157	0.065	0.44	0.065	0.157	15PSI_RENT_100	0.010	0.008			0.139	0.288	0.050	0.439	0.065	0.216	0.213	0.051	0.051	0.154	0.159	0.151	0.146	0.153	0.157	0.152	0.137	0.006	0.000	0.012	0.001	0.010	0.008	0.001	0.001	0.008	0.007	0.007	0.007	0.005	0.009	0.005	0.007		
2022-7-21_test006	0.101	0.030	0.21	0.030	0.101	8PSI_100	0.007	0.005			0.095	0.166		0.206	0.030	0.130	0.129	0.031	0.030	0.095	0.084	0.093	0.088	0.096	0.101	0.094	0.093	0.005	0.002	0.000	0.002	0.002	0.000	0.000	0.005	0.002	0.004	0.005	0.003	0.006	0.003	0.004			
2022-7-21_test007	0.092	0.027	0.17	0.027	0.092	7PSI_100	0.006	0.004			0.090	0.141		0.172	0.027	0.116	0.114	0.029	0.028	0.088	0.077	0.085	0.080	0.087	0.092	0.086	0.088	0.004	0.001	0.000	0.002	0.002	0.000	0.000	0.005	0.002	0.003	0.004	0.002	0.005	0.002	0.004			
2022-7-21_test008	0.060	0.017	0.08	0.017	0.060	6PSI_50	0.003	0.003			0.057	0.068		0.079	0.017	0.070	0.067	0.022	0.020	0.064	0.062	0.068	0.057	0.058	0.060	0.063	0.055	0.003	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.002	0.002	0.000	0.002	0.002	0.001	0.002			
2022-7-21_test009	0.042	0.011	0.04	0.011	0.042	6PSI_50	0.002	0.003			0.040	0.032		0.035	0.011	0.041	0.039	0.017	0.015	0.047	0.043	0.055	0.041	0.042	0.042	0.043	0.038	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.002	0.001	0.000	0.001	0.000	0.001				
2022-7-21_test010	0.033	0.008	0.018	0.008	0.033	6PSI_25	0.001	0.003			0.031	0.017		0.018	0.008	0.026	0.024	0.014	0.013	0.038	0.033	0.034	0.031	0.038	0.033	0.036	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001		
2022-7-21_test011	0.026	0.005	0.006	0.005	0.026	6PSI_15	0.001	0.002	0.0195		0.023	0.007		0.006	0.005	0.014	0.011	0.010	0.009	0.029	0.023	0.025	0.025	0.026	0.026	0.026	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-7-21_test012	0.022	2.69E-03	0.003			6PSI_10	0.001	2.0E-04			0.019	2.69E-03		0.003		0.010	0.007			0.025	0.018	0.021	0.023	0.022	0.025	0.022	0.018	0.000	0.000		0.000	0.000													
2022-7-21_test013	0.019	1.13E-03	0.002			6PSI_5	0.001	2.0E-04			0.016	1.13E-03		0.001		0.002	0.004			0.023	0.015	0.018	0.020	0.019	0.025	0.021	0.014	0.000	0.000		0.000	0.000													
erroneous data																																													

Table A.21: Inlet cover S22 (x2), Grade 1.0%, Cross slope 2.0%

Grade 1.0%, Cross-slope 2.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta																Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-7-21_test014	0.086	0.028	0.10	0.028	0.086	6PSI_100	0.004	0.004			0.078	0.113		0.103	0.028	0.098	0.098	0.030	0.028	0.090	0.056	0.071	0.076	0.063	0.086	0.060	0.076	0.004	0.001	0.000	0.001	0.001	0.000	0.000	0.004	0.001	0.003	0.002	0.001	0.003	0.001	0.003	
2022-7-21_test015	0.126	0.047	0.22	0.047	0.126	11PSI_100	0.007	0.006			0.111	0.226		0.222	0.047	0.160	0.163	0.042	0.041	0.125	0.085	0.102	0.104	0.098	0.126	0.092	0.109	0.005	0.006	0.000	0.004	0.004	0.000	0.000	0.006	0.003	0.005	0.005	0.004	0.006	0.003	0.004	
2022-7-21_test016	0.146	0.058	0.29	0.058	0.146	15PSI_100	0.008	0.007			0.130	0.286		0.286	0.058	0.188	0.194	0.048	0.047	0.150	0.100	0.120	0.121	0.115	0.146	0.108	0.128	0.007	0.011	0.001	0.007	0.006	0.001	0.001	0.007	0.004	0.005	0.006	0.004	0.007	0.004	0.006	
2022-7-21_test017	0.181	0.081	0.42	0.081	0.181	15PSI_RENT_NRC_100	0.010	0.010			0.168	0.286	0.050	0.415	0.081	0.238	0.249	0.059	0.059	0.178	0.123	0.156	0.156	0.145	0.181	0.141	0.166	0.007	0.000	0.019	0.002	0.012	0.011	0.002	0.001	0.009	0.007	0.009	0.008	0.006	0.009	0.005	0.007
2022-7-21_test018	0.155	0.068	0.34	0.068	0.155	15PSI_RENT_100	0.008	0.008			0.146	0.287	0.050	0.345	0.068	0.214	0.217	0.053	0.052	0.158	0.113	0.139	0.138	0.131	0.155	0.121	0.144	0.006	0.000	0.014	0.001	0.010	0.008	0.001	0.001	0.007	0.005	0.006	0.007	0.005	0.007		
2022-7-21_test019	0.106	0.037	0.16	0.037	0.106	8PSI_100	0.006	0.005			0.093	0.167		0.161	0.037	0.130	0.132	0.036	0.035	0.105	0.073	0.085	0.093	0.082	0.106	0.076	0.091	0.005	0.003	0.000	0.002	0.002	0.000	0.000	0.005	0.002	0.004	0.004	0.003	0.005	0.003	0.004	
2022-7-21_test020	0.098	0.033	0.13	0.033	0.098	7PSI_100	0.005	0.005			0.086	0.142		0.134	0.033	0.116	0.117	0.033	0.032	0.098	0.065	0.079	0.083	0.073	0.098	0.069	0.084	0.004	0.002	0.000	0.002	0.002	0.001	0.000	0.004	0.002	0.003	0.003	0.002	0.004	0.002	0.003	
2022-7-21_test021	0.073	0.021	0.06	0.021	0.073	6PSI_50	0.003	0.004			0.067	0.068		0.062	0.021	0.070	0.070	0.025	0.024	0.073	0.043	0.053	0.061	0.046	0.073	0.044	0.065	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.000	0.002
2022-7-21_test022	0.057	0.015	0.03	0.015	0.057	6PSI_35	0.002	0.003			0.052	0.034		0.030	0.015	0.043	0.044	0.020	0.019	0.058	0.032	0.042	0.048	0.033	0.057	0.030	0.050	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.001	
2022-7-21_test023	0.046	0.011	0.01	0.011	0.046	6PSI_25	0.001	0.003			0.042	0.017		0.014	0.011	0.026	0.027	0.017	0.016	0.050	0.023	0.031	0.038	0.024	0.046	0.021	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-7-21_test024	0.037	0.006	0.006	0.006	0.037	6PSI_15	0.001	0.002			0.032	0.007		0.006	0.006	0.014	0.015	0.012	0.011	0.039	0.016	0.024	0.031	0.019	0.037	0.021	0.030	0.000	0.000	0.000													

Table A.24: Inlet cover S22 (x2), Grade 0.5%, Cross slope 4.0%

Grade 0.5%, Cross-slope 4.0%																																												
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																		
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	
2022-7-26_test014	0.109	0.042	0.10	0.042	0.109	6PSI_100	0.004	0.005			0.102	0.111		0.101	0.042	0.096	0.097	0.038	0.039	0.127	0.066	0.081	0.103	0.057	0.109	0.057	0.098	0.004	0.001	0.000	0.001	0.001	0.000	0.000	0.004	0.003	0.003	0.003	0.002	0.003	0.002	0.003		
2022-7-26_test015	0.156	0.067	0.22	0.067	0.156	11PSI_100	0.007	0.008			0.145	0.226		0.220	0.067	0.160	0.162	0.051	0.053	0.173	0.112	0.135	0.135	0.100	0.156	0.099	0.141	0.005	0.006	0.001	0.004	0.004	0.001	0.001	0.007	0.005	0.007	0.007	0.004	0.006	0.004	0.006		
2022-7-26_test016	0.171	0.081	0.29	0.081	0.171	15PSI_100	0.008	0.009			0.162	0.289		0.286	0.081	0.188	0.194	0.058	0.060	0.170	0.132	0.158	0.147	0.117	0.171	0.112	0.158	0.007	0.011	0.002	0.007	0.006	0.001	0.001	0.008	0.005	0.007	0.008	0.005	0.007	0.004	0.006		
2022-7-26_test017	0.196	0.112	0.41	0.112	0.196	15PSI_RENT_NRC_100	0.009	0.013			0.184	0.286	0.050	0.413	0.112	0.237	0.247	0.070	0.073	0.231	0.166	0.165	0.205	0.148	0.196	0.148	0.180	0.006	0.000	0.019	0.004	0.012	0.010	0.002	0.002	0.007	0.007	0.008	0.007	0.008	0.005	0.006	0.006	0.007
2022-7-26_test018	0.185	0.095	0.34	0.095	0.185	15PSI_RENT_100	0.007	0.011			0.182	0.287	0.050	0.343	0.095	0.214	0.216	0.064	0.066	0.177	0.145	0.172	0.160	0.134	0.185	0.127	0.178	0.006	0.000	0.015	0.002	0.010	0.008	0.001	0.002	0.008	0.007	0.008	0.008	0.005	0.006	0.005	0.007	
2022-7-26_test019	0.130	0.054	0.16	0.054	0.130	8PSI_100	0.005	0.006			0.127	0.165		0.158	0.054	0.129	0.130	0.044	0.046	0.163	0.080	0.119	0.126	0.078	0.130	0.084	0.123	0.005	0.003	0.000	0.002	0.002	0.000	0.000	0.006	0.004	0.007	0.006	0.003	0.004	0.004	0.005		
2022-7-26_test020	0.123	0.049	0.13	0.049	0.123	7PSI_100	0.005	0.006			0.119	0.141		0.131	0.049	0.115	0.115	0.041	0.043	0.141	0.070	0.099	0.117	0.071	0.123	0.070	0.115	0.004	0.002	0.001	0.001	0.002	0.000	0.001	0.005	0.006	0.005	0.004	0.003	0.004	0.003	0.004		
2022-7-26_test021	0.088	0.033	0.06	0.033	0.088	6PSI_50	0.002	0.005			0.083	0.066		0.058	0.033	0.067	0.067	0.032	0.034	0.098	0.041	0.066	0.091	0.041	0.088	0.040	0.079	0.002	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.003	0.002	0.002	0.001	0.002	0.002			
2022-7-26_test022	0.070	0.024	0.03	0.024	0.070	6PSI_35	0.002	0.004			0.063	0.032		0.027	0.024	0.041	0.041	0.026	0.026	0.077	0.023	0.041	0.074	0.023	0.070	0.022	0.059	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.001	0.001	
2022-7-26_test023	0.055	0.016	0.01	0.016	0.055	6PSI_25	0.001	0.003			0.052	0.016		0.013	0.016	0.025	0.025	0.020	0.020	0.062	0.012	0.027	0.059	0.019	0.055	0.021	0.049	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	
2022-7-26_test024	0.042	0.007	0.01	0.007	0.042	6PSI_15	0.001	0.003			0.039	0.007		0.005	0.007	0.014	0.013	0.012	0.012	0.048	0.010	0.019	0.044	0.018	0.042	0.021	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001
2022-7-26_test025	0.036	2.56E-03	0.003		0.036	6PSI_10	0.001	5.1E-05			0.031	2.56E-03	0.003	0.003		0.009	0.009			0.041	0.009	0.014	0.036	0.017	0.036	0.021	0.027	0.000	0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-7-26_test026	0.032	1.26E-03	0.002		0.032	6PSI_5	0.001	2.5E-05			0.027	1.26E-03	0.001	0.002		0.006	0.006			0.036	0.009	0.014	0.033	0.017	0.032	0.021	0.023	0.000	0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
erroneous data																																												

Table A.25: Inlet cover S22 (x2), Grade 1.0%, Cross slope 4.0%

Grade 1.0%, Cross-slope 4.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-7-26_test001	0.106	0.035	0.10	0.035	0.106	6PSI_100	0.003	0.005			0.093	0.110		0.100	0.035	0.096	0.096	0.034	0.034	0.102	0.050	0.063	0.093	0.050	0.106	0.047	0.089	0.004	0.001	0.000	0.001	0.001	0.000	0.000	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.002	
2022-7-26_test002	0.141	0.058	0.22	0.058	0.141	11PSI_100	0.006	0.007			0.122	0.224		0.219	0.058	0.159	0.162	0.047	0.048	0.142	0.075	0.098	0.119	0.087	0.141	0.080	0.118	0.005	0.006	0.001	0.004	0.004	0.001	0.000	0.006	0.004	0.004	0.005	0.004	0.005	0.004	0.005	
2022-7-26_test003	0.160	0.069	0.28	0.069	0.160	15PSI_100	0.008	0.008			0.136	0.286		0.285	0.069	0.187	0.194	0.052	0.054	0.161	0.088	0.115	0.134	0.102	0.160	0.095	0.133	0.007	0.010	0.001	0.007	0.006	0.001	0.001	0.007	0.005	0.005	0.005	0.005	0.005	0.007	0.004	0.006
2022-7-26_test004	0.190	0.092	0.41	0.092	0.190	15PSI_RENT_NRC_100	0.009	0.010			0.172	0.285	0.050	0.414	0.092	0.239	0.247	0.063	0.065	0.191	0.109	0.152	0.165	0.131	0.190	0.126	0.168	0.007	0.000	0.019	0.002	0.012	0.010	0.001	0.001	0.008	0.006	0.008	0.007	0.006	0.008	0.006	0.006
2022-7-26_test005	0.171	0.078	0.34	0.078	0.171	15PSI_RENT_100	0.008	0.009			0.154	0.286	0.050	0.343	0.078	0.214	0.215	0.057	0.058	0.173	0.095	0.132	0.144	0.117	0.171	0.107	0.150	0.006	0.000	0.015	0.002	0.010	0.009	0.001	0.001	0.007	0.005	0.006	0.006	0.005	0.007	0.005	0.006
2022-7-26_test006	0.124	0.045	0.16	0.045	0.124	8PSI_100	0.005	0.005			0.108	0.165		0.156	0.045	0.128	0.130	0.040	0.041	0.121	0.066	0.084	0.108	0.068	0.124	0.063	0.104	0.005	0.003	0.000	0.002	0.002	0.000	0.000	0.005	0.003	0.004	0.004	0.003	0.004	0.003	0.004	
2022-7-26_test007	0.116	0.041	0.13	0.041	0.116	7PSI_100	0.004	0.005			0.101	0.139		0.131	0.041	0.114	0.115	0.037	0.038	0.115	0.060	0.076	0.101	0.061	0.116	0.056	0.097	0.004	0.002	0.000	0.002	0.002	0.000	0.000	0.003	0.003	0.003	0.003	0.002	0.003	0.002	0.003	
2022-7-26_test008	0.087	0.027	0.06	0.027	0.087	6PSI_50	0.001	0.004			0.076	0.064		0.057	0.027	0.066	0.066	0.028	0.029	0.086	0.033	0.054	0.071	0.036	0.087	0.030	0.072	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.001	
2022-7-26_test009	0.070	0.019	0.03	0.019	0.070	6PSI_35	0.001	0.003			0.061	0.031		0.026	0.019	0.040	0.040	0.022	0.023	0.070	0.019	0.032	0.059	0.019	0.070	0.021	0.057	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-7-26_test010	0.055	0.013	0.01	0.013	0.055	6PSI_25	0.001	0.003			0.045	0.016		0.013	0.013	0.025	0.025	0.018	0.018	0.061	0.016	0.022	0.050	0.017	0.055	0.021	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-7-26_test011	0.042	0.006	0.00	0.006	0.042	6PSI_15	0.001	0.002			0.030	0.006		0.005	0.006	0.013	0.013	0.011	0.011	0.046	0.015	0.017	0.038	0.017	0.042	0.021	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-7-26_test012A	0.038	2.70E-03	0.003		0.038	6PSI_10	0.001	5.4E-05	0.020		0.026	2.70E-03	0.003	0.																													

Table A.28: Ponding test, Inlet cover S22 (x2), Grade 0.5%, Cross slope 0.0%

Grade 0.5%, Cross-slope 0.0%																																									
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)
2022-7-27_test001	0.066	0.064	0.06	0.064	0.066	6PSI_50	0.004	0.008		0.061	0.064	0.057	0.064	0.066	0.066	0.050	0.052	0.071	0.065	0.070	0.063	0.065	0.066	0.071	0.061	0.002	0.000	0.001	0.000	0.000	0.001	0.001	0.003	0.004	0.003	0.003	0.001	0.003	0.003	0.003	
2022-7-27_test002	0.106	0.107	0.10	0.107	0.106	6PSI_100	0.006	0.014		0.102	0.109	0.099	0.107	0.095	0.096	0.068	0.072	0.107	0.079	0.098	0.108	0.106	0.106	0.109	0.102	0.004	0.001	0.004	0.001	0.001	0.002	0.002	0.006	0.004	0.004	0.005	0.004	0.005	0.004	0.005	
2022-7-27_test003	0.129	0.140	0.13	0.140	0.129	7PSI_100	0.007	0.019		0.123	0.139	0.130	0.140	0.114	0.115	0.079	0.086	0.137	0.098	0.120	0.132	0.128	0.129	0.131	0.123	0.005	0.002	0.007	0.002	0.001	0.003	0.004	0.008	0.004	0.004	0.006	0.004	0.006	0.004	0.007	
2022-7-27_test004	0.150	0.169	0.16	0.169	0.150	8PSI_100	0.008	0.025		0.146	0.165	0.157	0.169	0.129	0.130	0.087	0.098	0.154	0.123	0.138	0.153	0.144	0.150	0.147	0.146	0.004	0.003	0.010	0.002	0.002	0.004	0.005	0.010	0.005	0.005	0.006	0.005	0.007	0.005	0.007	
2022-7-27_test005	0.167	0.20	0.18	0.197	0.167	9PSI_100	0.009	0.031		0.160	0.188	0.180	0.197	0.141	0.142	0.095	0.108	0.163	0.147	0.151	0.167	0.158	0.167	0.161	0.160	0.005	0.004	0.014	0.003	0.003	0.006	0.006	0.012	0.005	0.005	0.007	0.005	0.008	0.005	0.008	
2022-7-27_test006	0.181	0.22	0.20	0.219	0.181	10PSI_100	0.009	0.031		0.171	0.207	0.202	0.219	0.151	0.154	0.100	0.117	0.174	0.163	0.165	0.179	0.171	0.181	0.174	0.171	0.005	0.005	0.017	0.004	0.004	0.007	0.007	0.012	0.005	0.005	0.008	0.005	0.008	0.006	0.008	
2022-7-27_test007	0.195	0.23	0.22	0.234	0.195	11PSI_100	0.010	0.034		0.184	0.225	0.221	0.234	0.160	0.163	0.104	0.125	0.188	0.177	0.178	0.190	0.185	0.195	0.188	0.184	0.005	0.006	0.020	0.005	0.004	0.007	0.008	0.012	0.006	0.005	0.007	0.006	0.009	0.006	0.010	
2022-7-27_test012	0.051	0.05	0.04	0.046	0.051	6PSI_40	0.002	0.006		0.048	0.045	0.038	0.046	0.051	0.051	0.040	0.041	0.058	0.057	0.059	0.052	0.055	0.051	0.061	0.048	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	
2022-7-27_test006A	0.181	0.22	0.20	0.218	0.181	10PSI_100	0.010	0.029		0.171	0.208	0.202	0.218	0.152	0.153	0.100	0.110	0.176	0.164	0.166	0.179	0.172	0.181	0.174	0.171	0.006	0.005	0.016	0.003	0.004	0.005	0.007	0.012	0.005	0.005	0.008	0.006	0.008	0.006	0.009	
2022-7-27_test008	0.217	0.26	0.26	0.263	0.217	13PSI_100	0.009	0.038			0.259	0.255	0.263	0.175	0.180	0.127	0.124	0.214	0.208	0.209	0.214	0.215	0.217	0.218	0.207	0.006	0.009	0.025	0.006	0.005	0.008	0.010	0.006	0.006	0.005	0.006	0.006	0.008	0.005	0.001	
2022-7-27_test009	0.246	0.29	0.28	0.293	0.246	15PSI_100	0.010	0.043			0.290	0.285	0.293	0.188	0.194	0.140	0.135	0.242	0.234	0.234	0.243	0.241	0.246	0.244	0.207	0.006	0.011	0.034	0.007	0.006	0.010	0.012	0.007	0.007	0.006	0.008	0.007	0.009	0.007	0.006	
2022-7-27_test010	0.281	0.33	0.35	0.328	0.281	15PSI_RENT_100	0.017	0.054			0.287	0.287	0.328	0.217	0.217	0.133	0.169	0.271	0.277	0.279	0.282	0.284	0.281	0.286	0.207	0.007	0.000	0.014	0.051	0.010	0.007	0.018	0.013	0.010	0.009	0.012	0.010	0.009	0.016	0.010	0.014
2022-7-27_test011	0.343	0.41	0.41		0.343	15PSI_RENT_NRC_100	0.019	0.069			0.285	0.285	0.328	0.238	0.249	0.133	0.169	0.271	0.277	0.279	0.282	0.284	0.281	0.286	0.207	0.007	0.000	0.014	0.051	0.010	0.007	0.018	0.013	0.010	0.009	0.012	0.010	0.009	0.016	0.010	0.014
2022-7-27_test012	0.051	0.046	0.04	0.046	0.051	6PSI_40	0.002	0.006		0.048	0.045	0.038	0.046	0.051	0.051	0.040	0.041	0.058	0.057	0.059	0.052	0.055	0.051	0.061	0.048	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	
2022-7-27_test013	0.041	0.040	0.02	0.040	0.041	6PSI_30	0.001	0.005		0.036	0.023	0.020	0.040	0.033	0.033	0.041	0.033	0.045	0.045	0.045	0.043	0.047	0.041	0.039	0.036	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.001	0.000	0.001	0.001	
2022-7-27_test014	0.032	0.025	0.01	0.025	0.032	6PSI_20	0.001	0.004		0.026	0.011	0.008	0.025	0.018	0.018	0.031	0.023	0.033	0.034	0.031	0.032	0.036	0.032	0.033	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-7-27_test015	0.026	3.28E-03	0.003		0.026	6PSI_10	0.001	6.6E-05		0.018	3.28E-03	0.003	0.003	0.009	0.009		0.030	0.026	0.022	0.028	0.025	0.026	0.023	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
erroneous data 2022-7-27_test011, Measurement tank unable to contain flow																																									

Table A.29: Inlet cover S28, Grade 0.5%, Cross slope 2.0%

Grade 0.5%, Cross-slope 2.0%																																									
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma															
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)
2022-8-5_test001	0.086	0.018	0.10	0.018	0.086	6PSI_100	0.004	0.004		0.077	0.107	0.096	0.018	0.093	0.094	0.022	0.022	0.092	0.062	0.072	0.079	0.053	0.086	0.055	0.075	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.003	0.005	0.004	0.002	0.003	0.003	0.003	
2022-8-5_test002	0.132	0.028	0.22	0.028	0.132	11PSI_100	0.007	0.005		0.117	0.224	0.218	0.028	0.158	0.162	0.030	0.029	0.155	0.109	0.124	0.117	0.092	0.132	0.093	0.115	0.006	0.006	0.001	0.004	0.004	0.001	0.001	0.009	0.005	0.006	0.006	0.004	0.006	0.004	0.005	
2022-8-5_test003	0.141	0.035	0.28	0.035	0.141	15PSI_100	0.007	0.006		0.130	0.286	0.281	0.035	0.185	0.193	0.034	0.034	0.170	0.130	0.152	0.134	0.111	0.141	0.116	0.128	0.006	0.010	0.001	0.006	0.006	0.001	0.001	0.011	0.006	0.007	0.007	0.004	0.006	0.005	0.005	
2022-8-5_test004	0.194	0.046	0.40	0.046	0.194	15PSI_RENT_NRC_100	0.010	0.007		0.188	0.284	0.284	0.046	0.230	0.247	0.041	0.041	0.186	0.165	0.167	0.164	0.158	0.194	0.153	0.186	0.006	0.000	0.021	0.002	0.011	0.011	0.001	0.002	0.012	0.008	0.014	0.012	0.007	0.009	0.006	0.008
2022-8-5_test005	0.154	0.042	0.34	0.042	0.154	15PSI_RENT_100	0.008	0.007		0.140	0.286	0.286	0.042	0.215	0.216	0.038	0.038	0.201	0.150	0.172	0.152	0.124	0.154	0.131	0.139	0.007	0.000	0.015	0.001	0.010	0.008	0.001	0.001	0.009	0.006	0.007	0.007	0.005	0.007	0.006	0.005
2022-8-5_test006	0.107	0.023	0.15	0.023	0.107	8PSI_100	0.005	0.004		0.106	0.162	0.154	0.023	0.127	0.129	0.026	0.026	0.129	0.085	0.099	0.093	0.076	0.107	0.076	0.104	0.004	0.003	0.000	0.002	0.002	0.000	0.000	0.006	0.004	0.005	0.005	0.003	0.004	0.004	0.004	
2022-8-5_test007	0.096	0.021	0.13	0.021	0.096	7PSI_100	0.005	0.004		0.092	0.138	0.128	0.021	0.112	0.113	0.024	0.024	0.118	0.077	0.094	0.090	0.065	0.096	0.068	0.090	0.004	0.002	0.000	0.001	0.002	0.001	0.000	0.007	0.004	0.006	0.005	0.003	0.004	0.003	0.004	
2022-8-5_test008	0.063	0.015	0.06	0.015	0.063	6PSI_50	0.003	0.003		0.057	0.064	0.056	0.015	0.065	0.066	0.019	0.019	0.072	0.041	0.054	0.065	0.039	0.063	0.039	0.055	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.002	
2022-8-5_test009	0.043	0.010	0.03	0.010	0.043	6PSI_35	0.002	0.003		0.039	0.031	0.026	0.010	0.039																											

Table A.30: Inlet cover S28, Grade 1.0%, Cross slope 2.0%

Grade 1.0%, Cross-slope 2.0%																																												
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																		
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	
2022-8-4_test014	0.078	0.015	0.10	0.015	0.078	6PSI_100	0.004	0.003	0.073	0.068		0.109			0.100	0.015	0.095	0.097	0.019	0.019	0.080	0.041	0.056	0.063	0.049	0.078	0.047	0.066	0.003		0.001	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.003	0.002	0.002	0.003	0.002	0.003
2022-8-4_test015	0.116	0.027	0.22	0.027	0.116	11PSI_100	0.006	0.004		0.102		0.225			0.221	0.027	0.160	0.163	0.029	0.028	0.121	0.071	0.089	0.094	0.085	0.116	0.079	0.100	0.006		0.006	0.000	0.004	0.005	0.000	0.000	0.006	0.004	0.005	0.005	0.004	0.005	0.004	0.005
2022-8-4_test016	0.133	0.032	0.29	0.032	0.133	15PSI_100	0.008	0.004	0.122	0.120		0.286			0.285	0.032	0.187	0.194	0.032	0.032	0.144	0.086	0.107	0.112	0.104	0.133	0.095	0.118	0.006		0.011	0.000	0.006	0.007	0.000	0.000	0.007	0.005	0.005	0.006	0.004	0.007	0.004	0.006
2022-8-4_test017	0.167	0.044	0.41	0.044	0.167	15PSI_RENT_NRC_100	0.009	0.005		0.157		0.285	0.050	0.413	0.044	0.237	0.248	0.039	0.040	0.171	0.109	0.145	0.149	0.134	0.167	0.127	0.155	0.007	0.000	0.021	0.000	0.012	0.010	0.000	0.000	0.011	0.007	0.009	0.007	0.006	0.008	0.005	0.007	
2022-8-4_test018	0.141	0.038	0.34	0.038	0.141	15PSI_RENT_100	0.007	0.005		0.132		0.285	0.050	0.344	0.038	0.214	0.217	0.036	0.036	0.153	0.098	0.127	0.130	0.120	0.141	0.108	0.130	0.007	0.000	0.016	0.000	0.010	0.009	0.000	0.000	0.010	0.006	0.006	0.007	0.005	0.006	0.004	0.006	
2022-8-4_test019	0.098	0.022	0.16	0.022	0.098	8PSI_100	0.005	0.004		0.086		0.165		0.160	0.022	0.130	0.132	0.025	0.024	0.103	0.058	0.072	0.081	0.069	0.098	0.070	0.084	0.005		0.003	0.000	0.002	0.002	0.001	0.000	0.005	0.003	0.004	0.004	0.003	0.004	0.003	0.004	
2022-8-4_test020	0.089	0.019	0.13	0.019	0.089	7PSI_100	0.005	0.004		0.078		0.140		0.133	0.019	0.115	0.117	0.023	0.023	0.094	0.051	0.065	0.071	0.061	0.089	0.064	0.076	0.004		0.002	0.000	0.002	0.001	0.001	0.000	0.005	0.002	0.003	0.003	0.003	0.004	0.002	0.003	
2022-8-4_test021	0.064	0.012	0.06	0.012	0.064	6PSI_50	0.003	0.003	0.057	0.056		0.067		0.061	0.012	0.069	0.070	0.016	0.016	0.066	0.029	0.039	0.051	0.035	0.064	0.031	0.054	0.002		0.000	0.000	0.000	0.001	0.000	0.000	0.004	0.001	0.001	0.001	0.001	0.002	0.001	0.002	
2022-8-4_test022	0.046	0.009	0.03	0.009	0.046	6PSI_35	0.002	0.003		0.040		0.032		0.028	0.009	0.041	0.042	0.014	0.014	0.050	0.017	0.026	0.035	0.019	0.046	0.016	0.039	0.001		0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	
2022-8-4_test023	0.034	0.007	0.01	0.007	0.034	6PSI_25	0.001	0.003		0.030		0.016		0.014	0.007	0.025	0.027	0.012	0.011	0.041	0.009	0.017	0.026	0.010	0.034	0.007	0.028	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.001	
2022-8-4_test023A	0.034	5.12E-03	0.014		0.034	6PSI_25	0.001	1.0E-04		0.030	5.12E-03	0.016		0.014	0.007	0.025	0.026			0.040	0.009	0.017	0.027	0.010	0.034	0.007	0.029	0.001		0.000		0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-4_test024	0.024	3.20E-03	0.005		0.024	6PSI_15	0.001	6.4E-05		0.019	3.20E-03	0.006		0.005		0.013	0.014			0.032	0.004	0.008	0.019	0.004	0.024	0.007	0.017	0.000		0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-4_test025	0.019	2.22E-03	0.003		0.021	6PSI_10	0.003	4.4E-05		0.014	2.22E-03	0.003		0.003		0.008	0.010			0.027	0.003	0.006	0.018	0.002	0.021	0.007	0.012	0.000		0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-4_test026	0.015	1.38E-03	0.002		0.019	6PSI_5	0.005	2.8E-05		0.010	1.38E-03	0.001		0.002		0.006	0.007			0.023	0.002	0.005	0.016	0.002	0.019	0.007	0.008	0.000		0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
erroneous data																																												

Table A.31: Inlet cover S28, Grade 2.5%, Cross slope 2.0%

Grade 2.5%, Cross-slope 2.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-8-4_test001	0.061	0.014	0.10	0.014	0.061	6PSI_100	0.003	0.003		0.050		0.110		0.100	0.014	0.096	0.097	0.019	0.019	0.056	0.035	0.041	0.054	0.033	0.061	0.034	0.048	0.003		0.001	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.002	0.002	0.001	0.002	0.002	0.002
2022-8-4_test002	0.083	0.022	0.22	0.022	0.083	11PSI_100	0.006	0.004		0.077		0.225		0.220	0.022	0.160	0.163	0.025	0.025	0.088	0.061	0.071	0.088	0.055	0.083	0.059	0.075	0.005		0.006	0.000	0.004	0.004	0.001	0.000	0.006	0.004	0.005	0.005	0.003	0.005	0.004	0.004
2022-8-4_test003	0.099	0.026	0.28	0.026	0.099	15PSI_100	0.006	0.004	0.086	0.089		0.287		0.284	0.026	0.187	0.193	0.028	0.027	0.108	0.073	0.082	0.099	0.065	0.099	0.075	0.087	0.007		0.011	0.000	0.007	0.007	0.001	0.000	0.008	0.004	0.005	0.006	0.003	0.005	0.004	0.004
2022-8-4_test004	0.125	0.032	0.41	0.032	0.125	15PSI_RENT_NRC_100	0.008	0.005	0.110	0.115		0.285	0.050	0.414	0.032	0.237	0.249	0.032	0.032	0.143	0.099	0.103	0.128	0.089	0.125	0.103	0.113	0.006	0.000	0.020	0.001	0.012	0.010	0.001	0.000	0.010	0.006	0.007	0.007	0.006	0.007	0.006	0.006
2022-8-4_test005	0.113	0.028	0.35	0.028	0.113	15PSI_RENT_100	0.007	0.005		0.101		0.286	0.051	0.345	0.028	0.215	0.217	0.030	0.029	0.128	0.083	0.090	0.110	0.075	0.113	0.089	0.099	0.007	0.000	0.016	0.001	0.011	0.008	0.001	0.000	0.008	0.005	0.006	0.006	0.004	0.006	0.005	0.004
2022-8-4_test006	0.074	0.019	0.16	0.019	0.074	8PSI_100	0.004	0.004		0.063		0.166		0.158	0.019	0.128	0.131	0.022	0.022	0.072	0.048	0.059	0.075	0.044	0.074	0.046	0.061	0.005		0.003	0.000	0.002	0.002	0.000	0.000	0.005	0.003	0.004	0.004	0.002	0.003	0.003	0.003
2022-8-4_test007	0.069	0.017	0.13	0.017	0.069	7PSI_100	0.004	0.004	0.059	0.058		0.140		0.131	0.017	0.114	0.115	0.021	0.021	0.068	0.042	0.052	0.065	0.039	0.069	0.041	0.056	0.004		0.002	0.000	0.002	0.001	0.000	0.000	0.004	0.003	0.004	0.003	0.001	0.003	0.003	0.003
2022-8-4_test008	0.047	0.011	0.06	0.011	0.047	6PSI_50	0.002	0.003		0.038		0.065		0.058	0.011	0.067	0.067	0.016	0.015	0.049	0.021	0.030	0.042	0.022	0.047	0.022	0.036	0.002		0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.001	0.001	0.000	0.001	0.001	0.001	0.001
2022-8-4_test009	0.034	0.008	0.03	0.008	0.034	6PSI_35	0.001	0.003	0.028	0.026		0.031		0.026	0.008	0.039	0.040	0.013	0.012	0.042	0.010	0.016	0.029	0.009	0.034	0.011	0.024	0.001		0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2022-8-4_test010	0.027	4.11E-03	0.013		0.027	6PSI_25	0.001	8.2E-05		0.019	4.11E-03	0.016		0.013		0.025	0.026			0.035	0.002	0.010	0.022	0.006	0.027	0.007	0.017	0.000		0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-8-4_test011	0.021	2.32E-03	0.005		0.021	6PSI_15	0.001	4.6E-05		0.013	2.32E-03	0.006		0.005		0.013	0.013			0.024	0.000	0.005	0.017	0.002	0.021	0.007	0.011	0.000		0.000		0.000	0.000	0.00									

Table A.34: Inlet cover S28, Grade 1.0%, Cross slope 4.0%

Grade 1.0%, Cross-slope 4.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-8-2_test014	0.093	0.020	0.10	0.020	0.093	6PSI_100	0.003	0.004	0.085	0.084	0.111	0.102	0.020	0.096	0.098	0.023	0.024	0.018	0.036	0.050	0.080	0.037	0.093	0.034	0.080	0.003	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.003	0.002	0.002	0.001	0.002	0.001	0.002			
2022-8-2_test015	0.127	0.032	0.22	0.032	0.127	11PSI_100	0.006	0.005		0.114	0.226		0.221	0.032	0.160	0.163	0.032	0.032	0.046	0.060	0.085	0.104	0.073	0.127	0.067	0.110	0.006	0.006	0.000	0.004	0.004	0.000	0.000	0.005	0.004	0.004	0.004	0.004	0.005	0.003	0.005		
2022-8-2_test016	0.147	0.039	0.29	0.039	0.147	15PSI_100	0.007	0.005		0.129	0.288		0.285	0.039	0.187	0.195	0.036	0.037	0.064	0.073	0.101	0.120	0.088	0.147	0.082	0.125	0.007	0.010	0.000	0.007	0.006	0.000	0.000	0.007	0.005	0.005	0.005	0.004	0.006	0.004	0.006		
2022-8-2_test017	0.176	0.051	0.41	0.051	0.176	15PSI_RENT_NRC_100	0.008	0.006		0.165	0.287	0.050	0.412	0.051	0.236	0.248	0.043	0.044	0.092	0.095	0.142	0.154	0.119	0.176	0.113	0.161	0.007	0.000	0.020	0.000	0.012	0.011	0.000	0.000	0.009	0.006	0.008	0.007	0.006	0.007	0.006	0.006	
2022-8-2_test018	0.155	0.045	0.34	0.045	0.155	15PSI_RENT_100	0.007	0.005		0.146	0.288	0.050	0.343	0.045	0.214	0.216	0.040	0.040	0.077	0.081	0.120	0.131	0.103	0.155	0.094	0.142	0.008	0.000	0.015	0.000	0.010	0.008	0.000	0.000	0.008	0.005	0.006	0.006	0.005	0.006	0.005	0.006	
2022-8-2_test019	0.110	0.026	0.16	0.026	0.110	8PSI_100	0.005	0.004		0.100	0.167		0.158	0.026	0.129	0.131	0.028	0.028	0.021	0.051	0.072	0.094	0.055	0.110	0.050	0.096	0.005	0.003	0.000	0.002	0.002	0.000	0.000	0.003	0.004	0.004	0.004	0.003	0.004	0.003	0.004		
2022-8-2_test020	0.104	0.024	0.13	0.024	0.104	7PSI_100	0.004	0.004		0.094	0.141		0.132	0.024	0.115	0.116	0.026	0.026	0.018	0.046	0.064	0.087	0.048	0.104	0.043	0.090	0.004	0.002	0.000	0.002	0.002	0.000	0.000	0.000	0.003	0.003	0.003	0.002	0.003	0.002	0.003		
2022-8-2_test021	0.074	0.016	0.06	0.016	0.074	6PSI_50	0.002	0.003		0.068	0.068		0.059	0.016	0.068	0.068	0.020	0.020	0.018	0.020	0.043	0.059	0.021	0.074	0.020	0.065	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.001	0.001	0.001		
2022-8-2_test022	0.057	0.011	0.03	0.011	0.057	6PSI_35	0.001	0.003		0.053	0.032		0.027	0.011	0.040	0.041	0.016	0.016	0.018	0.004	0.021	0.045	0.008	0.057	0.007	0.049	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-2_test023	0.041	0.008	0.01	0.008	0.041	6PSI_25	0.001	0.003	0.038	0.036	0.017		0.013	0.008	0.025	0.025	0.013	0.013	0.018	-0.002	0.008	0.036	0.002	0.041	0.007	0.032	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-2_test024	0.027	3.69E-03	0.005			6PSI_15	0.001	7.4E-05		0.022	3.69E-03	0.006	0.005		0.012	0.013		0.018	-0.003	0.001	0.024	0.002	0.027	0.007	0.018	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
2022-8-2_test025	0.023	2.52E-03	0.003			6PSI_10	0.001	5.0E-05		0.017	2.52E-03	0.003	0.003		0.008	0.009		0.018	-0.003	0.000	0.019	0.002	0.023	0.007	0.013	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
2022-8-2_test026	0.019	1.22E-03	0.001			6PSI_5	0.001	2.4E-05		0.012	1.22E-03	0.001	0.001		0.005	0.006		0.018	-0.004	0.000	0.014	0.002	0.019	0.007	0.008	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
erroneous data																																											

Table A.35: Inlet cover S28, Grade 2.5%, Cross slope 4.0%

Grade 2.5%, Cross-slope 4.0%																																											
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																	
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)
2022-8-3_test001	0.067	0.016	0.10	0.016	0.067	6PSI_100	0.002	0.003		0.058	0.107		0.095	0.016	0.092	0.093	0.020	0.020	0.057	0.022	0.039	0.065	0.021	0.067	0.023	0.054	0.004	0.001	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.002	0.001	0.002	0.001	0.002	0.002		
2022-8-3_test002	0.094	0.025	0.22	0.025	0.094	11PSI_100	0.006	0.004		0.089	0.224		0.218	0.025	0.158	0.162	0.027	0.027	0.088	0.051	0.070	0.099	0.046	0.094	0.051	0.086	0.005	0.006	0.000	0.004	0.004	0.000	0.000	0.005	0.004	0.005	0.005	0.003	0.005	0.004	0.004		
2022-8-3_test003	0.107	0.029	0.28	0.029	0.107	15PSI_100	0.007	0.004	0.104	0.101	0.289		0.283	0.029	0.186	0.193	0.030	0.030	0.107	0.062	0.082	0.110	0.056	0.107	0.064	0.097	0.006	0.011	0.000	0.007	0.006	0.000	0.000	0.006	0.004	0.005	0.006	0.004	0.006	0.005	0.004		
2022-8-3_test004	0.133	0.037	0.41	0.037	0.133	15PSI_RENT_NRC_100	0.008	0.005	0.120	0.123	0.286	0.050	0.410	0.037	0.236	0.247	0.035	0.035	0.152	0.086	0.098	0.139	0.080	0.133	0.088	0.120	0.007	0.000	0.019	0.000	0.012	0.010	0.000	0.000	0.010	0.006	0.007	0.007	0.006	0.007	0.007	0.006	
2022-8-3_test005	0.120	0.033	0.34	0.033	0.120	15PSI_RENT_100	0.008	0.005		0.109	0.287	0.050	0.341	0.033	0.213	0.216	0.032	0.033	0.138	0.070	0.087	0.122	0.065	0.120	0.075	0.106	0.007	0.000	0.016	0.000	0.011	0.008	0.000	0.000	0.007	0.005	0.006	0.006	0.004	0.007	0.005	0.004	
2022-8-3_test006	0.085	0.021	0.16	0.021	0.085	8PSI_100	0.003	0.004		0.075	0.164		0.156	0.021	0.127	0.130	0.024	0.024	0.088	0.039	0.053	0.082	0.035	0.085	0.038	0.071	0.004	0.003	0.000	0.002	0.002	0.000	0.000	0.004	0.003	0.003	0.003	0.002	0.002	0.003	0.003		
2022-8-3_test007	0.079	0.019	0.13	0.019	0.079	7PSI_100	0.003	0.004	0.069	0.069	0.139		0.129	0.019	0.112	0.114	0.023	0.023	0.079	0.032	0.047	0.075	0.030	0.079	0.032	0.065	0.005	0.002	0.000	0.001	0.002	0.000	0.000	0.004	0.003	0.003	0.003	0.002	0.002	0.003	0.002		
2022-8-3_test008	0.056	0.013	0.06	0.013	0.056	6PSI_50	0.001	0.003		0.046	0.064		0.056	0.013	0.065	0.066	0.017	0.017	0.055	0.009	0.024	0.054	0.010	0.056	0.011	0.043	0.002	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	
2022-8-3_test009	0.043	0.009	0.03	0.009	0.043	6PSI_35	0.001	0.003	0.037	0.033	0.031		0.026	0.009	0.039	0.040	0.014	0.014	0.023	-0.001	0.009	0.038	0.005	0.043	0.007	0.029	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-8-3_test010	0.035	0.007	0.01	0.007	0.035	6PSI_25	0.001	0.002		0.027	0.017		0.013	0.007	0.025	0.026	0.012	0.012	0.019	-0.002	0.003	0.030	0.004	0.035	0.007	0.023	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2022-8-3_test011	0.023	2.80E-03	0.005			6PSI_15	0.001	5.6E-05	0.020	0.016	2.80E-03	0.006	0.005		0.012	0.013		0.018	-0.003	0.000	0.019	0.002	0.023	0.007	0.012	0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000	
2022-8-3_test012	0.019	1.73E-03	0.002			6PSI_10	0.001	3.5E-05		0.011	1.73E-03	0.003	0.002		0.008	0.009		0.019	-0.003	0.000	0.016	0.002	0.019	0.007	0.007	0.000	0.000		0.000	0.000		0.00											

Table A.36: Inlet cover S28, Grade 5.0%, Cross slope 4.0%

Grade 5.0%, Cross-slope 4.0%																																										
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma																
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)
2022-8-3_test014	0.065	0.015	0.10	0.015	0.065	6PSI_100	0.002	0.003	0.057	0.059	0.108	0.097	0.015	0.094	0.095	0.020	0.020	0.062	0.022	0.034	0.064	0.020	0.065	0.014	0.055	0.004	0.001	0.000	0.001	0.001	0.000	0.000	0.002	0.001	0.001	0.002	0.001	0.001	0.000	0.002		
2022-8-3_test015	0.089	0.023	0.22	0.023	0.089	11PSI_100	0.005	0.004		0.082	0.225	0.219	0.023	0.159	0.162	0.026	0.026	0.087	0.049	0.061	0.080	0.041	0.089	0.035	0.078	0.005	0.006	0.000	0.004	0.004	0.000	0.000	0.004	0.005	0.004	0.004	0.003	0.004	0.003	0.004		
2022-8-3_test016	0.100	0.028	0.28	0.028	0.100	15PSI_100	0.006	0.004	0.089	0.094	0.287	0.282	0.028	0.186	0.193	0.030	0.029	0.095	0.061	0.070	0.093	0.050	0.100	0.044	0.090	0.006	0.010	0.000	0.006	0.006	0.000	0.000	0.005	0.006	0.004	0.005	0.003	0.005	0.004	0.005		
2022-8-3_test017	0.124	0.036	0.41	0.036	0.124	15PSI_RENT_NRC_100	0.007	0.005	0.111	0.117	0.287	0.050	0.413	0.036	0.237	0.248	0.035	0.034	0.113	0.085	0.092	0.125	0.065	0.124	0.057	0.113	0.006	0.000	0.020	0.001	0.012	0.010	0.000	0.000	0.006	0.007	0.007	0.007	0.004	0.006	0.004	0.007
2022-8-3_test018	0.114	0.032	0.34	0.032	0.114	15PSI_RENT_100	0.007	0.005		0.105	0.288	0.050	0.344	0.032	0.215	0.216	0.032	0.032	0.100	0.070	0.078	0.107	0.055	0.114	0.049	0.101	0.007	0.000	0.016	0.001	0.010	0.008	0.001	0.000	0.005	0.006	0.005	0.006	0.004	0.006	0.004	0.005
2022-8-3_test019	0.081	0.020	0.16	0.020	0.081	8PSI_100	0.004	0.004		0.071	0.165	0.156	0.020	0.128	0.129	0.023	0.023	0.078	0.034	0.048	0.075	0.031	0.081	0.027	0.067	0.005	0.003	0.000	0.002	0.002	0.000	0.000	0.004	0.004	0.003	0.003	0.002	0.003	0.002	0.003		
2022-8-3_test020	0.075	0.018	0.13	0.018	0.075	7PSI_100	0.003	0.004		0.066	0.140	0.130	0.018	0.113	0.114	0.022	0.022	0.073	0.029	0.042	0.072	0.027	0.075	0.022	0.062	0.003	0.002	0.000	0.001	0.001	0.000	0.000	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
2022-8-3_test021	0.057	0.013	0.06	0.013	0.057	6PSI_50	0.002	0.003		0.048	0.066	0.057	0.013	0.066	0.067	0.018	0.018	0.049	0.012	0.024	0.056	0.009	0.057	0.007	0.044	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.002
2022-8-3_test022	0.041	0.009	0.03	0.009	0.041	6PSI_35	0.001	0.003	0.033	0.032	0.032	0.027	0.009	0.040	0.040	0.014	0.014	0.040	0.000	0.008	0.042	0.005	0.041	0.007	0.028	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-8-3_test023	0.032	4.36E-03	0.013		0.032	6PSI_25	0.001	8.7E-05		0.023	4.36E-03	0.016	0.013		0.024	0.025		0.036	-0.001	0.001	0.028	0.003	0.032	0.007	0.019	0.000	0.000		0.000	0.000			0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-8-3_test024	0.023	2.41E-03	0.005		0.023	6PSI_15	0.001	4.8E-05		0.015	2.41E-03	0.006	0.005		0.012	0.012		0.022	-0.003	0.000	0.019	0.002	0.023	0.007	0.011	0.000	0.000		0.000	0.000			0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-8-3_test025	0.020	1.53E-03	0.002		0.020	6PSI_10	0.001	3.1E-05	0.013	0.012	1.53E-03	0.003	0.002		0.008	0.009		0.020	-0.004	0.000	0.016	0.002	0.020	0.007	0.008	0.000	0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
2022-8-3_test026	0.018	7.91E-04	0.001		0.018	6PSI_5	0.001	1.6E-05	0.011	0.009	7.91E-04	0.001	0.001		0.005	0.006		0.019	-0.004	0.000	0.013	0.002	0.018	0.007	0.005	0.000	0.000		0.000	0.000			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001		
erroneous data																																										

Table A.37: Ponding test, Inlet cover S28, Grade 0.5%, Cross slope 0.0%

Grade 0.5%, Cross-slope 0.0%																																								
test	depth (m)	Catchment (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	RD6 (m)	Pump_Set	D(depth) (m)	D(flow) (m ³ /s)	man depth (m)	adj. acc. (m)	Q_fill (m ³ /s)	eta														Sigma														
												FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)	RD6 (m)	RD7 (m)	WD4 (m)	FM1 (m ³ /s)	FM2 (m ³ /s)	HT (m ³ /s)	MT (m ³ /s)	HT1 (m)	HT2 (m)	MT1 (m)	MT2 (m)	RD1 (m)	RD2 (m)	RD3 (m)	RD4 (m)	RD5 (m)
2022-7-29_test001	0.109	0.060	0.06	0.060	0.109	6PSI_50	0.005	0.011	0.106	0.108	0.064	0.055	0.060	0.064	0.065	0.048	0.049	0.036	0.098	0.099	0.107	0.107	0.109	0.110	0.108	0.002	0.000	0.004	0.000	0.000	0.003	0.002	0.004	0.003	0.003	0.004	0.003	0.004	0.003	0.004
2022-7-29_test002	0.164	0.099	0.10	0.099	0.164	6PSI_100	0.005	0.020	0.161	0.166	0.111	0.100	0.099	0.096	0.097	0.066	0.067	0.115	0.153	0.154	0.162	0.162	0.164	0.165	0.166	0.004	0.001	0.009	0.001	0.001	0.006	0.004	0.007	0.004	0.004	0.004	0.004	0.004	0.004	0.007
2022-7-29_test003	0.204	0.132	0.13	0.132	0.204	7PSI_100	0.004	0.025	0.198	0.197	0.141	0.131	0.132	0.114	0.115	0.080	0.080	0.169	0.190	0.191	0.199	0.199	0.204	0.202	0.197	0.004	0.002	0.012	0.001	0.001	0.007	0.004	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.000
2022-7-29_test004	0.252	0.164	0.16	0.164	0.252	8PSI_100	0.005	0.033			0.167	0.158	0.164	0.129	0.130	0.091	0.090	0.210	0.237	0.238	0.247	0.247	0.252	0.250	0.197	0.005	0.003	0.017	0.002	0.002	0.009	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.002
2022-7-29_test005	0.331	0.210	0.20	0.210	0.331	10PSI_100	0.005	0.039			0.208	0.201	0.210	0.150	0.154	0.105	0.105	0.313	0.322	0.322	0.325	0.329	0.331	0.329	0.190	0.006	0.005	0.018	0.004	0.003	0.009	0.007	0.006	0.005	0.005	0.005	0.005	0.004	0.005	0.077
2022-7-29_test006	0.352	0.217	0.22	0.218	0.352	11PSI_100	0.004	0.032			0.226	0.221	0.218	0.160	0.163	0.111	0.105	0.320	0.342	0.342	0.345	0.349	0.352	0.349	0.178	0.006	0.006	0.018	0.004	0.004	0.009	0.006	0.005	0.003	0.004	0.004	0.004	0.003	0.003	0.136
2022-7-29_test007	0.292	0.203	0.18	0.203	0.292	9PSI_100	0.005	0.035			0.188	0.181	0.203	0.140	0.143	0.106	0.101	0.277	0.280	0.280	0.286	0.289	0.292	0.291	0.195	0.005	0.004	0.017	0.003	0.003	0.008	0.005	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.035
2022-7-29_test008	0.153	0.093	0.09	0.093	0.153	6PSI_70	0.005	0.019		0.154	0.101	0.091	0.093	0.090	0.091	0.065	0.063	0.142	0.144	0.145	0.151	0.152	0.153	0.155	0.154	0.004	0.001	0.009	0.001	0.001	0.006	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	
2022-7-29_test009	0.083	0.049	0.04	0.049	0.083	6PSI_40	0.006	0.009		0.083	0.047	0.039	0.049	0.051	0.052	0.043	0.041	0.070	0.075	0.074	0.082	0.083	0.083	0.086	0.083	0.002	0.000	0.003	0.000	0.000	0.002	0.002	0.005	0.003	0.004	0.005	0.004	0.005	0.004	0.005
2022-7-29_test013	0.135	0.081	0.08	0.081	0.135	6PSI_60	0.005	0.017		0.135	0.085	0.076	0.081	0.080	0.080	0.060	0.058	0.124	0.126	0.126	0.133	0.134	0.135	0.136	0.135	0.003	0.001	0.008	0.001	0.001	0.005	0.004	0.004	0.003	0.004	0.004	0.003	0.004	0.003	0.004
2022-7-29_test010	0.046	0.026	0.02	0.026	0.046	6PSI_30	0.002	0.004	0.046	0.045	0.024	0.019	0.026	0.032	0.033	0.029	0.027	0.031	0.037	0.035	0.043	0.045	0.046	0.049	0.045	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	
2022-7-29_test011	0.021	0.013	0.01	0.013	0.021	6PSI_20	0.002	0.003	0.020	0.020	0.011	0.008	0.013	0.018	0.019	0.019	0.017	0.015	0.019	0.019	0.020	0.021	0.021	0.025	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
2022-7-29_test012	0.012	3.40E-03	0.003		0.012	6PS																																		

B. Appendix – Summary measurement data tables

This appendix includes all of the summary measurement data tables. These data tables allow the user to determine an expected flow for a specific inlet cover installed in a specific configuration.

Table B.1: Inlet cover S19, Ponding test and Cross slope of 2.0%

cross-slope (%)	0.0		2.0		2.0		2.0		2.0	
Grade (%)	0.5		0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.012	0.001	0.016	0.000	0.010	0.000	0.014	0.000	0.013	0.001
	0.031	0.025	0.019	0.001	0.016	0.001	0.017	0.001	0.015	0.003
	0.041	0.033	0.024	0.001	0.021	0.001	0.022	0.002	0.018	0.005
	0.063	0.052	0.036	0.014	0.028	0.014	0.026	0.014	0.022	0.008
	0.065	0.054	0.046	0.021	0.035	0.021	0.034	0.021	0.022	0.010
	0.080	0.069	0.061	0.031	0.048	0.031	0.047	0.032	0.024	0.013
	0.093	0.081	0.070	0.038	0.060	0.038	0.057	0.036	0.032	0.021
	0.095	0.084	0.081	0.044	0.069	0.044	0.064	0.042	0.041	0.028
	0.105	0.091	0.085	0.047	0.074	0.047	0.070	0.045	0.046	0.033
	0.124	0.107	0.093	0.054	0.084	0.053	0.076	0.049	0.053	0.038
	0.144	0.123	0.102	0.059	0.093	0.058	0.084	0.053	0.057	0.041
	0.166	0.131	0.103	0.060	0.101	0.063	0.092	0.056	0.064	0.043
	0.204	0.144	0.111	0.065	0.114	0.069	0.101	0.060	0.072	0.048
	0.251	0.163	0.124	0.072					0.079	0.051
	0.311	0.180	0.124	0.073					0.086	0.056
	0.315	0.181								
	0.345	0.191								

Table B.2: Inlet cover S19, Cross slope of 4.0%

cross-slope (%)	4.0		4.0		4.0		4.0	
Grade (%)	0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.023	0.001	0.020	0.001	0.021	0.001	0.018	0.001
	0.028	0.003	0.024	0.003	0.024	0.002	0.021	0.002
	0.035	0.006	0.029	0.006	0.027	0.005	0.025	0.004
	0.046	0.018	0.041	0.018	0.034	0.015	0.030	0.014
	0.061	0.028	0.053	0.027	0.043	0.024	0.037	0.022
	0.081	0.039	0.067	0.040	0.052	0.032	0.055	0.030
	0.095	0.049	0.079	0.048	0.075	0.039	0.072	0.041
	0.107	0.053	0.093	0.052	0.089	0.049	0.083	0.046
	0.112	0.056	0.100	0.056	0.095	0.053	0.087	0.052
	0.122	0.064	0.114	0.064	0.105	0.058	0.093	0.057
	0.133	0.071	0.123	0.069	0.115	0.063	0.101	0.061
	0.146	0.076	0.132	0.073	0.121	0.067	0.108	0.063
	0.162	0.082	0.145	0.078	0.129	0.072	0.113	0.068

Table B.3: Inlet cover S22, Ponding test and Cross slope of 2.0%

cross-slope (%)	0.0		2.0		2.0		2.0		2.0	
Grade (%)	0.5		0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.012	0.002	0.017	0.001	0.017	0.001	0.013	0.001	0.007	0.001
	0.024	0.012	0.019	0.001	0.020	0.001	0.016	0.001	0.016	0.001
	0.048	0.024	0.022	0.002	0.023	0.002	0.020	0.001	0.019	0.001
	0.078	0.040	0.035	0.005	0.034	0.003	0.026	0.003	0.025	0.003
	0.102	0.054	0.045	0.007	0.046	0.005	0.034	0.004	0.034	0.004
	0.142	0.087	0.063	0.012	0.060	0.008	0.048	0.007	0.045	0.006
	0.149	0.091	0.079	0.015	0.075	0.012	0.059	0.010	0.055	0.007
	0.174	0.115	0.084	0.015	0.085	0.015	0.068	0.010	0.062	0.010
	0.189	0.128	0.095	0.019	0.094	0.018	0.073	0.014	0.067	0.011
	0.209	0.137	0.107	0.021	0.114	0.022	0.082	0.016	0.079	0.014
	0.226	0.159	0.129	0.027	0.135	0.027	0.096	0.019	0.095	0.017
	0.230	0.164	0.150	0.034	0.147	0.033	0.113	0.021	0.107	0.020
	0.237	0.164	0.151	0.035	0.148	0.033	0.126	0.024	0.116	0.023
	0.254	0.154	0.171	0.048	0.168	0.037				
	0.267	0.154	0.171	0.039						
	0.303	0.172	0.171	0.040						
	0.348	0.178	0.172	0.048						
	0.348	0.167								

Table B.4: Inlet cover S22, Cross slope of 4.0%

cross-slope (%)	4.0		4.0		4.0		4.0	
Grade (%)	0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.019	0.001	0.018	0.001	0.018	0.001	0.018	0.001
	0.022	0.002	0.022	0.002	0.019	0.001	0.020	0.001
	0.025	0.003	0.026	0.002	0.023	0.002	0.025	0.002
	0.028	0.004	0.026	0.002	0.035	0.005	0.034	0.003
	0.040	0.009	0.042	0.006	0.043	0.008	0.044	0.005
	0.042	0.009	0.042	0.006	0.058	0.010	0.061	0.009
	0.055	0.013	0.053	0.009	0.073	0.014	0.068	0.011
	0.073	0.018	0.074	0.014	0.083	0.017	0.079	0.014
	0.095	0.021	0.091	0.018	0.088	0.018	0.084	0.015
	0.095	0.022	0.105	0.021	0.099	0.021	0.093	0.017
	0.107	0.027	0.111	0.024	0.112	0.024	0.105	0.021
	0.122	0.028	0.126	0.029	0.124	0.027	0.119	0.024
	0.123	0.027	0.144	0.033	0.137	0.031	0.128	0.027
	0.148	0.036	0.157	0.037				
	0.162	0.043	0.175	0.042				
	0.186	0.046						
	0.187	0.046						
	0.190	0.057						

Table B.5: Inlet cover S22 (x2), Ponding test and Cross slope of 2.0%

cross-slope (%)	0.0		2.0		2.0		2.0		2.0	
Grade (%)	0.5		0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.026	0.0033	0.019	0.001	0.026	0.002	0.026	0.001	0.029	0.001
	0.032	0.025	0.022	0.003	0.030	0.003	0.029	0.002	0.031	0.001
	0.041	0.040	0.026	0.005	0.037	0.006	0.032	0.005	0.031	0.002
	0.051	0.046	0.033	0.008	0.046	0.011	0.039	0.007	0.035	0.004
	0.051	0.046	0.042	0.011	0.057	0.015	0.046	0.010	0.036	0.005
	0.066	0.064	0.060	0.017	0.073	0.021	0.059	0.015	0.041	0.008
	0.106	0.107	0.079	0.022	0.086	0.028	0.072	0.020	0.049	0.011
	0.129	0.140	0.080	0.022	0.098	0.033	0.080	0.023	0.055	0.013
	0.150	0.169	0.092	0.027	0.106	0.037	0.086	0.027	0.061	0.016
	0.167	0.20	0.101	0.030	0.126	0.047	0.095	0.032	0.066	0.017
	0.181	0.22	0.116	0.040	0.146	0.058	0.110	0.037	0.074	0.021
	0.181	0.22	0.133	0.052	0.155	0.068	0.125	0.041	0.080	0.022
	0.195	0.23	0.157	0.065	0.181	0.081	0.137	0.048	0.092	0.025
	0.217	0.26	0.165	0.083					0.093	0.025
	0.246	0.29							0.108	0.030
	0.281	0.33							0.108	0.030
	0.343	0.41							0.119	0.035
									0.130	0.042

Table B.6: Inlet cover S22 (x2), Cross slope of 4.0%

cross-slope (%)	4.0		4.0		4.0		4.0	
Grade (%)	0.5		1.0		2.5		5.0	
	depth	Catchment depth	Catchment depth	Catchment depth	Catchment depth	Catchment	Catchment	
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.032	0.001	0.033	0.001	0.031	0.001	0.031	0.001
	0.036	0.003	0.038	0.003	0.035	0.003	0.035	0.002
	0.042	0.007	0.042	0.006	0.040	0.006	0.038	0.004
	0.055	0.016	0.055	0.013	0.048	0.011	0.046	0.006
	0.070	0.024	0.070	0.019	0.055	0.016	0.056	0.009
	0.088	0.033	0.087	0.027	0.071	0.021	0.073	0.016
	0.109	0.042	0.106	0.035	0.086	0.028	0.081	0.019
	0.123	0.049	0.116	0.041	0.095	0.033	0.090	0.022
	0.130	0.054	0.124	0.045	0.101	0.036	0.094	0.024
	0.156	0.067	0.141	0.058	0.107	0.041	0.104	0.027
	0.171	0.081	0.160	0.069	0.121	0.047	0.119	0.032
	0.185	0.095	0.171	0.078	0.133	0.051	0.132	0.036
	0.196	0.112	0.190	0.092	0.147	0.059	0.142	0.042

Table B.7: Inlet cover S28, Ponding test and Cross slope of 2.0%

cross-slope (%)	0.0		2.0		2.0		2.0		2.0	
Grade (%)	0.5		0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.012	0.003	0.016	0.001	0.015	0.001	0.014	0.001	0.014	0.001
	0.021	0.013	0.018	0.003	0.019	0.002	0.017	0.002	0.017	0.001
	0.046	0.026	0.024	0.004	0.024	0.003	0.021	0.002	0.018	0.002
	0.083	0.049	0.034	0.008	0.034	0.005	0.027	0.004	0.023	0.004
	0.109	0.060	0.043	0.010	0.034	0.007	0.034	0.008	0.031	0.008
	0.135	0.081	0.063	0.015	0.046	0.009	0.047	0.011	0.042	0.011
	0.153	0.093	0.086	0.018	0.064	0.012	0.061	0.014	0.052	0.013
	0.164	0.099	0.086	0.018	0.078	0.015	0.062	0.015	0.058	0.016
	0.204	0.132	0.096	0.021	0.089	0.019	0.069	0.017	0.063	0.018
	0.252	0.164	0.107	0.023	0.098	0.022	0.074	0.019	0.078	0.021
	0.292	0.203	0.132	0.028	0.116	0.027	0.083	0.022	0.093	0.025
	0.331	0.210	0.132	0.028	0.133	0.032	0.083	0.022	0.103	0.028
	0.352	0.217	0.141	0.035	0.141	0.038	0.097	0.026	0.112	0.031
			0.141	0.035	0.167	0.044	0.098	0.025		
			0.142	0.036			0.098	0.025		
			0.154	0.042			0.099	0.026		
			0.194	0.046			0.113	0.028		
			0.195	0.048			0.125	0.032		
			0.195	0.048			0.126	0.031		
							0.126	0.030		
							0.127	0.030		

Table B.8: Inlet cover S28, Cross slope of 4.0%

cross-slope (%)	4.0		4.0		4.0		4.0	
Grade (%)	0.5		1.0		2.5		5.0	
	depth	Catchment	depth	Catchment	depth	Catchment	depth	Catchment
	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)	(m)	(m ³ /s)
	0.020	0.001	0.019	0.001	0.017	0.001	0.018	0.001
	0.024	0.003	0.023	0.003	0.019	0.002	0.020	0.002
	0.029	0.006	0.027	0.004	0.023	0.003	0.023	0.002
	0.029	0.005	0.041	0.008	0.035	0.007	0.032	0.004
	0.043	0.010	0.057	0.011	0.043	0.009	0.041	0.009
	0.056	0.014	0.074	0.016	0.056	0.013	0.057	0.013
	0.075	0.020	0.093	0.020	0.067	0.016	0.065	0.015
	0.098	0.024	0.104	0.024	0.079	0.019	0.075	0.018
	0.112	0.027	0.110	0.026	0.085	0.021	0.081	0.020
	0.117	0.029	0.127	0.032	0.094	0.025	0.089	0.023
	0.145	0.035	0.147	0.039	0.107	0.029	0.100	0.028
	0.157	0.043	0.155	0.045	0.120	0.033	0.114	0.032
	0.171	0.050	0.176	0.051	0.133	0.037	0.124	0.036
	0.183	0.057						