QUINTAIN DEVELOPMENTS IRELAND LIMITED

Proposed Residential Development

at

Portmarnock South - Phase 1D

Water Services Report

November 2021

BARRY & PARTNERS
consulting engineers

CIVIL • STRUCTURAL • ENVIRONMENTAL • TRANSPORTATION

Document Control Sheet

Client:	Quintain Developments Ireland Limited
Project Title:	Proposed Residential Development at Portmarnock South Phase 1D
Document Title:	Water Services Report
File Name:	21205-JBB-00-XX-RP-C-00209

Table of Contents *(incl. Y/N)*	**List of Tables** *(incl. Y/N)*	**List of Figures** *(incl. Y/N)*	**Pages of Text** *(No.)*	**Appendices** *(No.)*
Y	N	N	14 No.	5

Document Revision				**Document Verification**			
Issue Date *(DD/MM/YY)*	**Revision Code**	**Suitability Code**	**Author** *(Initials)*	**Checker** *(Initials)*	***Reviewer*** *As Per PMP (Initials)*	**Approver** *As Per PMP (Initials)*	**Peer Review** *(Initials or N/A)*
Add hyperlink to Verification Email on PIM Register for each issue							
14/04/2021	P01	S0	CH	JOB	CH	JOB	N/A
10/05/2021	P02	S1	CH	SW	CH	JOB	N/A
24/11/2021	P03	S3	CH	SW	CH	JOB	N/A
25/11/2021	P04	S3	CH	SW	CH	JOB	N/A

Table of Contents

SECTION 1: INTRODUCTION 1
SECTION 2: PRE-PLANNING MEETINGS 2
SECTION 3: WATER SUPPLY 2
SECTION 4: FOUL SEWER DESIGN & INFRASTRUCTURE 3
SECTION 5: IRISH WATER WAYLEAVES 7
SECTION 6: SURFACE WATER DESIGN & INFRASTRUCTURE 8
SECTION 7: SUSTAINABLE DRAINAGE SYSTEMS 10
SECTION 8: OPERATION/MAINTENANCE OF SUDS DEVICES 13
SECTION 9: RELATED REPORTS 13
SECTION 10: RELEVANT DRAWINGS 13

Appendix 1 IRISH WATER – CONFIRMATION OF FEASIBILITY STATEMENT 2019

Appendix 2 IRISH WATER – CONFIRMATION OF FEASIBILITY STATEMENT 2021

Appendix 3 IRISH WATER – DESIGN ACCEPTANCE 2021

Appendix 4 CAPITAL WATER SYSTEMS – FLOW AND RAINFALL SURVEY REPORT

Appendix 5 SuDS MEASURES CONSIDERED - GDSDS/CIRIA 522

FCC SuDS FORM

SECTION 1: INTRODUCTION

1.1 Quintain Developments Ireland Limited are applying for Planning Permission to An Bord Pleanála (ABP) for a residential development at Portmarnock South Phase 1D in the townlands of Drumnigh, Maynetown and Portmarnock, Portmarnock, Co Dublin.

This proposed Portmarnock Phase 1D development is in the Portmarnock South LAP lands to the southeast of Portmarnock DART station. The Phase 1D development is the fourth phase of a multi-phase development which commenced construction in 2016. Phases 1A and 1B are complete and Phase 1C is currently under construction. Figure 1 below shows the location of the proposed development.

The development will consist of 172 residential units (22no. duplexs and 150no. houses), associated roads, footpaths, private driveways, landscaping, upgrade works to existing foul pumping station, site services, SuDS measures and sundry related works.

This report has been prepared in support of the Planning Application. It takes account of the requirements of the Portmarnock South Local Area Plan (2013 – 2019, extended 2018 - 2023) including Appendix 1 to same (SuDS Strategy) and the Fingal County Development Plan (2017 - 2023).

Figure 1: Location of Portmarnock Phase 1D Development

1.2 This Report addresses the following:

- Section 2; Pre-Planning Meetings

- Section 3; Water Supply
- Section 4; Foul Sewer Design & Infrastructure
- Section 5; Irish Water Wayleaves
- Section 6; Surface Water Design & Infrastructure
- Section 7; Operation/Maintenance of SuDS Devices

SECTION 2: PRE-PLANNING MEETINGS

2.1 Pre-planning meetings were held to discuss the proposed development, as follows:

- A Section 247 meeting was held with Fingal County Council (FCC) on the 11th of March 2021.
- A Section 5 Pre-Application Consultation meeting was held with An Bord Pleanala and Fingal County Council on the 9th of July 2021.

SECTION 3: WATER SUPPLY

3.1 It is proposed to connect the Portmarnock 1D development to the existing watermain network in the Portmarnock South LAP lands which is ultimately fed from a 450mm extension from the North Fringe Watermain.

The connection will be (via 5 individual connection points) to the permitted Phase 1C development – refer to appended drawings 21205-JBB-00-XX-DR-C-03001 to 03007 incl, which is currently under construction, immediately to the north of the proposed Phase 1D development.

Separately a spur will be taken from the existing Phase 1B development to provide a supply to a welfare building and wash down hose reel for the proposed upgraded foul pumping station, refer to appended drawing 21205-JBB-00-XX-DR-C-04019.

3.2 The daily water demand for the proposed development is estimated, based on Section 3.7.2, Irish Water's Code of Practice for Water Infrastructure (July 2020 -Rev 2), as follows:

- Housing – 172 Units

  Daily Demand: 172 housing Units x 2.7 persons/unit x 150l/person/day = 69,660 l/day

  Average Water Demand: 69,660 l/day ÷ (24 x 3600) = 0.81 l/s

  Average Day/Peak Week Demand: 0.81 l/sec x 1.25 = 1.01 l/s

  Peak Demand: 5 times Average Day/Peak Week Demand = 1.01 l/sec x 5 = 5.05 l/s

3.3 A pre-connection enquiry form was originally submitted to Irish Water in September 2019 and Irish Water replied with Confirmation of Feasibility on the 23rd of October 2019. This document is attached in Appendix 1.

3.4 Notwithstanding the above and acknowledged no change in the nature of the application, the applicant was requested by Fingal County Council to obtain an updated Confirmation of Feasibility from Irish Water. Irish Water in turn requested a re-submission of the pre-connection enquiry, as it was in excess of 12 months old, for their review to confirm that no significant changes have occurred to the Irish Water 'water' network in the preceding 18 months, which would influence the feasibility assessment. The pre-connection enquiry form was re-submitted in April 2021.

3.5 Irish Water replied with Confirmation of Feasibility on the 4th of October 2021, noting *Feasible without infrastructure upgrade by Irish Water.* This document is attached in Appendix 2.

3.6 Irish Water noted that the proposed water connections for this development connect to the Irish Water network via infrastructure not yet taken in charge by Irish Water (in essence the water infrastructure currently under construction as part of the Phase 1C development) and therefore requested that prior to commencement of works for this proposed development, that current water infrastructure is transferred to them, following demonstration that same has been constructed in accordance with their Code of Practice and Standards.

3.7 Furthermore, to protect the existing 450mm DI watermain that traverses earlier phases and this proposed phase of the development, they have requested that drawings and method statements are provided at detail design stage which will demonstrate how the structural and functional integrity of this asset is safeguarded during the works.

3.8 A detailed design was submitted to Irish Water (October 2021) for the purposes of obtaining a Statement of Design Acceptance and approval for same received 23 November 2021, refer to Appendix 3.

3.9 Watermain Works, Metering and Pressure Control will be strictly in accordance with Irish Water and Fingal County Council requirements, specifications, code of practice and standard details.

SECTION 4: FOUL SEWER DESIGN & INFRASTRUCTURE

4.1 As noted earlier, Portmarnock South refers to the zoned lands south of Station Road c.40 Ha covered by the Portmarnock South Local Area Plan (2013 – 2019, extended 2018 - 2023) which will potentially lead to an overall development of some 1200 residential units and a local centre.

Development of the lands commenced in 2016 with Phase 1A (101 units). Subsequently, Phase 1B (150 units) has been completed and Phase 1C (153 units + a Local Centre) is currently under construction. The next Phase 1D (172 units), for which this report has been prepared, is to be submitted to ABP for a SHD Planning Application.

These lands lie within the North Fringe Sewer catchment, which in turn discharges to the Ringsend Wastewater Treatment Plant, currently undergoing significant upgrades.

The greater Portmarnock foul network discharges to an existing pumping station located adjacent to Portmarnock Bridge and from there the effluent is pumped via a rising main along the Coast Road to a high point and then flows by gravity to the Mayne Bridge Pumping Station which in turn pumps to the North Fringe Sewer (1600mm diameter in this locale) located approximately 1km to the south and as noted earlier this then flows into the Sutton Pumping Station which pumps to the Ringsend Wastewater Treatment Plant.

Although originally envisaged by the Local Area Plan, that a new permanent pumping station would be constructed on the Portmarnock South Lands, which would service both the proposed development flows and replace the existing Portmarnock Bridge Pumping Station (nearing capacity and lacking storage, particularly during significant rainfall events), upon review by Irish Water, following their assumption of responsibility for foul and water infrastructure in 2014, they proposed to develop a new Portmarnock Bridge Pumping Station on lands adjacent to the existing pumping station as part of their Local Network Reinforcement Project strategy.

4.2 It is intended to connect the foul sewerage from the proposed 172 residential units of this development to the existing foul sewer network in the Portmarnock South LAP lands. The connection (via 5 individual connection points) will be to the permitted Phase 1C development, which is currently under construction, immediately to the north of this proposed Phase 1D development.

This network currently discharges to an existing temporary pumping station (complete with 24-hour storage) adjacent to Station Road (constructed under the Phase 1B Development, Planning Ref: ABP–300514-17) from where it is pumped to a gravity line which then discharges to an existing foul sewer in Coast Road. This existing sewer in turn discharges to the Irish Water Mayne Bridge Pumping Station, from where it is pumped to the North Fringe Sewer.

Figure 2: Existing Foul Infrastructure

It is noted that the Mayne Bridge Pumping Station was upgraded with the installation of two new pumps and improved electrical and control systems as part of a condition appended to the grant of permission for Phase 1A in 2013.

Ultimately, it is intended that all foul flow from the Portmarnock South LAP lands will discharge by gravity to a proposed new Irish Water Pumping Station adjacent to Portmarnock Bridge from where it will be pumped directly to the North Fringe Sewer and the temporary pumping station serving this development would then be decommissioned.

4.3 The proposed new Irish Water Portmarnock Bridge Pumping Station will replace the existing Irish Water pumping station nearby and provide improved storage and operational capacity to cater for both existing foul flows and future foul flows arising from development of zoned lands within this locale.

Irish Water submitted a planning application for this proposed new pumping station in August 2019, which was initially granted permission by Fingal County Council, but subsequently appealed to An Bord Pleanala, wherein the Board decided to refuse permission (December 2020) due to flooding concerns.

Irish Water have subsequently lodged a new application for this proposed new Portmarnock Bridge Pumping Station in July 2021, which specifically seeks to address the concerns raised by the ABP Inspector under the previous application. This application is currently being assessed by Fingal County Council, with a request for additional information sought in September 2021.

When the new Irish Water Pumping Station becomes operational (currently envisaged as c. Q2 2025, subject to planning permission being granted for same) all flows from the existing Phase 1A and 1B developments, the Phase 1C development currently under construction, this proposed Phase 1D and all future phases will be permanently diverted to the new pumping station as shown on the drawing 21205-JBB-00-XX-DR-C-04001.

4.4 The estimated Dry Weather Flow (DWF) from Phase 1D, based on Section 3.6 and Appendix C, Irish Water's Code of Practice for Wastewater Infrastructure (July 2020 – Rev 2) is as follows:

- Housing – 172 Units

Daily Flow	172 Units x 446 l/unit/day	= 76,712 l/day
	1DWF (76,712 l/day ÷ (24 x 3600)	= 0.89 l/s
	6DWF (6 x 0.89l/s)	= 5.34 l/s

4.5 A pre-connection enquiry form was originally submitted to Irish Water in September 2019 and Irish Water replied with Confirmation of Feasibility on the 23rd of October 2019. This document is attached in Appendix 1

4.6 Notwithstanding the above and acknowledged no change in the nature of the application, the applicant was requested by Fingal County Council to obtain an updated Confirmation of Feasibility from Irish Water. Irish Water in turn requested a re-submission of the pre-connection enquiry as it was in excess of 12 months old, for their review to confirm that no significant changes have occurred to the Irish Water wastewater network in the last 18 months, which would influence the feasibility assessment. The pre-connection enquiry form was re-submitted in April 2021.

4.7 Irish Water's subsequent review of the existing infrastructure raised a concern that there may be insufficient capacity within the existing network on Coast Road/Mayne Bridge Pumping Station to receive increased flows when both the existing Irish Water Portmarnock Bridge Pumping Station and the temporary pumping station discharge simultaneously.

4.8 A meeting was held in August 2021 with Fingal County Water Services Department to assess this concern and explore options to resolve/remediate any issues which give rise to same.

4.9 As part of this process and in order to allay concerns about potential infiltration into the foul network from previously constructed phases of this development (which could give rise to increased flows), Capital Water Systems were commissioned to install flow monitors in June 2021 at 3 No. strategic locations on the foul network within the development.

4.10 A copy of their most recent Flow and Rainfall Survey Report is included in Appendix 4, and it is noted that the survey indicates the existing development' s foul infrastructure is not subject to either tidal influences or surface water ingress.

4.11 The flow monitoring also notes the total volumes recorded for 28 days of data as 2398.4m^3 which in turn equates to an average discharge rate of (2398/28/24/60/60) x1000 = 0.99litres/sec. This recorded average discharge rate is in keeping with the estimated discharge rate derived for the existing units from Phase 1A (101 Units) and Phase 1B (150 Units) as follows;

251 units x 446l/day =111,946 litres/day
1DWF = 111,946/24x3600 = 1.29litres/sec

4.12 Furthermore, and again to provide confidence in the existing development's foul infrastructure, a CCTV survey was carried out in August 2021 of the developments' outfall 225mm foul line which connects to the Irish Water 375mm gravity sewer on Coast Road. This CCTV survey indicated that these pipes and joints were in good condition albeit with some deposits, which were subsequently cleaned.

4.13 A number of meetings were held in September with both Fingal County Water Services Department and Irish Water to consider and assess a proposal put forward on behalf of this development, whereby the current temporary pumped discharge rate would be maintained for this proposed development phase, and any future phase thereafter, unless otherwise agreed, with the provision of additional operational storage in excess of that normally provided for emergencies (24-hour storage).

This additional operational storage (minimum 6 hours) together with telemetry and PLC upgrades (to allow the 3 pumping stations to communicate with one another) would facilitate the operational demand management of all three pumping stations i.e. Existing Portmarnock Bridge Pumping Station, Mayne Bridge Pumping Station and St. Marnocks Temporary Pumping Station and provide Irish Water with a managed system.

These telemetry and programmable logic control upgrades will, as needs arise, provide Irish Water with a managed system and allow for the St. Marnocks Temporary pumping station to be turned off or discharge at a reduced rate for a period of up to 6 hours, to facilitate instances where either increased discharges are required from the existing Portmarnock Bridge Pumping Station or where it is necessary to limit inflows to Mayne Bridge Pumping Station to allow pump and storage capacity to meet demand. The St. Marnocks Temporary Pumping Station would be re-engaged when circumstances allow, utilising off-peak periods to clear mobilized storage volumes.

4.14 Currently 227m^3 of storage is provided at the temporary pumping station, this will need to be increased to both provide for the cumulative 24-hour emergency storage for Phases 1A to 1D inclusive (576 units + Local Centre) of 258m^3 and additional operational (buffer) storage for Phases 1A to 1D of 65m^3, giving a required minimum total storage of 323m^3. This increased volume can be accommodated in the temporary pumping station location, as shown on drawings 21205-JBB-00-XX-DR-C-04019 and 04020.

4.15 During these discussions and in light of the envisaged timeline for delivery of the new Irish Water Portmarnock Bridge Pumping Station (c.2025), it was agreed that the St. Marnocks Temporary Pumping Station should be upgraded to reflect its interim status. These upgrades to include;

- New pumping station wet well (to replace existing), benched to facilitate scour cycle,
- New welfare building - housing control panel and telemetry,
- New storage tank(s) to supplement existing tanks,
- Lifting gantry to facilitate pump maintenance,
- Wash down hose reel to facilitate maintenance,
- Valve chambers.
- Assisted lift access hatches,
- Outdoor lighting,
- Pump isolation cabinet,
- Area of hardstanding to facilitate access and maintenance operations.
- Provide/Upgrade telemetry
- Install flowmeter and level sensors in storage tanks
- Install pumping station interlock as well as intelligent pumping station controls.
- Fencing to enclose area to restrict unauthorised access.

4.16 For clarity the operational and maintenance of the St. Marnock's Interim Pumping Station remains with the developer, and a maintenance agreement will be entered into with a suitable company for same. This interim pumping station and associated storage will be decommissioned and removed at such time as the new Irish Water Portmarnock Bridge pumping station becomes operational. All

flows from the Portmarnock South lands would then be redirected by gravity to the Irish Water Portmarnock Bridge pumping station as allowed for in the current design.

4.17 The proposed upgraded St. Marnock's Interim Pumping Station plan, sections, elevations and details are shown on drawings 21205-JBB-00-XX-DR-C-04019 and 04021.

4.18 Irish Water replied with Confirmation of Feasibility on the 4th of October 2021, noting *Feasible Subject to Upgrades.* This document is attached in Appendix 2.

4.19 Specifically Irish Water noted;

The proposed interim solution to provide additional storage at the existing Temporary Pumping Station in St. Marnocks prior to the completion of the Portmarnock Local Network Reinforcement Project is acceptable in principle subject to the following:

- *24 Hr storage to be provided for all existing phases and 24 Hr storage is to be provided for the new phases of the development. The size to be determined from flow monitoring or design flows (whichever is larger).*
- *Full telemetry system to be provided in conjunction with Irish Water to link the St. Marnocks Temporary PS with Portmarnock Bridge PS and Mayne Bridge PS.*
- *Full Flow Monitoring to be provided and linked to the Telemetry System visible to Irish Water (including pump forward flows from the Temporary Pumping Station and overflows).*
- *Design of the interim solution to be delivered prior to Connection Agreement.*
- *The customer is responsible for the maintenance and operation of the Temporary Pumping Station.*
- *The Temporary Pumping Station is to be fully decommissioned by the customer on completion of the Portmarnock Local Network Reinforcement Project.*

4.20 A detailed design was submitted to Irish Water (October 2021) for the purposes of obtaining a Statement of Design Acceptance and approval for same received 23 November 2021, enclosed in Appendix 3.

4.21 All Sewers on site, which are up to a maximum of 225mm diameter, will be uPVC pipes, which (incl. fittings) shall comply with the provisions IS EN 1401 2009/2012. Pipes to be application area code "UD", Stiffness Class 8kN/m2 and in accordance with Irish Water Standards.

4.22 Foul sewer construction will comply with Fingal County Council and Irish Water's requirements, specification, code of practice and standard details. The proposed new foul sewer network is shown in principle on accompanying drawings 21205-JBB-00-XX-DR-C-04001 to 04005 and 04011 to 04012 incl.

4.23 No foul effluent will discharge to the storm water system and vice versa.

SECTION 5: IRISH WATER WAYLEAVES

5.1 Irish Water have issued wayleaves for two developments currently awaiting planning permission, which traverse the proposed development along and across the proposed Access Road to Moyne Road, namely;

- 20m Temporary and 20m Permanent Wayleave for proposed outfall pipe from the Clonshaugh treatment facility as part of the Greater Dublin Drainage Project,
- 5m Temporary, 10m Permanent and 5m Temporary Wayleave for proposed 450mm rising main from proposed new Irish Water Portmarnock Bridge Pumping Station.

5.2 The primary impact of these two wayleaves was on the design and location of the proposed northern wetland/SuDS device serving the 6.5m Access Road with 3m verge/reservation each side, as a consequence and following meetings with Irish Water, this SuDS device was moved

c.200m eastwards to avoid both permanent and temporary wayleaves for both proposed developments.

SECTION 6: SURFACE WATER DESIGN & INFRASTRUCTURE

6.1 The foul and storm sewer networks, see Drawing No. 21205-JBB-00-XX-DR-C-04001 to 04005 incl, will be separate systems. No foul effluent will discharge to the storm water system and vice versa.

6.2 The storm water system for the entire Portmarnock South LAP lands is divided into three catchments (as shown in Figure 3), namely:

- Catchment No 1 (c. 37.55ha)
- Catchment No 2 (c. 1.55ha along Station Road)
- Catchment No 3 (c. 0.98ha along the route of the proposed Access Road to Mayne Road).

6.3 **Catchment No 1**, which includes the proposed Phase 1D area, drains to the Baldoyle Estuary via the new regional constructed wetland and the new storm water outfall (both previously constructed under Phase 1B).

The storm water network for Catchment No 1 including the regional wetland has been designed to cater for the existing Phases 1A and 1B, Phase 1C currently under construction, this Phase 1D and all future phases of the entire development with the exception of Catchments No 2 & No.3.

The constructed regional wetland provides attenuation for Catchment No. 1, with outflows restricted for the 1 year, 30 year and 100-year critical storm events. The 100-year (Q_{100}) outflow has been estimated at 200 l/s in accordance with the Greater Dublin Strategic Drainage Study.

A flow control device has been installed in the outfall from the wetland limiting the outflow to 200 l/sec. The network has been modelled using the Micro Drainage Suite of Programmes with attenuated outflows from the wetland, for the events and conditions noted below:

Critical Storm Event	**Discharge Conditions**
1:1 year	free discharge
1:1 year	+3.70mOD tide level*
1:30 years	free discharge
1: 30 years	+3.70mOD tide level*
1:100 years	free discharge
1:100 years	+3.70mOD tide level*

** +3.70mOD tide level is based on the 0.5% AEP (200-year return period) from FEM FRAMS of +3.2mOD plus recommended future OPW climate change of 0.5m rise in sea level for the Mid-Range Future Scenario. Note a more conservative approach is being adopted with respect to setting floor levels, refer to Flood Risk Assessment Report.*

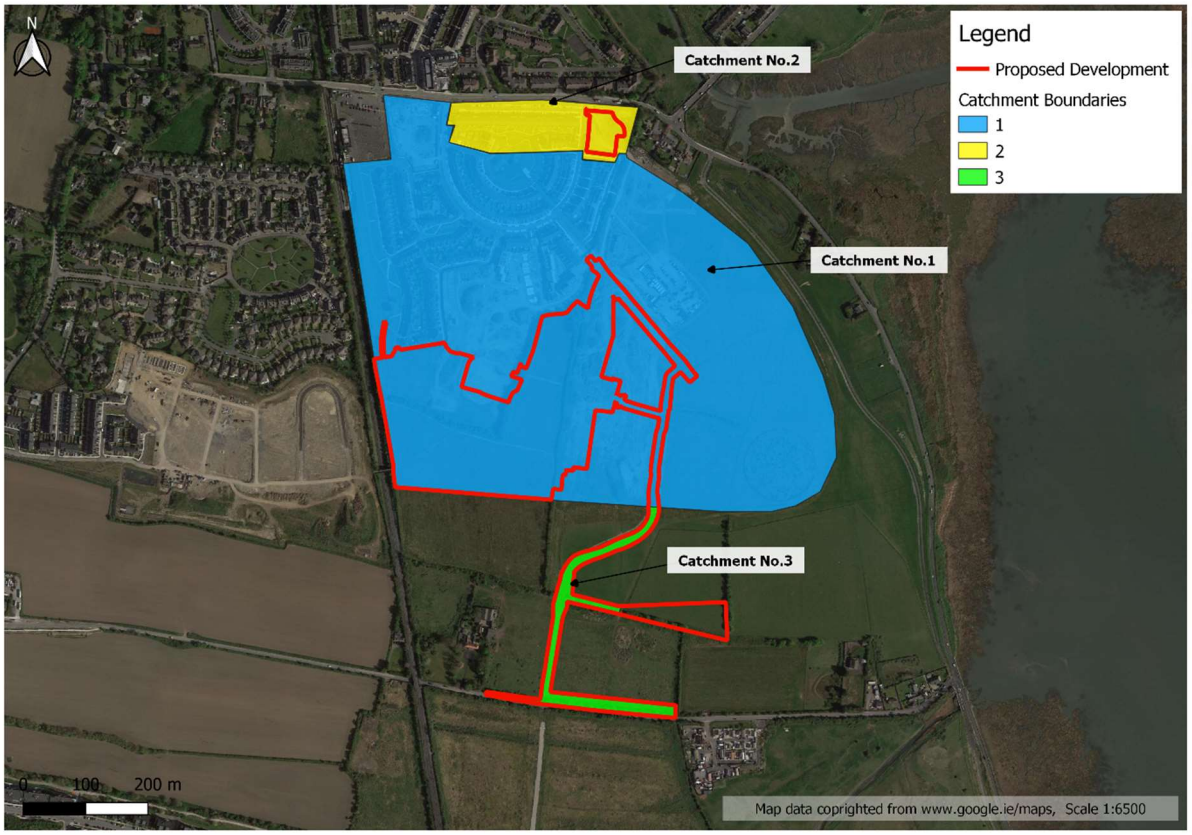


Figure 3: Catchment Areas

The modelling demonstrated the following:

- The surface water system, for the 1:1 year critical storm event, operates as an open channel under free discharge conditions, with some minor surcharging but without flooding under the +3.70mOD tidal condition.
- The surface water system, for the 1:30 years critical storm event surcharges for both conditions but again without flooding.
- The surface water system, for the 1:100 years critical storm event surcharges for both conditions but again without flooding.

The results as outlined above are considered acceptable Engineering Practice for surface water design.

The detailed analysis/results for the modelling are summarised in Table 1 below.

Critical Storm	Discharge Conditions	Top Water Level in Wetland (mOD)	Pipe Flow (l/s)	Velocity (m/s)
1 Year	Free Discharge	+3.19	130.20	0.60
1 Year	+3.70 Tide Level	+3.19	164.70	0.76
30 Years	Free Discharge	+3.56	169.50	0.78
30 Years	+3.70 Tide Level	+3.80	199.10	0.92
100 Years	Free Discharge	+3.69	182.90	0.85
100 Years	+3.70 Tide Level	+4.03	207.60	0.96

Table 1: Analysis/Results of Modelling for Catchment 1

The above summary is based on the size of the constructed regional wetland which was completed as part of the Phase 1B development.

6.4 2 No. 375mm diameter pipes outfall from this wetland to Baldoyle Estuary. The outfall required the construction of a concrete base and wing walls outfall structure and the installation of Tideflex non return valves at the discharge point to the Estuary. The geometry of the outfall structure has been designed and installed as part of the Phase 1B development to be outside the Annex 1 Habitat area of Baldoyle Estuary. A Foreshore Licence was obtained from the Department of Housing, Planning, Community and Local Government for the section of the concrete base and wing walls located below the high-water mark.

6.5 **Catchment No. 2** serves the northern section of previously constructed Phase 1B with surface water network out-falling to a detention pond in the northeast of this catchment adjacent to Station Road. This pond in turn discharges to the existing surface network on Station Road with flow limited to 9.1l/s. Upgrade works to the temporary foul pumping station are within this catchment.

6.6 **Catchment No. 3** consists of a proposed new 6.5m Access Road with 3m verge/reservation each side which heads south from the development and connects with Moyne Road. Surface water flows generated from this road will be attenuated through 2 No. SuDS features with flows limited from each to 2l/s via a flow control device prior to outfall through petrol interceptors to the existing ditches at two locations; 175m north of Moyne Road and an existing drainage ditch alongside Moyne Road.

This proposed infrastructure has been located and designed following engagement with FCC Biodiversity Officer and is sited and designed to facilitate future development of pedestrian/cycling way by others, albeit subject to increased volumes to reflect additional impermeable areas from same.

Refer to drawings 21205-JBB-00-XX-DR-C-04001 to 04005 and 04011 to 04012 incl. for further details.

SECTION 7: SUSTAINABLE DRAINAGE SYSTEMS

7.1 SuDS (Sustainable Drainage Systems) is defined in The SuDS Manual, CIRIA 753, 2015 as follows:

"Drainage systems that are considered to be environmentally beneficial, causing minimum or no long-term detrimental impact."

The SuDS strategy adopted for this development provides a comprehensive approach to the management of storm water on the site in line with the SuDS four pillars approach namely, water quality, water quantity, biodiversity and amenity. The treatment train approach has been adopted for the design of the storm water system for this development. This approach uses suitable SuDS measures in providing source, site and regional controls.

7.2 The SuDS recommendations included in the Portmarnock South LAP have been assessed and have been included where deemed appropriate and suitable for this Development. The storm water wetland is included as one of the essential SuDS measures for the Development. See drawings 21205-JBB-00-XX-DR-C-04006 to 04010 and 04013 incl. for the SUDs layout for this development.

7.3 The various SuDS measures proposed for Phase 1D are discussed below under the following headings:

- Source Controls
- Site Controls
- Regional Controls

7.3.1 Source Controls

Source Control measures can be defined as: *"the control of runoff at or near its source".* In the case of this development, this relates to the individual buildings, associated footpaths and driveways.

SuDS measures proposed, within the curtilage of dwellings, include the following:

- Permeable Paving for private driveways,
- Filter Drains to patio area in back gardens,
- Water butts for the individual housing units for car washing, garden and plant watering, (where deemed appropriate and subject to agreement with the Local Authority).

SuDS Measures	4 Pillars of SuDS*			
Source Controls	**Quantity**	**Quality**	**Biodiversity**	**Amenity**
Permeable Paving				
Filter Drains				
Water Butts				

** Refer to FCC Green / Blue Infrastructure for Development Guidance Note. Colours indicate performance in relevant SuDS area i.e. 'Green' = Good, 'Orange' = Moderate and 'Red' = Poor*

Table 2: Source Control SuDS Measures ranked against the 4 Pillars

There is provision for overflows from the above source controls via the house storm water drains to the public storm water sewers in the road reservations.

With respect to the proposed filter drains, these are a revision to earlier phases, where soakaways were incorporated in rear gardens, however due to poor infiltration, as a consequence of the subsoil being impermeable boulder clay, soakaways were found to be ineffective.

The proposed filter drains will be laid along the garden edge of patios and will provide source control via stone surround to perforated pipes, where infiltration exists this will be utilized, however in circumstance where infiltration is ineffective, then rainwater will be conveyed via the perforated pipe (and silt trap) to the local house surface water drainage network and from there to the main surface water infrastructure. Attenuation calculations for the development allow for this run-off.

Refer to drawing 21205-JBB-00-XX-DR-C-04013, for typical details of proposed filter drains.

For clarity, these source control measures are proposed for this phase of the development in addition to the regional control, already constructed under an earlier phase.

7.3.2 Site Controls

Site control is defined as: *"a control which is designed to control storm water quality and/ or quantity for a small development or site"*

SuDS measures proposed as site controls within public road reservations and the public open space include the following:

- Bio-retention areas within public open spaces,
- Swales running parallel to road carriageways / footpaths,
- Filtration trenches running parallel to road carriageways /footpaths/hard landscaping areas,

- Silt and Hydrocarbon interceptors for road carriageways/carpark areas.

SuDS Measures Site Controls	4 Pillars of SuDS*			
	Quantity	Quality	Biodiversity	Amenity
Bio-retention				
Swales				
Filtration Trenches				
Interceptors				

** Refer to FCC Green / Blue Infrastructure for Development Guidance Note. Colours indicate performance in relevant SuDS area i.e. 'Green' = Good, 'Orange' = Moderate and 'Red' = Poor*

Table 3: Site Control SuDS Measures ranked against the 4 Pillars

For clarity, these site control measures are proposed for this phase of the development in addition to the regional control, already constructed under an earlier phase.

7.3.3 **Regional Controls**

Regional Control is defined as*: "a storm water control practice which is designed to control storm Water quality and/or quantity from a large urban development, or a group of developments"*

The storm water wetland has been provided as a regional control under Phase 1B and as recommended in the SuDS Strategy Briefing Document, Portmarnock South LAP for the entire Catchment No 1. The storm water wetland is located as shown on Drawings 21205-JBB-00-XX-DR-C-04001 & 21205-JBB-00-XX-DR-C-04006 "SuDS layout drawing". All storm water from Catchment No 1 will pass through the wetland for attenuation as noted above and treatment prior to discharge to Baldoyle Estuary. The storm water wetland has a minimum permanent water level depth of 300mm and provides pollutants removal through biological treatment and settlement. A settlement forebay has been provided to decrease velocity and sediment loading. The wetlands comply with the Storm Water Wetland Briefing Paper, GDSDS.

SuDS Measures Regional Controls	4 Pillars of SuDS*			
	Quantity	Quality	Biodiversity	Amenity
Catchment 3; Ponds				
Catchment 1; Wetlands				

** Refer to FCC Green / Blue Infrastructure for Development Guidance Note. Colours indicate performance in relevant SuDS area i.e. 'Green' = Good, 'Orange' = Moderate and 'Red' = Poor*

Table 4: Regional Control SuDS Measure ranked against the 4 Pillars

7.4 All SuDS measures under Source and Site Controls, will be agreed with Fingal County Council. SuDS measures acceptable to Fingal County Council are described under Appendix 1 of the Portmarnock South Local Area Plan (2013-2019, extended 2018-2023).

7.5 The storm water run-off from the development will pass through a minimum of 3 SuDS Devices. This treatment train approach complies with Volume 2, New Development, GDSDS and the LAP including Appendix 1 to same.

7.6 The storm water system will be in accordance with "The Regional Code of Practice for Drainage Works".

SECTION 8: OPERATION/MAINTENANCE OF SuDS DEVICES

8.1 The SuDS components proposed for Phase 1D will be operated and maintained strictly in accordance with the requirements of the SuDS Manual, CIRIA 753, 2015 and Fingal County Council's Green/Blue Infrastructure for Developments Guidance Note document to ensure that "water quality standards are maintained".

8.2 Each SuDS component is referenced below to the relevant operation and maintenance sections of CIRIA 753, 2015 where appropriate.

- Water butts (where deemed appropriate) will be operated and maintained in accordance with "Good Practice and the Manufacturer's Specification".
- Permeable pavements will be operated and maintained in accordance Part D, Sub-Section 20.14 including Table 20.15 and Section 32 of CIRIA 753 as well as Section 3.6.2 of Fingal County Council's Green/Blue Infrastructure for Developments Guidance Note.
- Bioretention areas will be operated and maintained in accordance with Part D, Sub-Section 18.12 including Table 18.3 and Section 32 of CIRIA 753 as well as Section 3.6.4 of Fingal County Council's Green/Blue Infrastructure for Developments Guidance Note.
- Filter areas will be operated and maintained in accordance with Part D, Sub-Section 16.12 including Table 16.1 and Section 32 of CIRIA 753.
- Swales will be operated and maintained in accordance with Part D, Sub-Section 17.12 including Table 17.1 and Section 32 of CIRIA 753 as well as Section 3.6.1 of Fingal County Council's Green/Blue Infrastructure for Developments Guidance Note.
- Hydrocarbon interceptors will be operated and maintained in accordance with Part D Sub-Section 14.12 including Table 14.2 and Section 32 of CIRIA 753 and Manufacturer's supporting literature.
- Stormwater ponds and wetlands will be operated and maintained in accordance with Part D, Sub-Section 23.12 including Table 21.1 and Section 32 of CIRIA 753 as well as Section 3.6.5 of Fingal County Council's Green/Blue Infrastructure for Developments Guidance Note.
- Waste management of the various SuDS components for Phase 1C will be carried out strictly in accordance with Section 33 of CIRIA 753.

SECTION 9: RELATED REPORTS

9.1 A Flood Risk Assessment have been prepared as separate document. 21205-JBB-00-XX-RP-C-00208_Flood_Risk_Assessment_P02.

SECTION 10: RELEVANT DRAWINGS

10.1 **Drawing No** **Title**

21205-JBB-00-XX-DR-C-03001 – WATERMAIN LAYOUT SHEET 1.

21205-JBB-00-XX-DR-C-03002 – WATERMAIN LAYOUT SHEET 2.

21205-JBB-00-XX-DR-C-03003 – WATERMAIN LAYOUT SHEET 3.

21205-JBB-00-XX-DR-C-03004 – WATERMAIN LAYOUT SHEET 4.

21205-JBB-00-XX-DR-C-03005 – WATERMAIN LAYOUT SHEET 5.

21205-JBB-00-XX-DR-C-03006 – TYPICAL WATERMAIN DETAILS SHEET 1

21205-JBB-00-XX-DR-C-03007 – TYPICAL WATERMAIN DETAILS SHEET 2
21205-JBB-00-XX-DR-C-04001 – FOUL AND STORMS SEWERS LAYOUT SHEET 1.
21205-JBB-00-XX-DR-C-04002 – FOUL AND STORMS SEWERS LAYOUT SHEET 2.
21205-JBB-00-XX-DR-C-04003 – FOUL AND STORMS SEWERS LAYOUT SHEET 3.
21205-JBB-00-XX-DR-C-04004 – FOUL AND STORMS SEWERS LAYOUT SHEET 4.
21205-JBB-00-XX-DR-C-04005 – FOUL AND STORMS SEWERS LAYOUT SHEET 5.
21205-JBB-00-XX-DR-C-04006 – SUDS LAYOUT SHEET 1.
21205-JBB-00-XX-DR-C-04007 – SUDS LAYOUT SHEET 2.
21205-JBB-00-XX-DR-C-04008 – SUDS LAYOUT SHEET 3.
21205-JBB-00-XX-DR-C-04009 – SUDS LAYOUT SHEET 4.
21205-JBB-00-XX-DR-C-04010 – SUDS LAYOUT SHEET 5.
21205-JBB-00-XX-DR-C-04011 – TYPICAL FOUL SEWER DETAILS
21205-JBB-00-XX-DR-C-04012 – TYPICAL STORM SEWER DETAILS
21205-JBB-00-XX-DR-C-04013 – TYPICAL SuDS DEVICES
21205-JBB-00-XX-DR-C-04019 – PUMPING STATION GENERAL ARRANGEMENT
21205-JBB-00-XX-DR-C-04020 – PUMPING STATION SECTIONS
21205-JBB-00-XX-DR-C-04021 – PUMPING STATION BUILDING

APPENDIX 1

Irish Water

Confirmation of Feasibility Statement

23rd October 2019

Isabelle Gallagher
Fitzwilliam Court
Lesson Close
Dublin 2

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Thiar
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

23 October 2019

Dear Isabelle Gallagher,

Re: Connection Reference No CDS19006721 pre-connection enquiry -
Subject to contract | Contract denied

Connection for Housing Development of 172 units at Station Road, Portmarnock, Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Station Road, Portmarnock, Dublin.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

The proposed water and wastewater connections for the Development connect to the Irish Water network via infrastructure that has not been taken in charge by Irish Water (Third Party Infrastructure). Please be advised that at connection application stage and prior to the commencement of any Self-Lay Works, you have to:

- identify and procure transfer to Irish Water of the arterial (water and wastewater) Infrastructure within the Third Party Infrastructure
- demonstrate that the arterial infrastructure are in compliance with requirements of Irish Water Code of Practice and Standard Details and in adequate condition and capacity to cater for the additional load from the Development.

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

- In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
- You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact Marina Zivanovic Byrne from the design team on 01 89 25991 or email mzbyrne@water.ie. For further information, visit www.water.ie/connections.

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

APPENDIX 2

Irish Water

Confirmation of Feasibility Statement

4th October 2021

Jerome O'Brien

Classon House
Dundrum Business Park
Dublin 14
Co. Dublin
D14T9T0

Uisce Éireann
Bosca OP 448
Oifig Sheachadta
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

4 October 2021

Re: CDS21002563 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 172 unit(s) at Phase 1D, Portmarnock South, Portmarnock, Co. Dublin

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Phase 1D, Portmarnock South, Portmarnock, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

Strategic Housing Development

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

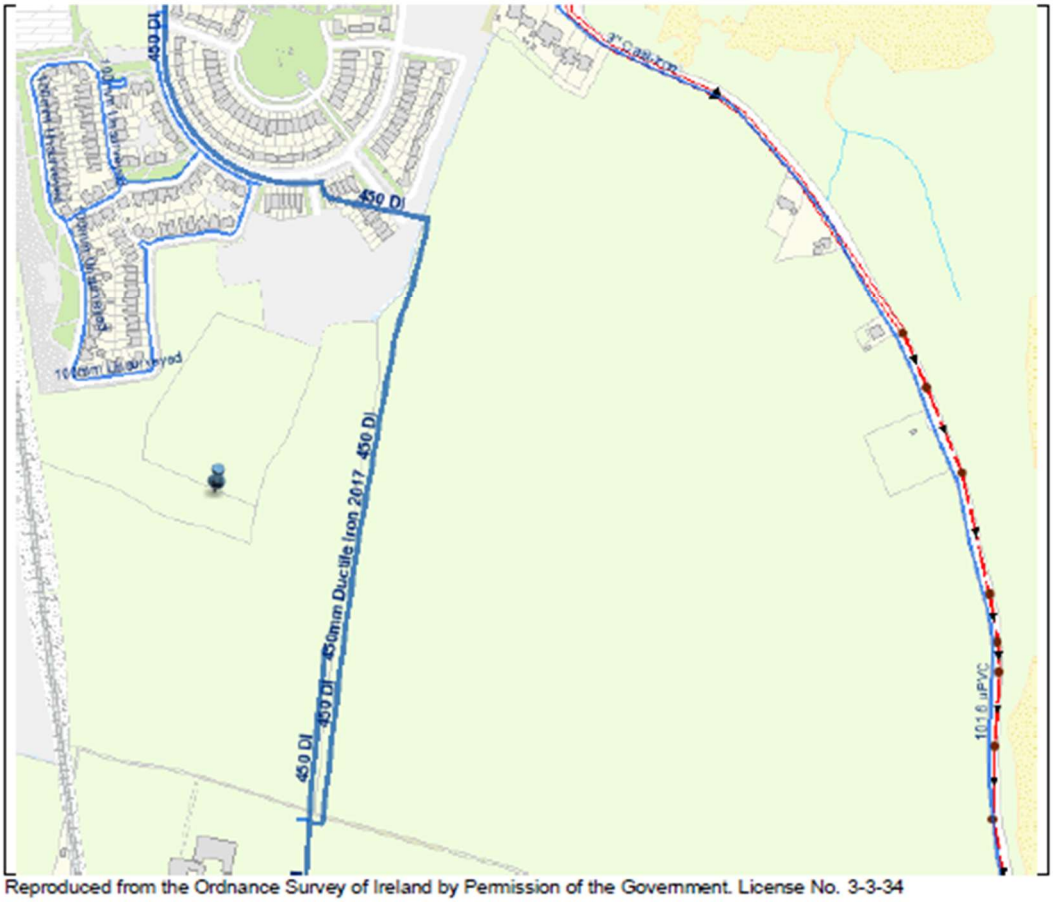
A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	

Water Connection	The proposed water connections for this development connect to the Irish Water network via infrastructure that has not been taken in charge by Irish Water (Third Party Infrastructure). Please be advised that at connection application stage and prior to the commencement of any Self-Lay Works, you have to: • Identify and procure transfer to Irish Water the arterial (water and wastewater) Infrastructure within the 3rd Party Infrastructure • Demonstrate that the arterial infrastructure is compliant with requirements of the Irish Water Codes of Practice and Standard Details and in adequate condition and capacity to cater for the additional load from the Development The proposed development indicates that an important Irish Water asset is present on the site (450mm DI main). At connection application stage, the Developer must demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the infrastructure during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Irish Water will be required over the infrastructure that is not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact IW Diversion Team via email address diversions@water.ie
Wastewater Connection	The long term strategy for the catchment is the delivery of the Portmarnock Local Network Reinforcement Project (including new PS and rising main) this project is currently underway by Irish Water and it is scheduled to be completed in Q2 2025 (this may be subject to change). The proposed interim solution to provide additional storage at the existing Temporary Pumping Station in St. Marnocks prior to the completion of the Portmarnock Local Network Reinforcement Project is acceptable in principle subject to the following: • 24 Hr storage to be provided for all existing phases and 24 Hr storage is to be provided for the new phases of the development. The size to be determined from flow monitoring or design flows (whichever is larger) • Full telemetry system to be provided in conjunction with Irish Water to link the St. Marnocks Temporary PS with Portmarnock Bridge PS and Mayne Bridge PS • Full Flow Monitoring to be provided and linked to the Telemetry System visible to Irish Water (including pump forward flows from the Temporary Pumping Station and overflows) • Design of the interim solution to be delivered prior to Connection Agreement • The customer is responsible for the maintenance and operation of the Temporary Pumping Station • The Temporary Pumping Station is to be fully decommissioned by the customer on completion of the Portmarnock Local Network Reinforcement Project

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

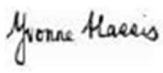
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Marina Byrne from the design team on 01 89 25991/ 087619321 or email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

APPENDIX 3

Irish Water

Design Acceptance

23rd November 2021

Jerome O'Brien
Classon House
Dundrum Business Park
Dublin 14
Co. Dublin D14T9T0

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

23 November 2021

Re: Design Submission for Phase 1D, Portmarnock South, Portmarnock, Co. Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS21002563

Dear Jerome O'Brien,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: James O'Sullivan
Phone: 02252269
Email: jameosull@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 21205-JBB-00-XX-DR-C-03001_WATERMAIN_LAYOUT_SHEET1_P04
- 21205-JBB-00-XX-DR-C-03002_WATERMAIN_LAYOUT_SHEET2_P04
- 21205-JBB-00-XX-DR-C-03003_WATERMAIN_LAYOUT_SHEET3_P04
- 21205-JBB-00-XX-DR-C-03004_WATERMAIN_LAYOUT_SHEET4_P04
- 21205-JBB-00-XX-DR-C-03005_WATERMAIN_LAYOUT_SHEET5_P04
- 21205-JBB-00-XX-DR-C-04001_FOUL_AND_STORM_SEWERS_LAYOUT_SHEET1_P04
- 21205-JBB-00-XX-DR-C-04002_FOUL_AND_STORM_SEWERS_LAYOUT_SHEET2_P04
- 21205-JBB-00-XX-DR-C-04003_FOUL_AND_STORM_SEWERS_LAYOUT_SHEET3_P04
- 21205-JBB-00-XX-DR-C-04004_FOUL_AND_STORM_SEWERS_LAYOUT_SHEET4_P04
- 21205-JBB-00-XX-DR-C-04005_FOUL_AND_STORM_SEWERS_LAYOUT_SHEET5_P04

Standard Details/Code of Practice Exemption:
n/a

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

APPENDIX 4

Capital Water Systems – Flow and Rainfall Survey Report

PORTMARNOCK SOUTH

FLOW & RAINFALL SURVEY

FINAL REPORT

24.08.2021

CWSL

capital water systems ltd.

web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (0)1 460 5912

Contents

1 Introduction
2 Project Background
3 Survey Drivers
4 Scope of the Project
5 Instrumentation Installation
6 Weather Conditions
7 Tidal Influence
8 Other Influences
9 Events
10 Instrumentation
11 Data Processing
12 Site Locations

Appendices accompanying Final Report

Appendix A General Information
Appendix B Digital Data
Appendix C Site Sheets
Appendix D Flow Monitor Event Results Plots
Appendix E Irregular Conduit Shape Information
Appendix F Scatter Graph Plots
Appendix G Photographs
Appendix H Survey Drawings
Appendix I Equipment Specification

1. Introduction

CAPITAL WATER SYSTEMS LTD. received commission from the J.B Barry Ltd. to carry out a flow and rainfall survey at various locations around Portmarnock South, Co. Dublin.

3 Flow Monitoring sites & 1 Rain Gauge site were selected as part of this survey.

The Flow and Rainfall survey was conducted between the 24/06/2021 and the 26/08/2021.

Outlined in this report are the results from all the monitoring locations in this survey.

Capital Water Systems Ltd carry out Sewer Flow and Rainfall surveys as described in Irish Water Technical Document – Wastewater Network Short Term Flow and Rainfall Survey Standard and “A Guide to Short Term Flow Surveys of Sewer Systems” pub. WRc 1987.

All data and technical information relating to the monitoring locations is contained in the Appendices accompanying this report as per the project specification.

2. Project Background

N/A

3. Survey Drivers

N/A

4. Final Scope of the Project

Installation & maintenance of 3 Flow Monitors 1 Rain Gauge for an initial period of 5 weeks.
Weekly extensions on instruction from client
Weekly interim reporting of observations and data as per specification.
Final report as per specification.

5. Instrumentation Installation/Removal

Instrument	Installation Date	Removal Date
Rain gauges	24/06/2021	26/08/2021
Flow/Depth Monitors	24/06/2021	26/08/2021
Additional Loggers Installed/Loggers Moved		
FM01 relocated to FM01A on the 22/07/2021		
Loggers Removed During Survey following presurvey		
N/A		

6. Weather Conditions

See Appendix A Equipment Performance Matrix for information on weather conditions.

7. Tidal Influence

No Tidal Influence noted

8. Other Influences

Pumped flows at FM01 & FM01A

9. Selected Events

Storm Event No.	1	2	3	4
Start	27/07/2021 14:30	30/07/2021 02:00	07/08/2021 09:30	21/08/2021 03:30
End	27/07/2021 21:00	30/07/2021 09:30	07/08/2021 13:00	21/08/2021 11:00
Rainfall Total mm	9.6	11.6	6.4	12.6
Rainfall Intensity mm/h	36	12	12	24

DWF	1	2
Start	25/07/2021	10/08/2021
End	26/07/2021	11/08/2021
Rainfall Total mm	0	0
Rainfall Intensity mm/h	0	0

10. Instrumentation

10.1 RAINFALL RECORDERS

Casella tipping bucket rain gauges together with Remote Sense data loggers were used in this survey. The rain gauges employ a 0.2 mm tipping bucket to record rainfall. Each rain gauge is connected to a self-contained battery powered data logger. The data is forwarded to a data hosting platform daily. This data is subsequently transferred to a PC for processing and analysis.

10.2 FLOW MONITORS

The flow monitors used in this survey were Area/Velocity survey loggers. These self-contained units are microprocessor controlled and are set to measure depth and velocity of flow at predetermined intervals. The data is stored on a logger device within the monitor. Data is sent daily to a hosting platform where signal allows. If no signal is available the data is extracted from the monitor via laptop on a weekly basis and subsequently processed using specialized software on a PC.

The flow monitor comprises two elements. The probe, which houses the depth and velocity sensors, is normally placed at least 300 mm from the face of the manhole where the hydraulic conditions are the most suitable for accurate flow measurement. A unit containing the data logger and power source is normally suspended at the top of the manhole. The two elements are connected via cables.

There is a cut off value unique to each monitor, which typically is in the range 10 mm to 15 mm. Below this depth, values are not recorded. In addition, a depth zero error is associated with each instrument which, although automatically compensated for during the data processing, can have the effect of raising the cutoff point above these typical values. Generally, these combined effects would not normally raise the cut off value above 40 mm of depth above the underside of the probe.

Velocity readings are of questionable accuracy when the depth of flow, above the underside of the probe, is below 75 mm. This is due to unstable flow conditions over the probe. Furthermore, the manufacturer advises that velocities of less than 0.20 m/sec are of lesser accuracy.

The recorded values of depth and velocity are average values taken over the recording interval which precedes the recording time. For this survey, the recording interval was taken as 2 minutes.

During each site inspection, insitu depth and velocity calibrations were carried out where flow characteristics permitted.

Calibrations for all equipment were performed before the survey in CAPITAL WATER SYSTEM'S own test tank, flume and workshops.

11. Data Processing

CAPITAL WATER SYSTEMS use STL's SSAS (Sewer Survey Analysis Software) package for processing both the rainfall and flow data.

11.1 RAINFALL DATA

The data is forwarded to a data hosting platform daily. The data is transferred from the hosting site to specialised analysis software in order to compute the rainfall intensities/event totals.

11.2 FLOW DATA

Data is sent daily to a hosting platform where signal allows. If no signal is available the data is extracted from the monitor via laptop on a weekly basis and subsequently processed using specialised software on a PC.

The processing consists of three stages editing, correction and flow computation. Editing involves the examination of raw data, for each site, and should the need arise, deleting any erroneous data. Correction for zero errors and response is then made prior to computation of flows.

Normally where depths above the underside of the probe are below 75 mm, velocity readings are ignored and hence flows are not calculated. However, for this survey a depth cut off of zero was used and all flows have been computed and included in the record. It should be noted that calculated flows where depths are less than 75mm above the underside of the probe should be treated with caution.

A velocity cut off of zero m/s was used in the processing but results processed where velocity values are below 0.2 m/s must be treated with caution.

12. Site Locations

See Appendix A - General Survey information for details

SURVEY	Portmarnock
CONSULTANT	JB Barry
LOCATION	Portmarnock
FLOW MONITORS	3 (1 Relocation)
RAIN GAUGES	1
SURVEY LIVE DATE	24/06/2021
DURATION	5 Weeks

Site ID	Origional MH ID	Installed MH ID
FM01	N/A	As per maps
FM02	N/A	As per maps
FM03	N/A	As per maps
FM01A	N/A	As per maps

Site ID	Coodinates	Location
RG01	53.417411, -6.144344	Construction Site off station Road

Pipe Size mm	Presurvey/Installation comments
225	Surcharging during installation
300	Very low flow
225	Slow flow
225	Pumped Flow

Portmarnock	Portmarnock
JB Barry	JB Barry
Portmarnock	Portmarnock
FLOW MONITO	3

Matrix Key

	Working Data Generally Consistent
	Slight correction required
	Issue affecting sensors for over 50% of period
	Data not accurate/significant correction required
	No Data/End of Survey at this location (EOS)

Flow Monitor Performance Matrix

Site ID	Interim 1	Interim 2	Interim 3	Interim 4	Interim 5	Interim 6	Interim 7	Interim 8	Interim 9
FM01	Flow backing up from PS leading to poor veloicity data capture. Flow profile changed on the 29/06/2021	Inconsistent veloicty data capture at times	Inconsistent veloicty data capture at times	Inconsistent veloicty data capture at times	Relocated to FM01A on the 22/07/2021	Relocated to FM01A on the 22/07	Relocated to FM01A on the 22/07	Relocated to FM01A on the 22/08	Relocated to FM01A on t
FM01A	NI	NI	NI	NI - Installed on the 22/07	Pumped Flow	Pumped Flow	Pumped Flow	Pumped Flow	Pumped Flow
FM02	Very low flows	Very low flows	Very low flows RV/RD at times	Very low flows RV at times	Very low flows RV at times	VLF	VLF	VLF	VLF
FM03	Very slow flow RV at times	RV between the	RV at times	RV at times	RV at times	RV between the 30/07 &	VSF	VSF	RV

Notes

LS	Logger Shutdown no data
NF	No Flow
SG	Surcharging in M/H
SV	Sediment/Stones affecting velocity sensors
WF	Wet Filter leading to inaccurate depth readings
RV	**Ragging affecting velocity data consistency**
RD	**Ragging affecting depth sensors**
FD	Fatty deposits affecting depth sensors
RS	Ragging affecting sensors
SD	Monitor shut down no data
(v)FF	(Very) Fast Flow
VLF	Very low flow leading to inconsistent velocity data capture
(V)SF	**Slow Flow leading to inconsistent velocity data capture**
DE	Monitor depth error
NI	Not installed
F/D	Flow depth relationship calculation used
Stat	Static Flow
CF	Clear Flow affecting velocity sensor
TF	Turbulent flow leading to decreased accuracy
PF	Pumped Flow/PS influence

Detailed Average Rainfall listing.

Portmarnock (721A)
Survey started on 20-JUN-21 0:00

All operating raingauges are equally weighted for averages.

Time Rainfall (over periods of 2 minutes)

	Average Intensity mm/hr	Summ mm	Gauges No. mm/hr
24-JUN-21 19:34	6.0	0.20	6.0
2 Mins. Totals (mm) =	0.2	0.2	
25-JUN-21 10:02	1.2	0.04	1.2
25-JUN-21 10:04	1.2	0.08	1.2
25-JUN-21 10:06	1.2	0.12	1.2
25-JUN-21 10:08	1.2	0.16	1.2
25-JUN-21 10:10	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
26-JUN-21 10:20	1.2	0.04	1.2
26-JUN-21 10:22	1.2	0.08	1.2
26-JUN-21 10:24	1.2	0.12	1.2
26-JUN-21 10:26	1.2	0.16	1.2
26-JUN-21 10:28	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
3-JUL-21 4:34	1.2	0.04	1.2
3-JUL-21 4:36	1.2	0.08	1.2
3-JUL-21 4:38	1.2	0.12	1.2
3-JUL-21 4:40	1.2	0.16	1.2
3-JUL-21 4:42	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
3-JUL-21 8:46	1.2	0.04	1.2
3-JUL-21 8:48	1.2	0.08	1.2
3-JUL-21 8:50	1.2	0.12	1.2
3-JUL-21 8:52	1.2	0.16	1.2
3-JUL-21 8:54	1.2	0.20	1.2
3-JUL-21 8:56	2.0	0.27	2.0
3-JUL-21 8:58	2.0	0.33	2.0
3-JUL-21 9:00	2.0	0.40	2.0
3-JUL-21 9:36	1.2	0.44	1.2
3-JUL-21 9:38	1.2	0.48	1.2
3-JUL-21 9:40	1.2	0.52	1.2
3-JUL-21 9:42	1.2	0.56	1.2
3-JUL-21 9:44	1.2	0.60	1.2
3-JUL-21 10:04	1.2	0.64	1.2
3-JUL-21 10:06	1.2	0.68	1.2
3-JUL-21 10:08	1.2	0.72	1.2
3-JUL-21 10:10	1.2	0.76	1.2
3-JUL-21 10:12	1.2	0.80	1.2
88 Mins. Totals (mm) =	0.8	0.8	
4-JUL-21 16:12	1.2	0.04	1.2
4-JUL-21 16:14	1.2	0.08	1.2
4-JUL-21 16:16	1.2	0.12	1.2
4-JUL-21 16:18	1.2	0.16	1.2
4-JUL-21 16:20	1.2	0.20	1.2
4-JUL-21 16:32	1.2	0.24	1.2
4-JUL-21 16:34	1.2	0.28	1.2
4-JUL-21 16:36	1.2	0.32	1.2
4-JUL-21 16:38	1.2	0.36	1.2
4-JUL-21 16:40	1.2	0.40	1.2
4-JUL-21 16:42	1.5	0.45	1.5
4-JUL-21 16:44	1.5	0.51	1.5
4-JUL-21 16:46	1.5	0.55	1.5
4-JUL-21 16:48	1.5	0.60	1.5
4-JUL-21 16:50	1.2	0.64	1.2
4-JUL-21 16:52	1.2	0.68	1.2
4-JUL-21 16:54	1.2	0.72	1.2
4-JUL-21 16:56	1.2	0.76	1.2
4-JUL-21 16:58	1.2	0.80	1.2
4-JUL-21 17:20	1.2	0.84	1.2
4-JUL-21 17:22	1.2	0.88	1.2
4-JUL-21 17:24	1.2	0.92	1.2
4-JUL-21 17:26	1.2	0.96	1.2
4-JUL-21 17:28	1.2	1.00	1.2
4-JUL-21 17:42	1.2	1.04	1.2
4-JUL-21 17:44	1.2	1.08	1.2
4-JUL-21 17:46	1.2	1.12	1.2
4-JUL-21 17:48	1.2	1.16	1.2
4-JUL-21 17:50	1.2	1.20	1.2
4-JUL-21 17:54	1.2	1.24	1.2
4-JUL-21 17:56	1.2	1.28	1.2
4-JUL-21 17:58	1.2	1.32	1.2
4-JUL-21 18:00	1.2	1.36	1.2
4-JUL-21 18:02	1.2	1.40	1.2
4-JUL-21 18:04	1.2	1.44	1.2
4-JUL-21 18:06	1.2	1.48	1.2
4-JUL-21 18:08	1.2	1.52	1.2
4-JUL-21 18:10	1.2	1.56	1.2
4-JUL-21 18:12	1.2	1.60	1.2
4-JUL-21 18:14	1.2	1.64	1.2
4-JUL-21 18:16	1.2	1.68	1.2
4-JUL-21 18:18	1.2	1.72	1.2
4-JUL-21 18:20	1.2	1.76	1.2
4-JUL-21 18:40	1.2	1.80	1.2
4-JUL-21 18:42	1.2	1.84	1.2
4-JUL-21 18:44	1.2	1.88	1.2
4-JUL-21 18:46	1.2	1.92	1.2
4-JUL-21 18:48	1.2	1.96	1.2
4-JUL-21 18:50	1.2	2.00	1.2
4-JUL-21 19:30	1.2	2.04	1.2
4-JUL-21 19:32	1.2	2.08	1.2
4-JUL-21 19:34	1.2	2.12	1.2
4-JUL-21 19:36	1.2	2.16	1.2
4-JUL-21 19:38	1.5	2.20	1.5
4-JUL-21 19:40	1.5	2.25	1.5
4-JUL-21 19:42	1.5	2.30	1.5
4-JUL-21 19:44	1.5	2.35	1.5
4-JUL-21 19:46	1.5	2.40	1.5
4-JUL-21 19:48	1.5	2.45	1.5
4-JUL-21 19:50	1.5	2.50	1.5
4-JUL-21 19:52	1.5	2.55	1.5
4-JUL-21 19:54	1.5	2.60	1.5
4-JUL-21 19:56	1.5	2.65	1.5
4-JUL-21 19:58	1.5	2.70	1.5
4-JUL-21 20:00	1.5	2.75	1.5
4-JUL-21 20:02	1.5	2.80	1.5
4-JUL-21 20:04	3.0	2.90	3.0
4-JUL-21 20:06	3.0	3.00	3.0
4-JUL-21 20:16	1.2	3.04	1.2
4-JUL-21 20:18	1.2	3.08	1.2
4-JUL-21 20:20	1.2	3.12	1.2
4-JUL-21 20:22	1.2	3.16	1.2
4-JUL-21 20:24	1.2	3.20	1.2
4-JUL-21 20:26	1.2	3.24	1.2
4-JUL-21 20:28	1.2	3.28	1.2
4-JUL-21 20:30	1.2	3.32	1.2
4-JUL-21 20:42	1.2	3.36	1.2
4-JUL-21 20:44	1.2	3.40	1.2
4-JUL-21 20:52	1.2	3.44	1.2
4-JUL-21 20:54	1.2	3.48	1.2
4-JUL-21 20:56	1.2	3.52	1.2
4-JUL-21 20:58	1.2	3.56	1.2
4-JUL-21 21:00	1.2	3.60	1.2
4-JUL-21 21:04	1.2	3.64	1.2
4-JUL-21 21:06	1.2	3.68	1.2
4-JUL-21 21:08	1.2	3.72	1.2
4-JUL-21 21:10	1.2	3.76	1.2
4-JUL-21 21:12	1.2	3.80	1.2
4-JUL-21 21:14	1.5	3.85	1.5
4-JUL-21 21:16	1.5	3.90	1.5
4-JUL-21 21:18	1.5	3.95	1.5
4-JUL-21 21:20	1.5	4.00	1.5
4-JUL-21 21:30	1.2	4.04	1.2
4-JUL-21 21:32	1.2	4.08	1.2
4-JUL-21 21:34	1.2	4.12	1.2
4-JUL-21 21:36	1.2	4.16	1.2
4-JUL-21 21:38	1.2	4.20	1.2
4-JUL-21 21:40	1.2	4.24	1.2
4-JUL-21 21:42	1.2	4.28	1.2
4-JUL-21 21:44	1.2	4.32	1.2
4-JUL-21 21:46	1.2	4.36	1.2
4-JUL-21 21:48	1.2	4.40	1.2
4-JUL-21 21:50	2.0	4.47	2.0
4-JUL-21 21:52	2.0	4.53	2.0
4-JUL-21 21:54	2.0	4.60	2.0
4-JUL-21 21:56	2.0	4.67	2.0
4-JUL-21 21:58	2.0	4.73	2.0
4-JUL-21 22:00	2.0	4.80	2.0
4-JUL-21 22:02	3.0	4.90	3.0
4-JUL-21 22:04	3.0	5.00	3.0
4-JUL-21 22:06	1.5	5.05	1.5
4-JUL-21 22:08	1.5	5.10	1.5
4-JUL-21 22:10	1.5	5.15	1.5
4-JUL-21 22:12	1.5	5.20	1.5
4-JUL-21 22:44	1.2	5.24	1.2
4-JUL-21 22:46	1.2	5.28	1.2
4-JUL-21 22:48	1.2	5.32	1.2
4-JUL-21 22:50	1.2	5.36	1.2
4-JUL-21 22:52	1.2	5.40	1.2
4-JUL-21 23:32	1.2	5.44	1.2
4-JUL-21 23:34	1.2	5.48	1.2
4-JUL-21 23:36	1.2	5.52	1.2
4-JUL-21 23:38	1.2	5.56	1.2
4-JUL-21 23:40	1.2	5.60	1.2
458 Mins. Totals (mm) =	5.6	5.6	
5-JUL-21 0:58	1.2	0.04	1.2
5-JUL-21 0:52	1.2	0.08	1.2
5-JUL-21 0:54	1.2	0.12	1.2
5-JUL-21 0:56	1.2	0.16	1.2
5-JUL-21 0:58	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
5-JUL-21 10:02	1.2	0.04	1.2
5-JUL-21 10:04	1.2	0.08	1.2
5-JUL-21 10:06	1.2	0.12	1.2
5-JUL-21 10:08	1.2	0.16	1.2
5-JUL-21 10:10	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
6-JUL-21 11:28	1.2	0.04	1.2
6-JUL-21 11:30	1.2	0.08	1.2
6-JUL-21 11:32	1.2	0.12	1.2
6-JUL-21 11:34	1.2	0.16	1.2
6-JUL-21 11:36	1.2	0.20	1.2
6-JUL-21 11:38	2.0	0.27	2.0
6-JUL-21 11:40	2.0	0.33	2.0
6-JUL-21 11:42	2.0	0.40	2.0
6-JUL-21 12:44	6.0	0.60	6.0
6-JUL-21 12:02	1.2	0.64	1.2
6-JUL-21 12:04	1.2	0.68	1.2
6-JUL-21 12:06	1.2	0.72	1.2
6-JUL-21 12:08	1.2	0.76	1.2
6-JUL-21 12:10	1.2	0.80	1.2
6-JUL-21 12:14	6.0	1.00	6.0
6-JUL-21 12:16	12.0	1.60	12.0
6-JUL-21 12:18	24.0	2.40	24.0
6-JUL-21 12:20	18.0	3.00	18.0
6-JUL-21 12:22	6.0	3.30	6.0
6-JUL-21 12:24	6.0	3.60	6.0
6-JUL-21 12:26	3.0	3.50	3.0
6-JUL-21 12:28	3.0	3.60	3.0
6-JUL-21 12:30	3.0	3.70	3.0
6-JUL-21 12:32	2.0	3.77	2.0
6-JUL-21 12:34	2.0	3.87	2.0
6-JUL-21 12:36	2.0	3.93	2.0
6-JUL-21 12:38	2.0	4.00	2.0
6-JUL-21 12:40	3.0	4.10	3.0
6-JUL-21 12:42	3.0	4.20	3.0
6-JUL-21 12:44	6.0	4.40	6.0
6-JUL-21 12:46	12.0	4.80	12.0
6-JUL-21 12:48	6.0	5.00	6.0
6-JUL-21 12:50	24.0	5.80	24.0
6-JUL-21 12:52	30.0	6.80	30.0
6-JUL-21 12:54	18.0	7.20	18.0
6-JUL-21 12:56	12.0	7.60	12.0
6-JUL-21 12:58	18.0	8.20	18.0
6-JUL-21 13:00	12.0	8.60	12.0
6-JUL-21 13:02	6.0	8.80	6.0
6-JUL-21 13:04	3.0	8.90	3.0
6-JUL-21 13:06	3.0	9.00	3.0
6-JUL-21 13:08	2.0	9.07	2.0
6-JUL-21 13:10	2.0	9.13	2.0
6-JUL-21 13:12	2.0	9.20	2.0
6-JUL-21 13:14	2.0	9.27	2.0
6-JUL-21 13:16	2.0	9.33	2.0
6-JUL-21 13:18	2.0	9.40	2.0
6-JUL-21 13:24	1.2	9.44	1.2
6-JUL-21 13:26	1.2	9.48	1.2
6-JUL-21 13:28	1.2	9.52	1.2
6-JUL-21 13:30	1.2	9.56	1.2
6-JUL-21 13:32	1.2	9.60	1.2
6-JUL-21 13:34	1.5	9.65	1.5
6-JUL-21 13:36	1.5	9.70	1.5
6-JUL-21 13:38	1.5	9.75	1.5
6-JUL-21 13:40	1.2	9.80	1.2
6-JUL-21 13:52	1.2	9.84	1.2
6-JUL-21 13:54	1.2	9.88	1.2
6-JUL-21 13:56	1.2	9.92	1.2
6-JUL-21 13:58	1.2	9.96	1.2
6-JUL-21 14:00	1.2	10.00	1.2
6-JUL-21 14:02	3.0	10.10	3.0
6-JUL-21 14:04	3.0	10.20	3.0
6-JUL-21 14:06	6.0	10.40	6.0
6-JUL-21 14:08	6.0	10.60	6.0
6-JUL-21 14:10	6.0	10.80	6.0
6-JUL-21 14:12	6.0	11.00	6.0
6-JUL-21 14:14	6.0	11.20	6.0
6-JUL-21 14:16	6.0	11.40	6.0
6-JUL-21 14:18	6.0	11.60	6.0
6-JUL-21 14:20	6.0	11.80	6.0
6-JUL-21 14:22	5.5	11.70	5.5
6-JUL-21 14:24	5.5	11.75	5.5
6-JUL-21 14:26	5.5	11.80	5.5
6-JUL-21 14:28	3.0	11.90	3.0
6-JUL-21 14:30	3.0	12.00	3.0
6-JUL-21 14:32	1.2	12.04	1.2
6-JUL-21 14:34	1.2	12.08	1.2
6-JUL-21 14:36	1.2	12.12	1.2
6-JUL-21 14:38	1.2	12.16	1.2
6-JUL-21 14:40	1.2	12.20	1.2
6-JUL-21 14:50	1.2	12.24	1.2
6-JUL-21 14:52	1.2	12.28	1.2
6-JUL-21 14:54	1.2	12.32	1.2
6-JUL-21 14:56	1.2	12.36	1.2
6-JUL-21 14:58	1.2	12.40	1.2
6-JUL-21 15:00	3.0	12.50	3.0
6-JUL-21 15:02	3.0	12.60	3.0
6-JUL-21 15:04	1.2	12.64	1.2
6-JUL-21 15:48	1.2	12.68	1.2
6-JUL-21 15:50	1.2	12.72	1.2
6-JUL-21 15:52	1.2	12.76	1.2
6-JUL-21 15:54	1.2	12.80	1.2
6-JUL-21 15:56	1.5	12.85	1.5
6-JUL-21 15:58	1.5	12.90	1.5
6-JUL-21 16:00	1.5	12.95	1.5
6-JUL-21 16:02	1.5	13.00	1.5
6-JUL-21 16:08	1.2	13.04	1.2
6-JUL-21 16:10	1.2	13.08	1.2
6-JUL-21 16:12	1.2	13.12	1.2
6-JUL-21 16:14	1.2	13.16	1.2
6-JUL-21 16:16	1.2	13.20	1.2
6-JUL-21 16:18	1.2	13.24	1.2
6-JUL-21 16:22	1.2	13.28	1.2
6-JUL-21 16:24	1.2	13.32	1.2
6-JUL-21 16:26	1.2	13.36	1.2
6-JUL-21 16:28	1.2	13.40	1.2
6-JUL-21 16:30	1.2	13.44	1.2
6-JUL-21 16:36	1.2	13.48	1.2
6-JUL-21 16:38	1.2	13.52	1.2
6-JUL-21 16:40	1.2	13.56	1.2
6-JUL-21 16:42	1.2	13.60	1.2
6-JUL-21 16:44	1.5	13.65	1.5
6-JUL-21 16:46	1.5	13.70	1.5
6-JUL-21 16:48	1.5	13.75	1.5
6-JUL-21 16:50	1.5	13.80	1.5
6-JUL-21 16:52	3.0	13.90	3.0
6-JUL-21 17:04	3.0	14.00	3.0
6-JUL-21 17:14	1.5	14.05	1.5
6-JUL-21 17:16	1.5	14.10	1.5
6-JUL-21 17:18	1.5	14.15	1.5
6-JUL-21 17:20	1.5	14.20	1.5
6-JUL-21 17:22	6.0	14.40	6.0
6-JUL-21 17:24	6.0	14.60	6.0
6-JUL-21 17:26	6.0	14.80	6.0
6-JUL-21 17:28	12.0	15.20	12.0
6-JUL-21 17:30	6.0	15.40	6.0
6-JUL-21 17:32	30.0	16.40	30.0
6-JUL-21 17:34	36.0	17.60	36.0
6-JUL-21 17:36	24.0	18.40	24.0
6-JUL-21 17:38	6.0	18.60	6.0
6-JUL-21 18:14	1.2	18.64	1.2
6-JUL-21 18:16	1.2	18.68	1.2
6-JUL-21 18:18	1.2	18.72	1.2
6-JUL-21 18:20	1.2	18.76	1.2
6-JUL-21 18:22	1.2	18.80	1.2
6-JUL-21 18:24	1.5	18.85	1.5
6-JUL-21 18:26	1.5	18.90	1.5
6-JUL-21 18:28	1.5	18.95	1.5
6-JUL-21 18:30	1.5	19.00	1.5
6-JUL-21 18:32	2.0	19.07	2.0
6-JUL-21 18:34	2.0	19.13	2.0
6-JUL-21 18:36	2.0	19.20	2.0
6-JUL-21 18:38	3.0	19.30	3.0
6-JUL-21 18:40	3.0	19.40	3.0
6-JUL-21 18:54	1.2	19.44	1.2
6-JUL-21 18:56	1.2	19.48	1.2
6-JUL-21 18:58	1.2	19.52	1.2
6-JUL-21 19:00	1.2	19.56	1.2
6-JUL-21 19:02	1.2	19.60	1.2
456 Mins. Totals (mm) =	19.6	19.6	
11-JUL-21 8:40	1.2	0.04	1.2
11-JUL-21 8:42	1.2	0.08	1.2
11-JUL-21 8:44	1.2	0.12	1.2
11-JUL-21 8:46	1.2	0.16	1.2
11-JUL-21 8:48	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
11-JUL-21 12:48	1.2	0.04	1.2
11-JUL-21 12:50	1.2	0.08	1.2
11-JUL-21 12:52	1.2	0.12	1.2
11-JUL-21 12:54	1.2	0.16	1.2
11-JUL-21 12:56	1.2	0.20	1.2
10 Mins. Totals (mm) =	0.2	0.2	
11-JUL-21 14:28	1.2	0.04	1.2
11-JUL-21 14:30	1.2	0.08	1.2
11-JUL-21 14:32	1.2	0.12	1.2
11-JUL-21 14:34	1.2	0.16	1.2
11-JUL-21 14:36	1.2	0.20	1.2
11-JUL-21 14:38	1.2	0.24	1.2
11-JUL-21 14:40	1.2	0.28	1.2
11-JUL-21 14:42	1.2	0.32	1.2
11-JUL-21 14:44	1.2	0.36	1.2
11-JUL-21 14:46	1.2	0.40	1.2
11-JUL-21 14:48	1.5	0.45	1.5
11-JUL-21 14:50	1.5	0.50	1.5
11-JUL-21 14:52	1.5	0.55	1.5
11-JUL-21 14:54	1.5	0.60	1.5
11-JUL-21 14:56	3.0	0.70	3.0
11-JUL-21 14:58	3.0	0.80	3.0
11-JUL-21 15:00	2.0	0.87	2.0
11-JUL-21 15:02	2.0	0.93	2.0
11-JUL-21 15:04	2.0	1.00	2.0
11-JUL-21 15:06	2.0	1.07	2.0
11-JUL-21 15:08	2.0	1.13	2.0
11-JUL-21 15:10	2.0	1.20	2.0
11-JUL-21 15:12	3.0	1.30	3.0
11-JUL-21 15:14	3.0	1.40	3.0
11-JUL-21 15:16	2.0	1.47	2.0
11-JUL-21 15:18	2.0	1.53	2.0
11-JUL-21 15:20	2.0	1.60	2.0
11-JUL-21 15:22	3.0	1.70	3.0
11-JUL-21 15:24	3.0	1.80	3.0
11-JUL-21 15:26	2.0	1.87	2.0
11-JUL-21 15:28	2.0	1.93	2.0
11-JUL-21 15:30	2.0	2.00	2.0
11-JUL-21 15:34	1.2	2.04	1.2

```
11-JUL-23 15:36      1.2    2.00    1.2
11-JUL-23 15:38      1.2    2.12    1.2
11-JUL-23 15:40      1.2    2.16    1.2
11-JUL-23 15:42      1.2    2.20    1.2
11-JUL-23 15:54      6.0    2.40    6.0
11-JUL-23 15:56      1.2    2.44    1.2
11-JUL-23 16:30      1.2    2.48    1.2
11-JUL-23 16:32      1.2    2.52    1.2
11-JUL-23 16:34      1.2    2.56    1.2
11-JUL-23 16:36      1.2    2.60    1.2
11-JUL-23 16:40      1.2    2.64    1.2
11-JUL-23 16:42      1.2    2.68    1.2
11-JUL-23 16:44      1.2    2.72    1.2
11-JUL-23 16:46      1.2    2.76    1.2
11-JUL-23 16:48      1.2    2.80    1.2
11-JUL-23 16:50      1.5    2.95    1.5
11-JUL-23 16:52      1.5    2.90    1.5
11-JUL-23 16:54      1.5    2.95    1.5
11-JUL-23 16:56      1.5    3.00    1.5
11-JUL-23 16:58      1.5    3.05    1.5
11-JUL-23 17:00      1.5    3.10    1.5
11-JUL-23 17:02      1.5    3.15    1.5
11-JUL-23 17:04      1.5    3.20    1.5
11-JUL-23 17:10      1.2    3.24    1.2
11-JUL-23 17:12      1.2    3.28    1.2
11-JUL-23 17:14      1.2    3.32    1.2
11-JUL-23 17:16      1.2    3.36    1.2
11-JUL-23 17:18      1.2    3.40    1.2
11-JUL-23 18:08      1.2    3.44    1.2
11-JUL-23 18:10      1.2    3.48    1.2
11-JUL-23 18:12      1.2    3.52    1.2
11-JUL-23 18:14      1.2    3.56    1.2
11-JUL-23 18:16      1.2    3.60    1.2
                                    ------  ------
 230 Mins.  Totals (ms) =    3.6     3.6
                             ------  ------


27-JUL-23 10:54      24.0    0.00   24.0
27-JUL-23 10:56      30.0    1.00   30.0
27-JUL-23 10:58      18.0    2.40   18.0
27-JUL-23 11:00      12.0    3.60   12.0
27-JUL-23 11:02      40.0    5.00   40.0
27-JUL-23 11:04      36.0    6.20   36.0
27-JUL-23 11:06      18.0    6.80   18.0
27-JUL-23 11:08      12.0    7.20   12.0
27-JUL-23 11:10      12.0    7.60   12.0
27-JUL-23 11:12      12.0    8.20   12.0
27-JUL-23 11:14      12.0    8.60   12.0
27-JUL-23 11:16      2.0     8.67    2.0
27-JUL-23 11:18      2.0     8.73    2.0
27-JUL-23 11:20      1.2     8.80    1.2
27-JUL-23 11:22      1.2     8.84    1.2
27-JUL-23 11:24      1.2     8.88    1.2
27-JUL-23 11:26      1.2     8.92    1.2
27-JUL-23 11:28      1.2     8.96    1.2
27-JUL-23 11:30      3.0     9.00    3.0
27-JUL-23 11:32      3.0     9.50    3.0
27-JUL-23 11:34      3.0     9.20    3.0
27-JUL-23 11:36      2.0     9.27    2.0
27-JUL-23 11:38      2.0     9.33    2.0
27-JUL-23 11:40      2.0     9.40    2.0
27-JUL-23 11:42      1.2     9.44    1.2
27-JUL-23 11:44      1.2     9.48    1.2
27-JUL-23 11:46      1.2     9.52    1.2
27-JUL-23 11:48      1.2     9.56    1.2
27-JUL-23 11:50      1.2     9.60    1.2
27-JUL-23 12:16      1.2     9.64    1.2
27-JUL-23 12:18      1.2     9.68    1.2
27-JUL-23 12:20      1.2     9.72    1.2
27-JUL-23 12:22      1.2     9.76    1.2
27-JUL-23 12:24      1.2     9.80    1.2
                                    ------  ------
 92 Mins.  Totals (ms) =     9.8     9.8
                             ------  ------


27-JUL-23 15:00      1.2    0.04    1.2
27-JUL-23 15:02      1.2    0.08    1.2
27-JUL-23 15:04      1.2    0.12    1.2
27-JUL-23 15:06      1.2    0.16    1.2
27-JUL-23 15:08      1.2    0.20    1.2
27-JUL-23 15:10      1.2    0.24    1.2
27-JUL-23 15:12      2.0    0.33    2.0
27-JUL-23 15:14      2.0    0.40    2.0
27-JUL-23 15:16      2.0    0.47    2.0
27-JUL-23 15:18      2.0    0.53    2.0
27-JUL-23 15:20      2.0    0.60    2.0
27-JUL-23 15:22      2.0    0.67    2.0
27-JUL-23 15:24      2.0    0.73    2.0
27-JUL-23 15:26      2.0    0.80    2.0
27-JUL-23 15:28      2.0    0.87    2.0
27-JUL-23 15:30      2.0    0.93    2.0
27-JUL-23 15:32      2.0    1.00    2.0
27-JUL-23 15:34      2.0    1.07    2.0
27-JUL-23 15:36      2.0    1.13    2.0
27-JUL-23 15:38      2.0    1.20    2.0
27-JUL-23 16:02      1.2    1.24    1.2
27-JUL-23 16:04      1.2    1.28    1.2
27-JUL-23 16:06      1.2    1.32    1.2
27-JUL-23 16:08      1.2    1.36    1.2
27-JUL-23 16:10      1.2    1.40    1.2
27-JUL-23 16:12      3.0    1.50    3.0
27-JUL-23 16:14      3.0    1.60    3.0
27-JUL-23 16:16      3.0    1.70    3.0
27-JUL-23 16:28      1.5    1.85    1.5
27-JUL-23 16:30      1.5    1.90    1.5
27-JUL-23 16:32      1.5    1.95    1.5
27-JUL-23 16:34      1.5    2.00    1.5
27-JUL-23 16:36      2.0    2.07    2.0
27-JUL-23 16:52      2.0    2.27    2.0
27-JUL-23 16:54      2.0    2.33    2.0
27-JUL-23 16:56      2.0    2.40    2.0
27-JUL-23 16:58      6.0    2.60    6.0
27-JUL-23 17:00      6.0    2.80    6.0
27-JUL-23 17:02      6.0    3.00    6.0
27-JUL-23 17:04      6.0    3.20    6.0
27-JUL-23 17:06      18.0   3.80   18.0
27-JUL-23 17:08      24.0   4.60   24.0
27-JUL-23 17:10      12.0   5.00   12.0
27-JUL-23 17:12      12.0   5.40   12.0
27-JUL-23 17:14      6.0    5.60    6.0
27-JUL-23 17:16      3.0    6.50    3.0
27-JUL-23 17:18      3.0    6.60    3.0
27-JUL-23 17:20      3.0    6.70    3.0
27-JUL-23 17:22      3.0    6.90    3.0
27-JUL-23 17:24      3.0    7.00    3.0
27-JUL-23 17:26      3.0    7.10    3.0
27-JUL-23 17:28      3.0    7.20    3.0
27-JUL-23 17:30      3.0    7.30    3.0
27-JUL-23 17:32      3.0    7.40    3.0
27-JUL-23 17:34      6.0    7.60    6.0
27-JUL-23 17:36      6.0    7.80    6.0
27-JUL-23 17:38      3.0    7.90    3.0
27-JUL-23 17:40      3.0    8.00    3.0
27-JUL-23 17:42      6.0    8.20    6.0
27-JUL-23 17:44      6.0    8.40    6.0
27-JUL-23 17:46      3.0    8.50    3.0
27-JUL-23 17:48      3.0    8.50    3.0
27-JUL-23 17:50      3.0    8.60    3.0
27-JUL-23 17:52      3.0    8.70    3.0
27-JUL-23 17:54      3.0    8.80    3.0
27-JUL-23 17:56      3.0    8.90    3.0
27-JUL-23 17:58      3.0    9.00    3.0
27-JUL-23 18:12      1.2    9.04    1.2
27-JUL-23 18:14      1.2    9.08    1.2
27-JUL-23 18:16      1.2    9.12    1.2
27-JUL-23 18:18      1.2    9.16    1.2
27-JUL-23 18:20      1.2    9.20    1.2
27-JUL-23 18:36      1.2    9.24    1.2
27-JUL-23 18:38      1.2    9.28    1.2
27-JUL-23 18:40      1.2    9.32    1.2
27-JUL-23 18:42      1.2    9.36    1.2
27-JUL-23 18:44      1.2    9.40    1.2
27-JUL-23 19:18      1.2    9.44    1.2
27-JUL-23 19:20      1.2    9.48    1.2
27-JUL-23 19:22      1.2    9.52    1.2
27-JUL-23 19:24      1.2    9.56    1.2
27-JUL-23 19:26      1.2    9.60    1.2
                                    ------  ------
 268 Mins.  Totals (ms) =    9.6     9.6
                             ------  ------


28-JUL-23 6:14       1.2    0.04    1.2
28-JUL-23 6:16       1.2    0.08    1.2
28-JUL-23 6:18       1.2    0.12    1.2
28-JUL-23 6:20       1.2    0.16    1.2
28-JUL-23 6:22       1.2    0.20    1.2
28-JUL-23 6:24       6.0    0.40    6.0
28-JUL-23 6:26       6.0    0.60    6.0
28-JUL-23 6:28       6.0    0.80    6.0
28-JUL-23 6:30       6.0    1.00    6.0
28-JUL-23 6:32       3.0    1.00    3.0
28-JUL-23 6:34       6.0    1.20    6.0
28-JUL-23 6:48       1.2    1.24    1.2
28-JUL-23 6:50       1.2    1.28    1.2
28-JUL-23 6:52       1.2    1.32    1.2
28-JUL-23 6:54       1.2    1.36    1.2
28-JUL-23 6:56       1.2    1.40    1.2
                                    ------  ------
 44 Mins.  Totals (ms) =     1.4     1.4
                             ------  ------


28-JUL-23 10:10      1.2    0.04    1.2
28-JUL-23 10:12      1.2    0.08    1.2
28-JUL-23 10:14      1.2    0.12    1.2
28-JUL-23 10:16      1.2    0.16    1.2
28-JUL-23 10:18      1.2    0.20    1.2
28-JUL-23 10:20      6.0    0.40    6.0
28-JUL-23 10:22      6.0    0.60    6.0
28-JUL-23 10:24      6.0    0.80    6.0
28-JUL-23 10:26      1.5    0.85    1.5
28-JUL-23 10:28      1.5    0.90    1.5
28-JUL-23 10:30      1.5    0.95    1.5
28-JUL-23 10:32      3.0    1.00    3.0
28-JUL-23 10:34      1.5    1.05    1.5
28-JUL-23 10:36      1.5    1.10    1.5
28-JUL-23 10:38      1.5    1.15    1.5
28-JUL-23 10:40      1.5    1.20    1.5
28-JUL-23 10:42      2.0    1.27    2.0
28-JUL-23 10:44      2.0    1.33    2.0
28-JUL-23 10:46      2.0    1.40    2.0
28-JUL-23 11:20      1.2    1.44    1.2
28-JUL-23 11:22      1.2    1.48    1.2
28-JUL-23 11:24      1.2    1.52    1.2
28-JUL-23 11:26      1.2    1.56    1.2
28-JUL-23 11:28      1.2    1.60    1.2
28-JUL-23 11:30      1.2    1.64    1.2
28-JUL-23 11:32      1.2    1.68    1.2
28-JUL-23 11:34      1.2    1.72    1.2
28-JUL-23 11:36      1.2    1.76    1.2
28-JUL-23 11:38      1.2    1.80    1.2
28-JUL-23 11:40      2.0    1.87    2.0
28-JUL-23 11:42      2.0    1.93    2.0
28-JUL-23 11:44      2.0    2.00    2.0
28-JUL-23 11:46      3.0    2.10    3.0
28-JUL-23 11:48      3.0    2.20    3.0
28-JUL-23 11:50      3.0    2.30    3.0
28-JUL-23 11:52      6.0    2.50    6.0
28-JUL-23 11:54      6.0    2.70    6.0
28-JUL-23 11:56      3.0    2.70    3.0
28-JUL-23 11:58      3.0    2.80    3.0
28-JUL-23 12:00      3.0    2.90    3.0
28-JUL-23 12:02      3.0    3.00    3.0
28-JUL-23 12:04      3.0    3.10    3.0
28-JUL-23 12:06      3.0    3.20    3.0
28-JUL-23 12:08      6.0    3.40    6.0
28-JUL-23 12:10      6.0    3.60    6.0
28-JUL-23 12:12      6.0    3.80    6.0
28-JUL-23 12:14      3.0    3.90    3.0
28-JUL-23 12:16      1.5    3.85    1.5
28-JUL-23 12:18      1.5    3.90    1.5
28-JUL-23 12:20      1.5    3.95    1.5
28-JUL-23 12:22      1.2    4.00    1.2
28-JUL-23 12:24      1.2    4.04    1.2
28-JUL-23 12:26      1.2    4.08    1.2
28-JUL-23 12:28      1.2    4.12    1.2
28-JUL-23 12:30      1.2    4.16    1.2
28-JUL-23 12:32      1.2    4.20    1.2
28-JUL-23 12:34      1.2    4.24    1.2
28-JUL-23 12:36      1.2    4.28    1.2
28-JUL-23 12:38      1.2    4.32    1.2
28-JUL-23 12:40      1.2    4.36    1.2
28-JUL-23 12:42      1.2    4.40    1.2
28-JUL-23 12:44      1.2    4.44    1.2
28-JUL-23 12:46      1.2    4.48    1.2
28-JUL-23 12:48      1.2    4.52    1.2
28-JUL-23 12:50      1.2    4.56    1.2
28-JUL-23 12:52      1.2    4.60    1.2
28-JUL-23 12:54      1.2    4.64    1.2
28-JUL-23 12:56      1.2    4.68    1.2
28-JUL-23 12:58      1.2    4.72    1.2
28-JUL-23 13:00      1.2    4.76    1.2
28-JUL-23 13:02      1.2    4.80    1.2
28-JUL-23 13:04      1.5    4.85    1.5
28-JUL-23 13:06      1.5    4.90    1.5
28-JUL-23 13:54      1.5    4.95    1.5
28-JUL-23 13:56      1.5    5.00    1.5
28-JUL-23 13:58      2.0    5.07    2.0
28-JUL-23 14:00      2.0    5.13    2.0
28-JUL-23 14:02      1.5    5.18    1.5
28-JUL-23 14:04      1.5    5.25    1.5
28-JUL-23 14:06      1.5    5.30    1.5
28-JUL-23 14:08      1.5    5.35    1.5
28-JUL-23 14:10      1.5    5.40    1.5
28-JUL-23 14:12      1.5    5.45    1.5
28-JUL-23 14:14      1.5    5.50    1.5
28-JUL-23 14:16      1.5    5.55    1.5
28-JUL-23 14:18      1.5    5.60    1.5
28-JUL-23 14:20      6.0    5.80    6.0
28-JUL-23 14:22      6.0    6.00    6.0
28-JUL-23 14:24      6.0    6.20    6.0
28-JUL-23 14:26      6.0    6.40    6.0
28-JUL-23 14:28      6.0    6.60    6.0
28-JUL-23 14:30      6.0    6.80    6.0
28-JUL-23 14:32      6.0    7.00    6.0
28-JUL-23 14:34      3.0    7.10    3.0
28-JUL-23 14:36      3.0    7.20    3.0
28-JUL-23 14:38      3.0    7.30    3.0
28-JUL-23 14:40      3.0    7.40    3.0
28-JUL-23 14:42      3.0    7.50    3.0
28-JUL-23 14:44      3.0    7.60    3.0
28-JUL-23 14:46      3.0    7.70    3.0
28-JUL-23 14:48      3.0    7.80    3.0
28-JUL-23 14:50      3.0    7.90    3.0
28-JUL-23 14:52      3.0    8.00    3.0
28-JUL-23 14:54      3.0    8.10    3.0
28-JUL-23 14:56      3.0    8.20    3.0
28-JUL-23 14:58      3.0    8.30    3.0
28-JUL-23 15:00      3.0    8.40    3.0
28-JUL-23 15:02      3.0    8.50    3.0
28-JUL-23 15:04      3.0    8.60    3.0
28-JUL-23 15:06      3.0    8.70    3.0
28-JUL-23 15:08      3.0    8.80    3.0
28-JUL-23 15:10      3.0    8.90    3.0
28-JUL-23 15:12      3.0    9.00    3.0
28-JUL-23 15:14      3.0    9.10    3.0
28-JUL-23 15:16      3.0    9.20    3.0
28-JUL-23 15:18      3.0    9.30    3.0
28-JUL-23 15:20      3.0    9.40    3.0
28-JUL-23 15:22      3.0    9.50    3.0
28-JUL-23 15:24      3.0    9.60    3.0
28-JUL-23 15:26      3.0    9.70    3.0
28-JUL-23 15:28      3.0    9.80    3.0
28-JUL-23 15:30      3.0    9.90    3.0
28-JUL-23 15:32      3.0    10.00   3.0
28-JUL-23 15:34      3.0    10.10   3.0
28-JUL-23 15:36      3.0    10.20   3.0
28-JUL-23 15:38      3.0    10.30   3.0
28-JUL-23 15:40      3.0    10.40   3.0
28-JUL-23 15:42      3.0    10.50   3.0
28-JUL-23 15:44      3.0    10.60   3.0
28-JUL-23 15:46      3.0    10.70   3.0
28-JUL-23 15:48      3.0    10.80   3.0
28-JUL-23 15:50      3.0    10.90   3.0
28-JUL-23 15:52      3.0    11.00   3.0
28-JUL-23 15:54      3.0    11.10   3.0
28-JUL-23 15:56      3.0    11.20   3.0
28-JUL-23 15:58      3.0    11.30   3.0
28-JUL-23 16:00      3.0    11.40   3.0
28-JUL-23 16:02      3.0    11.50   3.0
28-JUL-23 16:04      3.0    11.60   3.0
28-JUL-23 16:06      3.0    11.70   3.0
28-JUL-23 16:08      3.0    11.80   3.0
28-JUL-23 16:10      3.0    11.90   3.0
28-JUL-23 16:12      3.0    12.00   3.0
28-JUL-23 16:14      3.0    12.10   3.0
28-JUL-23 16:16      3.0    12.20   3.0
28-JUL-23 16:18      3.0    12.30   3.0
28-JUL-23 16:20      3.0    12.40   3.0
28-JUL-23 16:22      3.0    12.50   3.0
28-JUL-23 16:24      3.0    12.60   3.0
28-JUL-23 16:26      3.0    12.70   3.0
28-JUL-23 16:28      3.0    12.80   3.0
28-JUL-23 16:30      3.0    12.90   3.0
28-JUL-23 16:32      3.0    13.00   3.0
28-JUL-23 16:34      3.0    13.10   3.0
28-JUL-23 16:36      3.0    13.20   3.0
28-JUL-23 16:38      3.0    13.30   3.0
28-JUL-23 16:40      3.0    13.40   3.0
28-JUL-23 16:42      3.0    13.50   3.0
28-JUL-23 16:44      3.0    13.60   3.0
28-JUL-23 16:46      3.0    13.70   3.0
28-JUL-23 16:48      3.0    13.80   3.0
28-JUL-23 16:50      3.0    13.90   3.0
28-JUL-23 16:52      3.0    14.00   3.0
28-JUL-23 16:54      3.0    14.10   3.0
28-JUL-23 16:56      3.0    14.20   3.0
28-JUL-23 16:58      3.0    14.30   3.0
28-JUL-23 17:00      3.0    14.40   3.0
28-JUL-23 17:02      3.0    14.50   3.0
28-JUL-23 17:04      3.0    14.60   3.0
28-JUL-23 17:06      3.0    14.70   3.0
28-JUL-23 17:08      3.0    14.80   3.0
28-JUL-23 17:10      3.0    14.90   3.0
28-JUL-23 17:12      3.0    15.00   3.0
28-JUL-23 17:14      3.0    15.10   3.0
28-JUL-23 17:16      3.0    15.20   3.0
28-JUL-23 17:18      3.0    15.30   3.0
28-JUL-23 17:20      3.0    15.40   3.0
28-JUL-23 17:22      3.0    15.50   3.0
28-JUL-23 17:24      3.0    15.60   3.0
28-JUL-23 17:26      3.0    15.70   3.0
28-JUL-23 17:28      3.0    15.80   3.0
28-JUL-23 17:30      3.0    15.90   3.0
28-JUL-23 17:32      3.0    16.00   3.0
28-JUL-23 17:34      3.0    16.10   3.0
28-JUL-23 17:36      3.0    16.20   3.0
28-JUL-23 17:38      3.0    16.30   3.0
28-JUL-23 17:40      3.0    16.40   3.0
28-JUL-23 17:42      3.0    16.50   3.0
28-JUL-23 17:44      3.0    16.60   3.0
28-JUL-23 17:46      3.0    16.70   3.0
28-JUL-23 17:48      3.0    16.80   3.0
28-JUL-23 17:50      3.0    16.90   3.0
28-JUL-23 17:52      3.0    17.00   3.0
28-JUL-23 17:54      3.0    17.10   3.0
28-JUL-23 17:56      3.0    17.20   3.0
28-JUL-23 17:58      3.0    17.30   3.0
28-JUL-23 18:00      3.0    17.40   3.0
28-JUL-23 18:02      3.0    17.50   3.0
28-JUL-23 18:04      3.0    17.60   3.0
28-JUL-23 18:06      3.0    17.70   3.0
28-JUL-23 18:08      3.0    17.80   3.0
28-JUL-23 18:10      3.0    17.90   3.0
28-JUL-23 18:12      3.0    18.00   3.0
28-JUL-23 18:14      3.0    18.10   3.0
28-JUL-23 18:16      3.0    18.20   3.0
28-JUL-23 18:18      3.0    18.30   3.0
28-JUL-23 18:20      3.0    18.40   3.0
28-JUL-23 18:22      3.0    18.50   3.0
28-JUL-23 18:24      3.0    18.60   3.0
28-JUL-23 18:26      3.0    18.70   3.0
28-JUL-23 18:28      3.0    18.80   3.0
28-JUL-23 18:30      3.0    18.90   3.0
28-JUL-23 18:32      3.0    19.00   3.0
28-JUL-23 18:34      3.0    19.10   3.0
28-JUL-23 18:36      3.0    19.20   3.0
28-JUL-23 18:38      3.0    19.30   3.0
28-JUL-23 18:40      3.0    19.40   3.0
28-JUL-23 18:42      3.0    19.50   3.0
28-JUL-23 18:44      3.0    19.60   3.0
28-JUL-23 18:46      3.0    19.70   3.0
28-JUL-23 18:48      3.0    19.80   3.0
28-JUL-23 18:50      3.0    19.90   3.0
28-JUL-23 18:52      3.0    20.00   3.0
28-JUL-23 18:54      3.0    20.10   3.0
28-JUL-23 18:56      3.0    20.20   3.0
28-JUL-23 18:58      3.0    20.30   3.0
28-JUL-23 19:00      3.0    20.40   3.0
28-JUL-23 19:02      3.0    20.50   3.0
28-JUL-23 19:04      3.0    20.60   3.0
28-JUL-23 19:06      3.0    20.70   3.0
28-JUL-23 19:08      3.0    20.80   3.0
28-JUL-23 19:10      3.0    20.90   3.0
28-JUL-23 19:12      3.0    21.00   3.0
28-JUL-23 19:14      3.0    21.10   3.0
28-JUL-23 19:16      3.0    21.20   3.0
28-JUL-23 19:18      3.0    21.30   3.0
28-JUL-23 19:20      3.0    21.40   3.0
28-JUL-23 19:22      3.0    21.50   3.0
28-JUL-23 19:24      3.0    21.60   3.0
28-JUL-23 19:26      3.0    21.70   3.0
28-JUL-23 19:28      3.0    21.80   3.0
28-JUL-23 19:30      3.0    21.90   3.0
28-JUL-23 19:32      3.0    22.00   3.0
28-JUL-23 19:34      3.0    22.10   3.0
28-JUL-23 19:36      3.0    22.20   3.0
28-JUL-23 19:38      3.0    22.30   3.0
28-JUL-23 19:40      3.0    22.40   3.0
28-JUL-23 19:42      3.0    22.50   3.0
28-JUL-23 19:44      3.0    22.60   3.0
28-JUL-23 19:46      3.0    22.70   3.0
28-JUL-23 19:48      3.0    22.80   3.0
28-JUL-23 19:50      3.0    22.90   3.0
28-JUL-23 19:52      3.0    23.00   3.0
28-JUL-23 19:54      3.0    23.10   3.0
28-JUL-23 19:56      3.0    23.20   3.0
28-JUL-23 19:58      3.0    23.30   3.0
28-JUL-23 20:00      3.0    23.40   3.0
28-JUL-23 20:02      3.0    23.50   3.0
28-JUL-23 20:04      3.0    23.60   3.0
28-JUL-23 20:06      3.0    23.70   3.0
28-JUL-23 20:08      3.0    23.80   3.0
28-JUL-23 20:10      3.0    23.90   3.0
28-JUL-23 20:12      3.0    24.00   3.0
28-JUL-23 20:14      3.0    24.10   3.0
28-JUL-23 20:16      3.0    24.20   3.0
28-JUL-23 20:18      3.0    24.30   3.0
28-JUL-23 20:20      3.0    24.40   3.0
28-JUL-23 20:22      3.0    24.50   3.0
28-JUL-23 20:24      3.0    24.60   3.0
28-JUL-23 20:26      3.0    24.70   3.0
28-JUL-23 20:28      3.0    24.80   3.0
28-JUL-23 20:30      3.0    24.90   3.0
28-JUL-23 20:32      3.0    25.00   3.0
28-JUL-23 20:34      3.0    25.10   3.0
28-JUL-23 20:36      3.0    25.20   3.0
28-JUL-23 20:38      3.0    25.30   3.0
28-JUL-23 20:40      3.0    25.40   3.0
28-JUL-23 20:42      3.0    25.50   3.0
28-JUL-23 20:44      3.0    25.60   3.0
28-JUL-23 20:46      3.0    25.70   3.0
28-JUL-23 20:48      3.0    25.80   3.0
28-JUL-23 20:50      3.0    25.90   3.0
28-JUL-23 20:52      3.0    26.00   3.0
28-JUL-23 20:54      3.0    26.10   3.0
28-JUL-23 20:56      3.0    26.20   3.0
28-JUL-23 20:58      3.0    26.30   3.0
28-JUL-23 21:00      3.0    26.40   3.0
28-JUL-23 21:02      3.0    26.50   3.0
28-JUL-23 21:04      3.0    26.60   3.0
28-JUL-23 21:06      3.0    26.70   3.0
28-JUL-23 21:08      3.0    26.80   3.0
28-JUL-23 21:10      3.0    26.90   3.0
28-JUL-23 21:12      3.0    27.00   3.0
28-JUL-23 21:14      3.0    27.10   3.0
28-JUL-23 21:16      3.0    27.20   3.0
28-JUL-23 21:18      3.0    27.30   3.0
28-JUL-23 21:20      3.0    27.40   3.0
28-JUL-23 21:22      3.0    27.50   3.0
28-JUL-23 21:24      3.0    27.60   3.0
28-JUL-23 21:26      3.0    27.70   3.0
28-JUL-23 21:28      3.0    27.80   3.0
28-JUL-23 21:30      3.0    27.90   3.0
28-JUL-23 21:32      3.0    28.00   3.0
28-JUL-23 21:34      3.0    28.10   3.0
28-JUL-23 21:36      3.0    28.20   3.0
28-JUL-23 21:38      3.0    28.30   3.0
28-JUL-23 21:40      3.0    28.40   3.0
28-JUL-23 21:42      3.0    28.50   3.0
28-JUL-23 21:44      3.0    28.60   3.0
28-JUL-23 21:46      3.0    28.70   3.0
28-JUL-23 21:48      3.0    28.80   3.0
28-JUL-23 21:50      3.0    28.90   3.0
28-JUL-23 21:52      3.0    29.00   3.0
28-JUL-23 21:54      3.0    29.10   3.0
28-JUL-23 21:56      3.0    29.20   3.0
28-JUL-23 21:58      3.0    29.30   3.0
28-JUL-23 22:00      3.0    29.40   3.0
28-JUL-23 22:02      3.0    29.50   3.0
28-JUL-23 22:04      3.0    29.60   3.0
28-JUL-23 22:06      3.0    29.70   3.0
28-JUL-23 22:08      3.0    29.80   3.0
28-JUL-23 22:10      3.0    29.90   3.0
28-JUL-23 22:12      3.0    30.00   3.0
28-JUL-23 22:14      3.0    30.10   3.0
28-JUL-23 22:16      3.0    30.20   3.0
28-JUL-23 22:18      3.0    30.30   3.0
28-JUL-23 22:20      3.0    30.40   3.0
28-JUL-23 22:22      3.0    30.50   3.0
28-JUL-23 22:24      3.0    30.60   3.0
28-JUL-23 22:26      3.0    30.70   3.0
28-JUL-23 22:28      3.0    30.80   3.0
28-JUL-23 22:30      3.0    30.90   3.0
28-JUL-23 22:32      3.0    31.00   3.0
28-JUL-23 22:34      3.0    31.10   3.0
28-JUL-23 22:36      3.0    31.20   3.0
28-JUL-23 22:38      3.0    31.30   3.0
28-JUL-23 22:40      3.0    31.40   3.0
28-JUL-23 22:42      3.0    31.50   3.0
28-JUL-23 22:44      3.0    31.60   3.0
28-JUL-23 22:46      3.0    31.70   3.0
28-JUL-23 22:48      3.0    31.80   3.0
                                    ------  ------
 394 Mins.  Totals (ms) =    11.6    11.6
                             ------  ------


30-JUL-23  9:54      1.2    0.04    1.2
30-JUL-23  9:56      1.2    0.08    1.2
30-JUL-23  9:58      1.2    0.12    1.2
30-JUL-23 10:00      1.2    0.16    1.2
30-JUL-23 10:02      1.2    0.20    1.2
                                    ------  ------
  10 Mins.  Totals (ms) =     0.2     0.2
                             ------  ------


30-JUL-23 15:10      1.5    0.05    1.5
30-JUL-23 15:12      1.5    0.10    1.5
30-JUL-23 15:14      1.5    0.15    1.5
30-JUL-23 15:16      1.5    0.20    1.5
30-JUL-23 15:18     18.0    0.80   18.0
30-JUL-23 15:20     12.0    1.20   12.0
30-JUL-23 15:22     18.0    1.80   18.0
30-JUL-23 15:24      6.0    2.00    6.0
30-JUL-23 16:20      1.2    2.24    1.2
30-JUL-23 16:22      1.2    2.28    1.2
30-JUL-23 16:24      1.2    2.32    1.2
30-JUL-23 16:26      1.2    2.36    1.2
30-JUL-23 16:28      1.2    2.40    1.2
30-JUL-23 17:02      1.2    2.44    1.2
30-JUL-23 17:04      1.2    2.48    1.2
30-JUL-23 17:06      1.2    2.52    1.2
30-JUL-23 17:08      1.2    2.56    1.2
30-JUL-23 17:10      1.5    2.65    1.5
30-JUL-23 17:14      1.5    2.70    1.5
```

```
30-JUL-23 17:16      1.5   2.75    1.5
30-JUL-23 17:18      1.5   2.00    1.5
                   ------  ------
  130 Mins.  Totals (mm) =   2.8     2.8
                   ======  ======


31-JUL-23 12:52      1.2   0.04    1.2
31-JUL-23 12:54      1.2   0.08    1.2
31-JUL-23 12:56      1.2   0.12    1.2
31-JUL-23 12:58      1.2   0.16    1.2
31-JUL-23 13:00      1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


31-JUL-23 14:08      1.2   0.04    1.2
31-JUL-23 14:10      1.2   0.08    1.2
31-JUL-23 14:12      1.2   0.12    1.2
31-JUL-23 14:14      1.2   0.16    1.2
31-JUL-23 14:16      1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


31-JUL-23 20:06      1.5   0.05    1.5
31-JUL-23 20:08      1.5   0.10    1.5
31-JUL-23 20:10      1.5   0.15    1.5
31-JUL-23 20:12      1.5   0.20    1.5
31-JUL-23 20:14     12.0   0.60   12.0
31-JUL-23 20:16      3.0   0.70    3.0
31-JUL-23 20:18      3.0   0.80    3.0
31-JUL-23 20:20      3.0   0.90    3.0
31-JUL-23 20:24      1.2   0.88    1.2
31-JUL-23 20:26      1.2   0.92    1.2
31-JUL-23 20:28      1.2   0.96    1.2
31-JUL-23 20:30      1.2   1.00    1.2
31-JUL-23 20:32      1.2   1.04    1.2
31-JUL-23 21:00      1.2   1.08    1.2
31-JUL-23 21:02      1.2   1.12    1.2
31-JUL-23 21:04      1.2   1.16    1.2
31-JUL-23 21:06      1.2   1.20    1.2
                   ------  ------
   62 Mins.  Totals (mm) =   1.2     1.2
                   ======  ======


31-JUL-23 22:12      1.2   0.04    1.2
31-JUL-23 22:14      1.2   0.08    1.2
31-JUL-23 22:16      1.2   0.12    1.2
31-JUL-23 22:18      1.2   0.16    1.2
31-JUL-23 22:20      1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


4-AUG-23 15:38       1.2   0.04    1.2
4-AUG-23 15:40       1.2   0.08    1.2
4-AUG-23 15:42       1.2   0.12    1.2
4-AUG-23 15:44       1.2   0.16    1.2
4-AUG-23 15:46       1.2   0.20    1.2
4-AUG-23 15:48       6.0   0.60    6.0
4-AUG-23 15:50       6.0   0.60    6.0
                   ------  ------
   14 Mins.  Totals (mm) =   0.6     0.6
                   ======  ======


5-AUG-23  4:16       1.2   0.04    1.2
5-AUG-23  4:18       1.2   0.08    1.2
5-AUG-23  4:20       1.2   0.12    1.2
5-AUG-23  4:22       1.2   0.16    1.2
5-AUG-23  4:24       1.2   0.20    1.2
5-AUG-23  4:26       3.0   0.30    3.0
5-AUG-23  4:28       3.0   0.40    3.0
5-AUG-23  4:30       3.0   0.50    3.0
5-AUG-23  4:32       3.0   0.70    3.0
5-AUG-23  4:34       3.0   0.80    3.0
5-AUG-23  4:36       6.0   1.00    6.0
5-AUG-23  4:38       3.0   1.10    3.0
5-AUG-23  4:40       3.0   1.20    3.0
5-AUG-23  4:42       2.0   1.27    2.0
5-AUG-23  4:44       2.0   1.33    2.0
5-AUG-23  4:46       2.0   1.40    2.0
5-AUG-23  4:48       1.2   1.44    1.2
5-AUG-23  4:50       1.2   1.48    1.2
5-AUG-23  4:52       1.2   1.52    1.2
5-AUG-23  4:54       1.2   1.56    1.2
5-AUG-23  4:56       1.2   1.60    1.2
                   ------  ------
   42 Mins.  Totals (mm) =   1.6     1.6
                   ======  ======


5-AUG-23  8:12       1.2   0.04    1.2
5-AUG-23  8:14       1.2   0.08    1.2
5-AUG-23  8:16       1.2   0.12    1.2
5-AUG-23  8:18       1.2   0.16    1.2
5-AUG-23  8:20       1.2   0.20    1.2
5-AUG-23  9:18       1.2   0.24    1.2
5-AUG-23  9:20       1.2   0.28    1.2
5-AUG-23  9:22       1.2   0.32    1.2
5-AUG-23  9:24       1.2   0.36    1.2
5-AUG-23  9:26       1.2   0.40    1.2
5-AUG-23  9:28       2.0   0.47    2.0
5-AUG-23  9:30       2.0   0.53    2.0
5-AUG-23  9:32       2.0   0.60    2.0
5-AUG-23  9:34       2.0   0.67    2.0
5-AUG-23  9:36       2.0   0.73    2.0
5-AUG-23  9:38       2.0   0.80    2.0
5-AUG-23  9:40       3.0   0.90    3.0
5-AUG-23  9:50       6.0   1.00    6.0
5-AUG-23  9:52       1.2   1.04    1.2
5-AUG-23  9:54       1.2   1.08    1.2
5-AUG-23  9:56       1.2   1.12    1.2
5-AUG-23  9:58       1.2   1.16    1.2
5-AUG-23 10:00       3.0   1.26    3.0
5-AUG-23 10:02       3.0   1.30    3.0
5-AUG-23 10:04       3.0   1.40    3.0
5-AUG-23 10:06       3.0   1.50    3.0
5-AUG-23 10:08       3.0   1.60    3.0
5-AUG-23 10:10       3.0   1.70    3.0
5-AUG-23 10:12       3.0   1.80    3.0
5-AUG-23 10:14       3.0   1.90    3.0
5-AUG-23 10:16       3.0   1.98    3.0
5-AUG-23 10:22       1.2   2.04    1.2
5-AUG-23 10:24       1.2   2.08    1.2
5-AUG-23 10:26       1.2   2.12    1.2
5-AUG-23 10:28       1.2   2.16    1.2
5-AUG-23 10:30       1.2   2.20    1.2
5-AUG-23 10:32       1.2   2.24    1.2
5-AUG-23 10:34       1.2   2.28    1.2
5-AUG-23 10:36       1.2   2.32    1.2
5-AUG-23 10:38       1.2   2.36    1.2
5-AUG-23 10:40       1.2   2.40    1.2
5-AUG-23 10:52       1.5   2.45    1.5
5-AUG-23 10:54       1.5   2.50    1.5
5-AUG-23 10:56       1.5   2.55    1.5
5-AUG-23 10:58       1.5   2.60    1.5
                   ------  ------
  168 Mins.  Totals (mm) =   2.6     2.6
                   ======  ======


5-AUG-23 13:48       1.2   0.04    1.2
5-AUG-23 13:50       1.2   0.08    1.2
5-AUG-23 13:52       1.2   0.12    1.2
5-AUG-23 13:54       1.2   0.16    1.2
5-AUG-23 13:56       1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


5-AUG-23 16:30       1.2   0.04    1.2
5-AUG-23 16:32       1.2   0.08    1.2
5-AUG-23 16:34       1.2   0.12    1.2
5-AUG-23 16:36       1.2   0.16    1.2
5-AUG-23 16:38       1.2   0.20    1.2
5-AUG-23 16:40       6.0   0.40    6.0
5-AUG-23 16:42       3.0   0.50    3.0
5-AUG-23 16:44       3.0   0.60    3.0
5-AUG-23 17:30       1.2   0.64    1.2
5-AUG-23 17:32       1.2   0.68    1.2
5-AUG-23 17:34       1.2   0.72    1.2
5-AUG-23 17:36       1.2   0.76    1.2
5-AUG-23 17:38       1.2   0.80    1.2
5-AUG-23 17:40       6.0   1.00    6.0
5-AUG-23 17:42       3.0   1.10    3.0
5-AUG-23 17:44       3.0   1.20    3.0
5-AUG-23 17:46       1.5   1.25    1.5
5-AUG-23 17:48       1.5   1.30    1.5
5-AUG-23 17:50       1.5   1.35    1.5
5-AUG-23 17:52       1.2   1.40    1.2
5-AUG-23 18:04       1.2   1.44    1.2
5-AUG-23 18:06       1.2   1.48    1.2
5-AUG-23 18:08       1.2   1.52    1.2
5-AUG-23 18:10       1.2   1.56    1.2
5-AUG-23 18:12       1.2   1.60    1.2
5-AUG-23 18:14       6.0   1.80    6.0
5-AUG-23 18:16      12.0   2.20   12.0
5-AUG-23 18:18       6.0   2.40    6.0
5-AUG-23 18:20       3.0   2.50    3.0
5-AUG-23 18:22       3.0   2.60    3.0
5-AUG-23 18:24       2.0   2.67    2.0
5-AUG-23 18:26       2.0   2.73    2.0
5-AUG-23 18:28       2.0   2.80    2.0
5-AUG-23 18:30       2.0   2.87    2.0
5-AUG-23 18:32       2.0   2.93    2.0
5-AUG-23 18:34       2.0   3.00    2.0
                   ------  ------
  126 Mins.  Totals (mm) =   3.0     3.0
                   ======  ======


5-AUG-23 19:44       1.2   0.04    1.2
5-AUG-23 19:46       1.2   0.08    1.2
5-AUG-23 19:48       1.2   0.12    1.2
5-AUG-23 19:50       1.2   0.16    1.2
5-AUG-23 19:52       1.2   0.20    1.2
5-AUG-23 19:54       2.0   0.27    2.0
5-AUG-23 19:56       2.0   0.33    2.0
5-AUG-23 19:58       2.0   0.40    2.0
                   ------  ------
   16 Mins.  Totals (mm) =   0.4     0.4
                   ======  ======


5-AUG-23 23:28       3.0   0.10    3.0
5-AUG-23 23:30       3.0   0.20    3.0
6-AUG-23  0:18       1.2   0.24    1.2
6-AUG-23  0:20       1.2   0.28    1.2
6-AUG-23  0:22       1.2   0.32    1.2
6-AUG-23  0:24       1.2   0.36    1.2
6-AUG-23  0:26       1.2   0.40    1.2
6-AUG-23  0:52       1.2   0.44    1.2
6-AUG-23  0:54       1.2   0.48    1.2
6-AUG-23  0:56       1.2   0.52    1.2
6-AUG-23  0:58       1.2   0.56    1.2
6-AUG-23  1:00       1.2   0.60    1.2
6-AUG-23  1:16       1.2   0.64    1.2
6-AUG-23  1:18       1.2   0.68    1.2
6-AUG-23  1:20       1.2   0.72    1.2
6-AUG-23  1:22       1.2   0.76    1.2
6-AUG-23  1:24       1.2   0.80    1.2
6-AUG-23  1:26       3.0   0.90    3.0
6-AUG-23  1:28       3.0   1.00    3.0
6-AUG-23  1:30       1.2   1.04    1.2
6-AUG-23  1:32       1.2   1.08    1.2
6-AUG-23  1:34       1.2   1.12    1.2
6-AUG-23  1:36       1.2   1.16    1.2
6-AUG-23  1:38       1.2   1.20    1.2
6-AUG-23  1:42       1.2   1.24    1.2
6-AUG-23  1:44       1.2   1.28    1.2
6-AUG-23  1:46       1.2   1.32    1.2
6-AUG-23  1:48       1.2   1.36    1.2
6-AUG-23  1:50       1.2   1.40    1.2
                   ------  ------
  144 Mins.  Totals (mm) =   1.4     1.4
                   ======  ======


6-AUG-23  4:40       1.2   0.04    1.2
6-AUG-23  4:42       1.2   0.08    1.2
6-AUG-23  4:44       1.2   0.12    1.2
6-AUG-23  4:46       1.2   0.16    1.2
6-AUG-23  4:48       1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


6-AUG-23 12:06       1.2   0.04    1.2
6-AUG-23 12:08       1.2   0.08    1.2
6-AUG-23 12:10       1.2   0.12    1.2
6-AUG-23 12:12       1.2   0.16    1.2
6-AUG-23 12:14       1.2   0.20    1.2
6-AUG-23 12:28       1.2   0.24    1.2
6-AUG-23 12:30       1.2   0.28    1.2
6-AUG-23 12:32       1.2   0.32    1.2
6-AUG-23 12:34       1.2   0.36    1.2
6-AUG-23 12:36       1.2   0.40    1.2
                   ------  ------
   32 Mins.  Totals (mm) =   0.4     0.4
                   ======  ======


7-AUG-23  5:28       1.2   0.04    1.2
7-AUG-23  5:30       1.2   0.08    1.2
7-AUG-23  5:32       1.2   0.12    1.2
7-AUG-23  5:34       1.2   0.16    1.2
7-AUG-23  5:36       1.2   0.20    1.2
7-AUG-23  5:50       1.2   0.24    1.2
7-AUG-23  5:52       1.2   0.28    1.2
7-AUG-23  5:54       1.2   0.32    1.2
7-AUG-23  5:56       1.2   0.36    1.2
7-AUG-23  5:58       1.2   0.40    1.2
7-AUG-23  6:00       2.0   0.47    2.0
7-AUG-23  6:02       2.0   0.53    2.0
7-AUG-23  6:04       2.0   0.60    2.0
7-AUG-23  6:06       6.0   0.80    6.0
7-AUG-23  6:08       2.0   0.87    2.0
7-AUG-23  6:10       2.0   0.93    2.0
7-AUG-23  6:12       2.0   1.00    2.0
7-AUG-23  6:14       3.0   1.10    3.0
7-AUG-23  6:16       3.0   1.20    3.0
                   ------  ------
   50 Mins.  Totals (mm) =   1.2     1.2
                   ======  ======


7-AUG-23 10:02       1.2   0.04    1.2
7-AUG-23 10:04       1.2   0.08    1.2
7-AUG-23 10:06       1.2   0.12    1.2
7-AUG-23 10:08       1.2   0.16    1.2
7-AUG-23 10:10       1.2   0.20    1.2
7-AUG-23 10:12       2.0   0.27    2.0
7-AUG-23 10:14       2.0   0.33    2.0
7-AUG-23 10:16       2.0   0.40    2.0
7-AUG-23 10:18       3.0   0.50    3.0
7-AUG-23 10:20       3.0   0.60    3.0
7-AUG-23 10:22       3.0   0.70    3.0
7-AUG-23 10:24       3.0   0.80    3.0
7-AUG-23 10:26       3.0   0.90    3.0
7-AUG-23 10:28       3.0   1.00    3.0
7-AUG-23 10:30       3.0   1.10    3.0
7-AUG-23 10:32       3.0   1.20    3.0
7-AUG-23 10:34       3.0   1.30    3.0
7-AUG-23 10:36       3.0   1.40    3.0
7-AUG-23 10:38       2.0   1.47    2.0
7-AUG-23 10:40       2.0   1.53    2.0
7-AUG-23 10:42       2.0   1.60    2.0
7-AUG-23 10:44       2.0   1.67    2.0
7-AUG-23 10:46       2.0   1.73    2.0
7-AUG-23 10:48       2.0   1.80    2.0
7-AUG-23 10:50       3.0   1.90    3.0
7-AUG-23 10:52       3.0   2.00    3.0
7-AUG-23 10:54       3.0   2.10    3.0
7-AUG-23 10:56       3.0   2.20    3.0
7-AUG-23 10:58       3.0   2.30    3.0
7-AUG-23 11:00       3.0   2.40    3.0
7-AUG-23 11:02       3.0   2.50    3.0
7-AUG-23 11:04       3.0   2.60    3.0
7-AUG-23 11:06       6.0   2.80    6.0
7-AUG-23 11:08       6.0   3.00    6.0
7-AUG-23 11:10       2.0   3.07    2.0
7-AUG-23 11:12       2.0   3.13    2.0
7-AUG-23 11:14       2.0   3.20    2.0
7-AUG-23 11:16      12.0   3.60   12.0
7-AUG-23 11:18       6.0   3.80    6.0
7-AUG-23 11:20       2.0   3.87    2.0
7-AUG-23 11:22       2.0   3.93    2.0
7-AUG-23 11:24       2.0   4.00    2.0
7-AUG-23 11:26       2.0   4.07    2.0
7-AUG-23 11:28       2.0   4.13    2.0
7-AUG-23 11:30       2.0   4.20    2.0
7-AUG-23 11:32       2.0   4.27    2.0
7-AUG-23 11:34       2.0   4.33    2.0
7-AUG-23 11:36       2.0   4.40    2.0
7-AUG-23 11:38       6.0   4.60    6.0
7-AUG-23 11:40       3.0   4.70    3.0
7-AUG-23 11:42       3.0   4.80    3.0
7-AUG-23 11:44       6.0   5.00    6.0
7-AUG-23 11:46       6.0   5.20    6.0
7-AUG-23 11:48       6.0   5.40    6.0
7-AUG-23 11:50      12.0   5.80   12.0
7-AUG-23 11:52       6.0   6.00    6.0
7-AUG-23 11:54       3.0   6.10    3.0
7-AUG-23 11:56       3.0   6.30    3.0
7-AUG-23 11:58       3.0   6.40    3.0
                   ------  ------
  118 Mins.  Totals (mm) =   6.4     6.4
                   ======  ======


7-AUG-23 17:02       1.2   0.04    1.2
7-AUG-23 17:04       1.2   0.08    1.2
7-AUG-23 17:06       1.2   0.12    1.2
7-AUG-23 17:08       1.2   0.16    1.2
7-AUG-23 17:10       1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


7-AUG-23 18:26       1.2   0.04    1.2
7-AUG-23 18:28       1.2   0.08    1.2
7-AUG-23 18:30       1.2   0.12    1.2
7-AUG-23 18:32       1.2   0.16    1.2
7-AUG-23 18:34       1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


7-AUG-23 20:56       1.2   0.04    1.2
7-AUG-23 20:58       1.2   0.08    1.2
7-AUG-23 21:00       1.2   0.12    1.2
7-AUG-23 21:02       1.2   0.16    1.2
7-AUG-23 21:04       1.2   0.20    1.2
7-AUG-23 21:52       1.5   0.25    1.5
7-AUG-23 21:54       1.5   0.30    1.5
7-AUG-23 21:56       1.5   0.35    1.5
7-AUG-23 21:58       1.5   0.40    1.5
7-AUG-23 22:00       6.0   0.60    6.0
                   ------  ------
   66 Mins.  Totals (mm) =   0.6     0.6
                   ======  ======


8-AUG-23  0:02       1.2   0.04    1.2
8-AUG-23  0:04       1.2   0.08    1.2
8-AUG-23  0:06       1.2   0.12    1.2
8-AUG-23  0:08       1.2   0.16    1.2
8-AUG-23  0:10       1.2   0.20    1.2
                   ------  ------
   10 Mins.  Totals (mm) =   0.2     0.2
                   ======  ======


9-AUG-23  7:16       6.0   0.20    6.0
9-AUG-23  7:54       1.2   0.24    1.2
9-AUG-23  7:56       1.2   0.28    1.2
9-AUG-23  7:58       1.2   0.32    1.2
9-AUG-23  8:00       1.2   0.36    1.2
9-AUG-23  8:02       1.2   0.40    1.2
9-AUG-23  8:04       1.2   0.44    1.2
9-AUG-23  8:06       1.5   0.50    1.5
9-AUG-23  8:08       1.5   0.55    1.5
9-AUG-23  8:10       1.5   0.60    1.5
                   ------  ------
   56 Mins.  Totals (mm) =   0.6     0.6
                   ======  ======


9-AUG-23 12:42       1.5   0.05    1.5
9-AUG-23 12:44       1.5   0.10    1.5
9-AUG-23 12:46       1.5   0.15    1.5
```

```
 9-AUG-23 12:48      1.5   0.20    1.5
 9-AUG-23 12:50      6.0   0.40    6.0
 9-AUG-21 12:52      6.0   0.60    6.0
 9-AUG-23 12:54      6.0   0.80    6.0

                   ------  ------
  14 Mins.  Totals (mm) =   0.8     0.8
                   ------  ------


11-AUG-23 11:04      1.2   0.04    1.2
11-AUG-23 11:06      1.2   0.08    1.2
11-AUG-21 11:08      1.2   0.12    1.2
11-AUG-23 11:10      1.2   0.16    1.2
11-AUG-23 11:12      1.2   0.20    1.2
11-AUG-23 11:14      1.2   0.24    1.2
11-AUG-23 11:16      3.0   0.50    3.0
11-AUG-21 11:18      3.0   0.60    3.0
11-AUG-23 12:10      1.5   0.65    1.5
11-AUG-23 12:12      1.5   0.70    1.5
11-AUG-23 12:14      1.5   0.75    1.5
11-AUG-23 12:16      1.5   0.80    1.5
11-AUG-21 12:18      6.0   1.00    6.0
11-AUG-23 12:20      3.0   1.10    3.0
11-AUG-23 12:22      3.0   1.20    3.0
11-AUG-23 12:24      1.5   1.25    1.5
11-AUG-23 12:26      1.5   1.30    1.5
11-AUG-23 12:28      1.5   1.35    1.5
11-AUG-23 12:30      1.5   1.40    1.5
11-AUG-23 12:54      1.2   1.44    1.2
11-AUG-23 12:56      1.2   1.48    1.2
11-AUG-23 12:58      1.2   1.52    1.2
11-AUG-23 13:00      1.2   1.56    1.2
11-AUG-23 13:02      1.2   1.60    1.2

                   ------  ------
 120 Mins.  Totals (mm) =   1.6     1.6
                   ------  ------


12-AUG-23 13:58      1.2   0.04    1.2
12-AUG-21 14:00      1.2   0.08    1.2
12-AUG-23 14:02      1.2   0.12    1.2
12-AUG-23 14:04      1.2   0.16    1.2
12-AUG-21 14:06      1.2   0.20    1.2
12-AUG-23 14:08      6.0   0.40    6.0
12-AUG-21 14:10     18.0   1.00   18.0
12-AUG-23 14:12     10.0   1.20   10.0
12-AUG-23 14:14     10.0   2.00   10.0
12-AUG-21 14:16      6.0   2.20    6.0
12-AUG-21 14:18      6.0   2.40    6.0

                   ------  ------
  22 Mins.  Totals (mm) =   2.4     2.4
                   ------  ------


14-AUG-23  7:58      6.0   0.20    6.0
14-AUG-21  8:24      1.2   0.24    1.2
14-AUG-21  8:26      1.2   0.28    1.2
14-AUG-21  8:28      1.2   0.32    1.2
14-AUG-23  8:30      1.2   0.36    1.2
14-AUG-23  8:32      1.2   0.40    1.2
14-AUG-21  8:44      1.2   0.44    1.2
14-AUG-23  8:48      1.2   0.48    1.2
14-AUG-21  8:50      1.2   0.52    1.2
14-AUG-21  8:52      1.2   0.56    1.2
14-AUG-21  8:54      1.2   0.60    1.2
14-AUG-23  9:28      1.2   0.64    1.2
14-AUG-23  9:30      1.2   0.68    1.2
14-AUG-23  9:32      1.2   0.72    1.2
14-AUG-21  9:34      1.2   0.76    1.2
14-AUG-21  9:36      1.2   0.80    1.2
14-AUG-23 10:06      1.2   0.84    1.2
14-AUG-23 10:08      1.2   0.88    1.2
14-AUG-23 10:10      1.2   0.92    1.2
14-AUG-21 10:12      1.2   0.96    1.2
14-AUG-23 10:14      1.2   1.00    1.2

                   ------  ------
 138 Mins.  Totals (mm) =   1.0     1.0
                   ------  ------


14-AUG-23 13:04      1.2   0.04    1.2
14-AUG-23 13:06      1.2   0.08    1.2
14-AUG-21 13:08      1.2   0.12    1.2
14-AUG-23 13:10      1.2   0.16    1.2
14-AUG-21 13:12      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


16-AUG-23 17:06      6.0   0.20    6.0

                   ------  ------
   2 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


14-AUG-21 19:12      1.2   0.04    1.2
14-AUG-21 19:14      1.2   0.08    1.2
14-AUG-23 19:16      1.2   0.12    1.2
14-AUG-23 19:18      1.2   0.16    1.2
14-AUG-23 19:20      1.2   0.20    1.2
14-AUG-23 19:24      1.2   0.24    1.2
14-AUG-21 19:26      1.2   0.28    1.2
14-AUG-21 19:28      1.2   0.32    1.2
14-AUG-23 19:30      1.2   0.36    1.2
14-AUG-23 19:32      1.2   0.40    1.2
14-AUG-23 19:34      1.5   0.45    1.5
14-AUG-23 19:36      1.5   0.50    1.5
14-AUG-23 19:38      1.5   0.55    1.5
14-AUG-23 19:40      1.5   0.60    1.5

                   ------  ------
  30 Mins.  Totals (mm) =   0.6     0.6
                   ------  ------


16-AUG-21  6:18      1.2   0.04    1.2
16-AUG-21  6:20      1.2   0.08    1.2
16-AUG-21  6:22      1.2   0.12    1.2
16-AUG-21  6:24      1.2   0.16    1.2
16-AUG-21  6:26      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


19-AUG-23  4:06      1.2   0.04    1.2
19-AUG-21  4:08      1.2   0.08    1.2
19-AUG-21  4:10      1.2   0.12    1.2
19-AUG-23  4:12      1.2   0.16    1.2
19-AUG-21  4:14      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


19-AUG-21  8:28      1.2   0.04    1.2
19-AUG-21  8:30      1.2   0.08    1.2
19-AUG-23  8:32      1.2   0.12    1.2
19-AUG-21  8:34      1.2   0.16    1.2
19-AUG-23  8:36      1.2   0.20    1.2
19-AUG-23  8:38      2.0   0.27    2.0
19-AUG-21  8:40      2.0   0.33    2.0
19-AUG-23  8:42      2.0   0.40    2.0

                   ------  ------
  16 Mins.  Totals (mm) =   0.4     0.4
                   ------  ------


19-AUG-23 10:52      1.2   0.04    1.2
19-AUG-23 10:54      1.2   0.08    1.2
19-AUG-21 10:56      1.2   0.12    1.2
19-AUG-23 10:58      1.2   0.16    1.2
19-AUG-21 11:00      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


20-AUG-21  7:30      1.2   0.04    1.2
20-AUG-23  7:32      1.2   0.08    1.2
20-AUG-21  7:34      1.2   0.12    1.2
20-AUG-23  7:36      1.2   0.16    1.2
20-AUG-23  7:38      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


20-AUG-23 12:42      1.2   0.04    1.2
20-AUG-23 12:44      1.2   0.08    1.2
20-AUG-23 12:46      1.2   0.12    1.2
20-AUG-23 12:48      1.2   0.16    1.2
20-AUG-23 12:50      1.2   0.20    1.2
20-AUG-23 13:10      1.2   0.24    1.2
20-AUG-23 13:12      1.2   0.28    1.2
20-AUG-21 13:24      1.2   0.32    1.2
20-AUG-23 13:26      1.2   0.36    1.2
20-AUG-23 13:28      1.2   0.40    1.2
20-AUG-23 13:30      6.0   0.80    6.0
20-AUG-23 13:32      6.0   1.00    6.0
20-AUG-23 13:34      3.0   1.10    3.0
20-AUG-23 13:36      3.0   1.20    3.0
20-AUG-23 13:38      3.0   1.30    3.0
20-AUG-23 13:40      3.0   1.40    3.0
20-AUG-23 13:42      6.0   1.60    6.0
20-AUG-23 13:44      6.0   1.80    6.0
20-AUG-23 13:46      6.0   2.00    6.0
20-AUG-23 13:48      2.0   2.07    2.0
20-AUG-23 13:50      2.0   2.13    2.0
20-AUG-23 13:52      2.0   2.20    2.0
20-AUG-23 13:54      6.0   2.40    6.0
20-AUG-23 13:56      6.0   2.60    6.0
20-AUG-23 13:58      2.0   2.67    2.0
20-AUG-23 14:00      2.0   2.73    2.0
20-AUG-23 14:02      2.0   2.80    2.0
20-AUG-23 14:04      2.0   2.87    2.0
20-AUG-23 14:06      2.0   2.93    2.0
20-AUG-23 14:08      2.0   3.00    2.0
20-AUG-23 14:10      3.0   3.10    3.0
20-AUG-23 14:12      3.0   3.20    3.0

                   ------  ------
  92 Mins.  Totals (mm) =   3.2     3.2
                   ------  ------


20-AUG-21 15:54      1.2   0.04    1.2
20-AUG-23 15:56      1.2   0.08    1.2
20-AUG-23 15:58      1.2   0.12    1.2
20-AUG-21 16:00      1.2   0.16    1.2
20-AUG-21 16:02      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


20-AUG-23 18:08      1.2   0.04    1.2
20-AUG-23 18:10      1.2   0.08    1.2
20-AUG-23 18:12      1.2   0.12    1.2
20-AUG-23 18:14      1.2   0.16    1.2
20-AUG-23 18:16      1.2   0.20    1.2
20-AUG-23 18:40      1.2   0.24    1.2
20-AUG-23 18:42      1.2   0.28    1.2
20-AUG-23 18:44      1.2   0.32    1.2
20-AUG-23 18:46      1.2   0.36    1.2
20-AUG-23 18:48      1.2   0.40    1.2
20-AUG-23 19:02      1.2   0.44    1.2
20-AUG-23 19:04      1.2   0.48    1.2
20-AUG-23 19:06      1.2   0.52    1.2
20-AUG-23 19:08      1.2   0.56    1.2
20-AUG-23 19:10      1.2   0.60    1.2

                   ------  ------
  64 Mins.  Totals (mm) =   0.6     0.6
                   ------  ------


21-AUG-21  4:08      1.2   0.04    1.2
21-AUG-23  4:10      1.2   0.08    1.2
21-AUG-21  4:12      1.2   0.12    1.2
21-AUG-21  4:14      1.2   0.16    1.2
21-AUG-23  4:16      1.2   0.20    1.2
21-AUG-23  4:18      1.5   0.25    1.5
21-AUG-21  4:20      1.5   0.30    1.5
21-AUG-21  4:22      1.5   0.35    1.5
21-AUG-21  4:24      1.5   0.40    1.5
21-AUG-23  4:26      6.0   0.60    6.0
21-AUG-23  4:28      6.0   0.80    6.0
21-AUG-21  4:30     24.0   1.60   24.0
21-AUG-21  4:32     12.0   2.00   12.0
21-AUG-21  4:34     24.0   2.80   24.0
21-AUG-23  4:36     12.0   3.20   12.0
21-AUG-23  4:38      6.0   3.40    6.0
21-AUG-21  4:40     12.0   3.80   12.0
21-AUG-23  4:42      6.0   4.00    6.0
21-AUG-23  4:44      6.0   4.20    6.0
21-AUG-21  4:46      3.0   4.30    3.0
21-AUG-23  4:48      3.0   4.40    3.0
21-AUG-21  4:50      2.0   4.47    2.0
21-AUG-23  4:52      2.0   4.53    2.0
21-AUG-23  4:54      2.0   4.60    2.0
21-AUG-21  4:56      1.2   4.64    1.2
21-AUG-23  4:58      1.2   4.68    1.2
21-AUG-23  5:00      1.2   4.72    1.2
21-AUG-23  5:02      1.2   4.76    1.2
21-AUG-23  5:04      1.2   4.80    1.2
21-AUG-23  5:06      1.2   4.84    1.2
21-AUG-23  5:08      1.2   4.88    1.2
21-AUG-23  5:10      1.2   4.92    1.2
21-AUG-23  5:12      1.2   4.96    1.2
21-AUG-21  5:14      1.2   5.00    1.2
21-AUG-23  5:18      1.2   5.04    1.2
21-AUG-23  5:20      1.2   5.08    1.2
21-AUG-23  5:22      1.2   5.12    1.2
21-AUG-23  5:24      1.2   5.16    1.2
21-AUG-21  5:26      1.2   5.20    1.2
21-AUG-23  5:28      1.2   5.24    1.2
21-AUG-23  5:30      1.2   5.28    1.2
21-AUG-23  5:32      1.2   5.32    1.2
21-AUG-23  5:34      1.2   5.36    1.2
21-AUG-21  5:36      1.2   5.40    1.2
21-AUG-23  5:38      1.5   5.45    1.5
21-AUG-23  5:40      1.5   5.50    1.5
21-AUG-23  5:42      1.5   5.55    1.5
21-AUG-23  5:44      1.5   5.60    1.5
21-AUG-21  5:46      2.0   5.67    2.0
21-AUG-23  5:48      2.0   5.73    2.0
21-AUG-21  5:50      2.0   5.80    2.0
21-AUG-23  5:52      2.0   5.87    2.0
21-AUG-23  5:54      2.0   5.93    2.0
21-AUG-21  5:56      2.0   6.00    2.0
21-AUG-23  5:58      3.0   6.10    3.0
21-AUG-23  6:00      3.0   6.20    3.0
21-AUG-23  6:02      3.0   6.30    3.0
21-AUG-23  6:04     18.0   7.00   18.0
21-AUG-21  6:06     24.0   7.80   24.0
21-AUG-23  6:08     12.0   8.20   12.0
21-AUG-23  6:10      6.0   8.40    6.0
21-AUG-23  6:12     12.0   8.80   12.0
21-AUG-23  6:14     18.0   9.40   18.0
21-AUG-23  6:16     12.0   9.80   12.0
21-AUG-21  6:18      6.0  10.00    6.0
21-AUG-23  6:20     12.0  10.40   12.0
21-AUG-21  6:22     12.0  10.80   12.0
21-AUG-23  6:24      6.0  11.00    6.0
21-AUG-23  6:26      6.0  11.20    6.0
21-AUG-23  6:28      6.0  11.40    6.0
21-AUG-21  6:30      1.5  11.45    1.5
21-AUG-21  6:32      1.5  11.50    1.5
21-AUG-23  6:34      1.5  11.55    1.5
21-AUG-23  6:36      1.5  11.60    1.5
21-AUG-23  7:04      1.2  11.64    1.2
21-AUG-21  7:06      1.2  11.68    1.2
21-AUG-21  7:08      1.2  11.72    1.2
21-AUG-21  7:10      1.2  11.76    1.2
21-AUG-23  7:42      1.2  11.80    1.2
21-AUG-23  7:44      1.2  11.84    1.2
21-AUG-21  7:46      1.2  11.88    1.2
21-AUG-21  7:48      1.2  11.92    1.2
21-AUG-21  7:50      1.2  11.96    1.2
21-AUG-23  8:40      6.0  12.16    6.0
21-AUG-23  8:42      6.0  12.20    6.0
21-AUG-21  8:48      1.2  12.24    1.2
21-AUG-21  8:50      1.2  12.28    1.2
21-AUG-23  8:52      1.2  12.32    1.2
21-AUG-23  8:54      1.5  12.37    1.5
21-AUG-23  8:56      1.2  12.40    1.2
21-AUG-21  8:58      1.5  12.45    1.5
21-AUG-23  9:00      1.5  12.50    1.5
21-AUG-23  9:02      1.5  12.55    1.5
21-AUG-23  9:04      1.5  12.60    1.5

                   ------  ------
 298 Mins.  Totals (mm) =  12.6    12.6
                   ------  ------


21-AUG-23 13:26      1.2   0.04    1.2
21-AUG-21 13:28      1.2   0.08    1.2
21-AUG-23 13:30      1.2   0.12    1.2
21-AUG-23 13:32      1.2   0.16    1.2
21-AUG-23 13:34      1.2   0.20    1.2
21-AUG-23 13:36      1.2   0.24    1.2
21-AUG-21 13:46      1.2   0.28    1.2
21-AUG-21 13:48      1.2   0.32    1.2
21-AUG-23 13:50      1.2   0.36    1.2
21-AUG-23 13:52      1.2   0.40    1.2
21-AUG-23 13:54      1.5   0.45    1.5
21-AUG-23 13:56      1.5   0.50    1.5
21-AUG-21 13:58      1.5   0.55    1.5
21-AUG-23 14:00      1.5   0.60    1.5
21-AUG-23 14:02      2.0   0.67    2.0
21-AUG-23 14:04      2.0   0.73    2.0
21-AUG-23 14:06      2.0   0.80    2.0
21-AUG-21 14:08      6.0   1.00    6.0
21-AUG-23 14:10      6.0   1.20    6.0
21-AUG-23 14:12     12.0   1.60   12.0
21-AUG-23 14:14      6.0   1.80    6.0
21-AUG-23 14:16      6.0   2.00    6.0
21-AUG-21 14:18      6.0   2.20    6.0
21-AUG-23 14:20      3.0   2.30    3.0
21-AUG-23 14:22      3.0   2.40    3.0
21-AUG-23 14:24      3.0   2.50    3.0
21-AUG-23 14:42      1.5   2.56    1.5
21-AUG-23 14:44      1.5   2.55    1.5
21-AUG-23 14:46      1.5   2.60    1.5
21-AUG-23 14:48      6.0   2.80    6.0
21-AUG-23 14:50     12.0   3.20   12.0
21-AUG-23 14:52     18.0   3.80   18.0
21-AUG-23 14:54     12.0   4.20   12.0
21-AUG-23 14:56     12.0   4.60   12.0
21-AUG-23 14:58     12.0   5.00   12.0
21-AUG-23 15:00     12.0   5.40   12.0
21-AUG-23 15:02      6.0   5.60    6.0
21-AUG-23 15:04      6.0   5.80    6.0
21-AUG-21 15:06      3.0   5.90    3.0
21-AUG-21 15:08      3.0   5.90    3.0
21-AUG-23 15:10      3.0   6.00    3.0
21-AUG-23 15:12      3.0   6.10    3.0
21-AUG-23 15:14      3.0   6.20    3.0

                   ------  ------
 110 Mins.  Totals (mm) =   6.2     6.2
                   ------  ------


22-AUG-21  0:00      1.2   0.04    1.2
22-AUG-21  0:02      1.2   0.08    1.2
22-AUG-21  0:04      1.2   0.12    1.2
22-AUG-21  0:06      1.2   0.16    1.2
22-AUG-21  0:08      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


22-AUG-23 13:34      1.2   0.04    1.2
22-AUG-23 13:36      1.2   0.08    1.2
22-AUG-23 13:38      1.2   0.12    1.2
22-AUG-23 13:40      1.2   0.16    1.2
22-AUG-23 13:42      1.2   0.20    1.2

                   ------  ------
  10 Mins.  Totals (mm) =   0.2     0.2
                   ------  ------


    Grand totals (mm) =   123.8   123.8
                   ------  ------
```

Capital Water Systems Ltd.

FLOW MONITOR INSTALLATION DETAILS

Site Ref No: t21 FM1

Client: IW

Survey: . t21

Site Location: construction site car park

Clients MH Ref. No. 0000

PIPE DETAILS

Shape: Circular Yes | Egg No | Irregular No

Material: Concrete Yes | Clayware No | Brick No | Plastic No

Other, Specify .....

Dimensions 225 mm Vertical

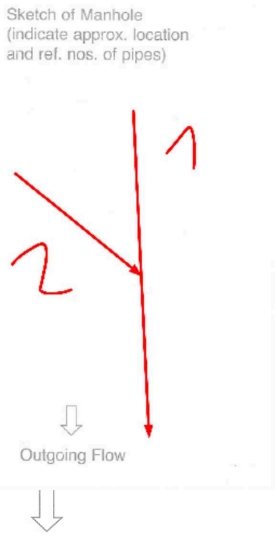
225 mm Horizontal

Remarks: .....

Condition: Good Yes | Fair No | Poor No

MANHOLE DETAILS

Sketch of Manhole (indicate approx. location and ref. nos. of pipes)



Outgoing Flow

Size of pipes:
- incoming no 1 225 mm
- incoming no 2 100 mm
- incoming no 3 ..... mm
- incoming no 4 ..... mm
- Outgoing 228 mm

In which pipe is probe mounted?.
No. Pipe1

How far up pipe entry is probe?
300 mm

Outgoing 2 O/F..... mm

Shaft: Material
- Concrete ring: Yes
- In situ Concrete: No
- Brick: No
- Other, specify .....

Condition of Manhole:
- Good: Yes
- Fair: No
- Poor: No

Chamber: Material
- Concrete Ring: Yes
- In situ concrete: No
- Brick: No
- Other, specify .....

Access:
- Ladder: Yes
- Step Irons: No
- No Access facilities: No
- Dangerous access facilities: No

INSTALLATION

Serial No. of Monitor 6562 Start Date 24/06/21

Start Time 10:53 (1 GMT) Recording Interval 2 min

Type of Installation : Sprung Band Yes | Drill In No | Expander No

Depth of Sediment (if none, enter "0") 0 (mm)

Is the probe mounted off the invert? No

If YES, then = Depth of Flow to probe ..... (mm)

Depth of flow to invert ..... (mm) Probe to invert ..... (mm)

Are there greasy deposits in the pipe? No

Photograph Time ..... Cover to invert measurement 2100

COMMENTS

Calibration	Time (GMT)	Monitored Velocity	Monitored Depth	Actual Depth	Monitor Type	Voltage
		0.00	125.00	125.00	MSFM	12.50

11. Flow Conditions

Fast | Slow No | Turbulent No

None | Medium No | Static Yes | Steady No

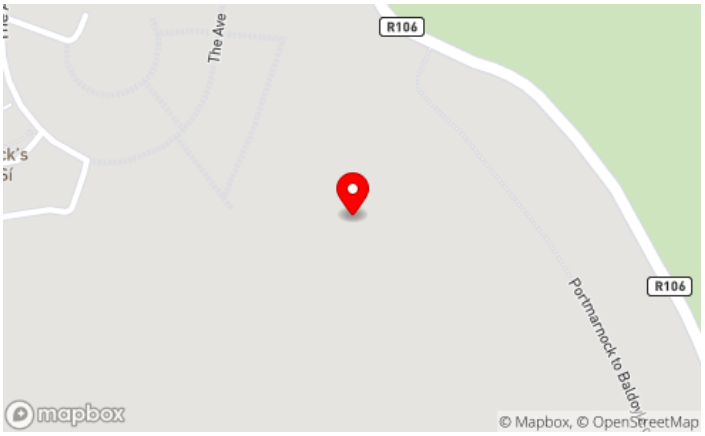
Crew Leader

Bart Pawlikowski


cze 24, 2021 10:55:06 AM


cze 24, 2021 10:55:08 AM


cze 24, 2021 10:55:19 AM
REDAM


The Ave
R106
R106
Portmarnock to Baldoyle
mapbox
© Mapbox, © OpenStreetMap

Capital Water Systems Ltd.

FLOW MONITOR INSTALLATION DETAILS

Site Ref No: t21 FM2

Client: IW

Survey: t21.

Site Location: construction site

Clients MH Ref. No. 00000

PIPE DETAILS

Shape: Circular Yes | Egg No | Irregular No

Material: Concrete Yes | Clayware No | Brick No | Plastic No

Other, Specify .....

Dimensions 300 mm Vertical

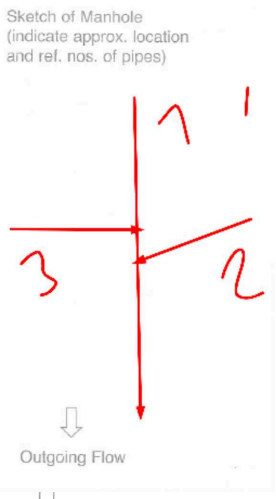
300 mm Horizontal

Remarks: .....

Condition: Good Yes | Fair No | Poor No

MANHOLE DETAILS

Sketch of Manhole (indicate approx. location and ref. nos. of pipes)



Outgoing Flow

Size of pipes:
- incoming no 1 300 mm
- incoming no 2 300 mm
- incoming no 3 225 mm
- incoming no 4 ..... mm
- Outgoing 300 mm

In which pipe is probe mounted?.
No. Outgoing

How far up pipe entry is probe?
300 mm

Outgoing 2 O/F..... mm

Shaft Material: Concrete ring Yes | In situ Concrete No | Brick No

Other, specify .....

Condition of Manhole: Good Yes | Fair No | Poor No

Chamber Material: Concrete Ring Yes | In situ concrete No | Brick No

Other, specify .....

Access: Ladder No | Step Irons No

No Access facilities No

Dangerous access facilities No

INSTALLATION

Serial No. of Monitor 6204 Start Date 24/06/21

Start Time 11:32 (1 GMT) Recording Interval 2 min

Type of Installation : Sprung Band Yes | Drill In No | Expander No

Depth of Sediment (if none, enter "0") 0 (mm)

Is the probe mounted off the invert? No

If YES, then = Depth of Flow to probe ..... (mm)

Depth of flow to invert ..... (mm) Probe to invert ..... (mm)

Are there greasy deposits in the pipe? No

Photograph Time ..... Cover to invert measurement 2900

COMMENTS

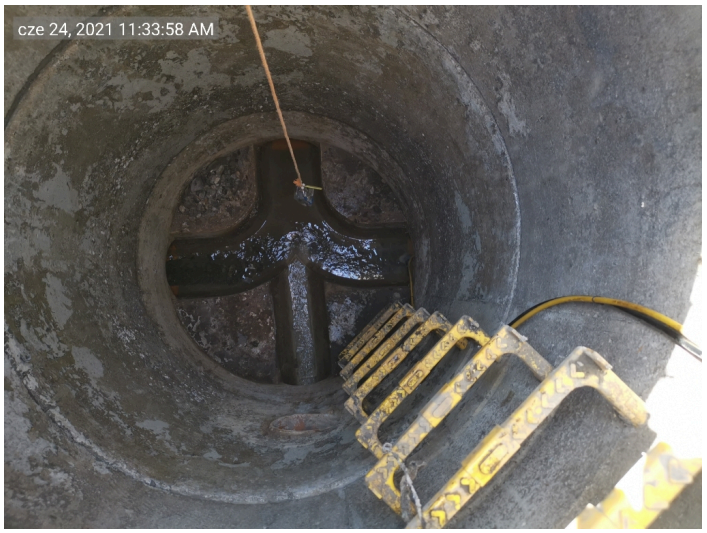
Calibration	Time (GMT)	Monitored Velocity	Monitored Depth	Actual Depth	Monitor Type	Voltage
		0.30	35.00	35.00	MSFM	12.50

11. Flow Conditions: Fast No | Slow Yes | Turbulent

None No | Medium No | Static No | Steady Yes

Crew Leader

Bart Pawlikowski


cze 24, 2021 11:33:58 AM


cze 24, 2021 11:34:12 AM

Capital Water Systems Ltd.

FLOW MONITOR INSTALLATION DETAILS

Site Ref No: t21 FM3

Client: IW

Survey: t21.

Site Location: housing Estate

Clients MH Ref. No. 7712

PIPE DETAILS

Shape: Circular Yes | Egg No | Irregular No

Material: Concrete Yes | Clayware No | Brick No | Plastic No

Other, Specify .....

Dimensions 225 mm Vertical

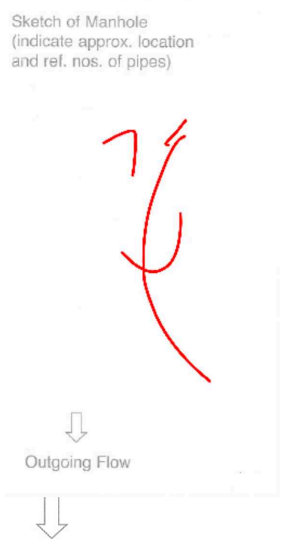
225 mm Horizontal

Remarks: .....

Condition: Good Yes | Fair No | Poor No

MANHOLE DETAILS

Sketch of Manhole (indicate approx. location and ref. nos. of pipes)



Outgoing Flow

Size of pipes:
- incoming no 1 225 mm
- incoming no 2 ..... mm
- incoming no 3 ..... mm
- incoming no 4 ..... mm
- Outgoing 225 mm

In which pipe is probe mounted?.
No. Pipe1

How far up pipe entry is probe?
300 mm

Outgoing 2 O/F ..... mm

Shaft: Material
- Concrete ring: Yes
- In situ Concrete: No
- Brick: No
- Other, specify .....

Condition of Manhole:
- Good: Yes
- Fair: No
- Poor: No

Chamber: Material
- Concrete Ring: Yes
- In situ concrete: No
- Brick: No
- Other, specify .....

Access:
- Ladder: Yes
- Step Irons: No
- No Access facilities: No
- Dangerous access facilities: No

INSTALLATION

Serial No. of Monitor 7712 Start Date 24/06/21

Start Time 12:00 (1 GMT) Recording Interval 2 min

Type of Installation : Sprung Band Yes | Drill In No | Expander No

Depth of Sediment (if none, enter "0") 0 (mm)

Is the probe mounted off the invert? No

If YES, then = Depth of Flow to probe ..... (mm)

Depth of flow to invert ..... (mm) Probe to invert ..... (mm)

Are there greasy deposits in the pipe? No

Photograph Time ..... Cover to invert measurement 3500

COMMENTS

Calibration	Time (GMT)	Monitored Velocity	Monitored Depth	Actual Depth	Monitor Type	Voltage
		0.05	35.00	35.00	MSFM	12.50

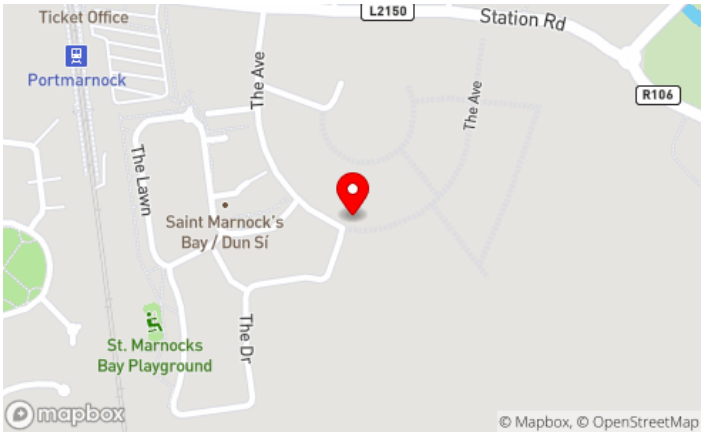
11. Flow Conditions
- Fast: No
- Slow: Yes
- Turbulent: No
- None: No
- Medium: No
- Static: No
- Steady: No

Crew Leader

Bart Pawlikowski


cze 24, 2021 12:05:29 PM


cze 24, 2021 12:05:37 PM


Ticket Office
Portmarnock
L2150
Station Rd
R106
The Ave
The Ave
The Lawn
Saint Marnock's
Bay / Dún Sí
St. Marnocks
Bay Playground
The Dr
mapbox
© Mapbox, © OpenStreetMap

Capital Water Systems Ltd.

FLOW MONITOR INSTALLATION DETAILS

Site Ref No: t21 FM01A

Client: t21

Survey: portmanock

Site Location: field

Clients MH Ref. No.

PIPE DETAILS

Shape: Circular Yes; Egg No; Irregular No

Material: Concrete Yes; Clayware No; Brick No; Plastic No

Other, Specify .....

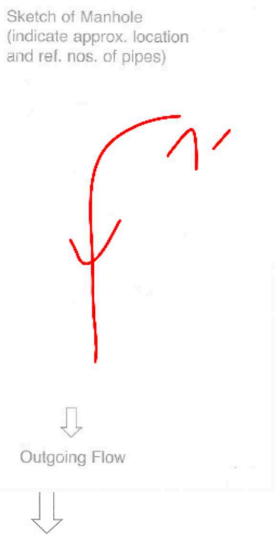
Dimensions 225 mm Vertical; 225 mm Horizontal

Remarks: .....

Condition: Good Yes; Fair No; Poor No

MANHOLE DETAILS

Sketch of Manhole (indicate approx. location and ref. nos. of pipes)



Size of pipes:
- incoming no 1 225 mm
- incoming no 2 ..... mm
- incoming no 3 ..... mm
- incoming no 4 ..... mm
- Outgoing 225 mm

In which pipe is probe mounted?.
No. Outgoing

How far up pipe entry is probe?
300 mm

Outgoing 2 O/F ..... mm

Shaft: Material
- Concrete ring Yes
- In situ Concrete No
- Brick No
- Other, specify .....

Condition of Manhole:
- Good Yes
- Fair No
- Poor No

Chamber: Material
- Concrete Ring Yes
- In situ concrete No
- Brick No
- Other, specify .....

Access:
- Ladder Yes
- Step Irons No
- No Access facilities No
- Dangerous access facilities No

INSTALLATION

Serial No. of Monitor 7737 Start Date 22/07/21

Start Time 11:23 (1 GMT) Recording Interval 2 min

Type of Installation : Sprung Band Yes; Drill In No; Expander No

Depth of Sediment (if none, enter "0") 0 (mm)

Is the probe mounted off the invert? No

If YES, then = Depth of Flow to probe ..... (mm)

Depth of flow to invert ..... (mm) Probe to invert ..... (mm)

Are there greasy deposits in the pipe? No

Photograph Time ..... Cover to invert measurement 1650

COMMENTS

Calibration	Time (GMT)	Monitored Velocity	Monitored Depth	Actual Depth	Monitor Type	Voltage
		0.03	27.00	25.00	MSFM	12.80

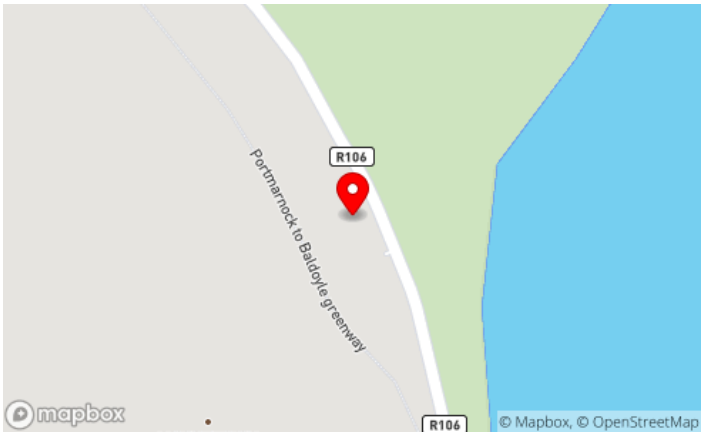
11. Flow Conditions: Fast No; Slow Yes; Turbulent No; None No; Medium No; Static No; Steady No

Crew Leader: Bart Pawlikowski


lip 22, 2021 11:33:44 AM


lip 22, 2021 11:33:48 AM


lip 22, 2021 11:33:51 AM


R106
Portmarnock to Baldoyle greenway
R106
mapbox
© Mapbox, © OpenStreetMap

capital water systems ltd.	Document Reference: QM-SLS-03	Rev No. 01	Author: EB Approved: VB

RAIN GAUGE INSTALLATION LOG SHEET

SURVEY:	t21	Date	24/06/21

RG Location:	construction site, 5 meters from fm2
Address:	
Contact Name:	caretaker
Contact Tel. No:	
Installation Date/Time	24/06/21 11:37 (1 GMT)
Site ID:	RG001
Logger ID:	tl01029416

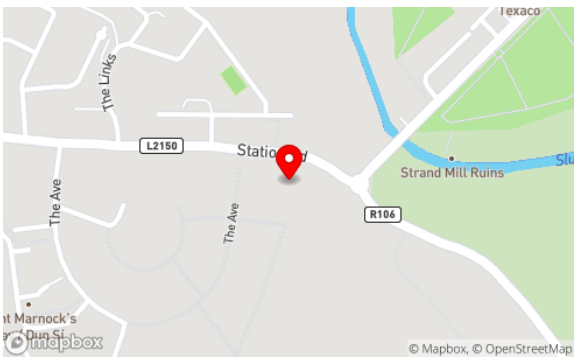
RG Location:	
Address:	
Contact Name:	
Contact Tel. No:	
Installation Date/Time	
Site ID:	
Logger ID:	

RG Location:	
Address:	
Contact Name:	
Contact Tel. No:	
Installation Date/Time	
Site ID:	
Logger ID:	

Additional Checks	Yes / No
Site secure from Vandalism?	Yes
Site Safe to Access?	Yes
Site accessible each visit?	Yes
Site open to all weather conditions?	Yes
RG overshadowed by tree/building?	No

Crew Leader:		Date & Time:	24/06/21

1st Rain Gauge Detail



Appendix D – Event Plots

Storm Event Periods

Storm Event No.	1	2	3	4
Start	27/07/2021 14:30	30/07/2021 02:00	07/08/2021 09:30	21/08/2021 03:30
End	27/07/2021 21:00	30/07/2021 09:30	07/08/2021 13:00	21/08/2021 11:00
Rainfall Total mm	9.6	11.6	6.4	12.6
Rainfall Intensity mm/h	36	12	12	24

FM No.	Data Available	Data Available	Data Available	Data Available
FM01A	PF - Little or no reaction to rainfall	PF - Little or no reaction to rainfall	PF - Little or no reaction to rainfall	PF - Little or no reaction to rainfall
FM02	VLF <25mm no reaction to rainfall	VLF <25mm no reaction to rainfall	VLF <25mm no reaction to rainfall	VLF <25mm no reaction to rainfall
FM03	VSF no significant reaction to rainfall	VSF no significant reaction to rainfall	VSF no significant reaction to rainfall	VSF RV no significant reaction to rainfall

Storm Event Periods

DWF	1	2
Start	25/07/2021	10/08/2021
End	26/07/2021	11/08/2021
Rainfall Total mm	0	0
Rainfall Intensity mm/h	0	0

FM No.	Data Available	Data Available
FM01A	PF	PF
FM02	VLF <20mm	VLF <20mm
FM03	RV at times	RV at times

Event Matrix Legend

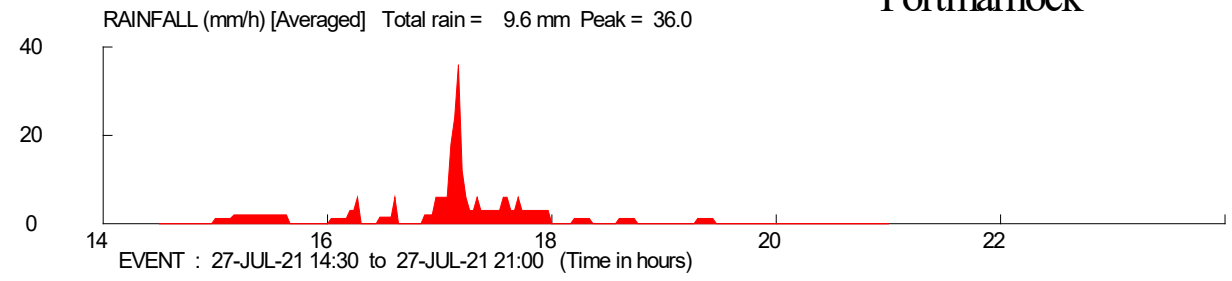
	Consistent Data
RD	Ragging affecting depths
RV	Ragging affecting velocities
	Poor Data
	Not Accurate/No Data
SG	Surcharging

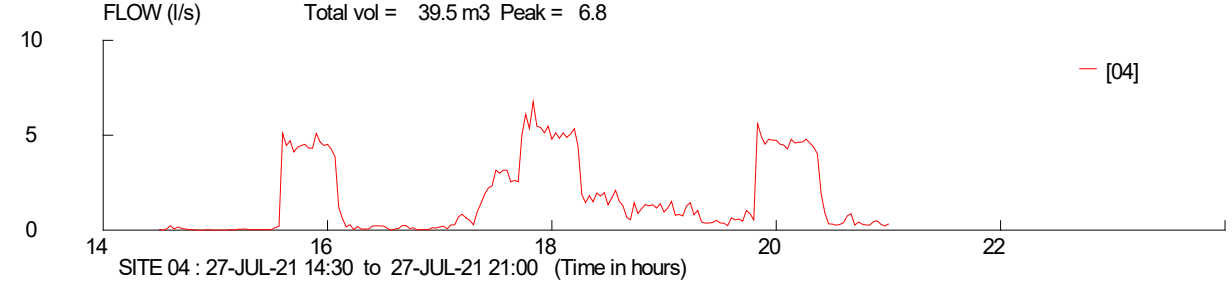
LS	Logger Shutdown no data
NF	No Flow
RV	**Ragging affecting velocity sensors**

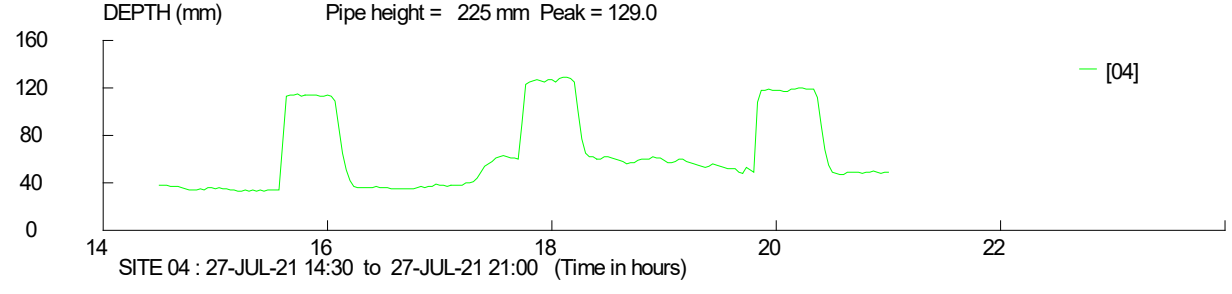
SG	Surcharging in M/H
SV	Sediment/Stones affecting velocity sensors
WF	Wet Filter leading to inaccurate depth readings
RD	Ragging affecting depth sensors
FD	Fatty deposits affecting depth sensors
RS	Ragging affecting sensors
SD	Monitor shut down no data
(V)LF	**(Very) low flow leading to inconsistent velocity data capture**
(V)SF	**(Very) Slow Flow leading to inconsistent velocity data capture**
(V)FF	**(Very) Fast Flow**
DE	Monitor depth error
NI	Not installed
F/D	Flow depth relationship calculation used
Stat	Static Flow
CF	Clear Flow affecting velocity sensor
TF	Turbulent flow leading to decreased accuracy
PF	Pumped Flow

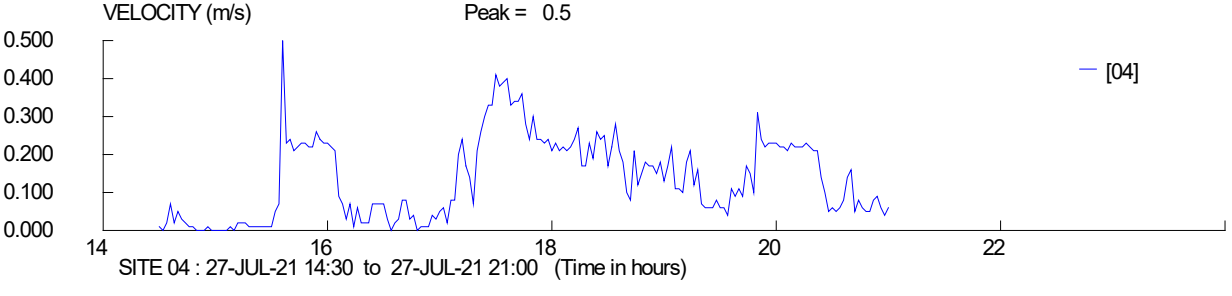
Storm Event 1

Portmarnock

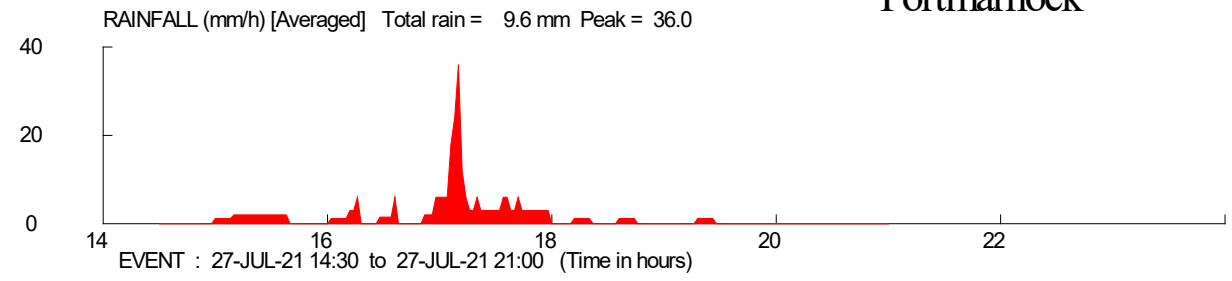


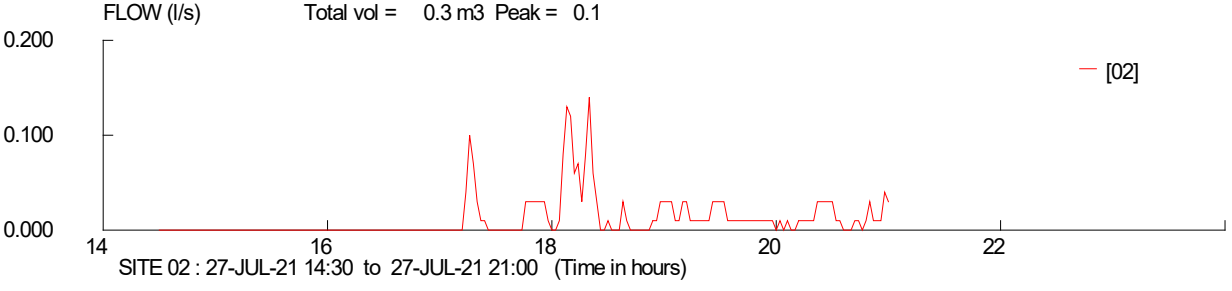


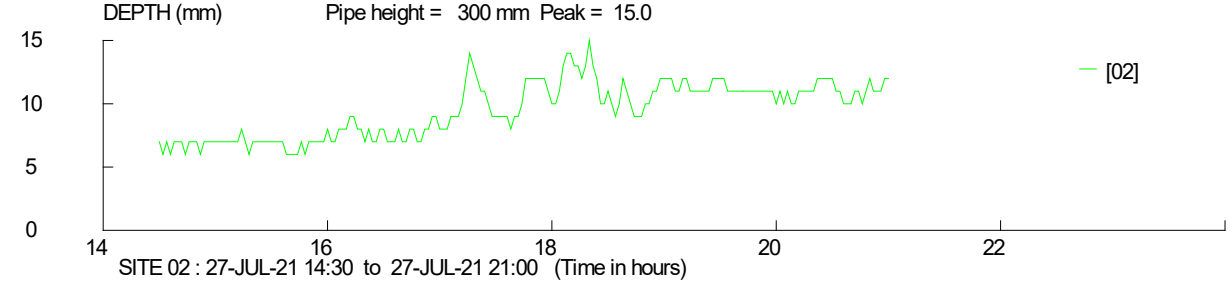


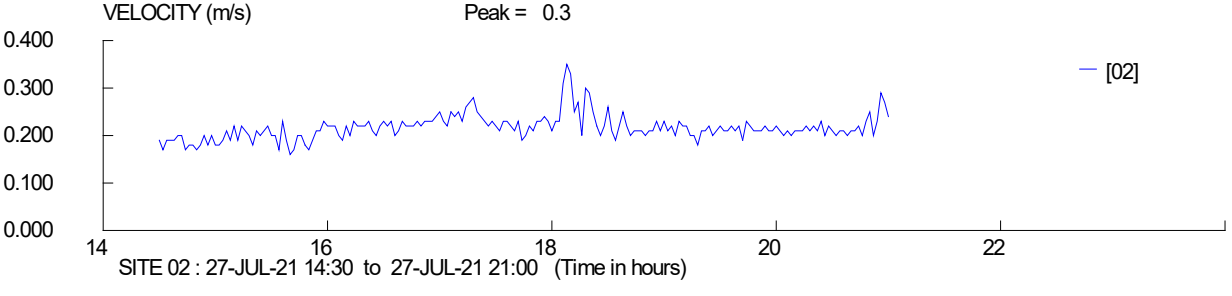


Portmarnock

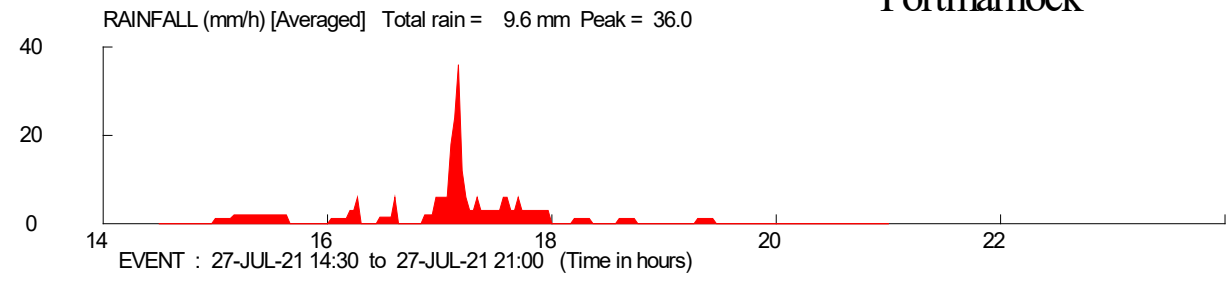


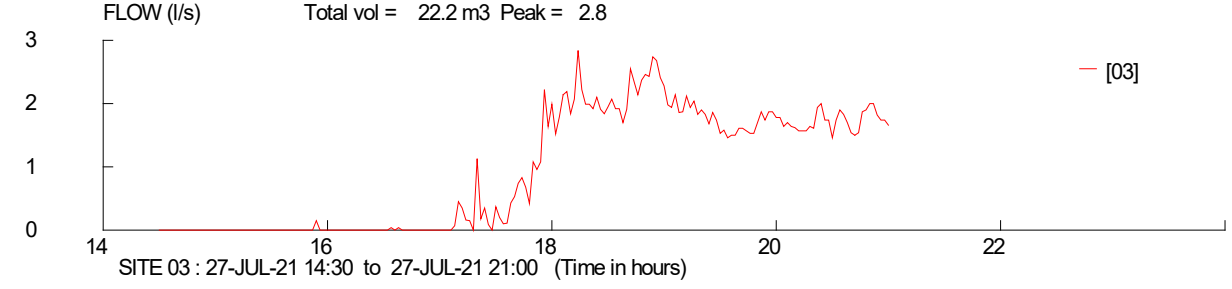


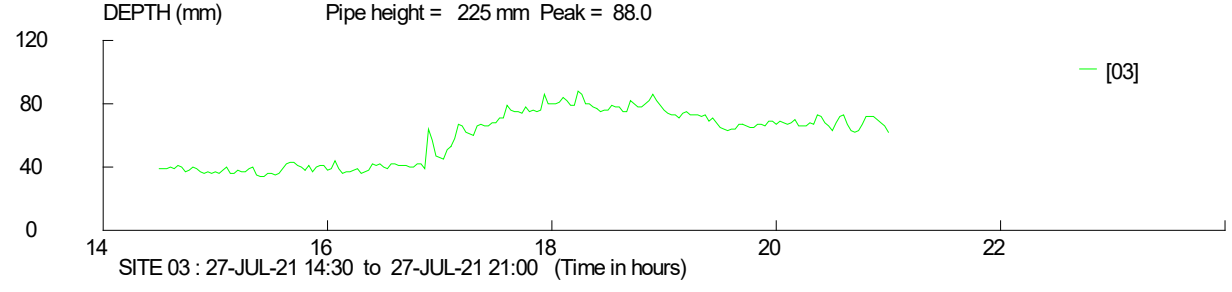


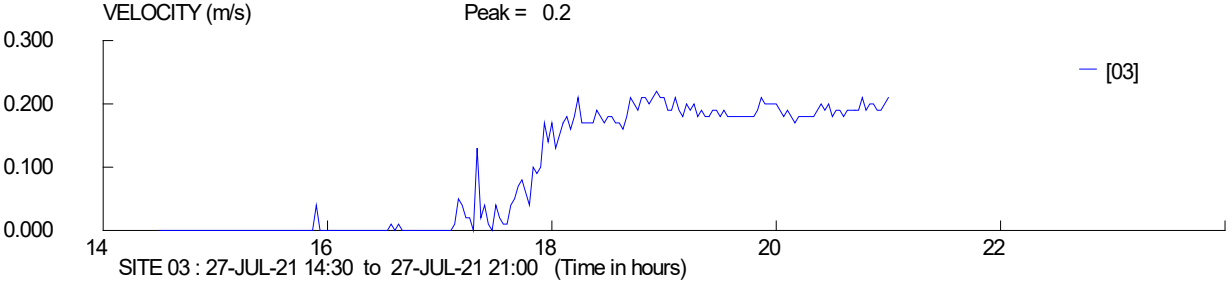


Portmarnock



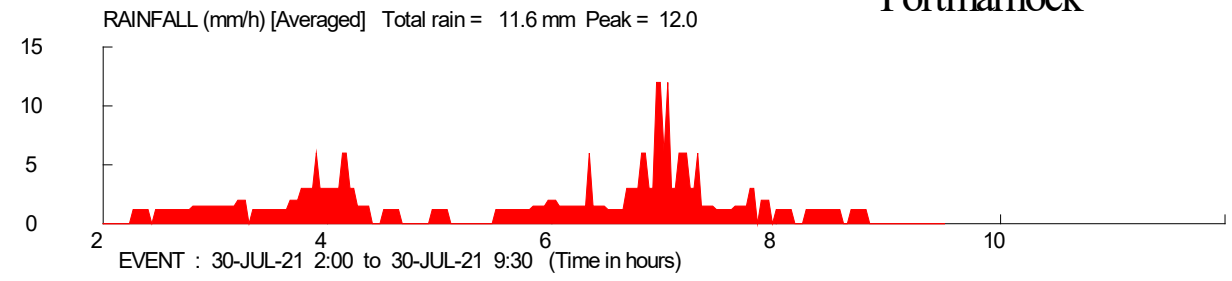


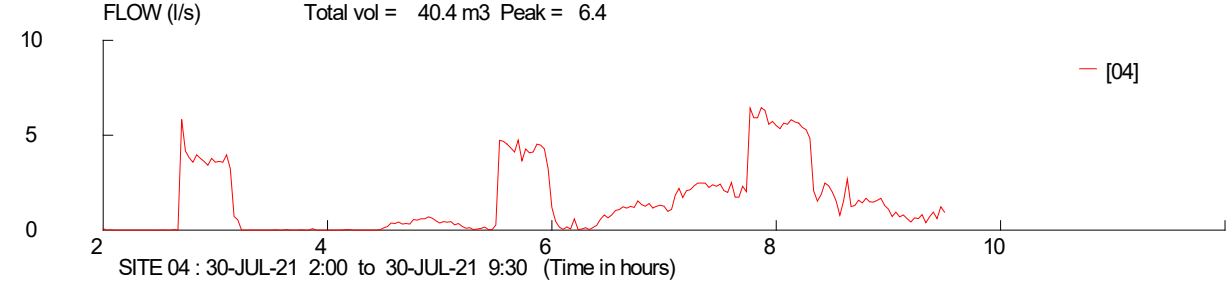


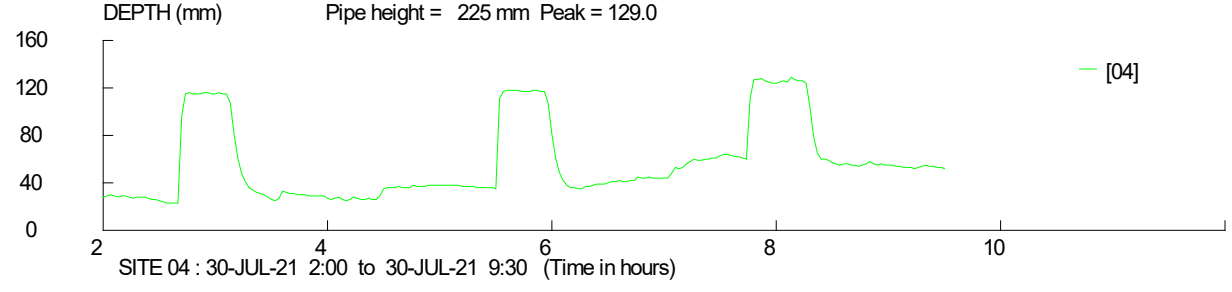


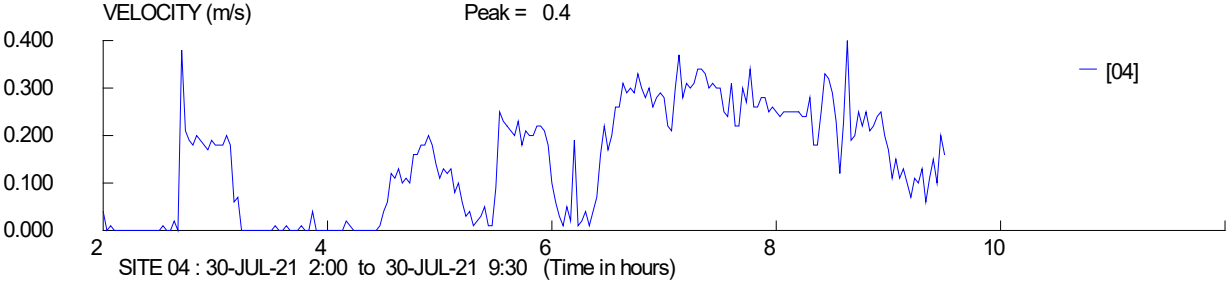
Storm Event 2

Portmarnock

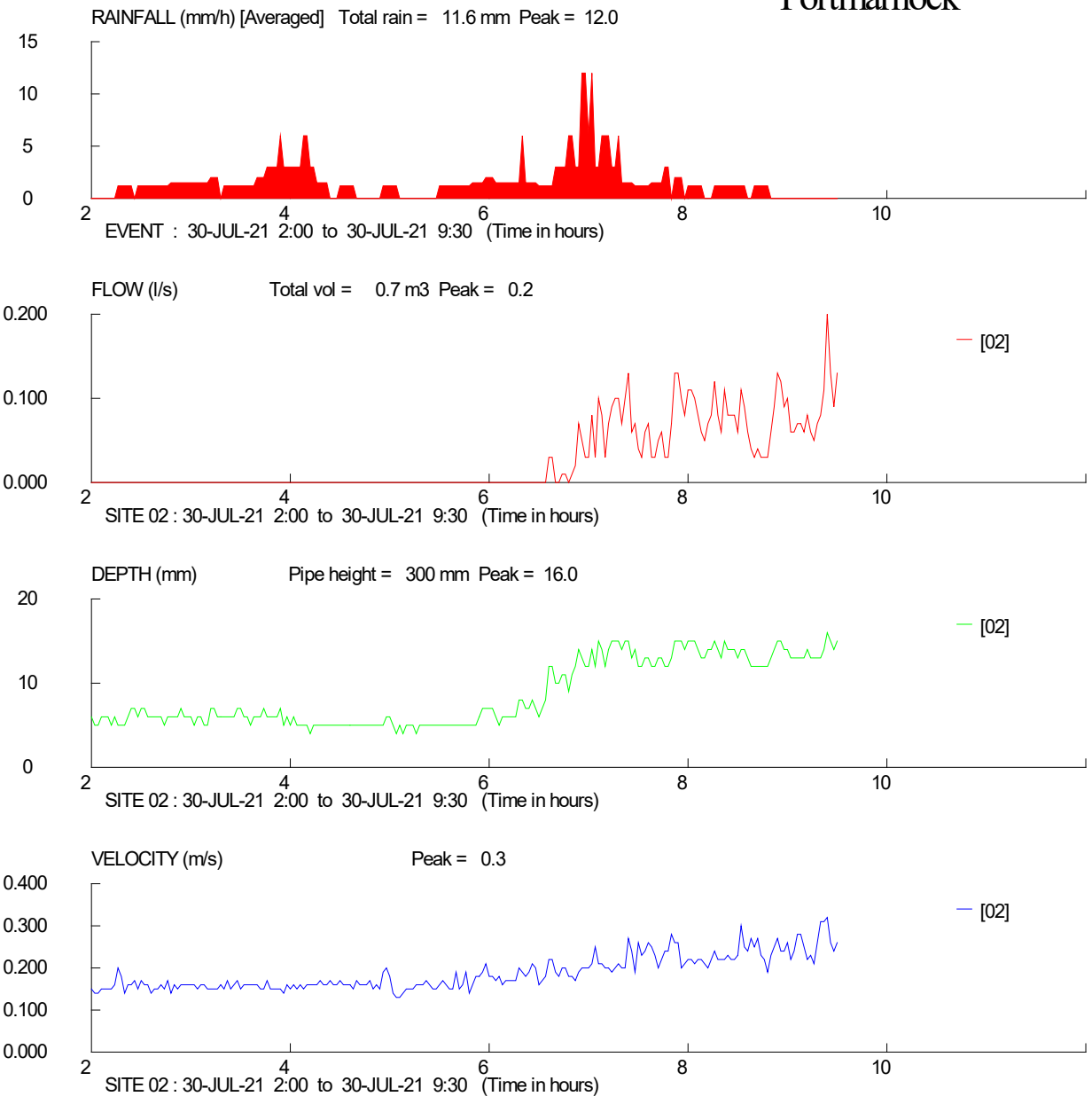




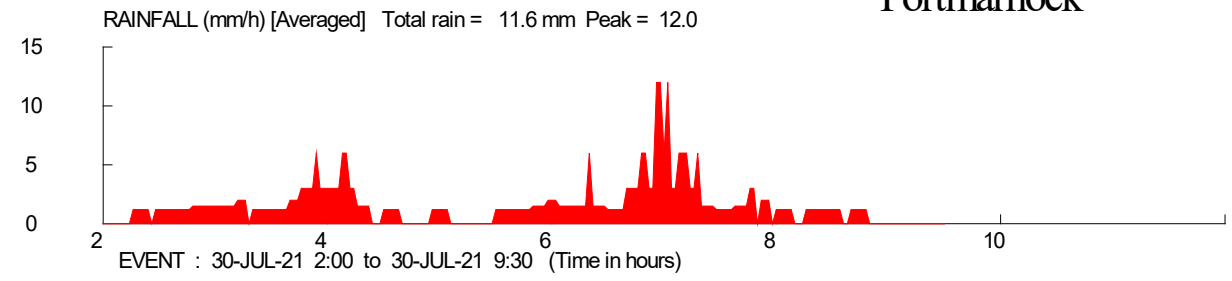


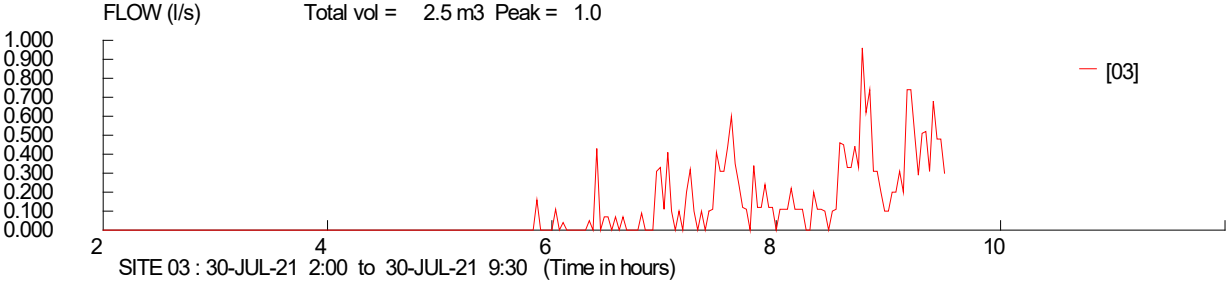


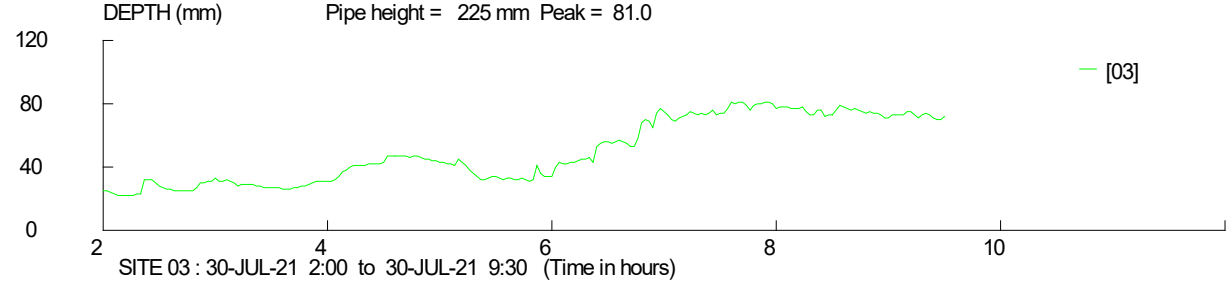
Portmarnock

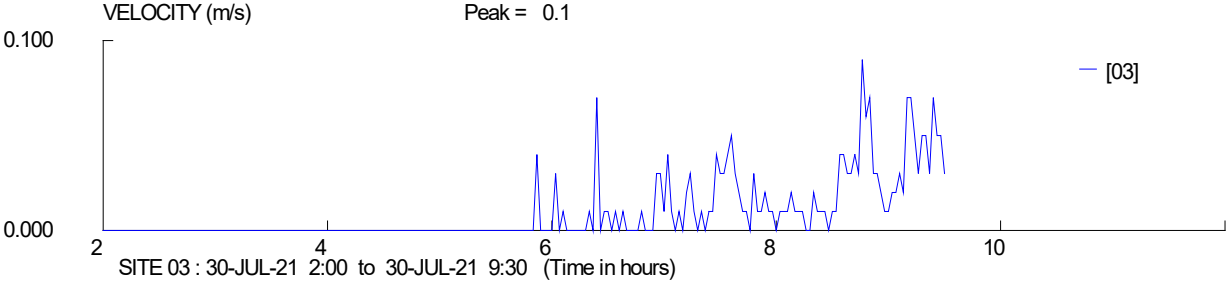


Portmarnock



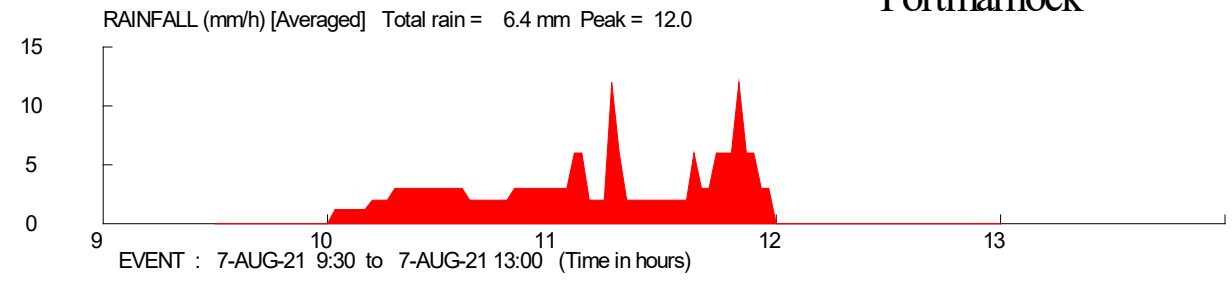


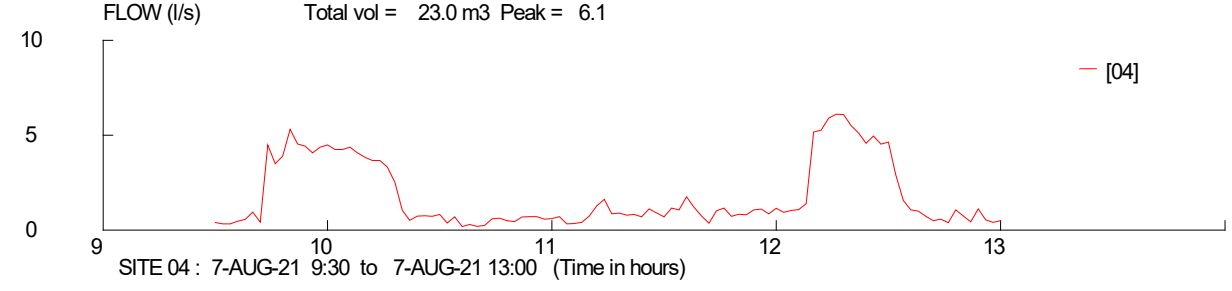


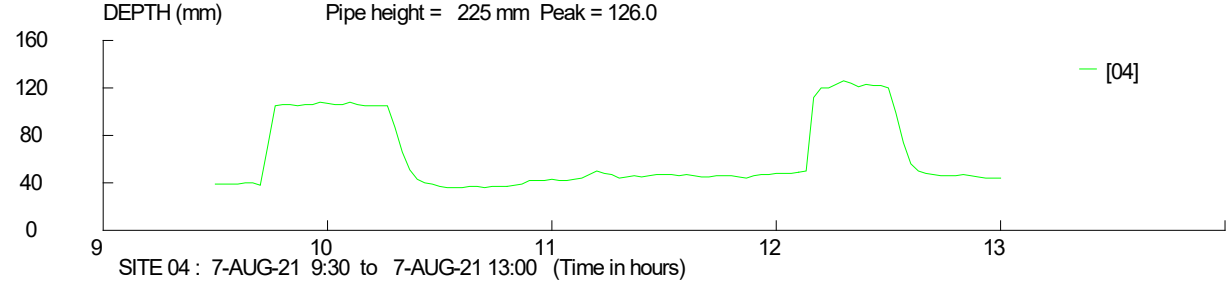


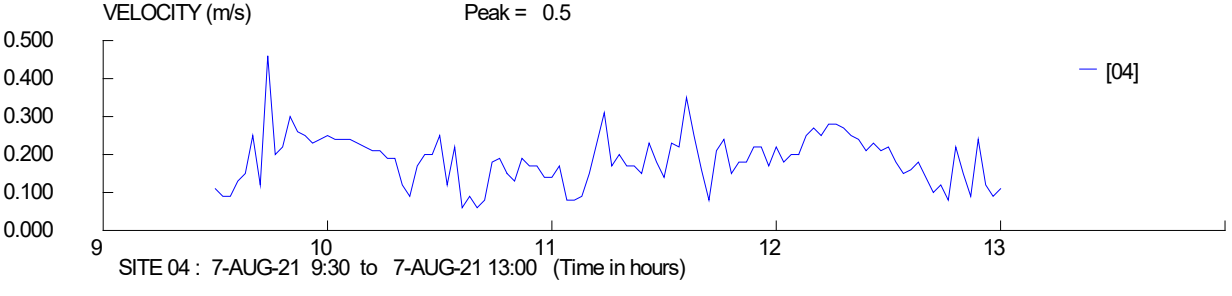
Storm Event 3

Portmarnock

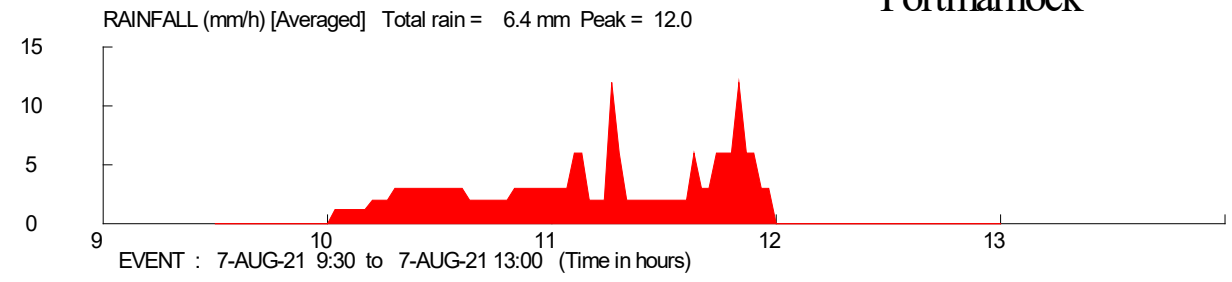


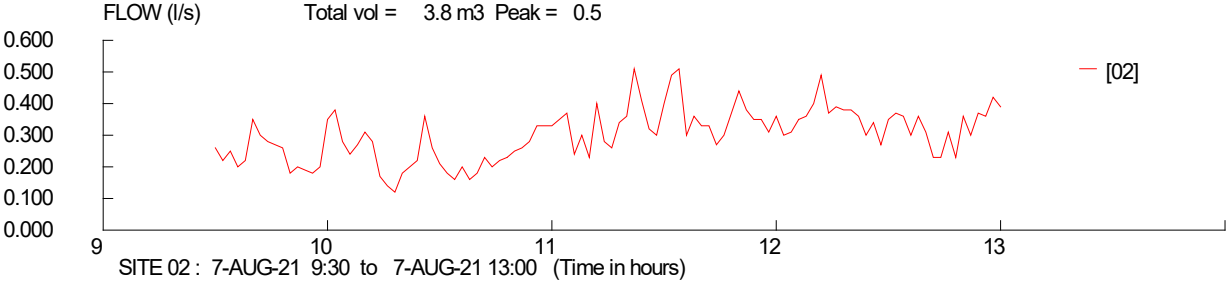


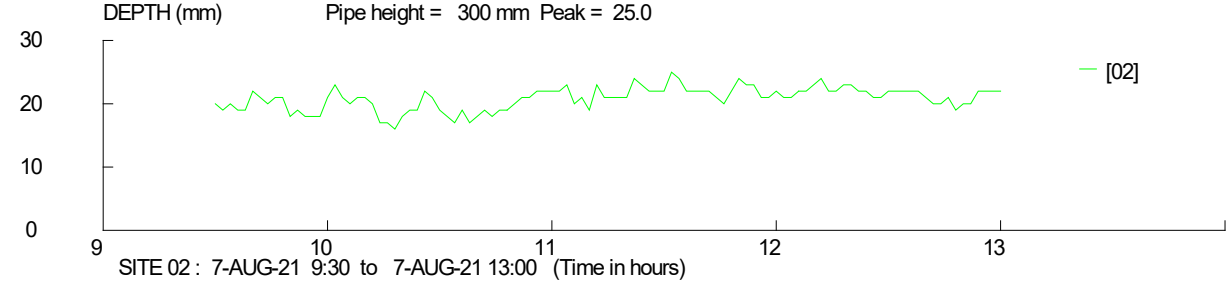


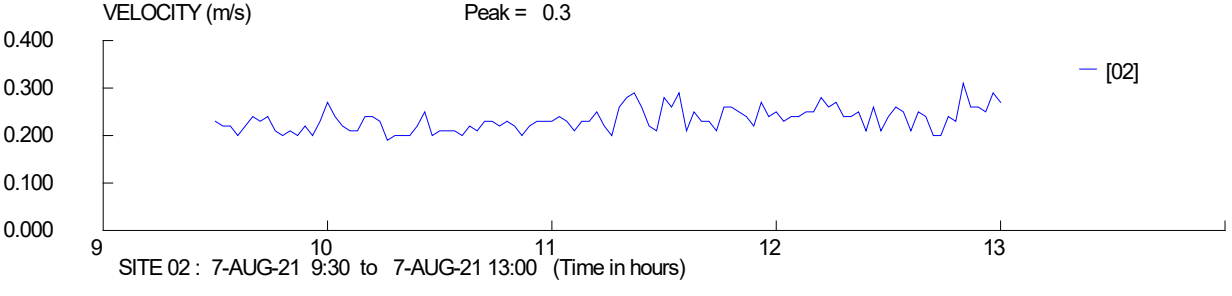


Portmarnock

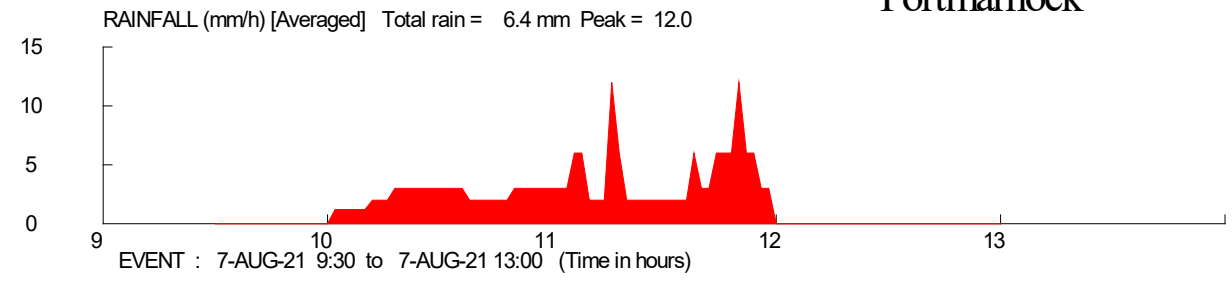


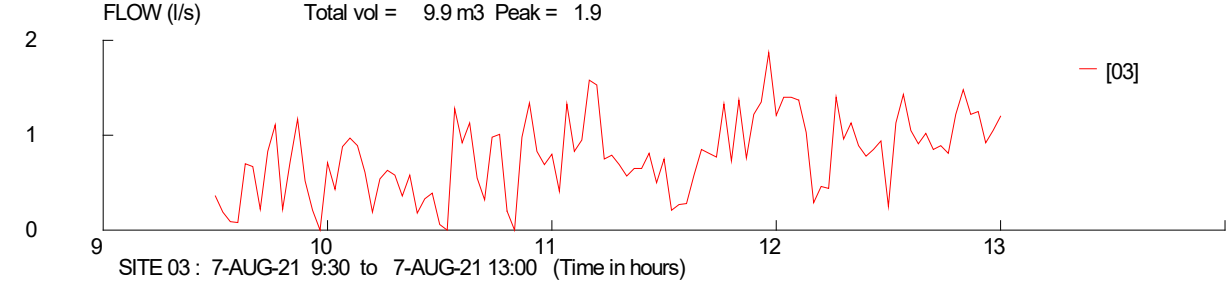


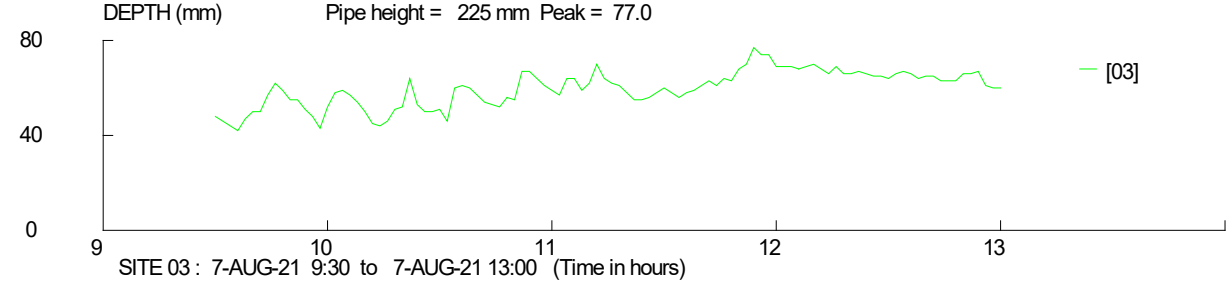


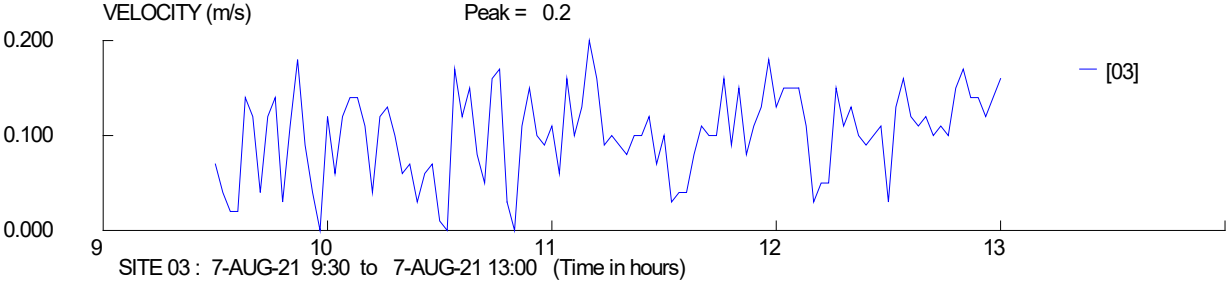


Portmarnock



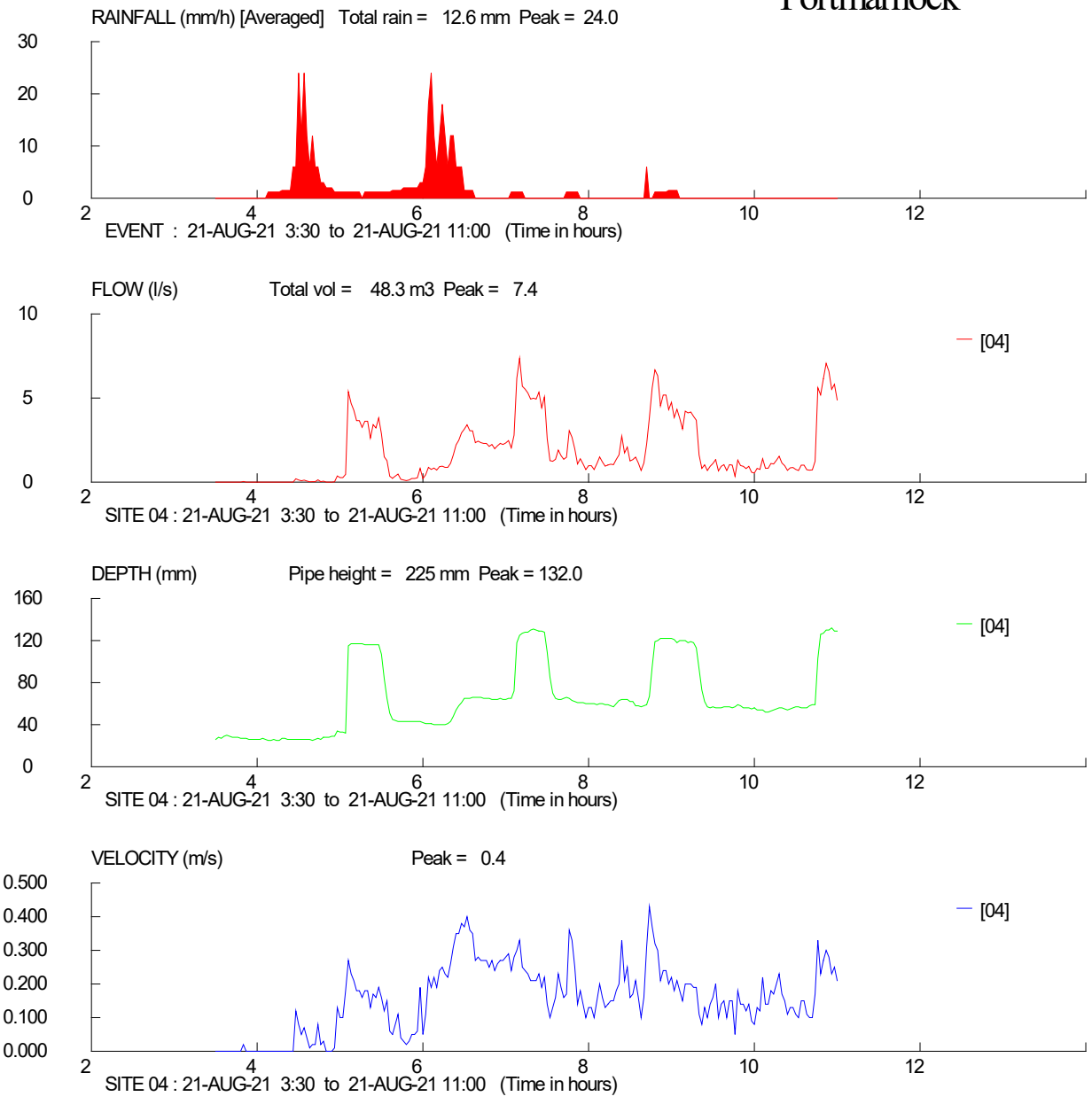




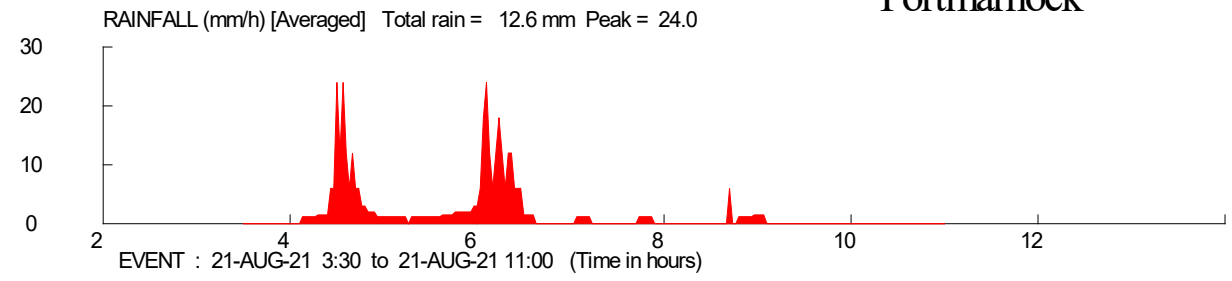


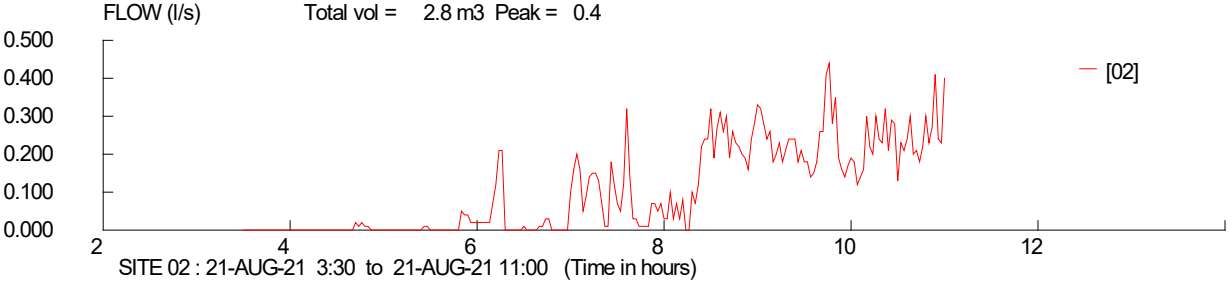
Storm Event 4

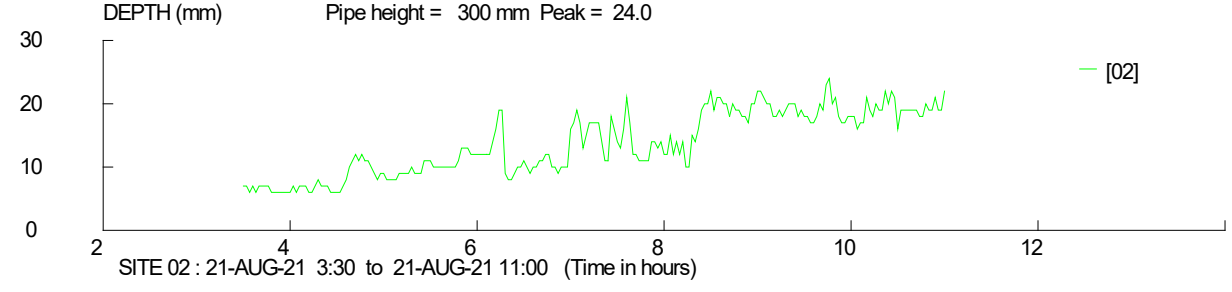
Portmarnock

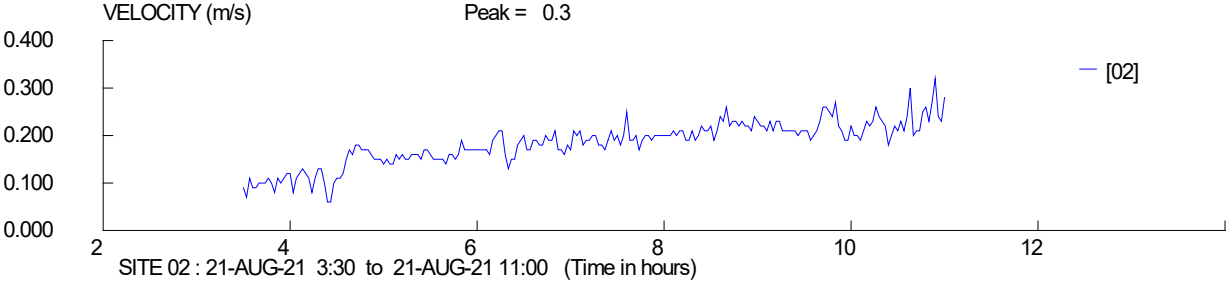


Portmarnock

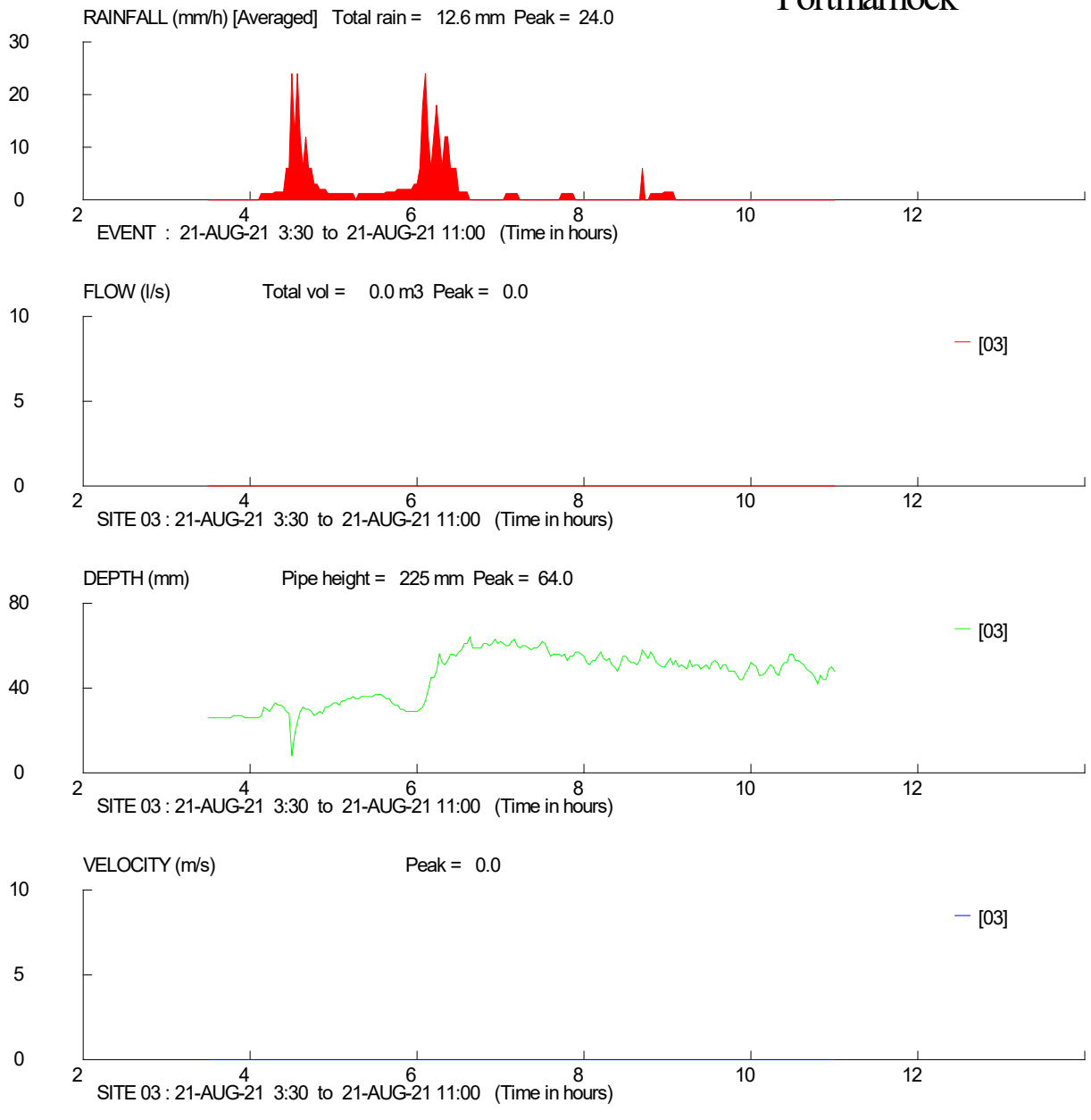




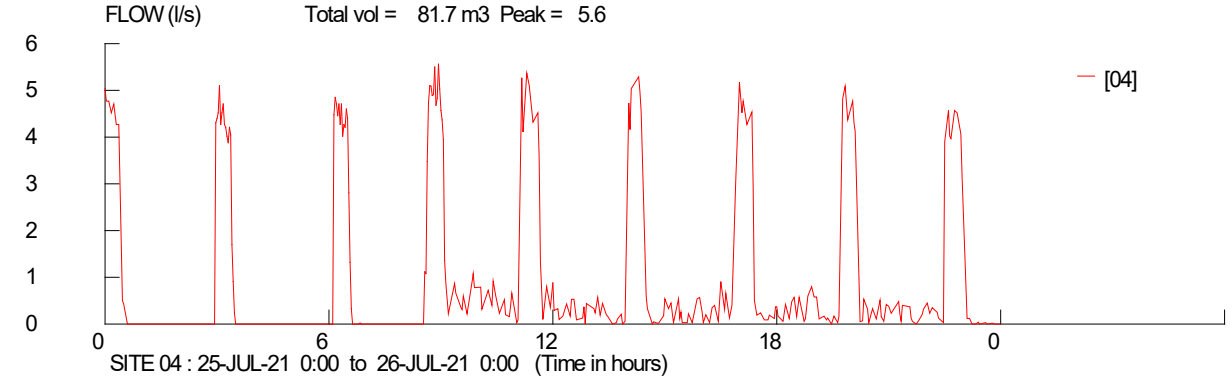


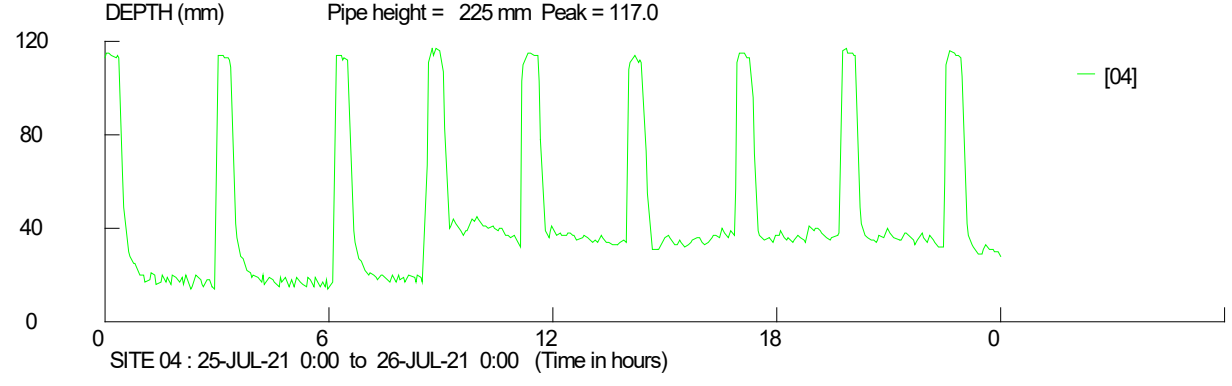


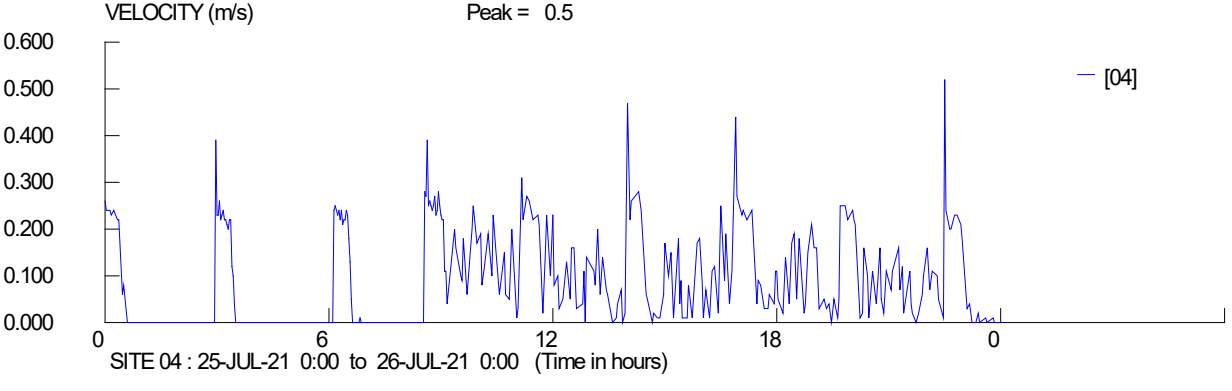
Portmarnock



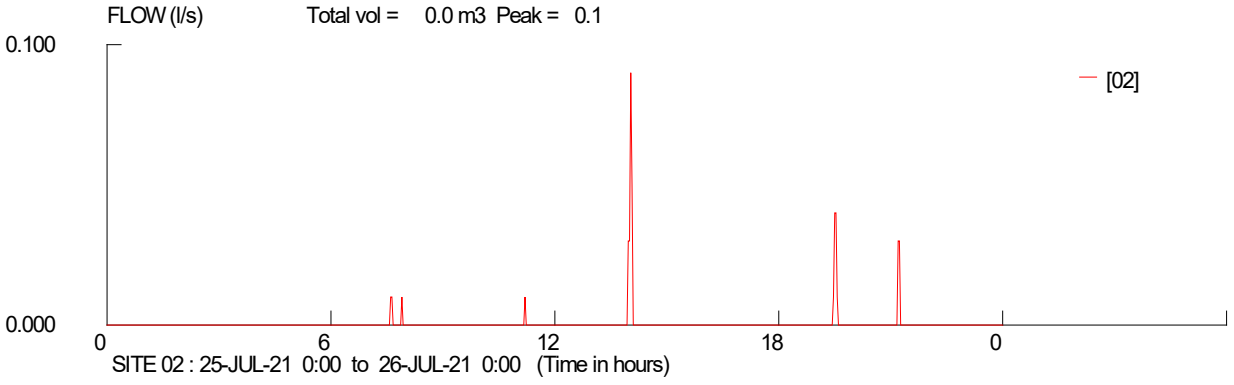
FM01A FM01A Portmarnock

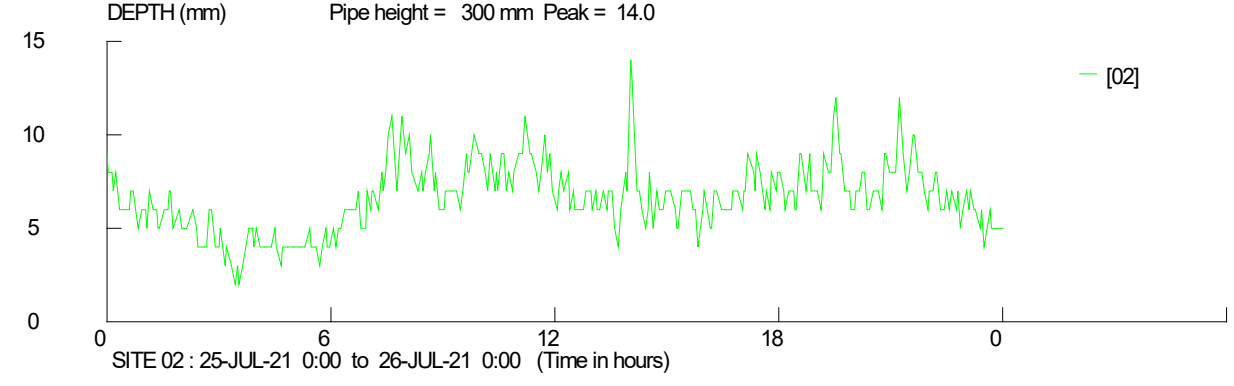


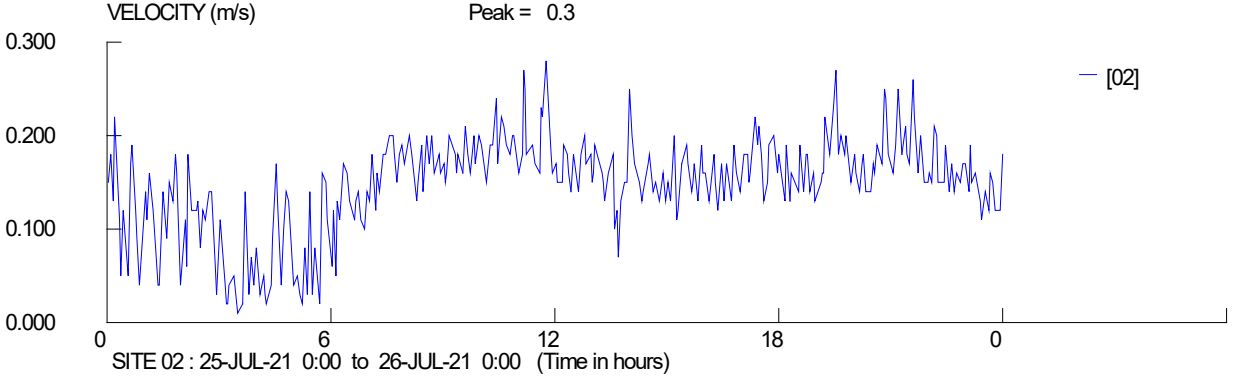




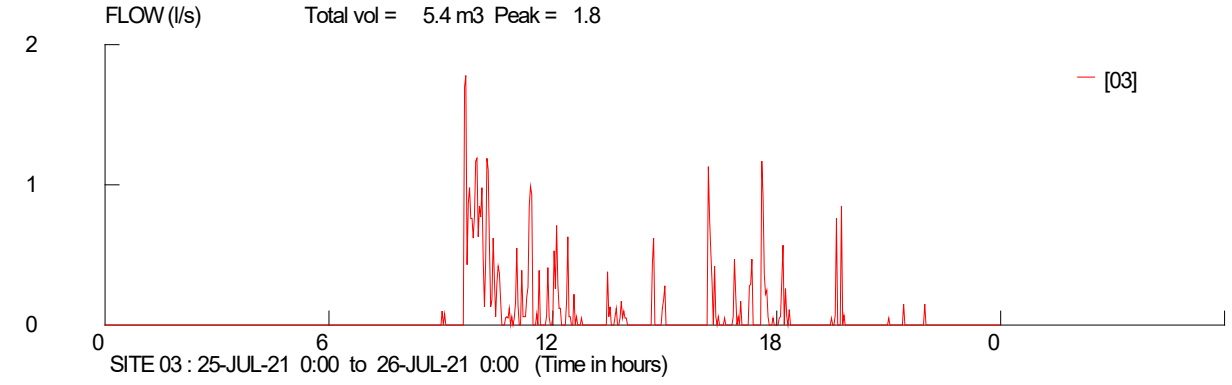
FM02 FM02 Portmarnock

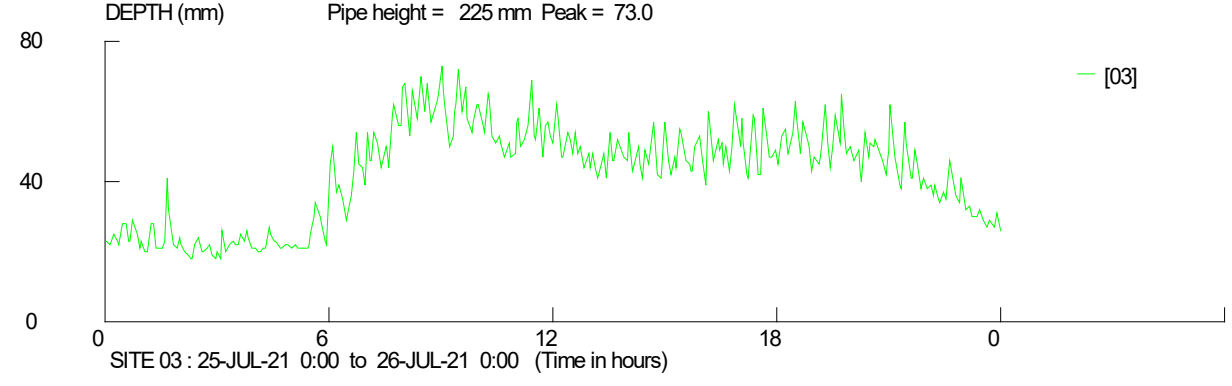


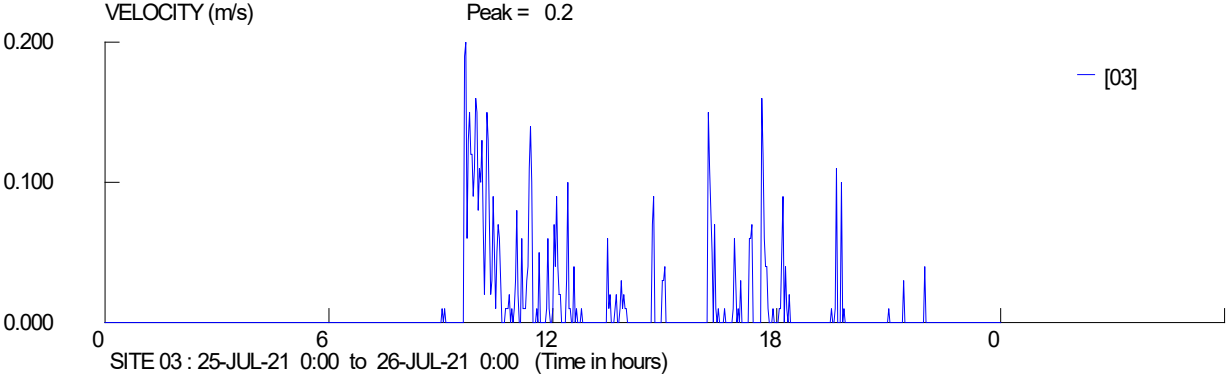




FM03 FM03 Portmarnock

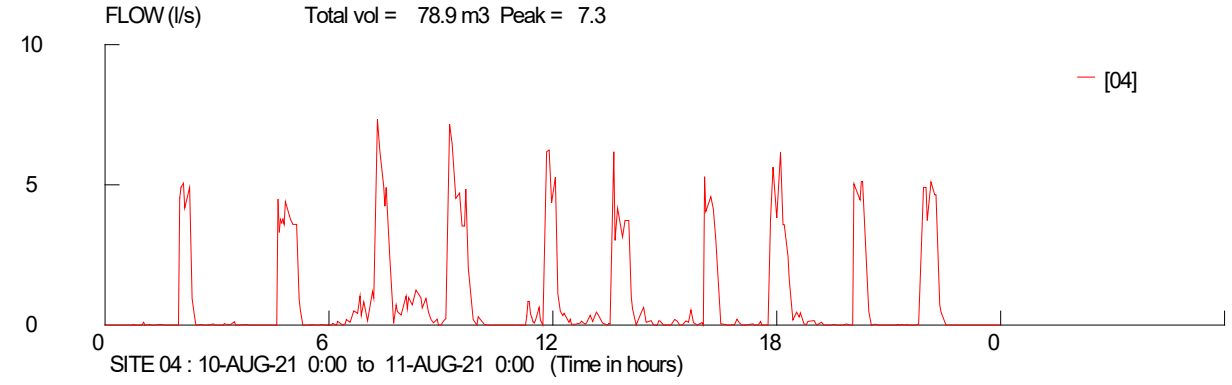


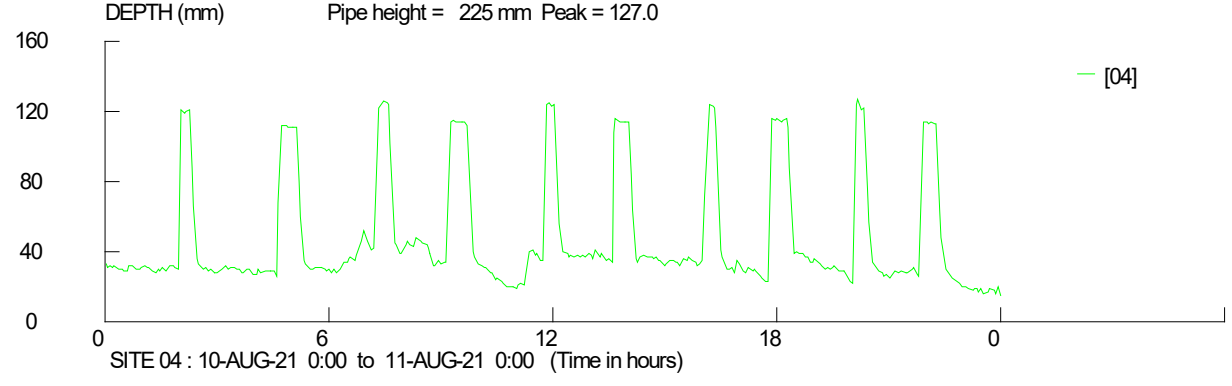


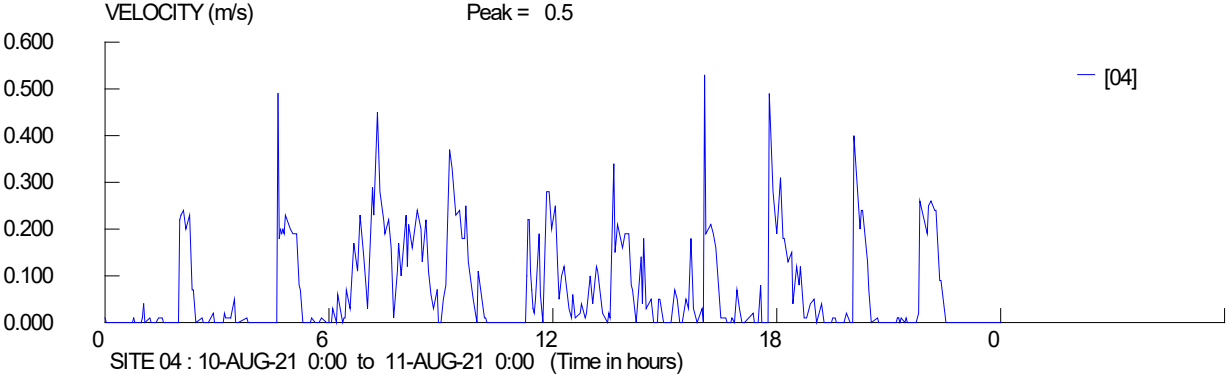


DWF2

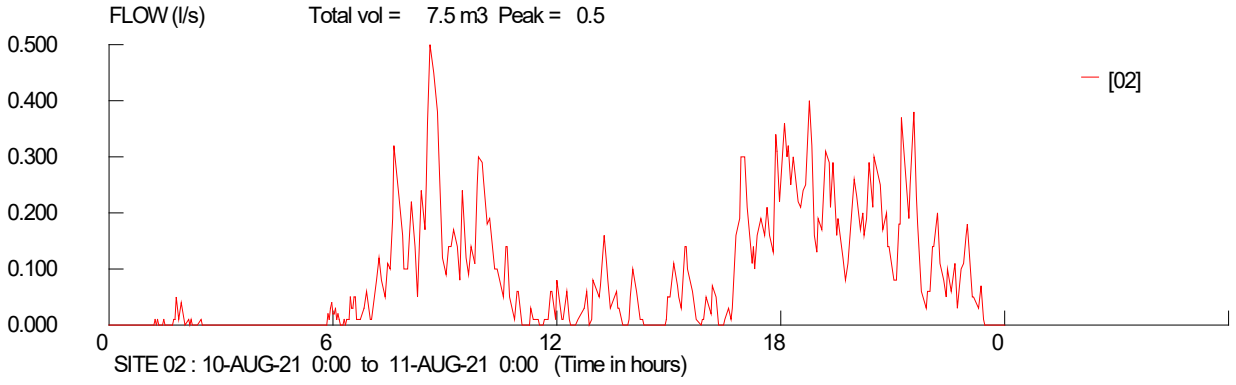
FM01A FM01A Portmarnock

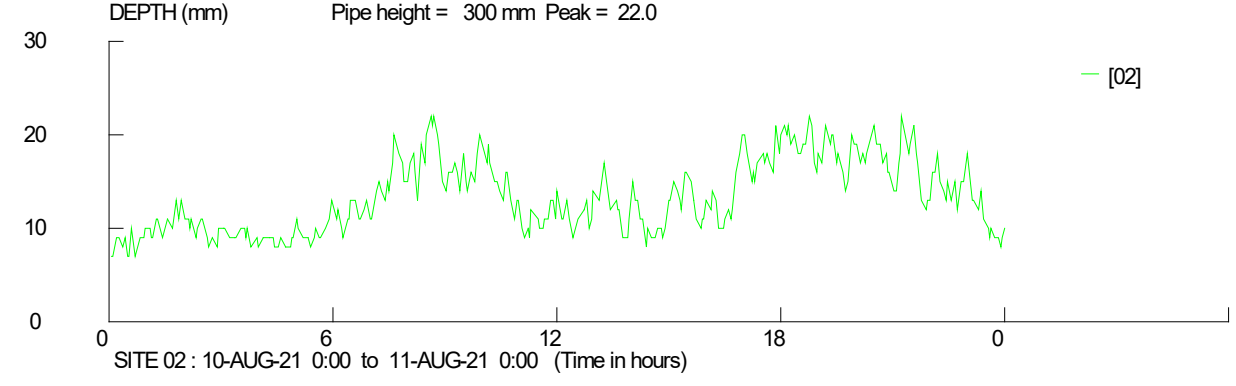


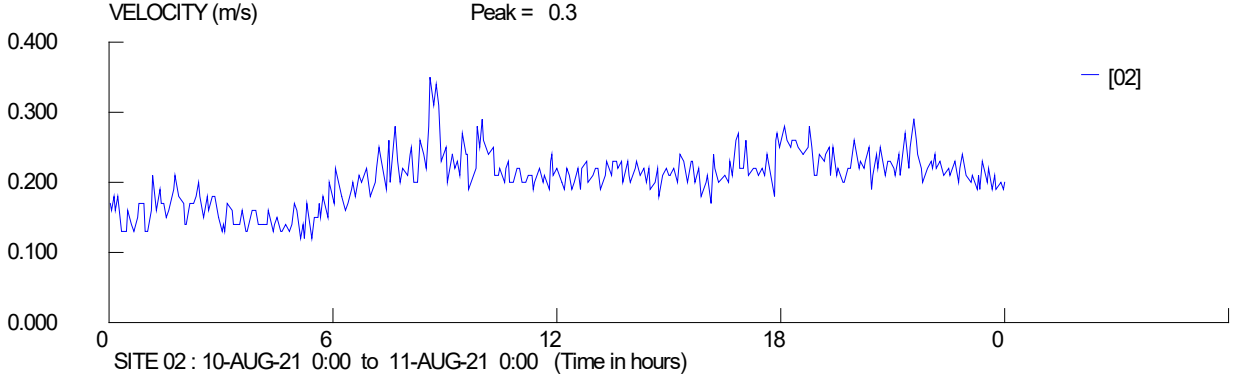




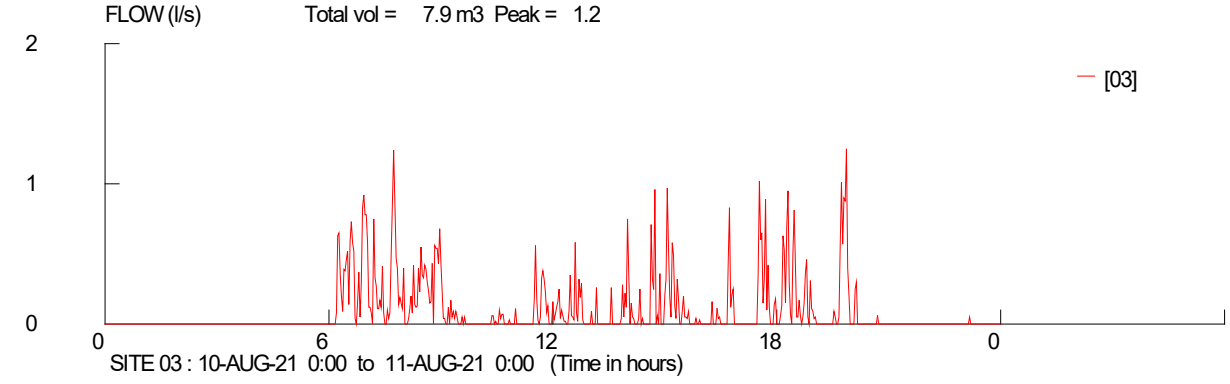
FM02 FM02 Portmarnock

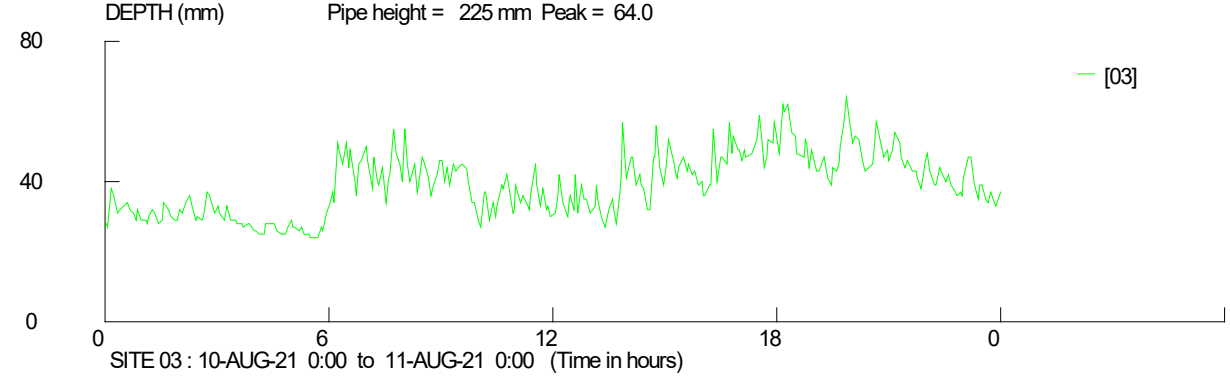


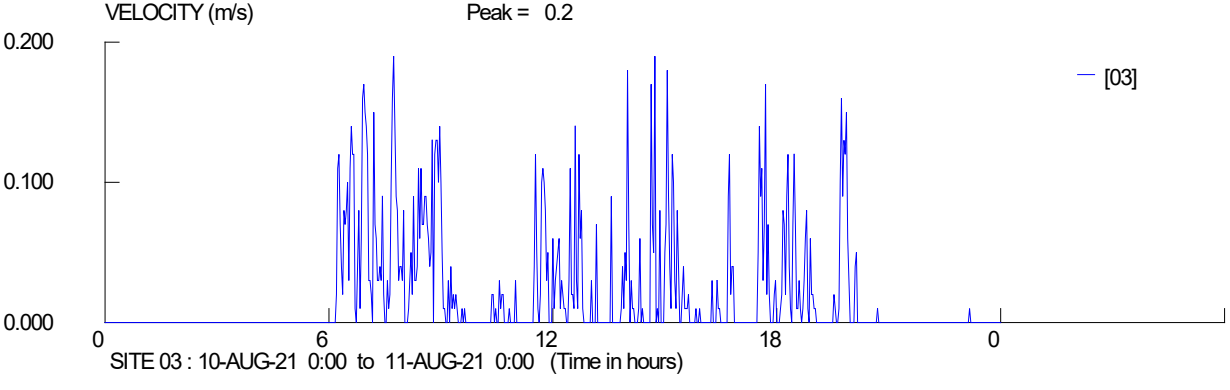




FM03 FM03 Portmarnock







Appendix E – Irregular Conduit Cross Sections

No Irregular Pipes in Survey

Appendix F: Scattergraphs

Survey	Portmarnock
Main Contractor	CWSL
Consultant	N/A
Location	Portmarnock
FM No	3 (+ 1 relocation)
Site ID	**Comments**
FM01	Poor scatter formation with scatter formation with no significant increase in accuracy as depths increase. Pumped flow at this location leading to turbulent flow conditions at times and reduced depth and velocity data accuracy
FM01A	Fair scatter formation with scatter formation with no significant increase in accuracy as depths increase. Pumped flow at this location.
FM02	No enough data above 40mm for consistent scatter formation
FM03	Poor scatter formation with no significant increase in accuracy as depths increase. Ragging affecting velocity consistency throughout out the survey period.

Manhole number: 1A LOG (FLOW) / LOG (DEPTH) GRAPH

```
 DEPTH      FLOW     NO  S.DEV                                    FLOW (Litres/Sec)                                    AV VEL BAND
   MM        L/S         PERCENT   0.29      0.52      0.92      1.63      2.90      5.16      9.17      16.31     29.00   25%     75%

   40  *   0.29 * 280 *  97 *    +5:4:44:344:344333321:123111::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+    0.03    0.10
   42  *   0.31 * 717 *  95 *    5 6 6 5455554543554434433232 1                                                      +    0.03    0.10
   43  *   0.34 *1190 * 121 *    +556555555565655555555544544432312                                                   +    0.03    0.12
   45  *   0.40 * 726 * 117 *    + 6 5 5 6 55 555 555444444443443                                                     +    0.04    0.13
   47  *   0.49 *1865 * 107 *    66 7 666665666665666665655655554311 1                                                +    0.05    0.14
   49  *   0.59 *2202 * 106 *    +66 65666666765656666666676565454312                                                 +    0.06    0.16
   51  *   0.67 *2432 * 109 *    6 66 66 766566 767666777666666565532                                                 +    0.07    0.17
   53  *   0.79 *2714 * 104 *    +6  6 56 6 7 666767666777767766666654431                                             +    0.08    0.19
   55  *   0.88 *2651 * 104 *    + 6  6 65 6 656657675677677777767666655542311                                        +    0.08    0.20
   57  *   1.02 *3309 * 104 *    +  65 6556 656566666766777777777766766654432                                         +    0.09    0.21
   59  *   1.13 *1644 * 102 *    55  45 55 5 556555655665666666676666666554533                                        +    0.10    0.23
   62  *   1.23 *1315 * 110 *    +55  44 5  5 5 455 5445556556666666666556553333                                      +    0.10    0.23
   64  *   1.12 *1605 * 148 *    + 55  54 55 555455555545565655665666666666555331                                     +    0.07    0.24
   67  *   0.94 *1045 * 181 *    +  55  54 55 5 45455 64555455555555555555544433                                      +    0.05    0.22
   69  *   0.98 *1324 * 176 *    5   54  65 55 555555555546455555656566555555554544                                  +    0.05    0.22
   72  *   1.12 *1220 * 173 *    45   55  64 55 55555545555545555555556555555555544543                               +    0.05    0.22
   75  *   1.37 *1007 * 173 *    +45   54  54 45 444545455545545555555555556555555544                               +    0.07    0.27
   78  *   1.52 *1024 * 163 *    + 45   45  43 45 5445 5455555545554555655555555655545432                            +    0.08    0.25
   81  *   1.96 * 998 * 146 *    +  45   44  44 44 444444455445445555565656565555555443                              +    0.10    0.29
   84  *   2.52 *1039 * 129 *    +   34   44  4  34 434444345445445445555656566666666655554                         +    0.14    0.32
   88  *   2.78 *1285 * 129 *    +    25   44  44 35 45343454544445554555565666667666665542                          +    0.15    0.33
   91  *   3.17 * 668 * 125 *    2     34   34  33 13 4233 434314444344444454555566666555531                         +    0.17    0.35
   95  *   3.28 * 635 * 140 *    24     34   43  33 23 414324333433424443344444555566655555431l                     +    0.15    0.36
   99  *   3.55 * 366 * 113 *    +3      32   3   31 33 33 3  2323333334334424445555554445331l1                       +    0.16    0.33
  102  *   3.44 * 263 *  99 *    + 13     11    1  21 11 23 413232331433444454344445454444313 1                      +    0.15    0.32
  107  *   3.75 * 238 *  90 *    +  1      2    33   1 33  1122211312333234343344443455453322213                      +    0.16    0.31
  111  *   4.44 * 255 *  67 *    +    1           2  11 1   1 1 2213133333333344444454555433   3                     +    0.19    0.32
  115  *   5.14 * 159 *  54 *    +                   1   2  11  1  312 2323223343443444444421                        +    0.21    0.34
  120  *   5.88 * 167 *  41 *    +                          1  2    1 213332 143424444444444                          +    0.23    0.35
  125  *   5.27 * 109 *  98 *    +       1          11   1  1       11211  1 23 33234444334434321                     +    0.22    0.35
  130  *   6.25 * 117 *  72 *    +       1      1     1  1  1  11    1  11   2111223234444444343                     +    0.25    0.36
  135  *   6.65 *  83 *  72 *    +        1       1          1  1      111   1 1 233322 4334434331                    +    0.23    0.36
  140  *   6.31 * 101 *  79 *    +                1    1   3   1 2   1 1  21   1 22222343444334411                   +    0.23    0.36
  146  *   6.56 *  79 *  76 *    +                     2   1  2  1   2   111 1  11 32334343333333   1 1              +    0.22    0.34
  152  *   6.75 *  91 *  61 *    +                           1  1 2 211221 11132123333343333333231l1                 +    0.19    0.33
  158  *   7.40 *  97 *  49 *    +                              1  1 1 1231  31223 3333344343333211                  +    0.21    0.32
  164  *   7.90 * 102 *  46 *    +                           1        1  21 2 3 3123232344444334333                  +    0.21    0.32
  171  *   8.97 *  82 *  43 *    +                                  1     111 2 131132333343433432   1 1            +    0.23    0.36
  177  *   9.64 *  92 *  34 *    +                                       1 1  1 2 212223344444343421                 +    0.25    0.36
  185  *  11.79 *  64 *  22 *    +                                             1  2  223334333333                    +    0.30    0.39
  192  *  14.27 *  41 *  21 *    +                                                1  1   33332432 1 2              +    0.36    0.44
  200  *  15.94 *  74 *  17 *    +                                                      112244444313311               +    0.39    0.46
  208  *  17.93 *  73 *  15 *    +                                                         2 3444442123 1+            +    0.43    0.50
  216  *  20.21 *  69 *  15 *    +                                                          1 23444444331+            +    0.46    0.57
  224  *  21.17 *  32 *   9 *    +                                                               343443               +    0.49    0.57
  233  *  16.95 *   6 *  39 *    +                                                  1             122                 +    0.46    0.51
  243  *  25.85 *   1 *   0 *    +                                                                      1 +           +    0.64    0.66
  252  *   0.00 *   0 *   0 *    +                                                                                    +
  263  *   0.00 *   0 *   0 *    +                                                                                    +
  273  *   0.00 *   0 *   0 *    +                                                                                    +
  284  *  25.85 *   1 *   0 *    +:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::1:+    0.64    0.66
```

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Rich Hill : 12-MAY-21 0:02 To 19-JUL-21 11:46

Manhole number: 1 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM	FLOW L/S	NO	S.DEV PERCENT	FLOW (Litres/Sec) 0.10 0.19 0.35 0.65 1.22 2.29 4.29 8.02 15.00	AV VEL 25%	BAND 75%
20	0.04	452	39	3:333:::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+	0.02	0.03
21	0.06	*1413	55	6 64553 42 2 +	0.02	0.04
23	0.07	991	63	6 7 665 342 2 +	0.02	0.05
25	0.09	*1995	71	6 77777 65 5544323 1 +	0.03	0.05
26	0.11	*1873	77	7 67767 76 6 6 5545433 21 +	0.03	0.06
28	0.14	*1546	80	7 6666 767 77 6655444434 3 1 +	0.03	0.07
30	0.16	*1068	82	5 6565 666656665654643434 23 2 +	0.04	0.08
32	0.17	696	108	5 5 6 5 5555 6555 55543542334 21 +	0.03	0.09
35	0.15	549	108	+ 55555 544455455 4344444333332322 +	0.02	0.06
37	0.15	200	129	5 44 5 4434 4 4 143331 1222 1 22 +	0.02	0.06
40	0.18	247	93	+ 54 5 5345 543433442311 122322 2 1 +	0.03	0.06
43	0.29	172	69	+ 332 4 43 544454234 133132312 2 1 +	0.04	0.07
46	0.37	94	45	+ 22 11 222335534 3232 3 22 21 +	0.06	0.08
49	0.40	70	96	+ 3 12 11 1321 3 443433 2 2 +	0.05	0.09
53	0.47	104	87	+ 3 122 122 21 3123233234353343 +	0.05	0.10
56	0.57	65	97	+ 2 3 2 33 11114 212343322 2 1 2 +	0.05	0.12
60	0.72	41	58	+ 1 11 23 121213 1331 22222 +	0.06	0.11
65	0.67	39	123	+ 2 32 1 22112322132 1 2 +	0.05	0.11
69	0.75	33	89	+ 2 2 21 12 2 12 222 131 1 2 1 1 1 +	0.05	0.11
74	0.71	50	144	3 3 3 3 1 3 1232 23131321121 11 +	0.04	0.12
80	1.08	51	145	+ 3 2 3 1 3 12 1 333313 22 11 2 2 2 +	0.06	0.13
85	1.38	106	90	+ 2 21 1 3 123 2 32 2343433443433 3 1 2 +	0.09	0.15
92	1.86	338	72	+ 2 132 1 33 13 4314243344445565555545433233 211 2 +	0.10	0.17
98	2.47	497	88	+ 3 41 32 1 12 241344334445555555545444445445443 1 +	0.11	0.22
105	2.34	582	157	+ 34 6 5 33 4 1334434234 55554555445545445453442 +	0.08	0.26
113	1.68	*2154	201	+ 476 66 465 56 365364666656566666666666555555555555555454 +	0.04	0.19
121	2.37	783	164	+ 441 5 54 452 54 5435163554555555455555454443332333445544 2+	0.06	0.20
129	3.01	65	32	+ 3 33234334423 +	0.11	0.15
139	0.00	0	0	+		
149	0.00	0	0	+		
159	0.00	0	0	+		
171	0.00	0	0	+		
183	0.00	0	0	+		
196	0.00	0	0	+		
210	0.00	0	0	+		
225	0.00	0	0	+		
241	0.00	0	0	+		
258	0.00	0	0	+		
277	0.00	0	0	+		
297	0.00	0	0	+		
318	0.00	0	0	+		
341	0.00	0	0	+		
365	0.00	0	0	+		
391	0.00	0	0	+		
419	0.00	0	0	+		
449	0.00	0	0	+		
482	0.00	0	0	+		
516	0.00	0	0	+		
553	0.00	0	0	+		
593	0.00	0	0	+		
635	0.00	0	0	+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+		

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Portmarnock : 24-JUN-21 9:46 To 22-JUL-21 10:36

Manhole number: 2 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM	FLOW L/S	NO PERCENT	S.DEV	FLOW (Litres/Sec) 0.05 0.09 0.16 0.28 0.50 0.89 1.58 2.81 5.00	AV VEL BAND 25%	75%
8	0.00	0	0			
8	0.00	0	0			
8	0.00	0	0			
9	0.00	0	0			
9	0.00	0	0			
9	0.00	0	0			
10	0.00	0	0			
10	0.00	0	0			
11	0.00	0	0			
11	0.00	0	0			
12	0.00	0	0			
12	0.00	0	0			
13	0.04	2599	40	9 8 6 5 4 3 21	0.03	0.05
14	0.00	0	0			
14	0.06	2793	44	8 8 8 8 7 7 64 431 1	0.04	0.07
15	0.08	2599	50	7 7 8 8 8 8 87 6655233 1 1	0.05	0.08
16	0.10	2239	52	5 6 7 7 8 8 78 7775653442423 1	0.06	0.09
16	0.00	0	0			
17	0.13	1887	45	4 5 6 6 6 7 77 77776675555431431	0.07	0.10
18	0.16	1545	51	4 4 5 4 5 5 76 67677766666654441 12	0.08	0.11
19	0.18	1096	53	4 3 3 4 4 4 55 666666666676655544411 1	0.08	0.13
20	0.21	865	60	3 4 3 4 3 4 5 455666 6557666664554431 1	0.08	0.14
21	0.23	728	64	4 4 3 3 3 4 44 5566 66556666554454441 1	0.08	0.14
22	0.24	535	67	1 3 4 4 4 44 54 55 56 5 5456555344442	0.08	0.15
23	0.25	350	80	2 2 3 3 2 44 44 4 45555 5444545343333331	0.09	0.15
24	0.24	248	110	3 3 3 3 3 3 33 4 4 5 5554433244242342311	0.08	0.14
25	0.27	193	96	2 2 1 3 1 3 2 2 4 35455544333234 131223 1	0.09	0.13
26	0.28	169	113	3 1 2 3 1 3 3 333 44554333343121111 2	0.09	0.13
27	0.35	137	61	2 2 2 1 1 31 3 44554442443223 2 1	0.10	0.14
29	0.38	160	60	2 1 121 1 2 2 3234355 53353413211 22 1	0.10	0.14
30	0.46	30	40	1 1 1 334333 1 1	0.12	0.14
31	0.55	17	36	1 2 1232 121 11	0.13	0.17
33	0.60	15	31	11 212 3 1 111 1	0.11	0.18
34	0.83	12	19	1 2 133 1	0.16	0.20
36	0.94	4	24	1 2 1	0.16	0.19
38	1.12	5	15	1 11 11	0.20	0.25
39	0.00	0	0			
41	0.00	0	0			
43	1.33	1	0	1	0.21	0.22
45	0.00	0	0			
47	0.00	0	0			
50	0.00	0	0			
52	0.00	0	0			
54	0.00	0	0			
57	0.00	0	0			
60	0.00	0	0			
62	0.00	0	0			
65	0.00	0	0			
68	0.00	0	0			
72	0.00	0	0			
75	4.46	1	0	1	0.32	0.33

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Portmarnock : 24-JUN-21 10:26 To 23-AUG-21 0:00

Manhole number: 3 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM	FLOW L/S	NO	S.DEV PERCENT	FLOW (Litres/Sec) 0.04 0.07 0.13 0.22 0.40 0.71 1.26 2.25 4.00	AV VEL BAND 25%	75%
20	0.06	27	81	2:::2::3::+:1:3:1:33+	0.02	0.06
21	0.00	0	0	+		
21	0.09	19	62	+ 1 1 2 1 133 3	0.04	0.07
22	0.10	27	92	+ 1 3 2 1 1 3 33 1 2	0.04	0.07
23	0.00	0	0	+		
23	0.06	67	98	5 3 2 2 1 1 1 333 2 2 11	0.02	0.06
24	0.06	86	81	4 5 4 3 3 2 3 23 12 1 11	0.02	0.04
25	0.06	72	139	+ 2 3 4 3 21 13 3 3 11 11	0.01	0.05
26	0.00	0	0	+		
26	0.05	73	160	+ 4 3 2 1 23 3 13 1 11 2 1	0.01	0.05
27	0.08	73	156	4 3 4 2 3 1 3 1 3 3 4 1 1 1 21	0.01	0.07
28	0.10	93	139	3 4 4 3 4 3 3 34 33 313 31	0.02	0.07
29	0.11	108	131	3 4 4 4 3 3 3 3 44 213 2 21 211	0.02	0.07
30	0.10	142	190	5 4 3 4 3 4 4 3 3 433 33 1223 31	0.01	0.08
31	0.09	171	179	+ 5 4 4 4 4 4 4 3 44 333 111 2	0.01	0.06
32	0.12	255	153	+ 5 5 4 4 5 4 4 5 4 44 333322222331	0.01	0.07
33	0.14	277	151	+ 5 5 5 4 55 4 44 4443331 31311	0.01	0.08
34	0.14	340	162	+ 6 5 5 5 4 5 45 45 4434333322233	0.02	0.09
35	0.14	387	168	+ 6 5 5 5 5 5 4 5 55 4444311312333	0.02	0.09
36	0.17	428	170	+ 5 5 5 5 5 5 5 5 554 43442213323231	0.01	0.09
37	0.19	475	163	+ 5 5 5 5 5 5 5 5 5555 544423131332	0.02	0.10
38	0.19	549	172	+ 6 6 5 5 5 5 5 55 55 54444221233211	0.02	0.09
39	0.21	644	150	6 6 5 6 6 5 55 55 5 665 5 54 31 4221	0.02	0.10
40	0.24	664	149	6 6 6 5 5 5 5 55 6 56 655544433 3341	0.02	0.10
42	0.25	1402	159	7 7 7 55 55 56 6 55556566666556544343431	0.02	0.10
43	0.24	748	171	7 6 6 6 5 5 5 5 56 6 66545 554 31321	0.02	0.10
44	0.26	747	156	+ 7 6 6 6 5 5 5 5 65 6655544433423	0.03	0.11
46	0.26	1644	166	+ 8 6 6 66 6 55 6 6 55555656666656554434431 3	0.02	0.10
47	0.28	851	170	+ 7 6 6 6 5 6 5 5 5 566 665444334331	0.02	0.11
48	0.31	1709	171	+ 7 7 6 7 66 6 6 56 6 5565566656665553344431	0.03	0.11
50	0.34	807	161	7 6 6 6 5 6 5 5 55 66 5555544133433	0.03	0.11
52	0.35	1372	166	7 7 66 56 55 6 5555 655665656656554354343	0.03	0.11
53	0.38	652	167	6 6 6 5 5 5 5 55 5 5555 5554433313	0.03	0.12
55	0.46	1144	152	6 6 6 55 55 55 55 6 55556 656565666554434331	0.03	0.12
56	0.53	960	139	6 5 5 54 55 55 6 5 55546 656565655555534442	0.04	0.13
58	0.63	742	129	6 45 54 5 44 45 5 5 545 54556566555443332	0.05	0.14
60	0.68	277	136	5 4 3 4 3 4 4 3 3 4 44 5555444321 3	0.06	0.14
62	0.76	427	110	5 53 32 4 4 44 43 45444544555555554333131	0.07	0.14
64	0.76	268	127	5 23 34 43 32 3 4 4143444335445455432 13	0.06	0.15
66	0.83	150	124	4 2 3 33 2 31 3 32234 4334344444242 1	0.07	0.15
68	0.70	121	207	5 3 2 12 3 3 3 411234434443	0.03	0.16
70	0.86	111	154	3 3 3 3 1 3 1 11 2 2 43133345433332121 1	0.07	0.14
72	0.81	135	177	4 4 113 2 3 1 11 3 1 14345533432 21	0.04	0.15
74	0.73	51	155	3 1 1 4 3 3 1 3 1 2 12 333312	0.03	0.15
77	0.60	32	199	4 1 3 12 3 1 213121111	0.02	0.13
79	0.78	36	239	33 11 2 1 2 33333 31	0.01	0.16
81	0.89	13	225	2 2 1 211 1111	0.02	0.18
84	1.94	5	5	3 1	0.14	0.14
87	2.28	4	11	1 2 1	0.15	0.16
89	2.83	1	0	1	0.19	0.20
92	0.71	1	0	+:::::::::1::::::::+	0.05	0.05

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Portmarnock : 24-JUN-21 10:56 To 23-AUG-21 0:00

Manhole number: 5 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM		FLOW L/S		NO	S.DEV PERCENT	FLOW (Litres/Sec) 0.37 0.66 1.17 2.08 3.70 6.58 11.70 20.81 37.00	AV VEL BAND 25%	75%
40	*	0.32	*	346	* 98 *	4:5:554:4444354332311:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+	0.03	0.11
42	*	0.40	*	887	* 97 *	5555555554555555554543 +	0.05	0.14
44	*	0.53	*	1293	* 91 *	5556 656565666666566555341 +	0.06	0.16
45	*	0.65	*	2341	* 88 *	566556766666766766776676653 3 1 +	0.08	0.19
47	*	0.84	*	3047	* 80 *	55656656656776777777777776765 32 +	0.10	0.22
50	*	0.93	*	3107	* 94 *	55 6 6 65566566767777787877766 43 +	0.11	0.22
52	*	1.08	*	2763	* 93 *	455 555565565566666667777787765431 +	0.12	0.25
54	*	1.26	*	3419	* 90 *	65 655555556665666666767677887787744 +	0.14	0.27
56	*	1.42	*	1783	* 91 *	+44 54 5444454555555556666676777775431 +	0.15	0.29
59	*	1.56	*	1471	* 99 *	4 5 44 5 5445345454556555666676677765 41 +	0.15	0.30
61	*	1.64	*	1769	* 98 *	44 45 4445 5454555455565656666667777666 54 1 +	0.15	0.30
64	*	1.91	*	1478	* 90 *	+ 43 54 5 435354444555555565666666776666662 +	0.16	0.32
67	*	2.17	*	1380	* 97 *	4 43 44 5334434454454555455565566666666766653 +	0.18	0.35
70	*	2.64	*	1174	* 88 *	42 34 13 3334323442444455545555555656676767641 +	0.21	0.38
73	*	3.10	*	1109	* 77 *	+23 23 34 313344434334434454554555565666677766 3 +	0.24	0.40
76	*	3.54	*	1003	* 90 *	+ 21 33 2 33 2 32212333432443445555555666676764 +	0.28	0.43
79	*	3.89	*	749	* 88 *	+ 13 21 3 11 213131232333134344445545555676765 +	0.29	0.44
83	*	4.23	*	780	* 79 *	4 3 13 322313 213231342333344434454554566667663 +	0.29	0.44
86	*	4.67	*	451	* 82 *	+3 1 211 2 3 211332133322323343444555566666 4 +	0.32	0.46
90	*	4.92	*	245	* 81 *	+ 2 1 3 2 22 1 2 11 2313333323454555553 +	0.34	0.44
94	*	5.75	*	284	* 53 *	+ 1 1 1 1 2 1 1 3 3 1313 3333345455565541 +	0.34	0.46
98	*	6.48	*	209	* 60 *	+ 1 1 1 11 1 22 12 232 1333445555553 +	0.38	0.49
102	*	7.69	*	142	* 38 *	+ 1 1 1 1 33 33344445541 +	0.41	0.52
107	*	8.00	*	116	* 47 *	+ 1 1 1 1 1 1131 1 33134245552 +	0.41	0.53
111	*	9.36	*	123	* 24 *	+ 1 1 1 1 12334445553 +	0.44	0.54
116	*	10.88	*	102	* 21 *	+ 1 1233444553 +	0.49	0.58
121	*	11.93	*	122	* 15 *	+ 11 3344445543 +	0.50	0.61
126	*	12.98	*	139	* 24 *	+ 11 1 1254455541 +	0.53	0.64
132	*	14.07	*	94	* 22 *	+ 1 1 234445541 +	0.54	0.64
138	*	15.08	*	135	* 31 *	+ 1 1 1 1 1 1 34435651 +	0.56	0.67
144	*	16.90	*	120	* 11 *	+ 4454554 +	0.58	0.68
150	*	17.32	*	107	* 31 *	+ 1 135544541 +	0.57	0.69
156	*	19.59	*	80	* 36 *	+ 1 2453454 +	0.63	0.75
163	*	21.47	*	68	* 10 *	+ 2354454 +	0.64	0.76
170	*	23.80	*	75	* 11 *	+ 23344544 +	0.69	0.80
178	*	25.55	*	44	* 18 *	+ 1 234344 +	0.72	0.84
186	*	27.19	*	37	* 20 *	+ 1 1 1 14444 +	0.75	0.85
194	*	28.52	*	21	* 23 *	+ 11 1 424 +	0.79	0.89
202	*	29.31	*	20	* 49 *	+ 1 1 11334+	0.82	0.92
211	*	32.74	*	8	* 10 *	+ 1 123+	0.83	0.90
220	*	30.62	*	7	* 10 *	+ 221 2+	0.72	0.86
230	*	24.45	*	5	* 58 *	+ 1 13 +	0.73	0.79
240	*	29.39	*	3	* 5 *	+ 111 +	0.71	0.77
250	*	31.13	*	2	* 0 *	+ 2 +	0.77	0.79
261	*	31.13	*	5	* 7 *	+ 22 1+	0.74	0.80
272	*	27.75	*	5	* 34 *	+ 1 22 +	0.77	0.82
284	*	32.51	*	4	* 3 *	+ 13 +	0.81	0.84
297	*	32.98	*	3	* 0 *	+ 3 +	0.82	0.84
309	*	31.13	*	2	* 6 *	+ 1 1 +	0.74	0.83
323	*	29.39	*	1	* 0 *	+ 1 +	0.73	0.75
337	*	29.39	*	1	* 0 *	+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::1:::+	0.73	0.75

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

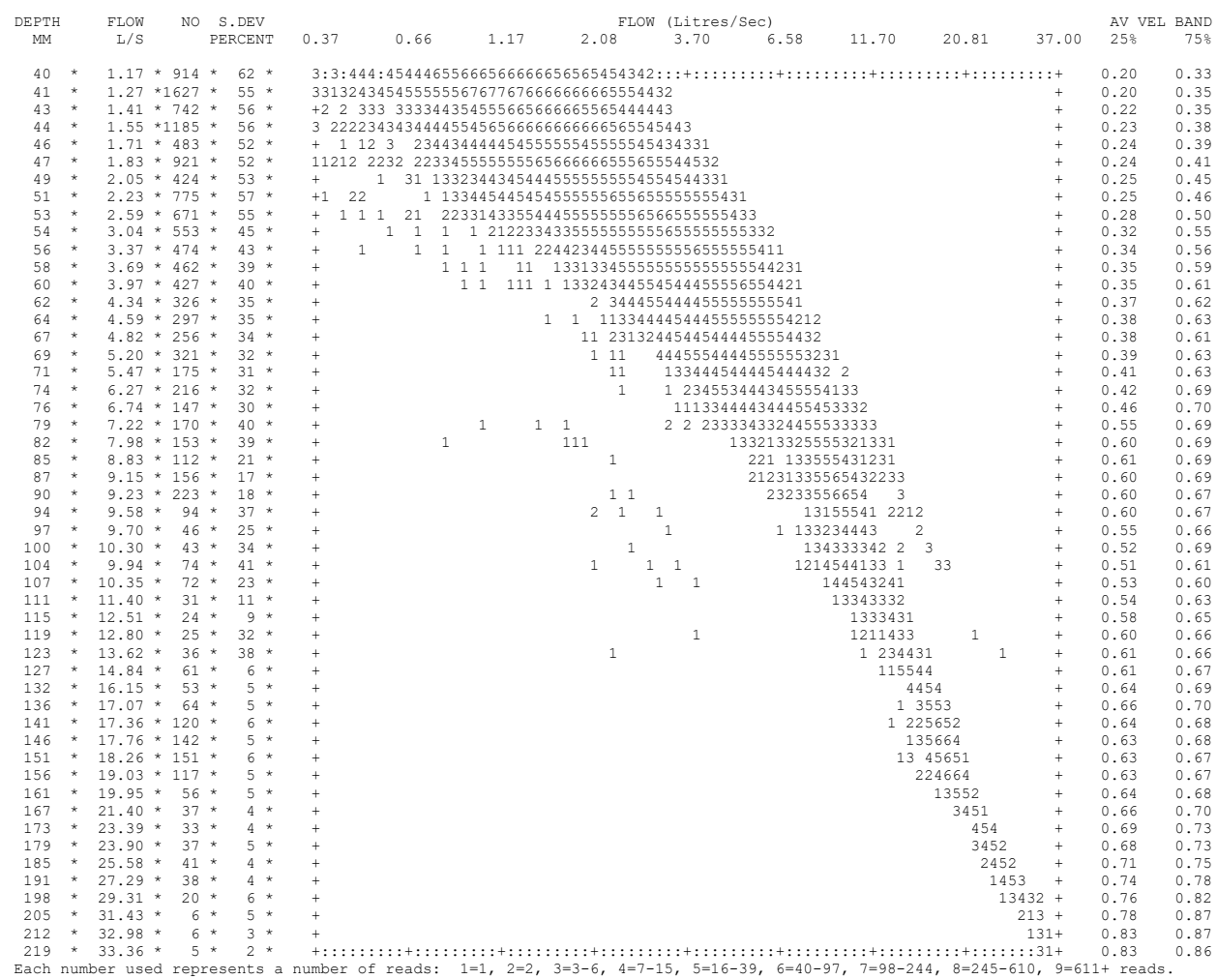
Rich Hill : 12-MAY-21 0:02 To 8-JUL-21 0:00

Manhole number: 6 LOG (FLOW) / LOG (DEPTH) GRAPH

```
 DEPTH      FLOW     NO  S.DEV                                  FLOW (Litres/Sec)                                  AV VEL BAND
   MM        L/S         PERCENT   1.00      1.64      2.70      4.43      7.28     11.96     19.64     32.27     53.00   25%     75%

   40  *   1.08 * 218 *  27 *    5455554441+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+    0.19    0.25
   41  *   1.17 * 556 *  26 *    6555656665532                                                                          +    0.19    0.26
   43  *   1.28 * 365 *  24 *    455564565653 213                                                                       +    0.20    0.27
   45  *   1.37 * 941 *  27 *    55656656676665443                                                                      +    0.20    0.27
   46  *   1.46 * 405 *  28 *    44445556556655543                                                                      +    0.21    0.28
   48  *   1.58 * 929 *  27 *    445546566576776653121                                                                  +    0.21    0.28
   50  *   1.74 * 944 *  28 *    434455655566767765443                                                                  +    0.22    0.29
   51  *   1.90 * 966 *  29 *    4243555556556677776553                                                                 +    0.24    0.31
   53  *   2.08 * 865 *  27 *    233 2534455655667776554  1                                                             +    0.25    0.32
   55  *   2.27 * 814 *  26 *    3 32433455444555677666541                                                              +    0.27    0.33
   57  *   2.45 * 568 *  25 *    +22131 3343444554666666544                                                             +    0.27    0.34
   59  *   2.57 * 532 *  31 *    + 331331334444445455666664431                                                          +    0.27    0.34
   61  *   2.78 * 462 *  24 *    2 1   2311344343454546666654231                                                        +    0.27    0.34
   64  *   2.98 * 313 *  23 *    +   1 231 32223344344556655421                                                         +    0.28    0.34
   66  *   3.17 * 447 *  26 *    + 2    3 211333434454555666665431                                                      +    0.28    0.35
   68  *   3.42 * 304 *  28 *    +         221 32334445455555555331                                                     +    0.29    0.37
   71  *   3.65 * 473 *  34 *    +1 1    2  321123133444555566655311                                                    +    0.29    0.37
   74  *   3.96 * 287 *  27 *    +      1 1  1 3 1223243344555566534                                                   +    0.30    0.38
   76  *   4.24 * 468 *  29 *    +          11 21 43 33244545566666531                                                 +    0.32    0.39
   79  *   4.57 * 532 *  25 *    + 1    1 2 321 11122233444445666676533                                                 +    0.32    0.39
   82  *   4.97 * 507 *  24 *    +           1  112  234243335555566754441                                           +    0.33    0.40
   85  *   5.42 * 519 *  18 *    +         1      21 12 32 434445556776541                                           +    0.35    0.41
   88  *   5.79 * 502 *  18 *    +             1   121   322114455566676533                                         +    0.35    0.42
   91  *   6.21 * 575 *  16 *    +         1     1      111 33334445567775411                                        +    0.37    0.42
   95  *   6.74 * 687 *  15 *    +              1  1 2 111  3334435567777653                                         +    0.38    0.43
   98  *   7.11 * 413 *  21 *    +              2    3   131  31 1334455667654                                       +    0.39    0.44
  102  *   7.84 * 402 *  14 *    +                    1    121   11143545666651 1                                    +    0.40    0.45
  105  *   8.42 * 231 *  16 *    +                      1 1    11 11233344556553                                    +    0.41    0.47
  109  *   9.14 * 222 *  13 *    +                        1      1   2133345566532                                   +    0.42    0.48
  113  *   9.85 * 153 *  16 *    +                               21 11 12124345554 3                                  +    0.44    0.50
  117  *  10.65 * 113 *  11 *    +                                    1  112234555412                                +    0.45    0.51
  121  *  11.29 *  91 *  11 *    +                                     1   1223445542                                 +    0.46    0.51
  126  *  12.29 * 114 *  11 *    +                                       1 1  2335555431                           +    0.47    0.53
  131  *  13.21 * 122 *   9 *    +                                           3234555441                            +    0.48    0.54
  135  *  14.07 * 120 *  10 *    +                                          1 3313555543                           +    0.50    0.55
  140  *  15.33 * 115 *   9 *    +                                             21 34555531                         +    0.52    0.58
  145  *  16.81 * 133 *   9 *    +                                           1   11 3455543                         +    0.54    0.60
  151  *  18.38 * 148 *   8 *    +                                                  134455543                      +    0.56    0.63
  156  *  20.01 * 130 *   9 *    +                                                1    3455554                     +    0.59    0.66
  162  *  21.66 * 148 *   8 *    +                                                     133456551                   +    0.62    0.68
  168  *  23.44 * 100 *   8 *    +                                                      2 1444553                  +    0.64    0.70
  174  *  25.66 *  84 *   7 *    +                                                         2334555                 +    0.68    0.74
  180  *  27.56 *  74 *   8 *    +                                                         1  3445531            +    0.69    0.77
  187  *  31.09 *  44 *   6 *    +                                                              133444           +    0.77    0.83
  194  *  32.55 *  45 *  21 *    +                                                1                   134442      +    0.78    0.85
  201  *  36.29 *  27 *   4 *    +                                                                      3442     +    0.83    0.89
  208  *  37.64 *  38 *   6 *    +                                                                     1144411   +    0.83    0.90
  216  *  40.10 *  34 *  25 *    +                                                    1                   3 43411 +    0.88    0.97
  223  *  41.14 *  19 *  34 *    +                                                    1                      3433 +    0.91    0.98
  232  *  49.20 *   2 *   3 *    +                                                                          11+    1.01    1.06
  240  *  53.00 *   1 *   0 *    +:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:1    1.08    1.11
 Each number used represents a number of reads:  1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.
 Rich Hill : 12-MAY-21  0:00  To   8-JUL-21  0:00
```

Manhole number: 8 LOG (FLOW) / LOG (DEPTH) GRAPH



Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Rich Hill : 12-MAY-21 0:02 To 8-JUL-21 0:00

Manhole number: 9 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM		FLOW L/S	NO	S.DEV PERCENT		FLOW (Litres/Sec) 1.00	1.67	2.78	4.64	7.75	12.92	21.56	35.97	60.00	AV VEL 25%	BAND 75%
40	*	1.08	*1607	* 39 *		7677777766553:1:::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+									0.18	0.27
42	*	1.36	*1165	* 34 *		5555667677765542								+	0.23	0.30
44	*	1.53	*1224	* 34 *		5555656667777765431								+	0.24	0.31
47	*	1.68	*2175	* 42 *		555555666777877776654								+	0.25	0.32
49	*	1.93	*1907	* 35 *		444455555657678777776543								+	0.27	0.34
52	*	2.23	*3252	* 29 *		44454556566667888888765531								+	0.28	0.35
55	*	2.59	*3143	* 26 *		433343345555667678888888776541								+	0.30	0.37
58	*	2.88	*3066	* 30 *		34334324445455566777888888776532								+	0.31	0.39
61	*	3.27	*2846	* 24 *		+223312244344444556777888887765 3								+	0.33	0.40
64	*	3.59	*3461	* 30 *		21233131324333454566667888888887654 31								+	0.34	0.41
68	*	3.98	*2186	* 26 *		+ 2131 22 2333444454566777888776554 2								+	0.35	0.41
72	*	4.34	*2499	* 25 *		+ 2 1131334333344545555667788887765542								+	0.35	0.42
75	*	4.87	*1929	* 25 *		+11 21 2 33 3444455566667788877654311								+	0.37	0.44
79	*	5.50	*1371	* 21 *		+ 2 3 1 24334444555667778776543 1								+	0.38	0.46
84	*	6.07	*1128	* 24 *		+ 1 11 133334444445555667777655431								+	0.39	0.48
88	*	6.97	* 538	* 23 *		+ 1 1 1 21 31 3234544556676654331								+	0.42	0.51
93	*	7.72	* 479	* 19 *		+ 1 3221231234556666655443 11								+	0.43	0.51
98	*	8.58	* 389	* 19 *		+ 1 1 3111334445566665544433								+	0.45	0.53
104	*	9.62	* 405	* 19 *		+ 1 12 11313444556666554343								+	0.46	0.55
109	*	10.82	* 287	* 22 *		+ 2 1 111 221444456665444421								+	0.49	0.59
115	*	12.28	* 227	* 22 *		+ 1 21 334455655434341								+	0.51	0.61
121	*	13.52	* 162	* 23 *		+ 12 2245555544331								+	0.54	0.63
128	*	15.20	* 114	* 13 *		+ 1 11445554432								+	0.56	0.65
135	*	17.59	* 132	* 11 *		+ 345555452								+	0.61	0.70
142	*	19.25	* 131	* 15 *		+ 1 13455554521								+	0.62	0.73
150	*	20.36	* 156	* 16 *		+ 1 114445545533								+	0.62	0.73
158	*	22.54	* 140	* 16 *		+ 1 355554333								+	0.65	0.74
166	*	24.69	* 136	* 11 *		+ 12 33345554 22								+	0.68	0.76
176	*	27.37	* 141	* 17 *		+ 1 11 322314555443311								+	0.71	0.80
185	*	29.37	* 91	* 21 *		+ 2 11221 13554 312 1								+	0.74	0.80
195	*	33.69	* 68	* 24 *		+ 1 1 11234443 44 12								+	0.76	0.96
206	*	36.45	* 38	* 36 *		+ 1 1 11 13234341221								+	0.80	0.97
217	*	39.57	* 38	* 24 *		+ 1 22311113334121 1								+	0.72	1.02
229	*	41.19	* 20	* 30 *		+ 1 211 11 321 231								+	0.67	1.12
241	*	38.51	* 9	* 21 *		+ 12111 11 1								+	0.67	0.97
254	*	35.18	* 7	* 19 *		+ 1 212 1								+	0.66	0.74
268	*	34.88	* 10	* 25 *		+ 1 1112 1 21								+	0.63	0.89
282	*	33.85	* 11	* 18 *		+ 1 1 21 1311								+	0.62	0.78
298	*	34.52	* 5	* 24 *		+ 111 1 1								+	0.59	0.82
314	*	32.10	* 9	* 23 *		+ 1 2111 1 11								+	0.57	0.78
331	*	34.35	* 10	* 17 *		+ 2 211 1111								+	0.62	0.81
349	*	35.36	* 9	* 18 *		+ 1 11 1111 2								+	0.62	0.82
368	*	33.80	* 14	* 21 *		+ 1 132 11 3 11								+	0.60	0.81
388	*	33.63	* 16	* 16 *		+ 2331 13 3								+	0.60	0.78
409	*	40.11	* 15	* 14 *		+ 1 1 23313								+	0.79	0.89
431	*	39.96	* 17	* 17 *		+ 11 323221								+	0.78	0.89
454	*	40.63	* 21	* 17 *		+ 1 1 1 23233								+	0.79	0.93
479	*	41.93	* 38	* 12 *		+ 1 11 234441								+	0.84	0.91
505	*	42.66	* 33	* 13 *		+ 11 1 4441								+	0.85	0.94
532	*	41.86	* 29	* 14 *		+ 1112 4431								+	0.85	0.92
561	*	34.46	* 6	* 2 *		+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::31:::::::::+								+	0.69	0.71

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

Rich Hill : 12-MAY-21 0:02 To 8-JUL-21 0:00

Manhole number: 10 LOG (FLOW) / LOG (DEPTH) GRAPH

DEPTH MM		FLOW L/S	NO	S.DEV PERCENT		FLOW (Litres/Sec) 0.38 0.68 1.20 2.14 3.80 6.76 12.02 21.37 38.00	AV VEL BAND 25%	75%
40	*	1.14	*1033	* 66 *		3:333443345456556566566666666655433321:::+:::::::::+:::::::::+:::::::::+:::::::::+	0.18	0.32
42	*	1.31	* 578	* 59 *		+ 121 221332444455565655555555555433 +	0.19	0.34
44	*	1.39	* 489	* 63 *		+23 12423314343434554555555646454554332 1 +	0.19	0.33
47	*	1.58	* 449	* 59 *		+31 211 32142144445355455555554565443321 +	0.20	0.35
49	*	1.66	* 554	* 68 *		+ 1 1112133313434445555555555555554321 +	0.19	0.36
52	*	1.64	* 439	* 79 *		+ 12331 333234331345545455545554455443111 +	0.18	0.32
55	*	1.70	* 318	* 83 *		+ 1 21 1 2 1 233343434445455545544444454223 1 +	0.17	0.32
58	*	1.72	* 306	* 90 *		+ 21 3 311 113242233344455454544445444443423 +	0.16	0.31
61	*	2.01	* 212	* 71 *		+ 1 1 31 2 32 32 232243435444443442434444 2 +	0.17	0.31
64	*	1.80	* 160	* 103 *		+ 2 13 311 2 333321322344433333342233133343132 +	0.13	0.31
67	*	2.07	* 128	* 114 *		1 11 2 211 211 1113331 3334333434333313123342 +	0.14	0.32
71	*	1.94	* 61	* 126 *		+11 1 1 1 11 1131 3333 12111332 1112 22222 +	0.12	0.28
75	*	3.03	* 43	* 112 *		+ 12 1 1 1 21 3 1 12111 1 1 33 31 22 +	0.14	0.45
79	*	4.24	* 25	* 136 *		+ 1 1 2 1 1 2 433 +	0.24	0.53
83	*	6.00	* 51	* 65 *		+ 1 1 1 1 111 1 12 22324324 2 +	0.41	0.58
87	*	7.38	* 26	* 43 *		+ 1 1 2 2 333322 +	0.49	0.59
92	*	6.45	* 21	* 100 *		+ 1 1 1 1 1 33 3 +	0.46	0.56
97	*	8.72	* 42	* 40 *		+ 1 1 1 1 1 1334433 +	0.50	0.58
102	*	10.00	* 27	* 37 *		+ 1 1 234421 +	0.54	0.60
107	*	11.79	* 36	* 9 *		+ 24253 2 +	0.55	0.61
113	*	13.10	* 20	* 4 *		+ 432 +	0.59	0.63
119	*	13.92	* 18	* 7 *		+ 3323 +	0.57	0.65
126	*	15.30	* 5	* 9 *		+ 22 1 +	0.58	0.62
132	*	1.80	* 1	* 0 *		+ 1 +	0.07	0.07
139	*	0.00	* 0	* 0 *		+ +		
147	*	0.00	* 0	* 0 *		+ +		
155	*	0.00	* 0	* 0 *		+ +		
163	*	21.37	* 2	* 6 *		+ 1 1 +	0.60	0.67
172	*	0.00	* 0	* 0 *		+ +		
181	*	21.37	* 1	* 0 *		+ 1 +	0.55	0.57
190	*	26.90	* 8	* 5 *		+ 323 +	0.64	0.71
201	*	28.50	* 1	* 0 *		+ 1 +	0.66	0.68
211	*	0.00	* 0	* 0 *		+ +		
223	*	0.00	* 0	* 0 *		+ +		
234	*	0.00	* 0	* 0 *		+ +		
247	*	0.00	* 0	* 0 *		+ +		
260	*	0.00	* 0	* 0 *		+ +		
274	*	0.00	* 0	* 0 *		+ +		
289	*	0.00	* 0	* 0 *		+ +		
304	*	0.00	* 0	* 0 *		+ +		
320	*	0.00	* 0	* 0 *		+ +		
337	*	0.00	* 0	* 0 *		+ +		
356	*	0.00	* 0	* 0 *		+ +		
375	*	0.00	* 0	* 0 *		+ +		
394	*	0.00	* 0	* 0 *		+ +		
416	*	0.00	* 0	* 0 *		+ +		
438	*	0.00	* 0	* 0 *		+ +		
461	*	0.00	* 0	* 0 *		+ +		
486	*	0.00	* 0	* 0 *		+ +		
512	*	0.00	* 0	* 0 *		+ +		
539	*	0.00	* 0	* 0 *		+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+:::::::::+		

Each number used represents a number of reads: 1=1, 2=2, 3=3-6, 4=7-15, 5=16-39, 6=40-97, 7=98-244, 8=245-610, 9=611+ reads.

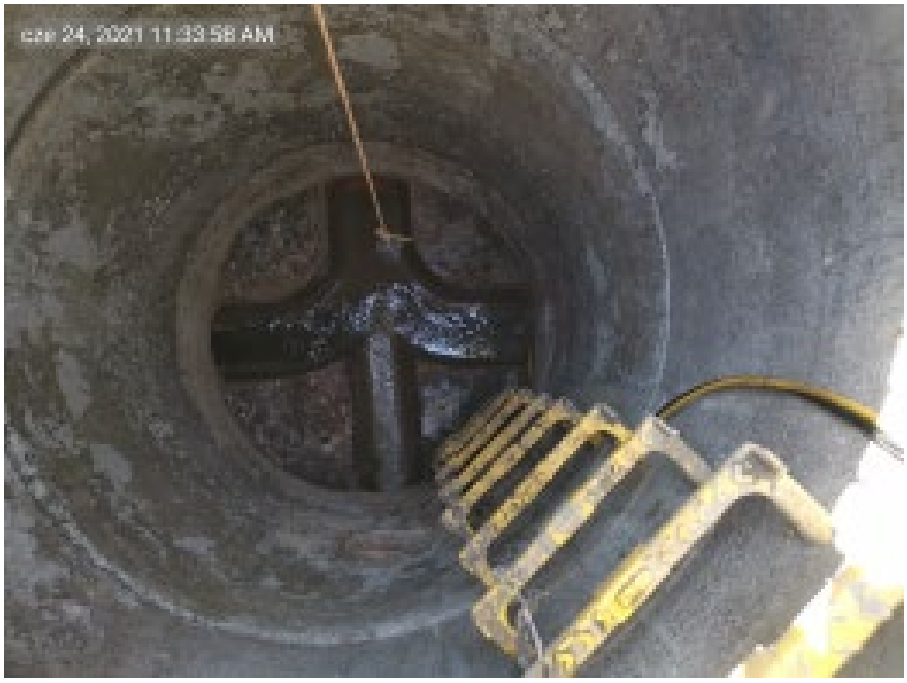
Rich Hill : [8] 5-JUN-21 0:00 To 8-JUL-21 0:00

Appendix G - Installation Photographs

FM01

FM01A

FM02



FM03

STATION ROAD

NEW FOUL CONNECTION TO PROPOSED NEW IW PUMPING STATION (APPROX Q3 2019). TEMPORARY PUMPING STATION TO BE DECOMMISSIONED THEREAFTER.

LOCATION OF IRISH WATER FOUL PUMPING STATION. SUBJECT TO PLANNING APPLICATION BY IRISH WATER

STRAND ROAD

PORTMARNOCK BRIDGE ROUNDABOUT

SEPTIC TANK

PRIVATE SIDE INSPECTION CHAMBERS

SPURS FOR FUTURE DEVELOPMENT

E723338.051 N742444.335

E723330.752 N742444.895

E723329.441 N742427.806

E723336.740 N742427.246

E723182.000 N742384.000

CAPPED FOR FUTURE CONNECTION

FOR FUTURE DEVELOPMENT

CAPPED FOR FUTURE DEVELOPMENT

PORTMARNOCK SOUTH PHASE 1A (ST. MARNOCK BAY)

RISING MAIN FROM TEMPORARY PUMPING STATION TO EXISTING 2250mm FOUL SEWER. THIS IS TEMPORARY UNTIL THE CONSTRUCTION OF NEW IW PUMPING STATION (APPROX. Q3 2019)

SECTIONS OF SEWER TO BE CONSTRUCTED / AMENDED AND EXISTING 2250mm FOUL SEWER TO COAST ROAD DECOMMISSIONED WHEN NEW TREATMENT PLANT IS OPERATIONAL (APPROX Q3 2019).

EXISTING 2250mm FOUL SEWER

FOR FUTURE DEVELOPMENT

LENGTH OF EXISTING SEWER DIVERTED AND DECOMMISSIONED

POSSIBLE 2ND LOCATION TO DISCOUNT PHASE 1A NETWORK IF DATA FROM INITIAL TEST IS HIGH.

POSSIBLE 3rd LOCATION TO ESTABLISH FLOW THAT ACTUALLY ENTER PUMPING STATION

RISING MAIN FROM PUMPING STATION GOES HERE

DRESCOMPOUND PROPOSED FLOW METER LOCATION

Ex F1.4

Meters 15 0 15 30

1:500

NOTES:

1. Figured dimensions only to be taken from this drawing.
2. All dimensions to be checked on site.
3. All levels are in metres O.D. and are related to Ordnance datum at Malin

NOTES

1 SEWER LAYING TO BE IN ACCORDANCE WITH IRISH WATER STANDARD DETAILS.

2 REFER TO ARCHITECTS LAYOUT FOR OVERALL SETTING OUT INFORMATION (BUILDINGS, ROADS, BOUNDARIES AND FOOTPATHS)

3 ALL PIPES WITH LESS THAN 1.2m COVER (ROAD) AND 0.9m (LANDSCAPED AREAS) SHALL BE ENCASED IN min 150mm CONCRETE SURROUND CI. 16/20

4 MANHOLE COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY CONCRETE PLINTH, 200MM ALL AROUND AND 100MM DEEP, IN COMPLIANCE WITH IW STANDARDS

5 SEPARATION DISTANCES FROM WATERMAIN TO BE IN COMPLIANCE WITH STD-WW-05 OF IW STANDARDS.

LEGEND:

EXISTING uPVC FOUL SEWER

PROPOSED uPVC FOUL SEWER

PROPOSED uPVC FOUL SEWER (APPROX Q3 2019)

PROPOSED INSPECTION CHAMBER

PROPOSED PE TEMPORARY RISING MAIN

Description:	Drawn	Date:	Rev.:
PUMPING STATION AMENDED. COORDINATES ADDED	SW	13/03/19	C5
LAYOUT AND NOTES REVISED	ES	25/02/19	C4
COVER LEVELS REVISED	SW	12/10/18	C3
COVER LEVELS REVISED	ES	31/08/18	C2
ISSUED FOR CONSTRUCTION	ES	22/08/18	C1
DRES SURVEY ADDED. F3.7a to F3.7 ADDED. F1.2A to F1.2 ADDED FOR FUTURE LANDS. F1.3 to F4 DIAMETERS AMENDED. HOUSE CONNECTIONS ADDED.	SW	31/07/18	P2
LAYOUT AMENDED	SW	31/05/18	P1
ISSUED FOR PLANNING	SW	14/12/17	F
LAYOUT & WETLAND AMENDED	SW	11/12/17	E
ISSUED FOR PRE-PLANNING APPLICATION TO A.B.P.	SW	22/09/17	D
GENERAL REVISIONS	SW	07/09/17	C
ISSUED FOR PRE-PLANNING	ES	03/08/17	B
INITIAL ISSUE FOR REVIEW	SW	28/07/17	A

Client:

St. Marnock's II DAC and Clear Real Estate Investments plc.

Project:

PORTMARNOCK SOUTH PHASE 1B.

Clients Representative:

J. B. Barry and Partners Limited Consulting Engineers

Classon House
Dundrum Business Park
Dundrum Road
Dublin 14

Tel: +353 1 485 1400
email: info@jbbarry.ie
web: www.jbbarry.ie

Drawn By:	Date:	Checked By:	Date:	Approved By:	Date:
SW	JULY 2017	SW	JULY 2017	JO'B	JULY 2017

Internal Project Ref: Y17205

Stage: CONSTRUCTION

Drawing Title:

FOUL SEWERS LAYOUT

Scales: 1:500 @ A1

Drawing. No.: Y17205-C-200

Rev: C5

DETECTRONIC

FLOW MEASUREMENT AND DATA DELIVERY

DATA SHEET

ATEX MSFM MULTI SENSOR FLOW MONITOR S2U

Remote-reporting flow measurement system for water and wastewater applications:

- COMBINED SEWERS
- OPEN-CHANNELS
- STORM SEWERS
- INDUSTRIAL EFFLUENT

MSFM S2U is designed to monitor raw sewage, industrial effluents and storm waters. Automatic GPRS data retrieval is standard and can be used worldwide*. An additional standard input accepts Detectronic Ultrasonic Level Sensor or PTI Pressure-Depth Sensor.

Certified to ATEX/IEC Ex Zone 1.

*Contact Detectronic for competitive global tariffs

THREE HEADS ARE BETTER THAN ONE

The MSFM records data from 3 sensor inputs: Pressure Depth, Ultrasonic Velocity and (optional) Ultrasonic Level/PTI. Readings can be logged at regular intervals between 1 and 60 minutes.

TELEMETRY

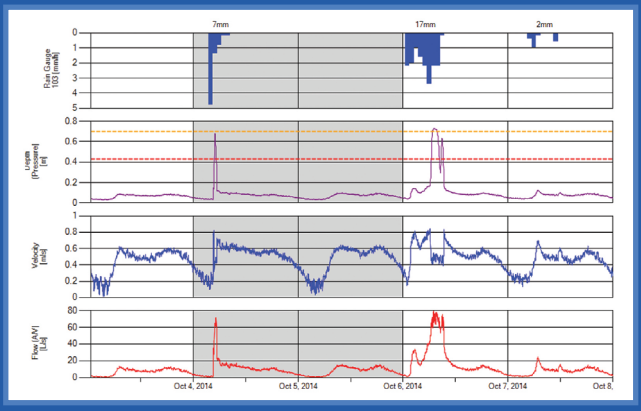
Thanks to its custom-designed antenna, which improves signal sensitivity in underground locations, logged data is then transmitted via GSM/GPRS at user-selectable intervals (typically once an hour, once a day, once a week or once a month).

When using the Ultrasonic Level Sensor, depth of flow is inferred from the measured distance from the sensor to the surface of the flow. This distance is calculated by measuring the time taken for the ultrasonic pulses to traverse the return patch from the probe to the water surface. Compensation for the effects of changes in air temperature is applied automatically.

ADDITIONAL I/O FLEXIBILITY AS STANDARD

2 spare logger channels included (e.g. rainfall/float/intruder) plus high/low local alarm output (e.g. sampler/pulse).

WWW.DETECDATAPRO.COM



For more information about the Multi Sensor Flow Monitor and Detectronic, please call: **+44 (0)1282 449 124**
or email: **info@detectronic.org**
or **SCAN THE CODE**

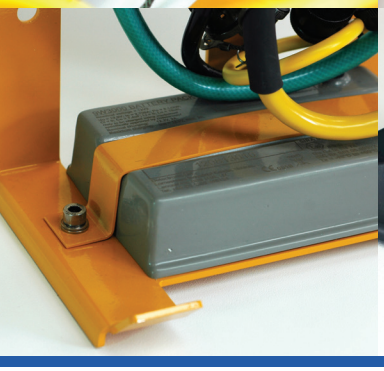
DATA SHEET

ATEX MSFM
MULTI SENSOR FLOW MONITOR S2U

FEATURES

- IS certified (Europe and worldwide)
- Embedded GPRS remote data delivery
- Worldwide roaming data tariffs
- Combined A/V sensor
- Hydrostatic (pressure) depth sensor
- Ultrasonic velocity sensor
- Pressure Transducer Interface (optional 3rd sensor)
- Ultrasonic level sensor (optional 3rd sensor)
- 2 spare logger channels (e.g. rainfall/float/intruder)
- External Li-ion rechargeable sensor battery
- 30+ weeks at 5 min battery life A/V sensor
- 5 years battery life for GPRS comms, logger and sensor
- Hi/low alarms with '**send latest data**' feature
- Hi/low alarms with local output (e.g. sampler)
- IP68/NEMA 6P construction
- Military specification connectors
- Custom internal hi-gain underground antenna
- External antenna option (for marginal signal sites)






TECHNICAL SPECIFICATION

Velocity Sensor - Dual Piezoelectric Elements
Velocity range: 0.03m/s to 4.00m/s (resolution 1mm/s)
Linearity: ±1%
Accuracy: ±2.5% FS (±1% in calibrated range 0.05m/s - 2.00m/s)

Depth Sensor (Hydrostatic Pressure)
Titanium diaphragm isolated silicon sensor
(integrated temperature compensation)
Range: 0.0m to 6.0m (resolution 1.0mm)
Linearity: 0.1% BSL
Accuracy: ±0.2% FS (±0.1% in calibrated range 0.03m - 2.00m)

Optional Level Sensor (Ultrasonic)
CSO Temperature Compensated Ultrasonic Depth Probe
Range: 0.0m - 3.00m (with 200mm deadband)
Accuracy: ±0.25% FS (integrated temp compensation)
Main beam angle: 10° (-3dB)

Optional Depth Sensor (PTI) Pressure Transducer Interface
Ranges available between 0-3m and 0-100m
Accuracy dependent upon pressure range, typically +/-0.1% F.S.
Resolution: +/-1.0mm

Data Logger and GPRS/GSM Communication
Memory: solid state 128K - 40K per channel (rotating store or store until full)
Recording interval programmable between 1 minute and 1 hour
GSM/GPRS communication worldwide compatibility:
900MHz, 1800MHz integral antenna (worldwide except North America),
850MHz, 1900MHz integral antenna (North America)
Data transmission: GPRS - 15 minutes, hourly, daily, weekly, monthly at programmable intervals
Data logger and GPRS comms power supply: 5 years typical life span internal lithium battery pack (user replaceable)

Main Sensor Power Supply and Operating Capacity
12V ATEX Li-ion rechargeable battery pack
Full Charge provides 30+ weeks at 5 min logging rate

Alarm Dial Out
High/low threshold and profile alarms on each channel with 'send latest data' on alarm and option to repeat data send

Additional I/O
2 analogue/digital input channels
1 pulse output

Environmental
Operating temperature: -20°C to +60°C
Protection: IP68/NEMA6P
Connectors: IP68 Mil – Spec
Dimensions: 530 x 213 x 150 (maximum) including battery pack and protection frame
Weight: 8.5kg (including battery pack, frame, depth and velocity sensors with standard 10m cables)

Approvals

SIRA 12 ATEX 2110X	Ex II 1G	Ta -40°C to +60°C
IEC Ex SIR 12.0044X	Ex ia IIB T4 Ga	Ta -40°C to +60°C

GSM Communication Certification
IC: 2417C-SL6087 FCC ID: N7NSL6087

Detectronic systems and products are certified and audited to the following standards:

DETECTRONIC
FLOW MEASUREMENT AND DATA DELIVERY

Detectronic Limited
Regent Street
Whitewalls Industrial Estate
Colne, Lancashire BB8 8LJ

T: 01282 449 124
F: 01282 692 002
E: info@detectronic.org
W: www.detectronic.org

Working in **partnership** to **reduce flooding** and **prevent pollution**

SUPPLY | INSTALL | MAINTAIN | MONITOR | ANALYSE | REPORT

Automatic Rain Gauges

Tipping bucket rain gauge

TIPPING BUCKET RAIN GAUGE

The Casella CEL Tipping Bucket Rain Gauge is a reliable and extremely robust transducer, designed as a stand-alone sensor for operation within an existing logging system, such as the Casella CEL Automatic Weather Station. The body and funnel are made from aluminium alloy with an accurately machined septum ring at the top giving an aperture of 400cm^2. The tipping bucket mechanism is mounted inside the body on a cast aluminium-alloy base, incorporating a built-in spirit level to ease correct positioning.

The rain gauge comprises a divided bucket assembly, which is pivoted at the centre. Rain collects in one side of the bucket, which then tips when a predetermined volume of water has been collected. The tipping action discharges the collected water and repositions the opposite side of the bucket under the discharge nozzle ready for filling. The bucket tips are monitored by means of a sealed reed switch, capable of indefinite operation, thus ensuring that this instrument has a long working life.

Applicable Standards

BS 7843 Guide to acquisition and management of MET precipitation data recorders part 1 and 2

200CM TIPPING BUCKET RAINGAUGE

Casella Tipping Bucket Rain Gauges are reliable and extremely robust devices intended for use as stand-alone sensors operating within an existing logging or data acquisition system.

This latest 200cm^2 version of Tipping Bucket Rain Gauge is based on the best selling 400cm2 gauge supplied by Casella CEL worldwide and has been specially designed for many applications that now require a gauge with smaller diameter for hydrometric applications.

The measuring principle complies with 'Guide to Meteorological Instruments No. 8 of the WMO'.

FEATURES

- Proven tipping bucket mechanism
- Catchment area of 200cm^2
- Resolution of 0.2 mm
- Accuracy 1% (@26mm/hr)
- Integral Levelling screws and bulls eye level

Specification	TIPPING BUCKET RAIN GAUGE
Bucket sizes	0.1, 0.2 or 0.5mm
Aperture	400cm^2
Accuracy	±1% @ 1 litre/hr
Weight	2.6kg
Ordering information	
0.1mm Tipping Bucket Rain Gauge (light rainfall)	102471E
0.2mm Tipping Bucket Rain Gauge (moderate rainfall)	100000E
0.5mm Tipping Bucket Rain Gauge (heavy rainfall)	100573E

Specification	200CM TIPPING BUCKET RAIN GAUGE
Bucket size	0.2 mm
Aperture	200 cm^2
Accuracy	±1% at 26mm/hr
Capacity	Unlimited
Transducer	Magnet/Reed switch
Operating temperature range	1°C to 85°C
Output	Contact closure
Weight	3.2 kg
Reed Switch Details	
Double pole relay for attachment to 2 separate logging devices. Switching contact closure time is typically less than 100 milli-seconds for 0.2 mm of rain.	
Maximum current rating	500 mA
Breakdown voltage	400 V D.C. minimum
Contact resistance	150 mΩ
Insulation resistance	10^{11} Ω (100 GΩ)
Capacitance open contacts	0.2 pF
Life	10^{11} operations.
Ordering information	
200cm Tipping Bucket Rain Gauge	100594D

Tel: +44(0)1234 847799 Fax: +44(0)1234 841490 Email: info@casellameasurement.com
Casella, Regent House, Wolseley Road, Kempston, Bedford, MK42 7JY, United Kingdom

Flow & Rainfall Survey

Interim Report 1
Portmarnock

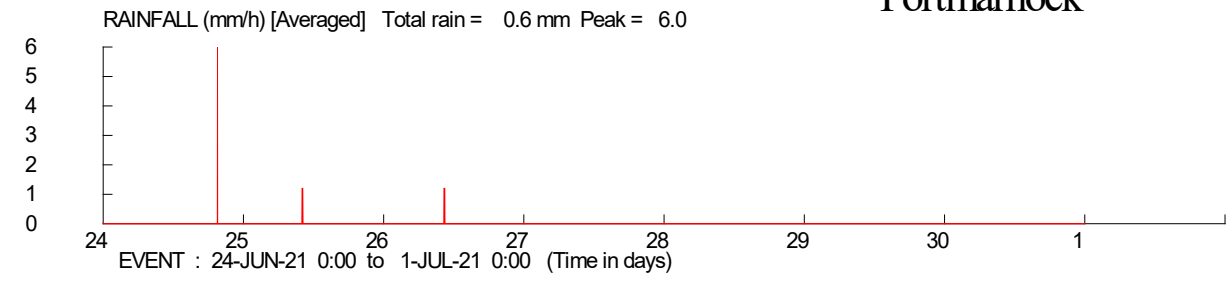
Catchment	Portmarnock
Client	N/A
Consultant	JB Barry
Interim No	1
Rainfall Events Recorded	0

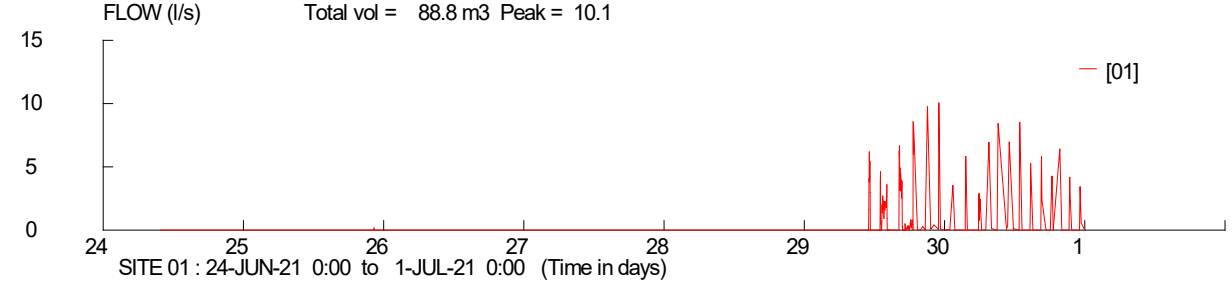
capital water systems ltd.

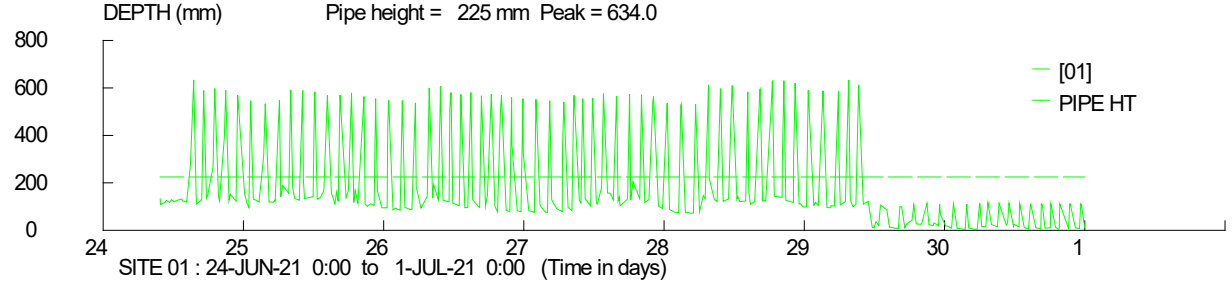
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

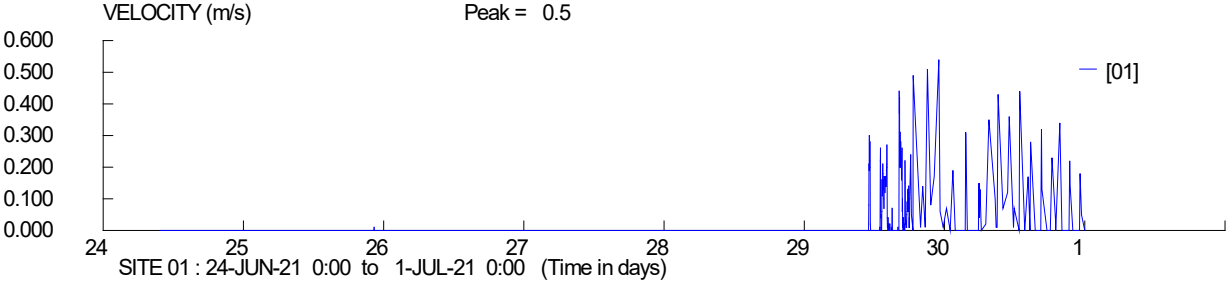
Interim Plots

Portmarnock

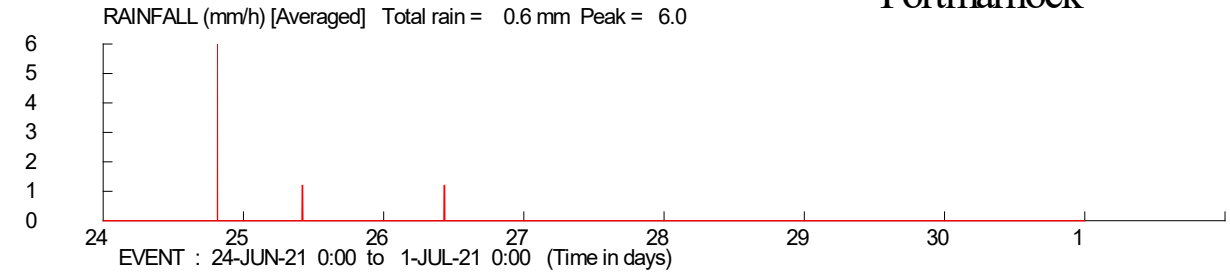


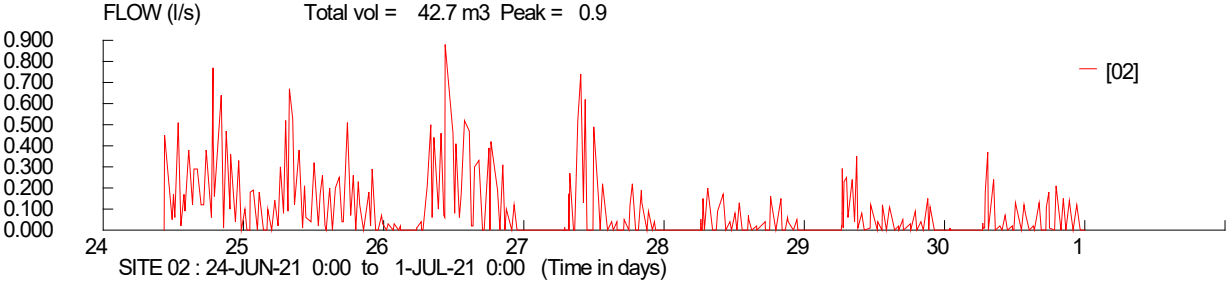


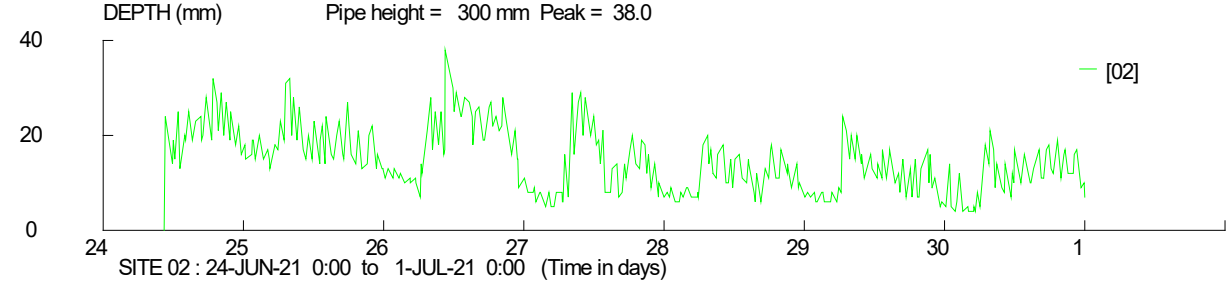


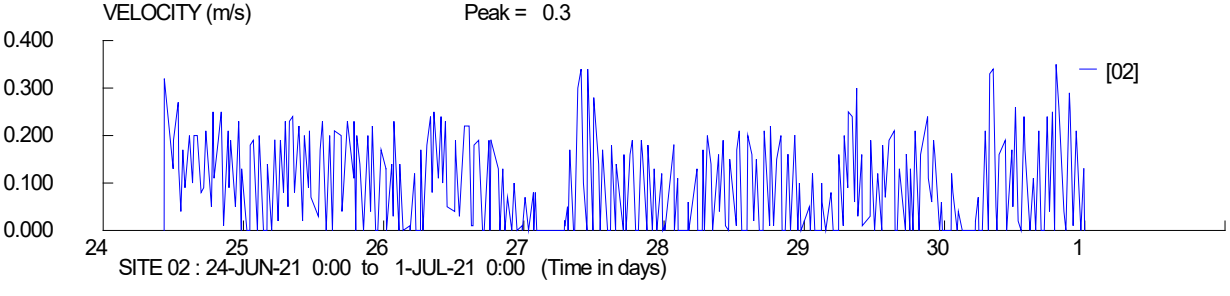


Portmarnock

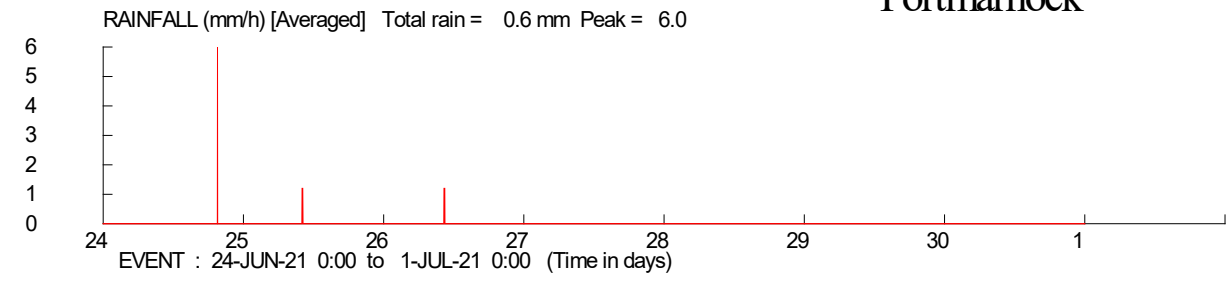


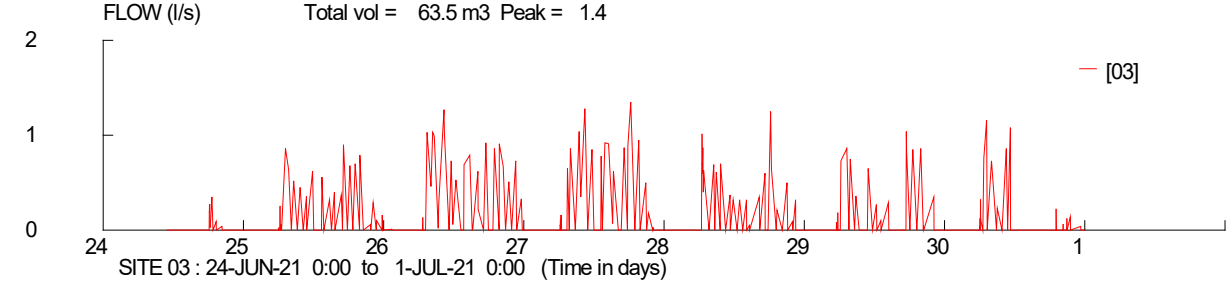


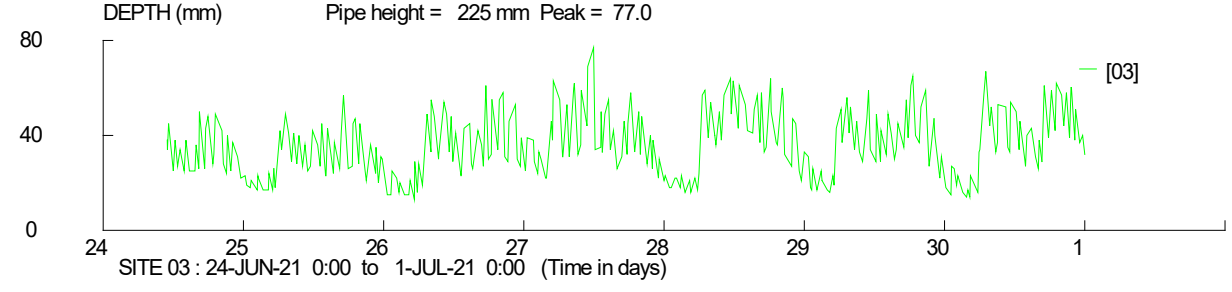


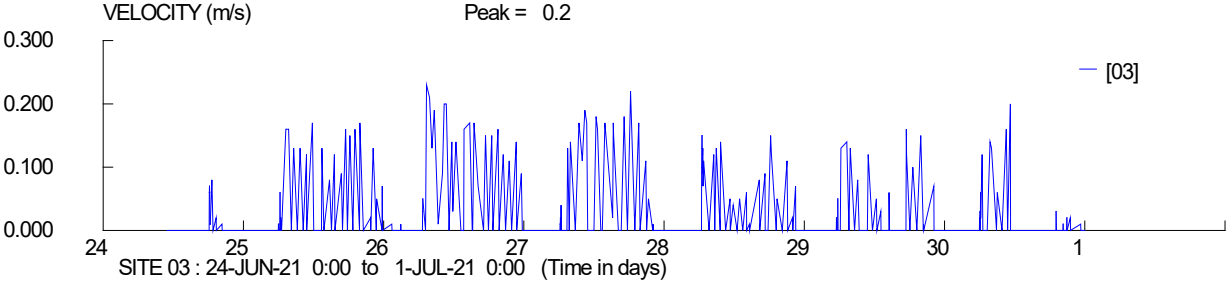


Portmarnock









Flow & Rainfall Survey

Interim Report 2
Portmarnock

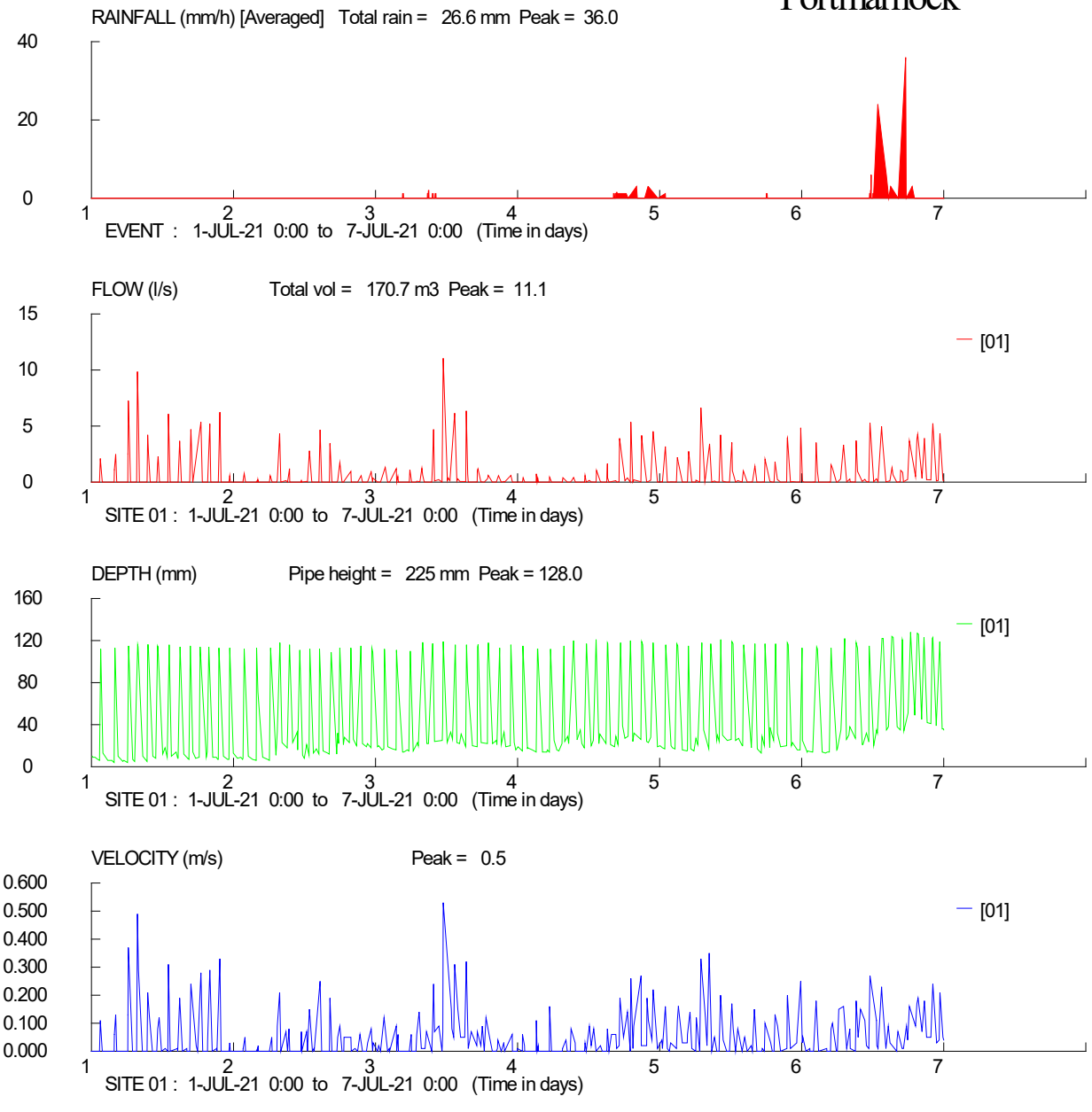
Catchment	Portmarnock
Client	N/A
Consultant	JB Barry
Interim No	2
Rainfall Events Recorded	1

capital water systems ltd.

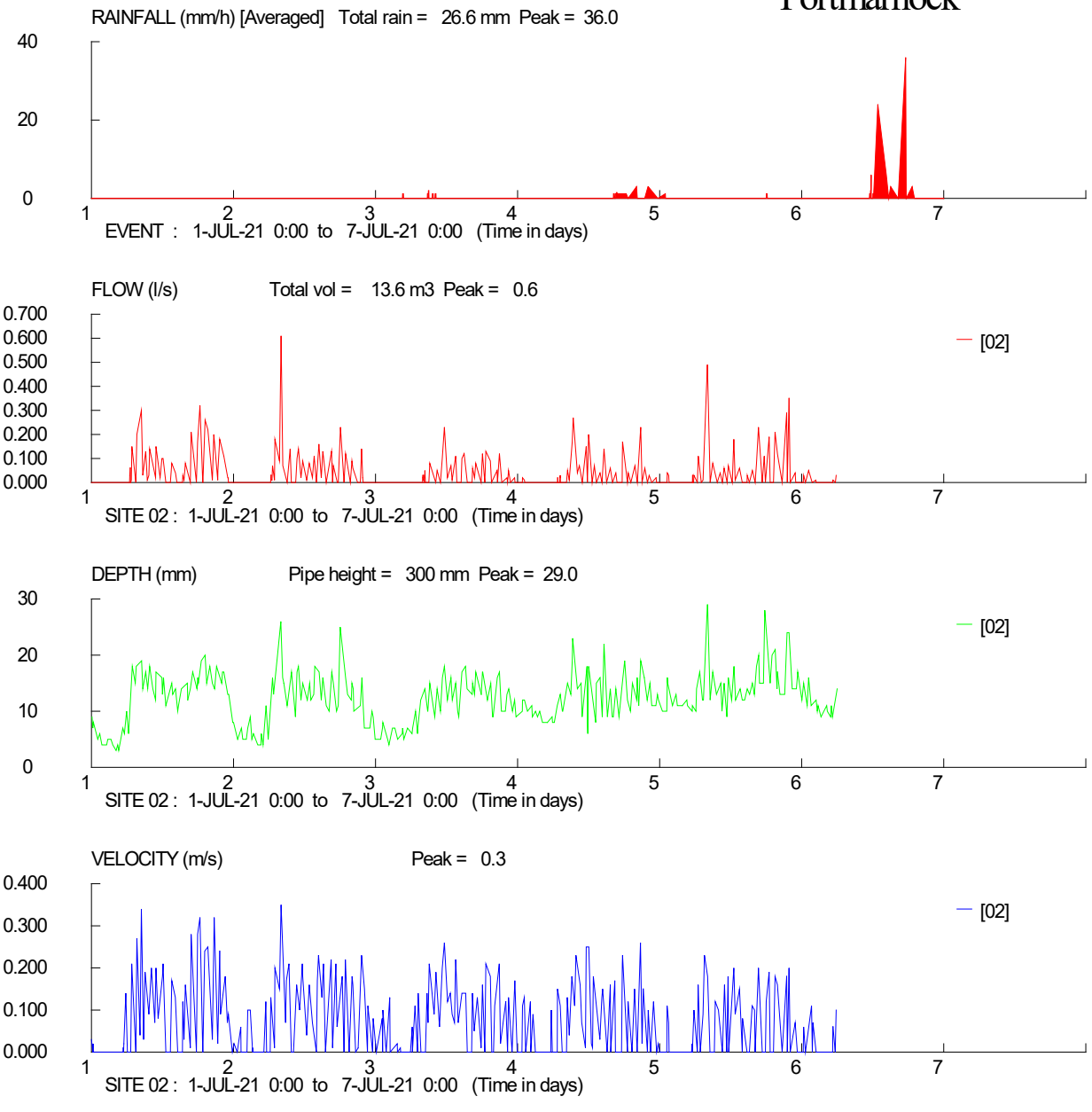
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

Interim Plots

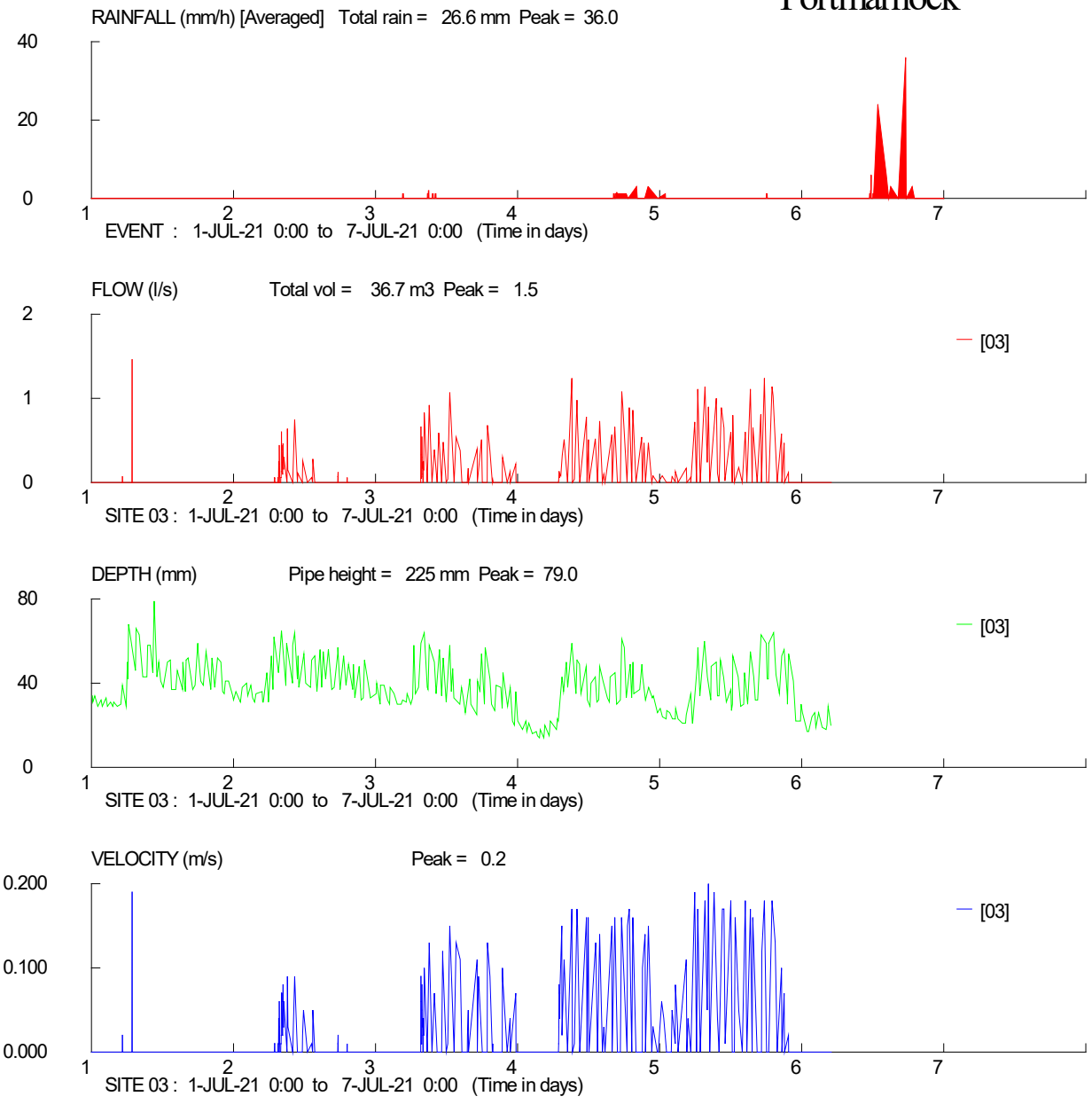
Portmarnock



Portmarnock



Portmarnock



Flow & Rainfall Survey

Interim Report 3
Portmarnock

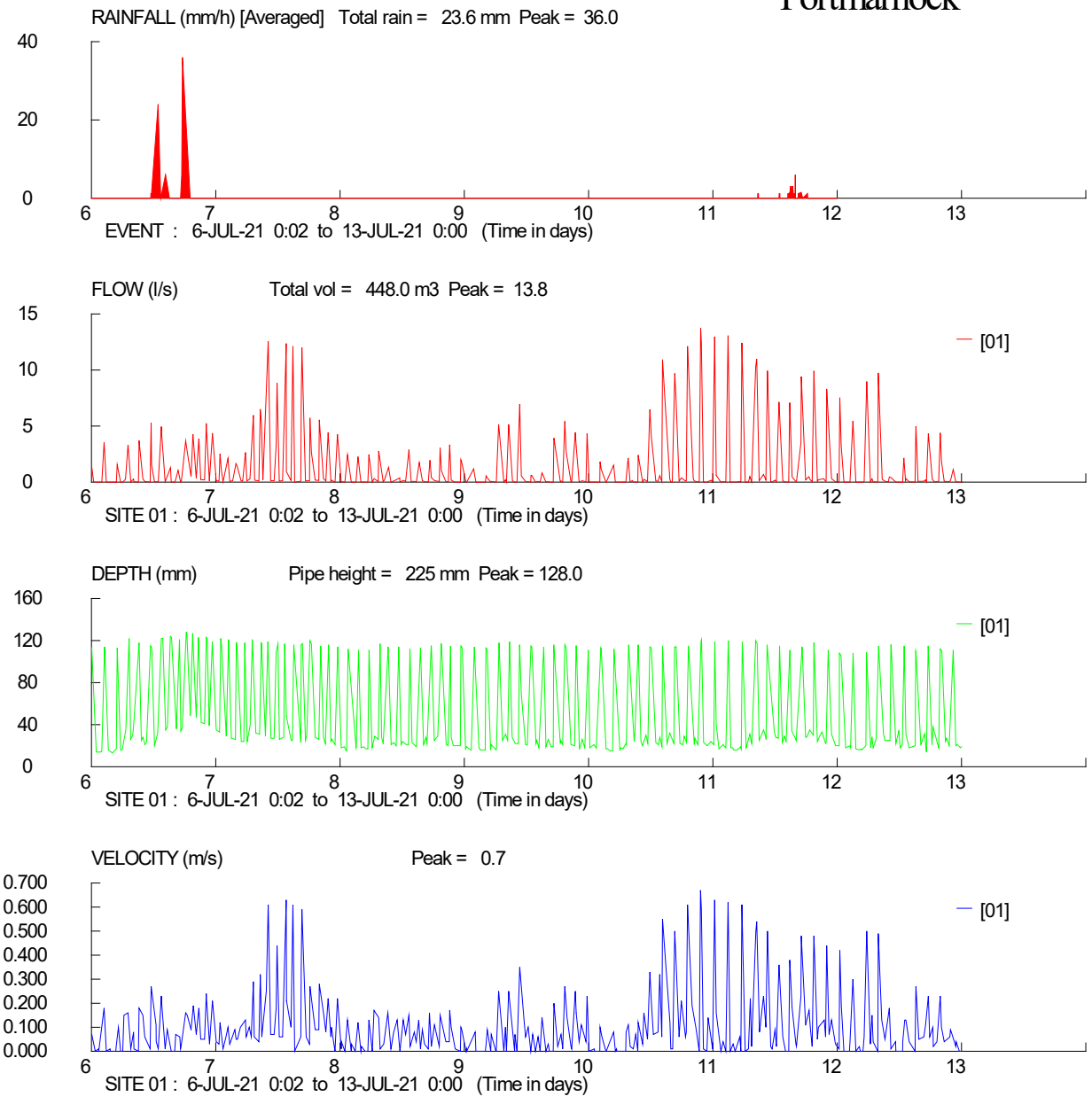
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	3
Rainfall Events Recorded	0

capital water systems ltd.

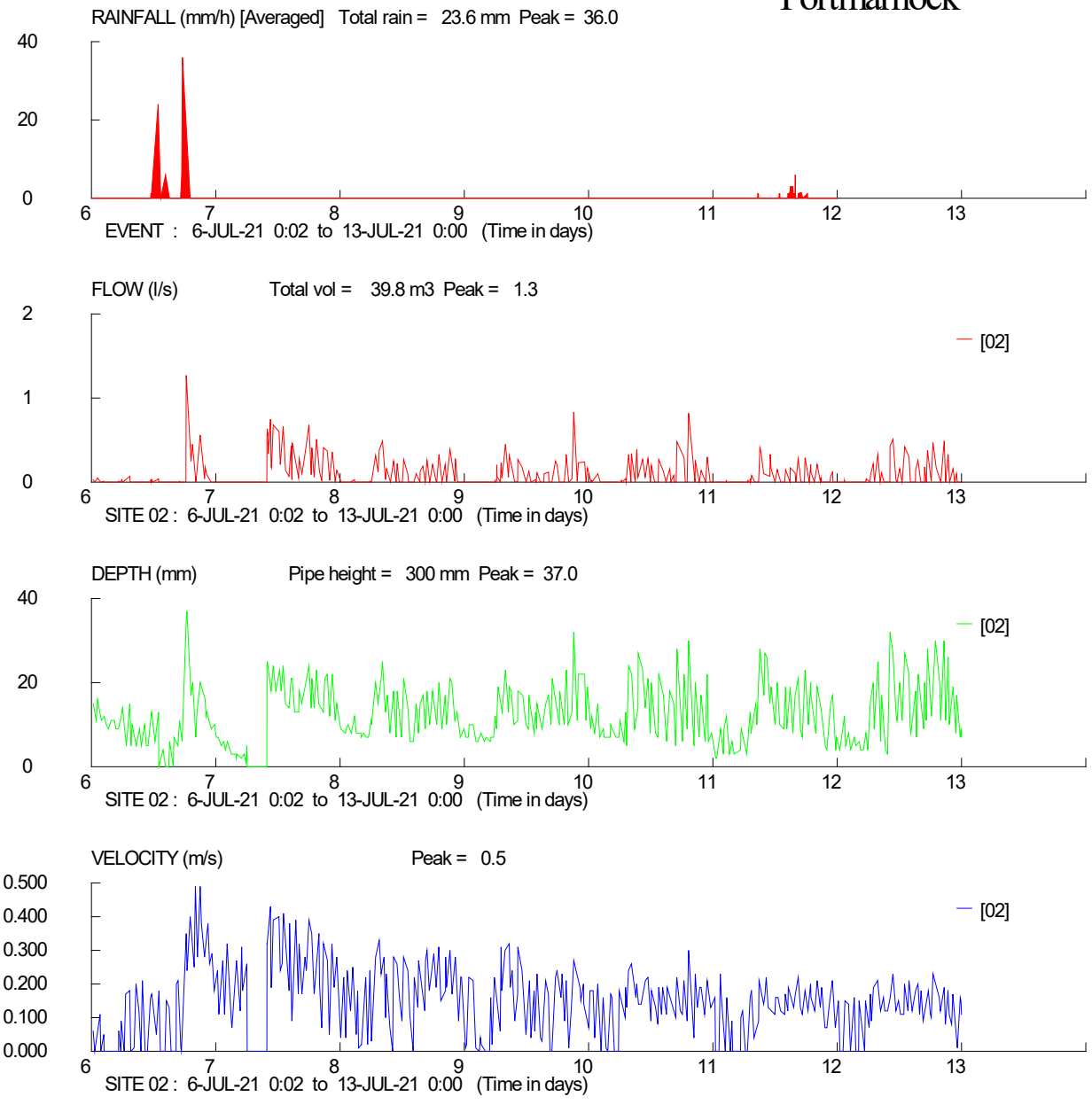
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

Interim Plots

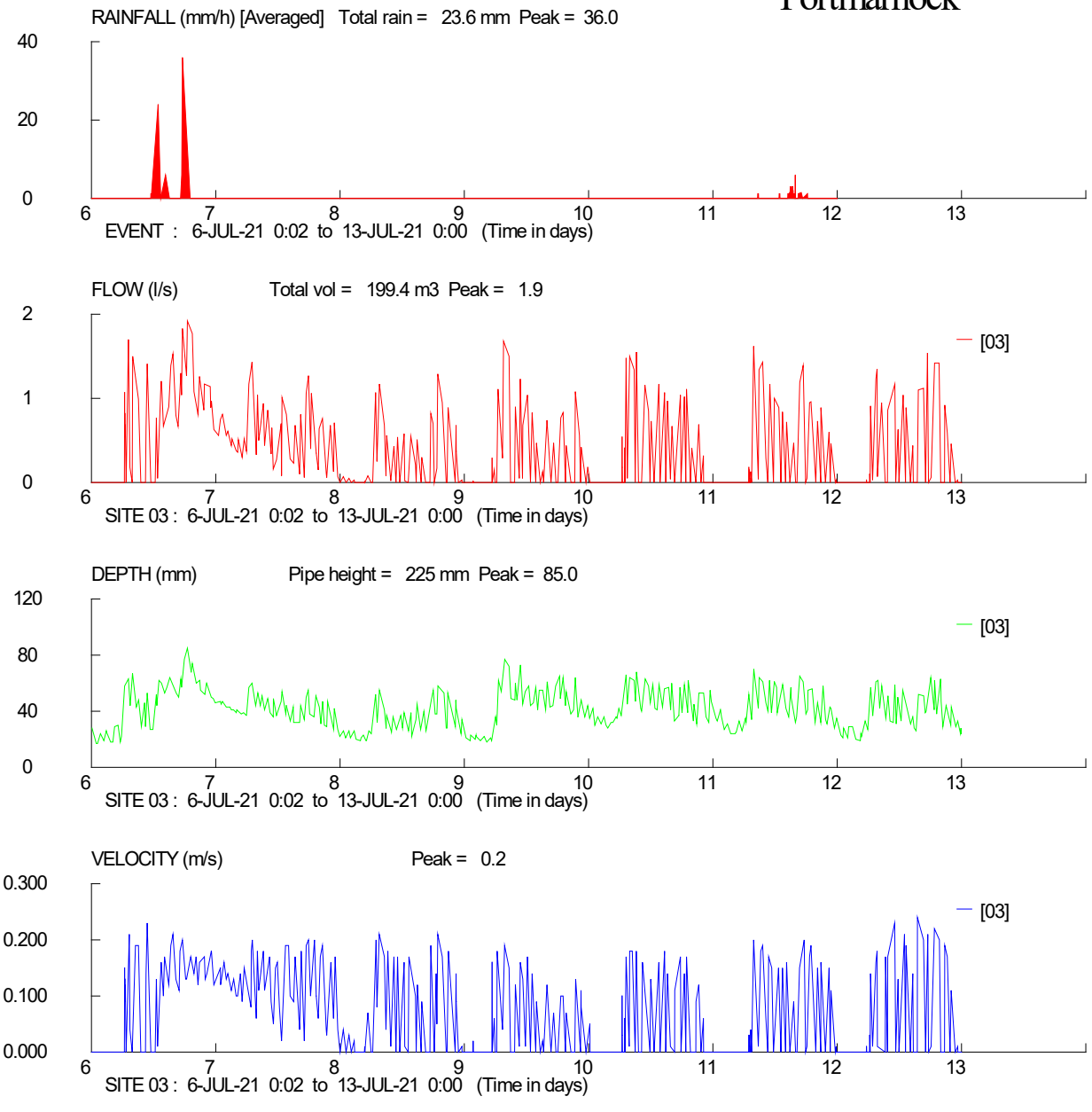
Portmarnock



Portmarnock



Portmarnock



Flow & Rainfall Survey

Interim Report 4
Portmarnock

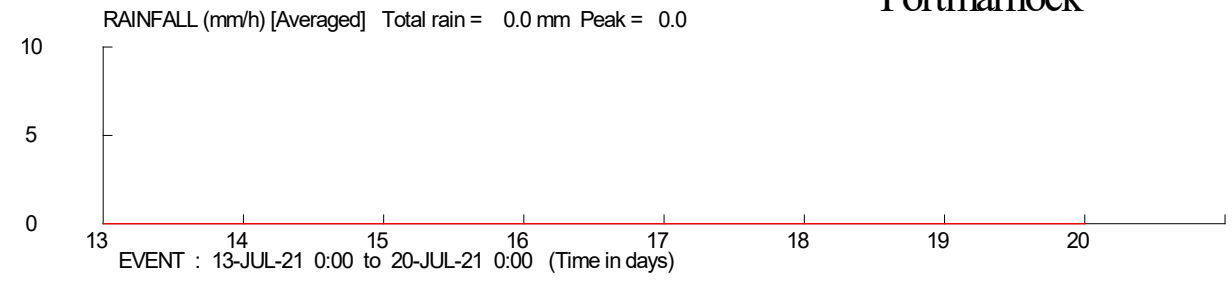
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	4
Rainfall Events Recorded	0

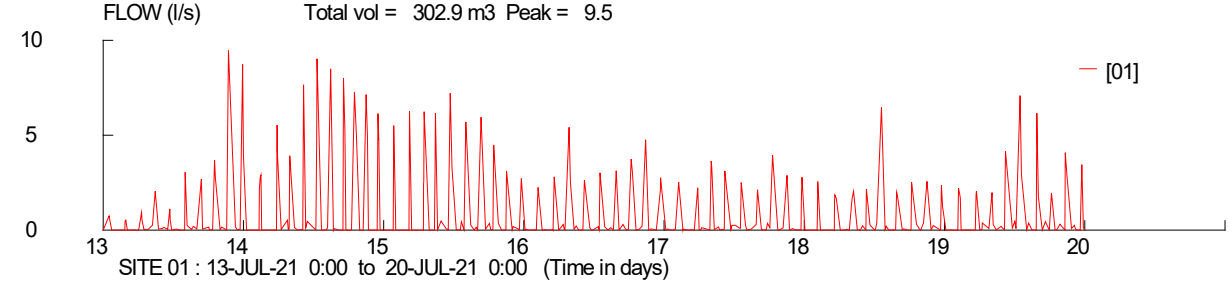
capital water systems ltd.

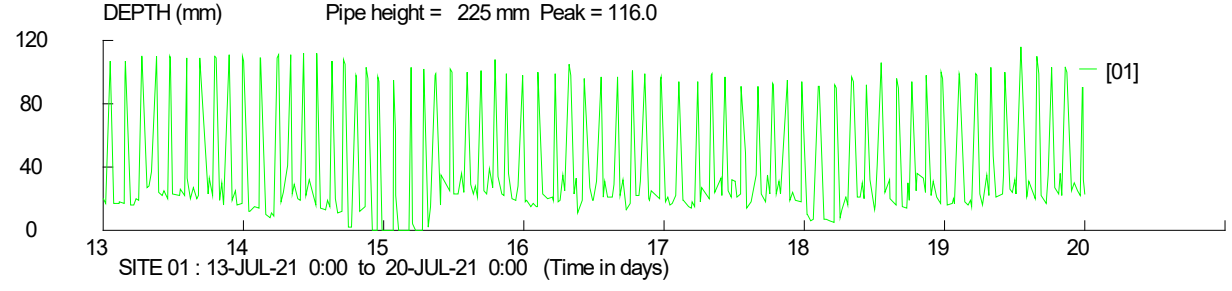
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

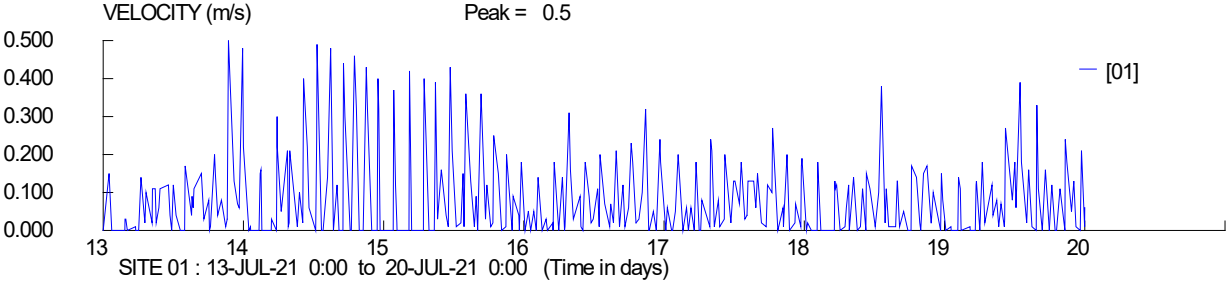
Interim Plots

Portmarnock

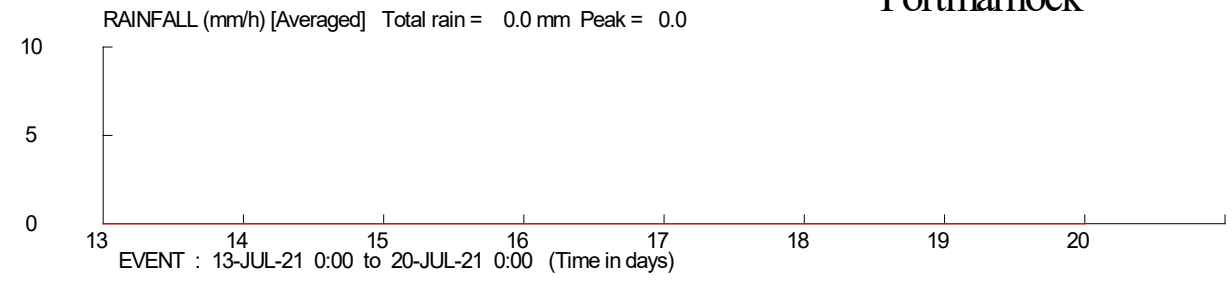


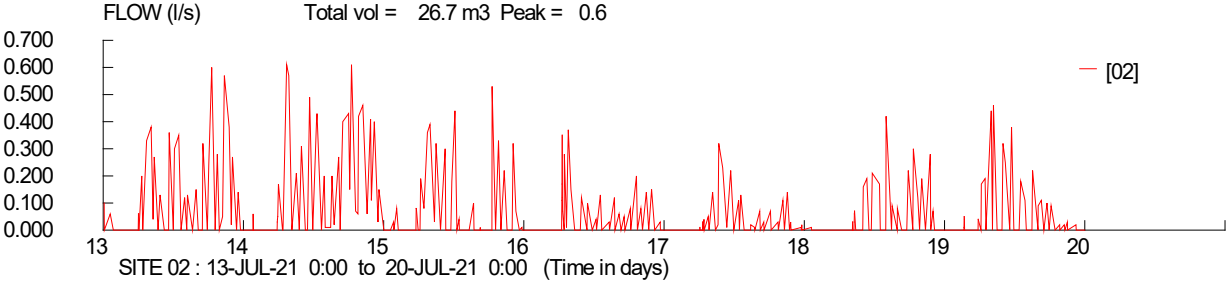


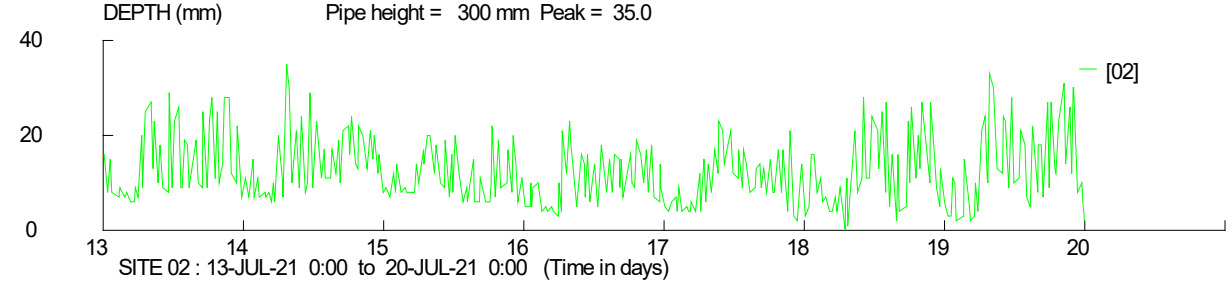


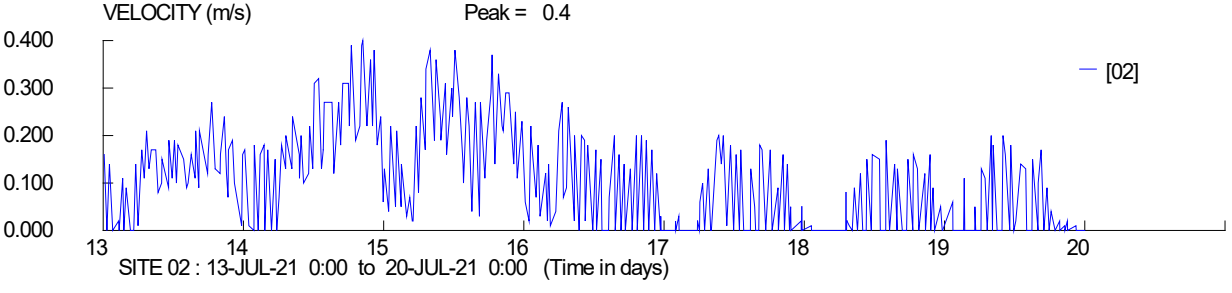


Portmarnock

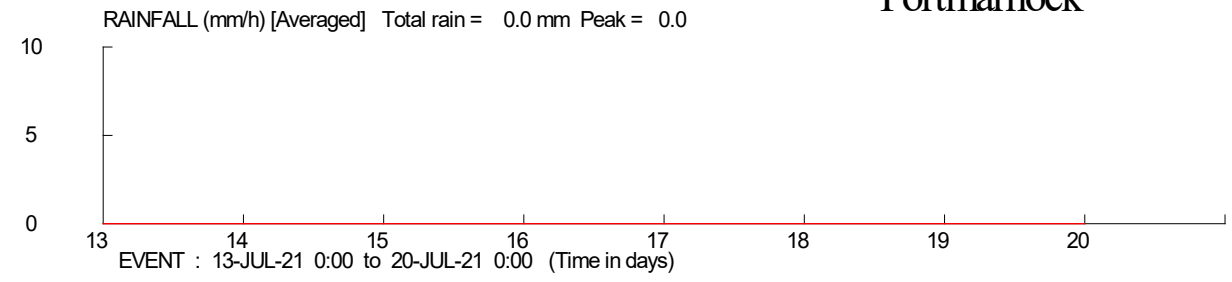


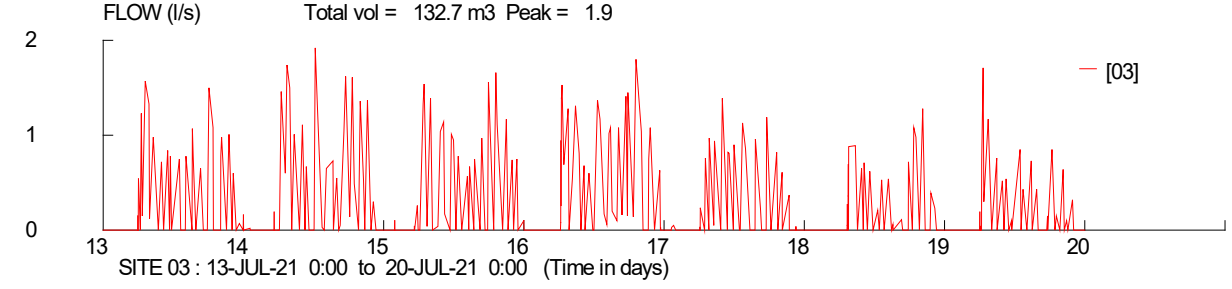


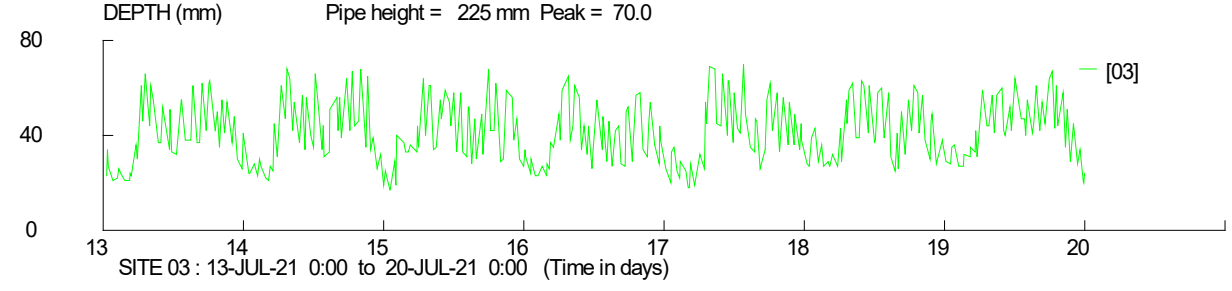


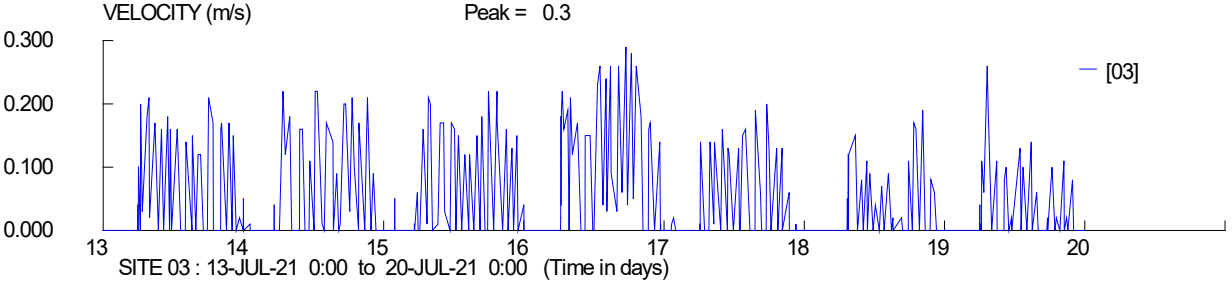


Portmarnock









Flow & Rainfall Survey

Interim Report 5
Portmarnock

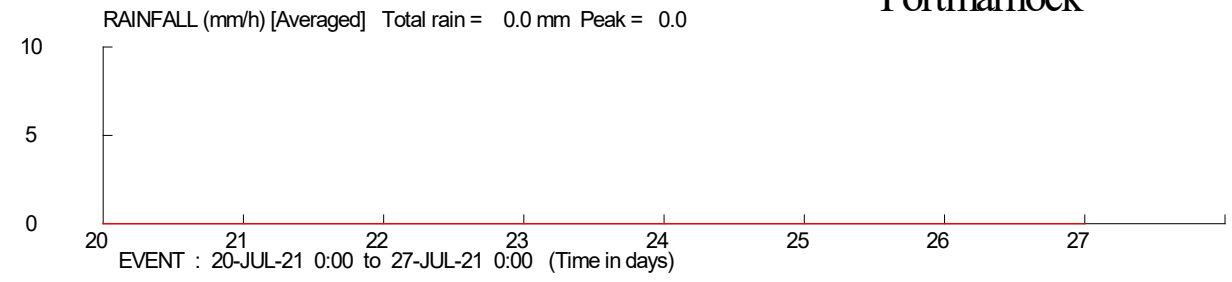
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	5
Rainfall Events Recorded	0

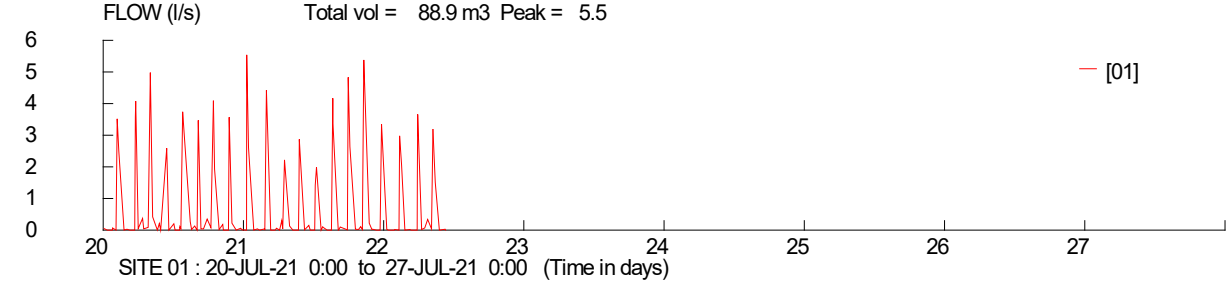
capital water systems ltd.

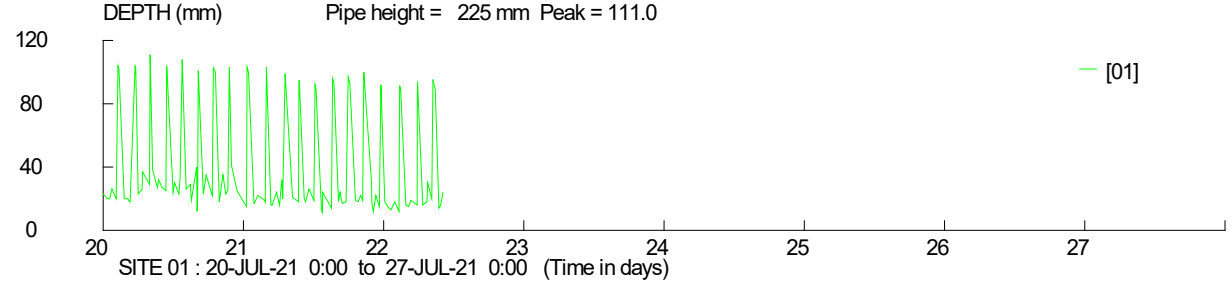
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

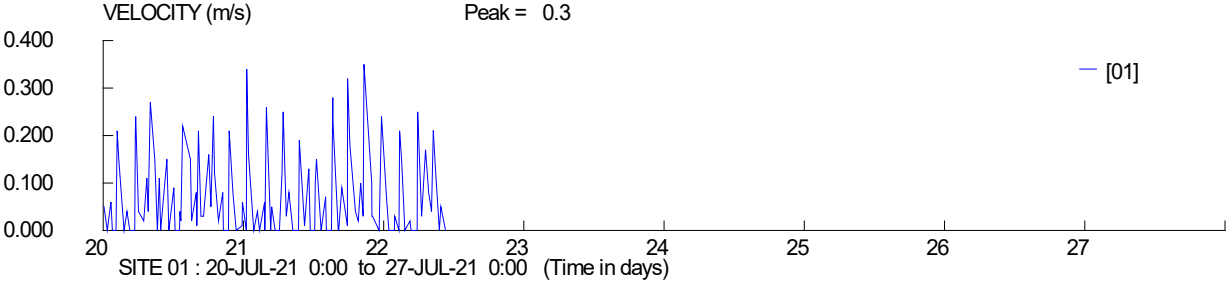
Interim Plots

Portmarnock

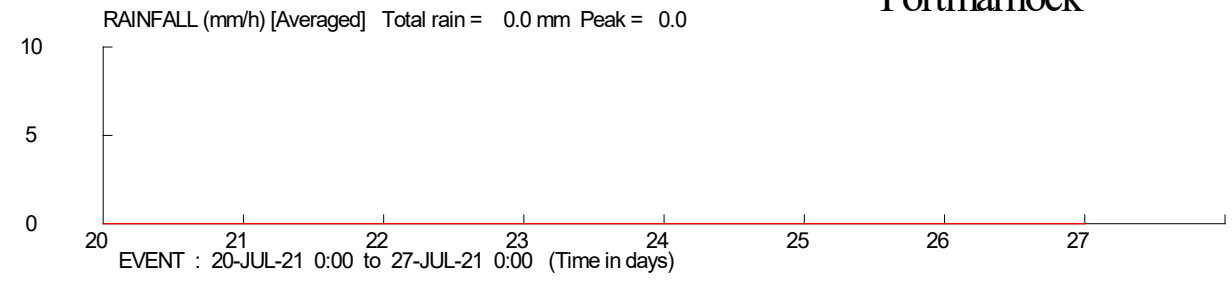


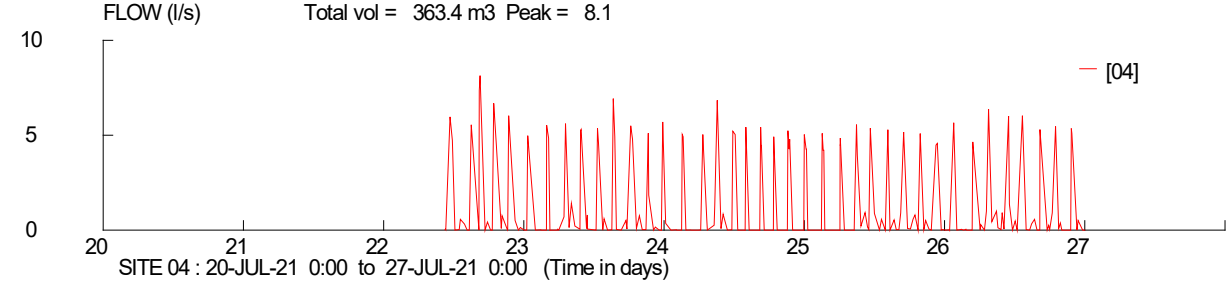


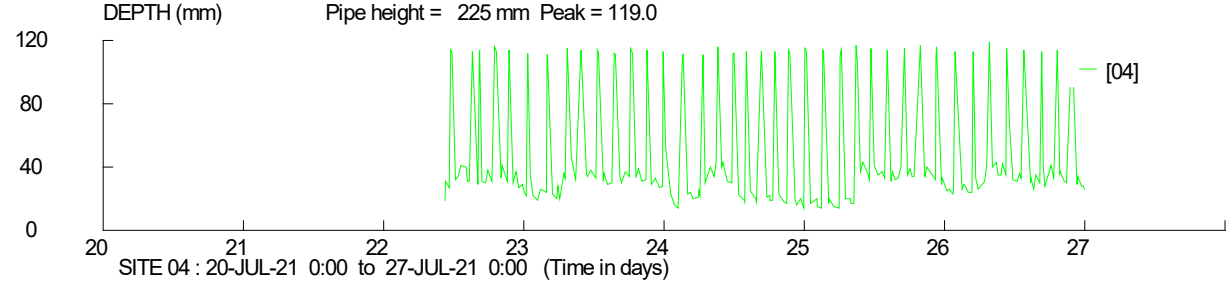


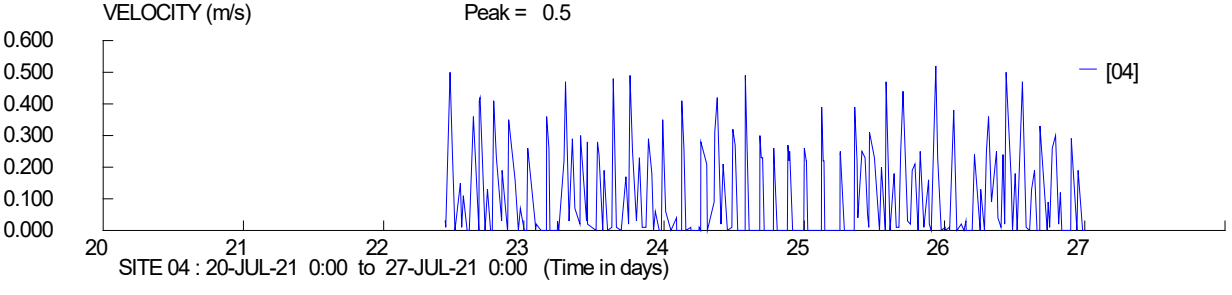


Portmarnock

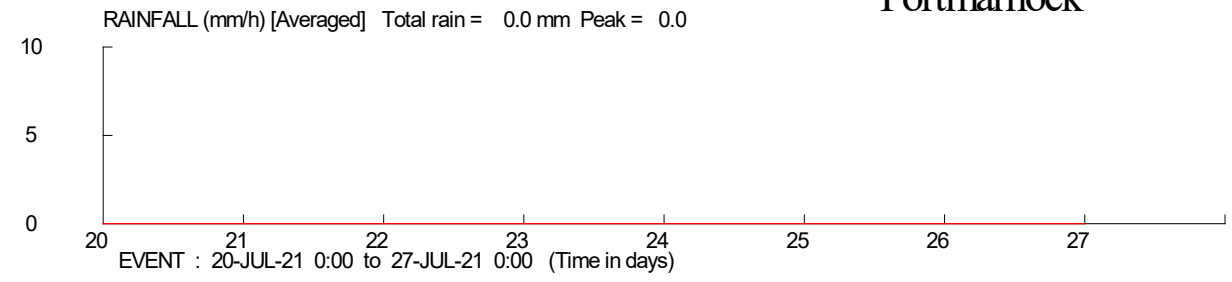


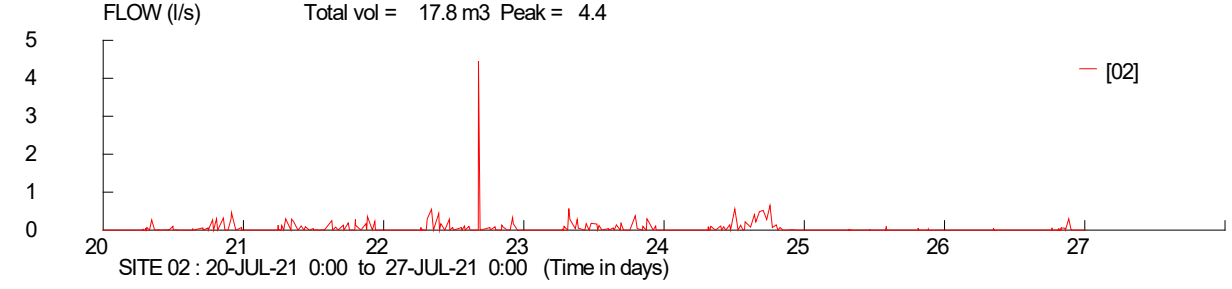


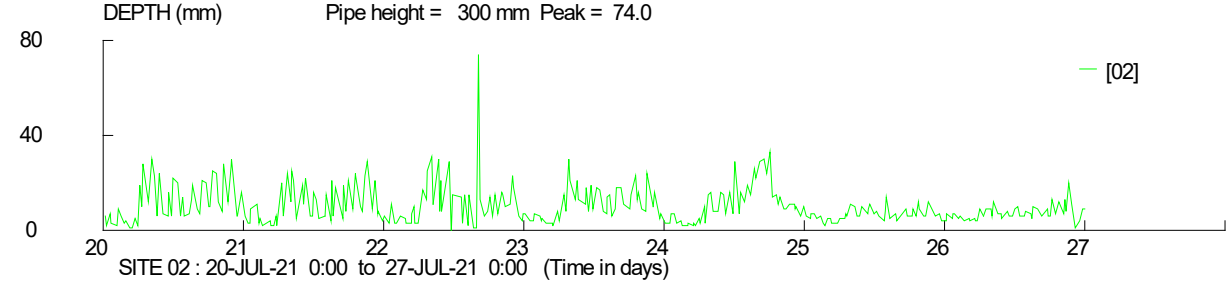


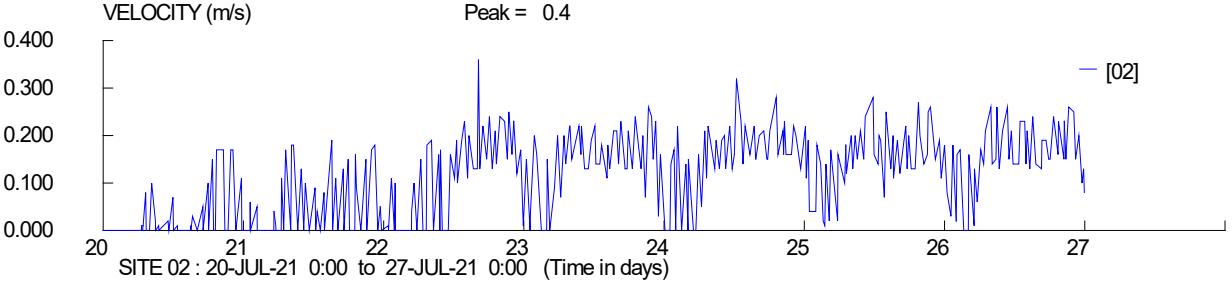


Portmarnock

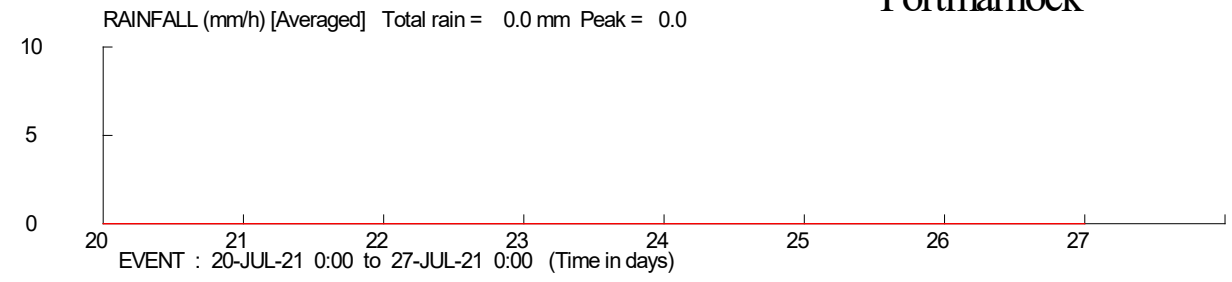


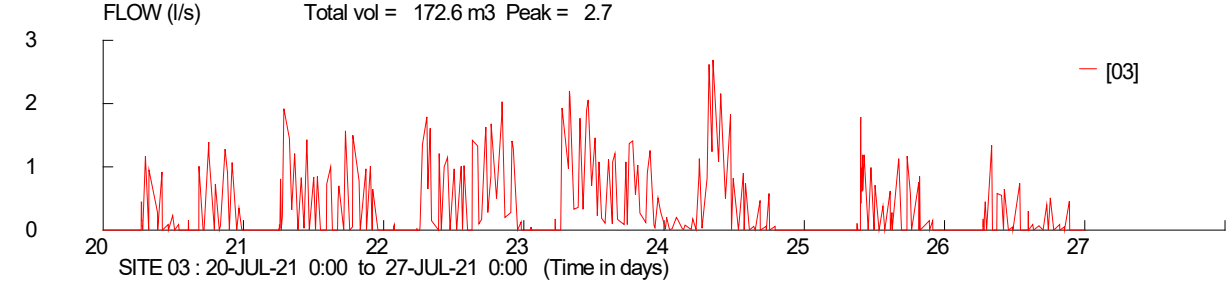


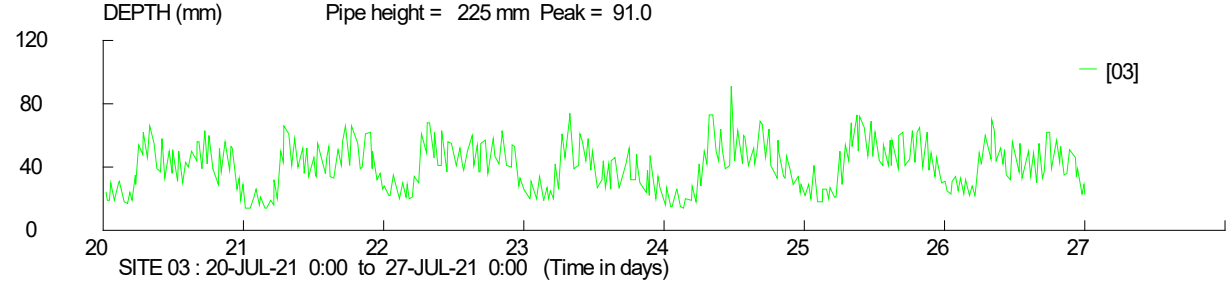


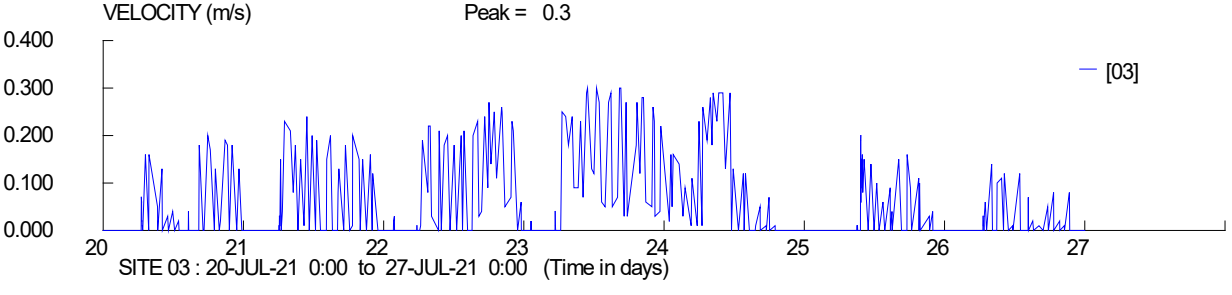


Portmarnock









Flow & Rainfall Survey

Interim Report 6
Portmarnock

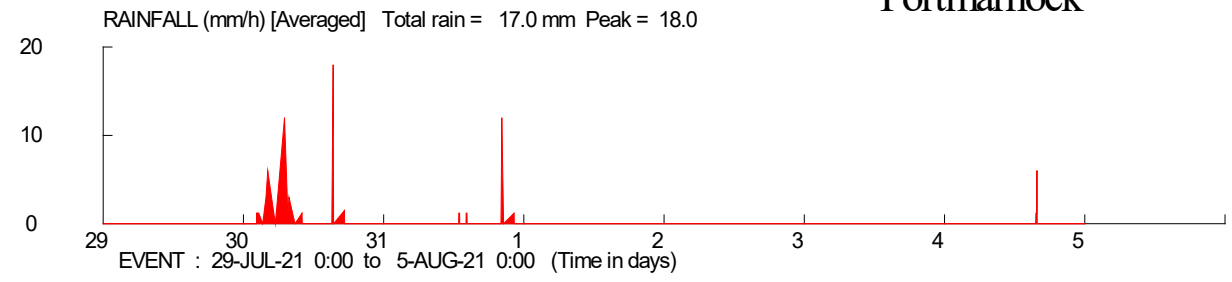
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	6
Rainfall Events Recorded	1 - 30/07/2021

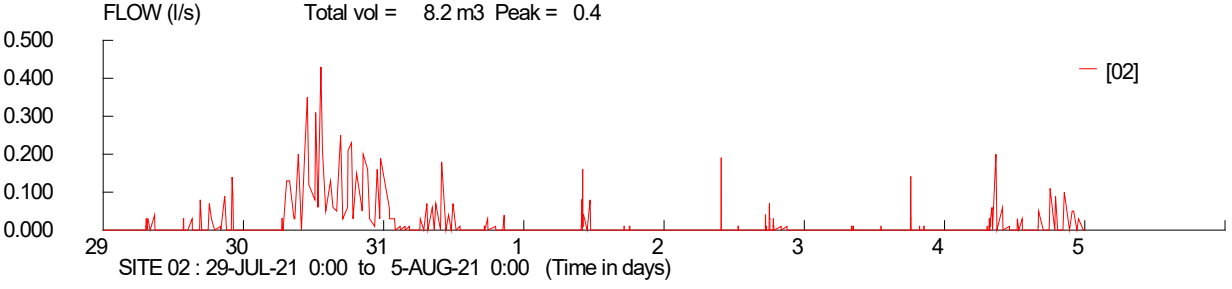
capital water systems ltd.

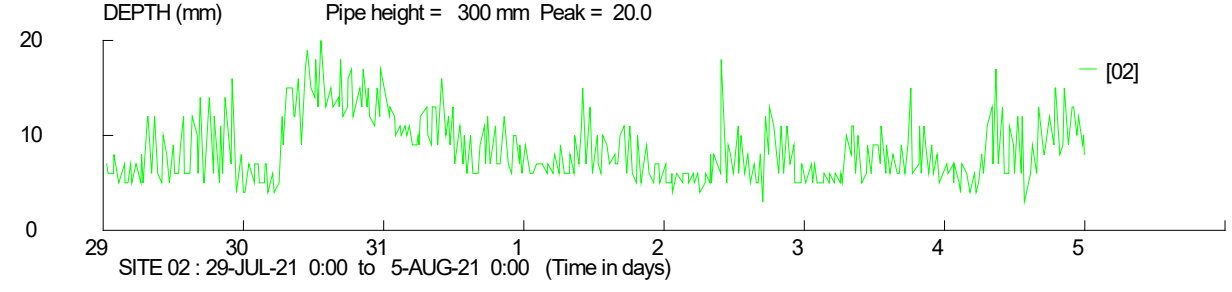
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

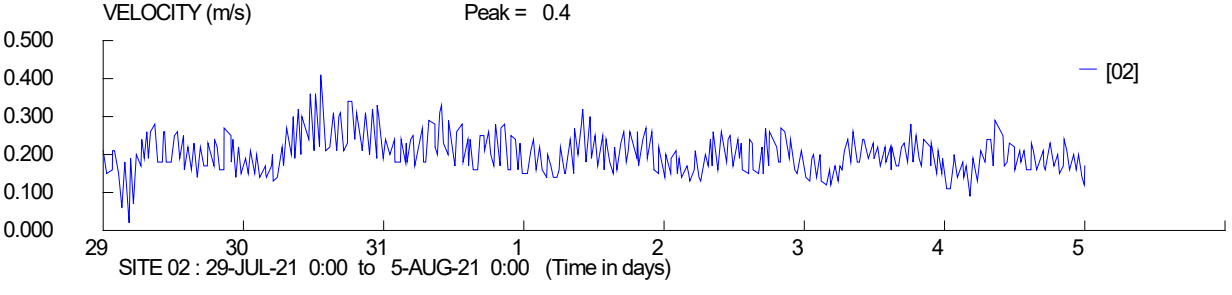
Interim Plots

Portmarnock

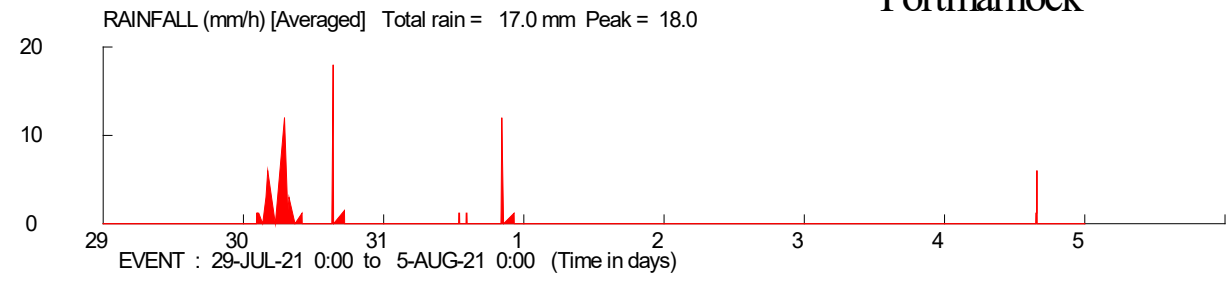


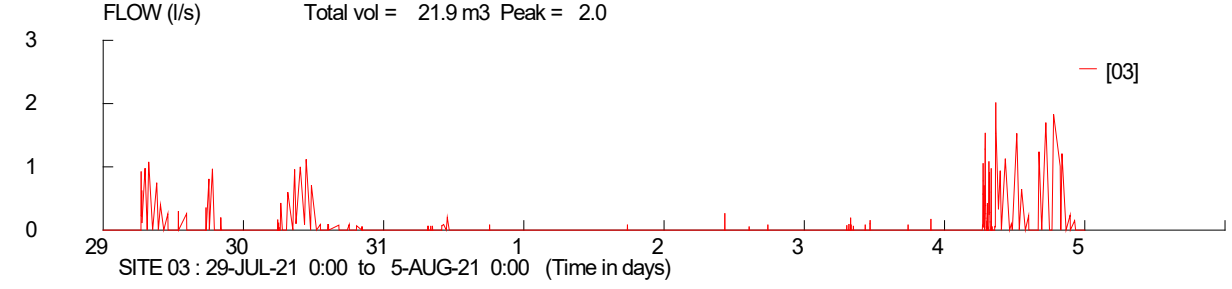


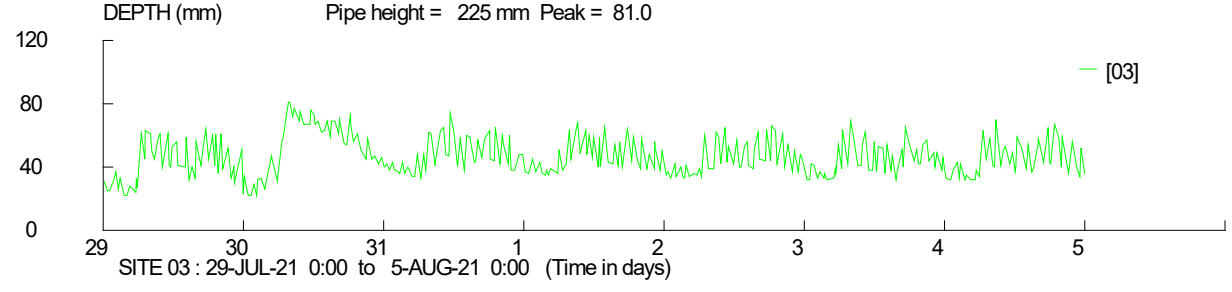


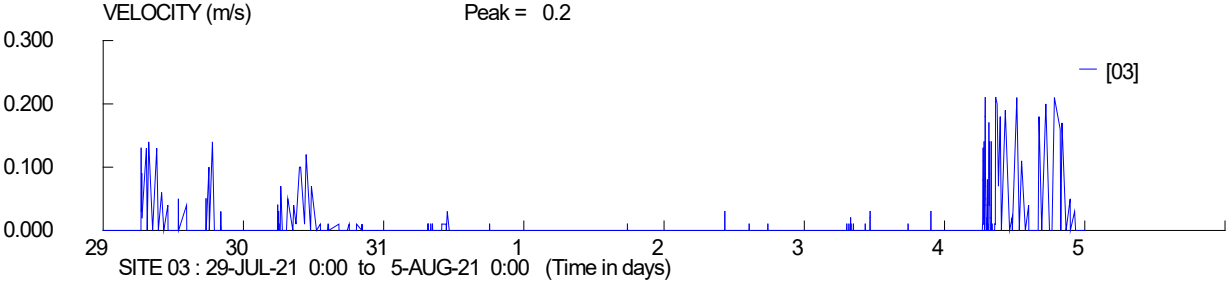


Portmarnock

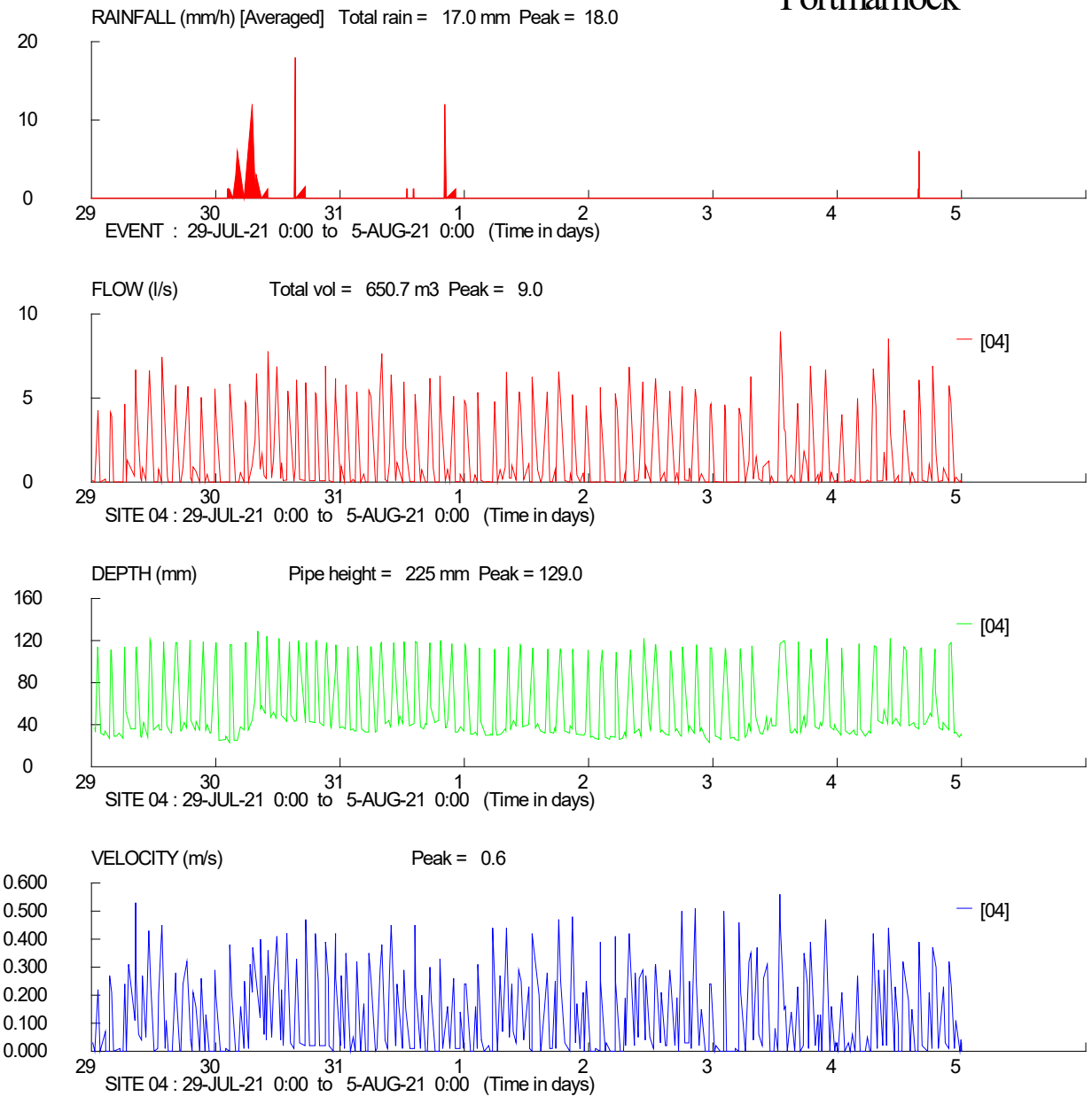








Portmarnock



Flow & Rainfall Survey

Interim Report 7
Portmarnock

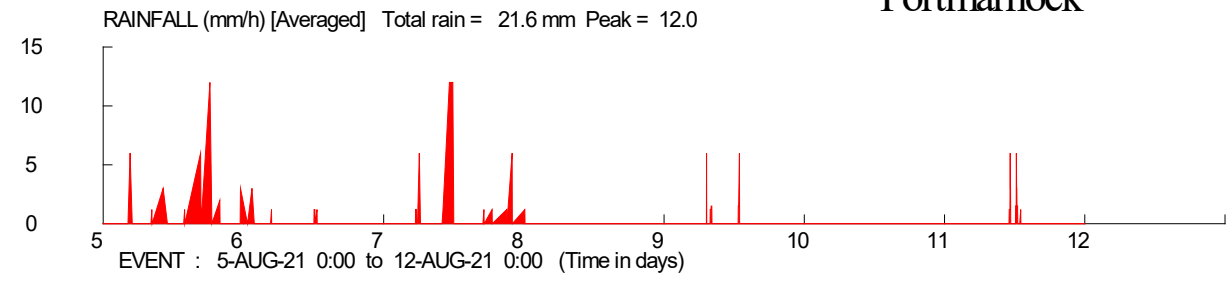
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	7
Rainfall Events Recorded	1 - 07/08/2021

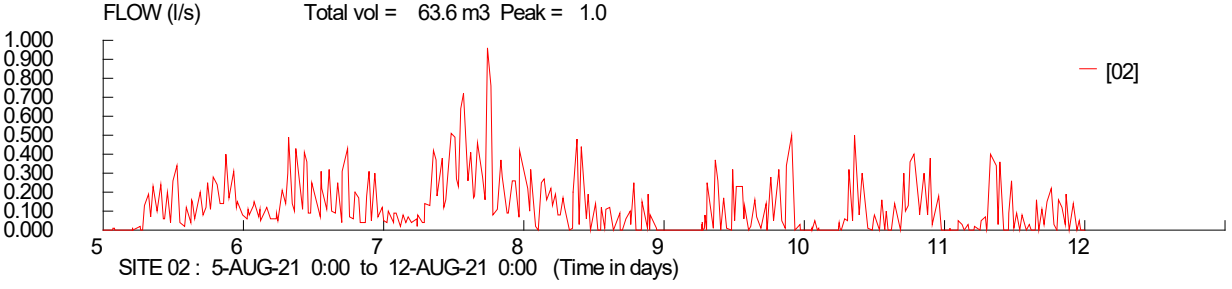
capital water systems ltd.

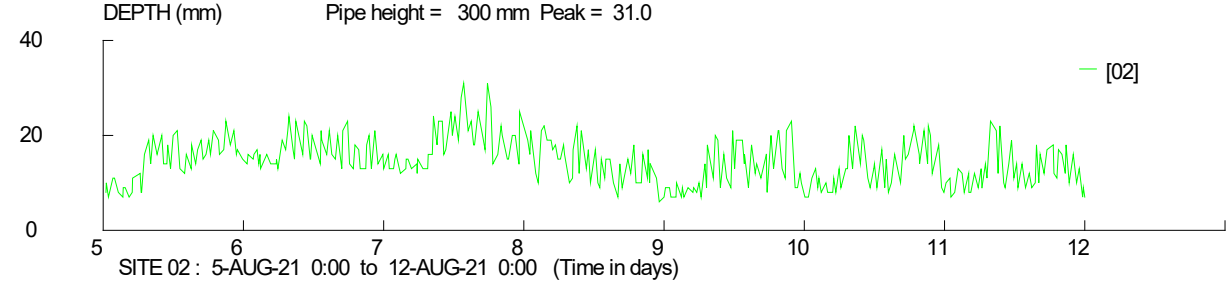
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

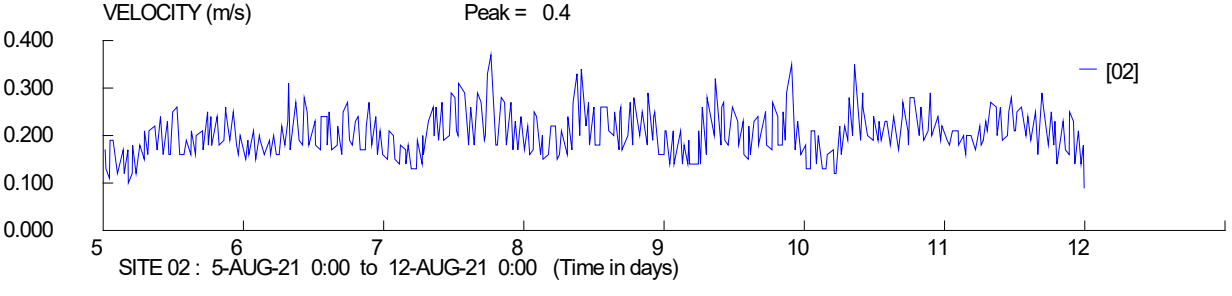
Interim Plots

Portmarnock

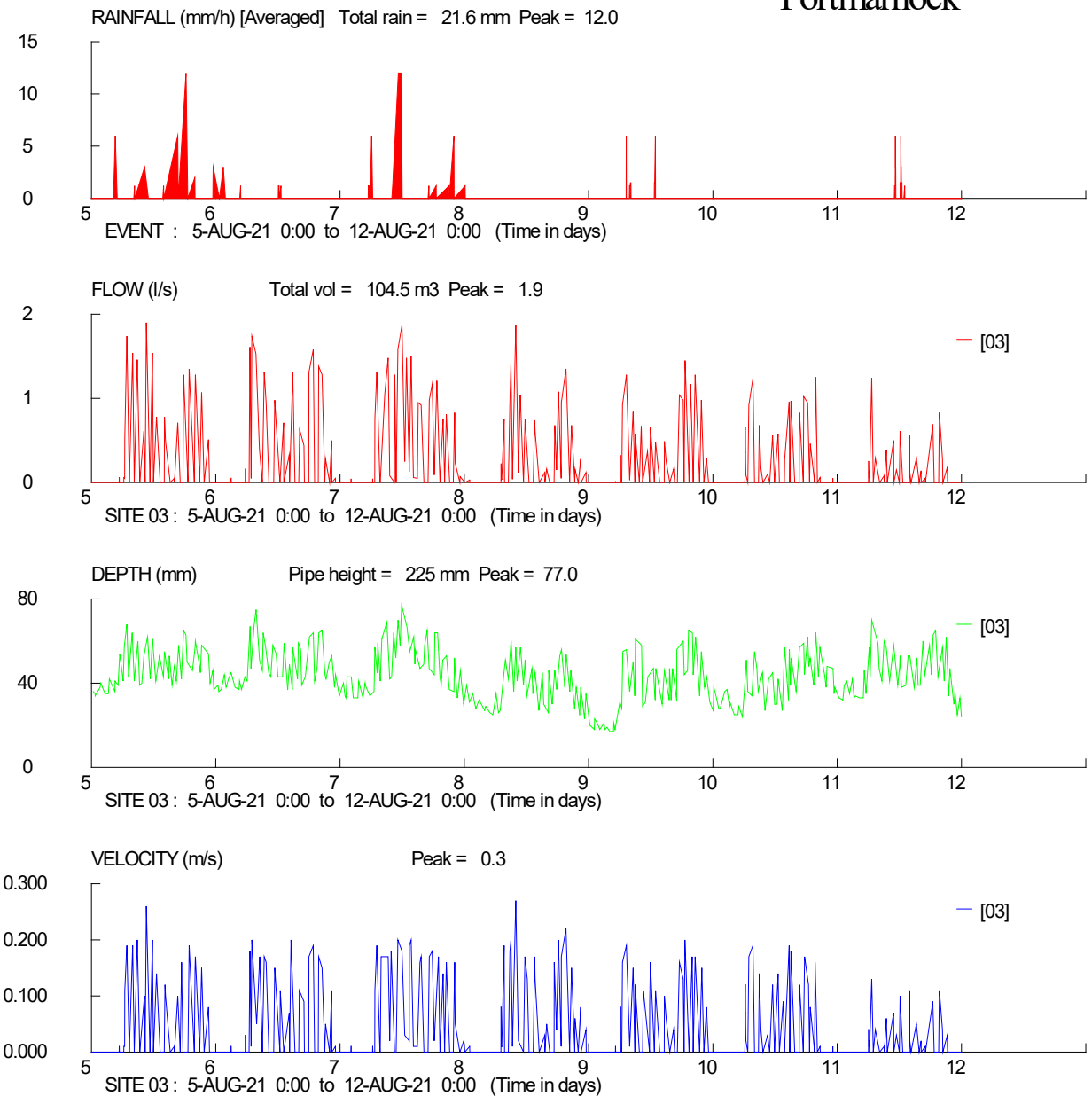




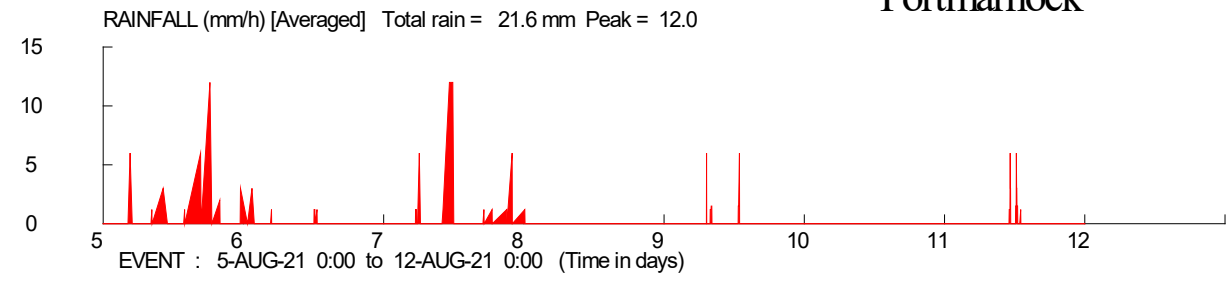


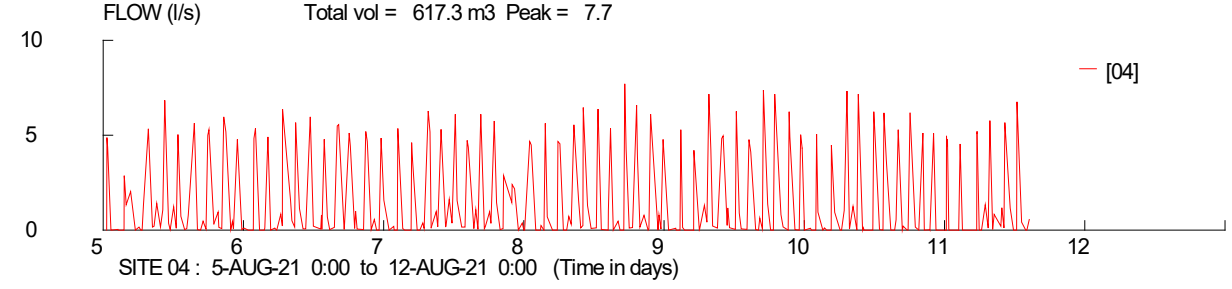


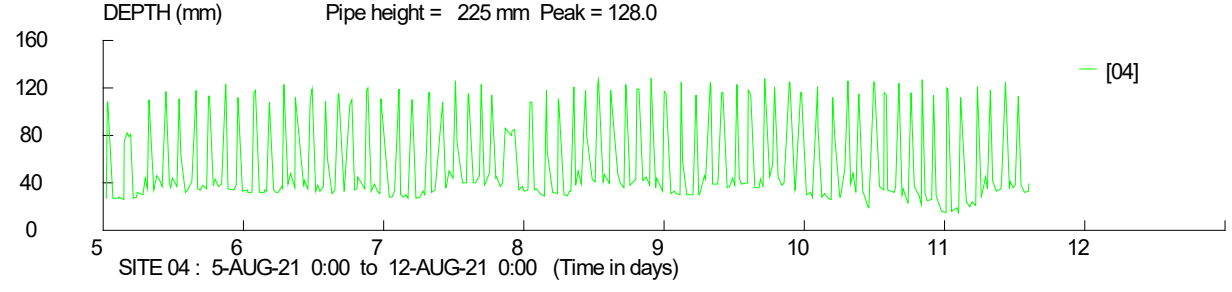
Portmarnock

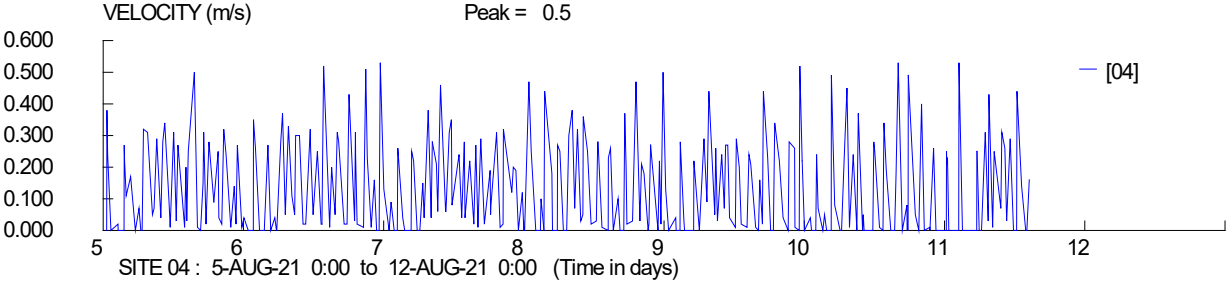


Portmarnock









Flow & Rainfall Survey

Interim Report 8
Portmarnock

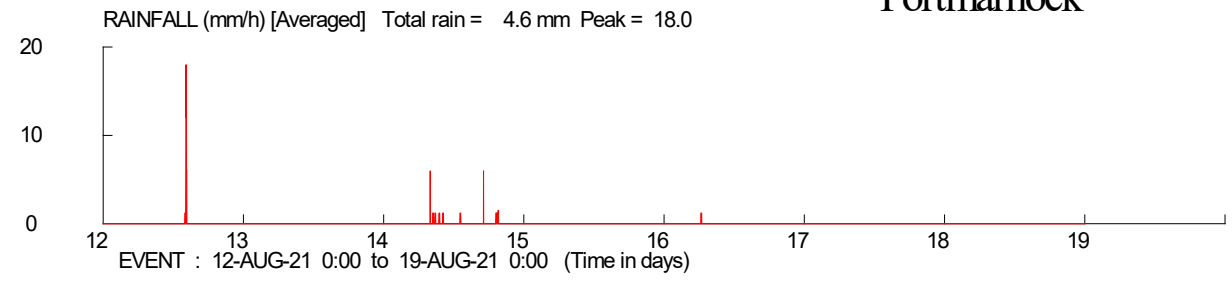
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	8
Rainfall Events Recorded	0

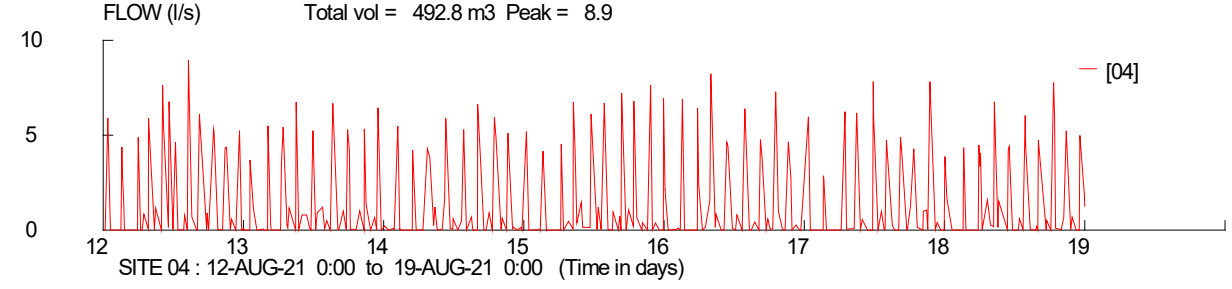
capital water systems ltd.

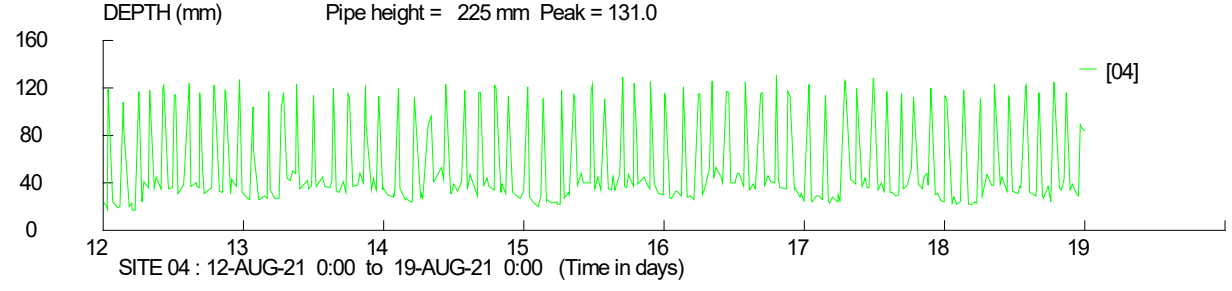
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

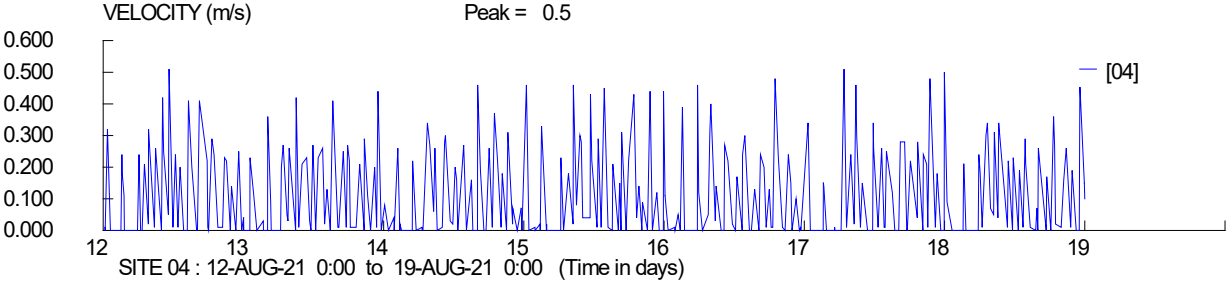
Interim Plots

Portmarnock

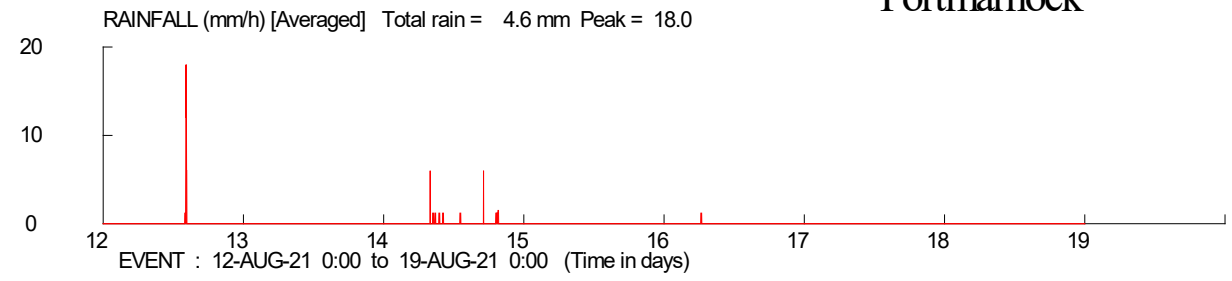


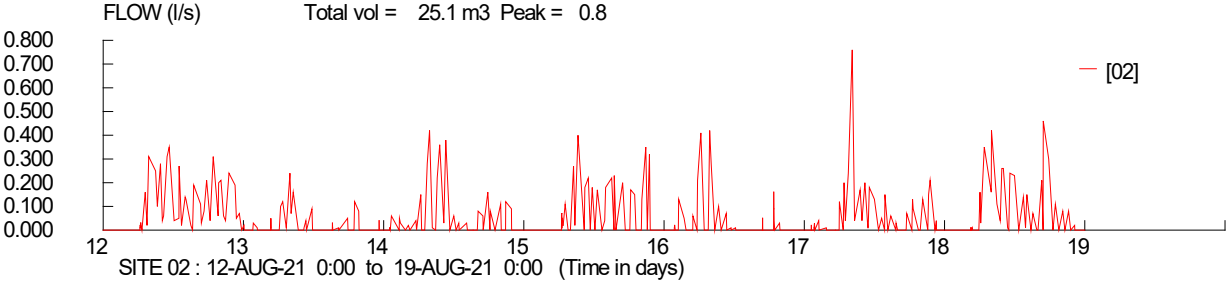


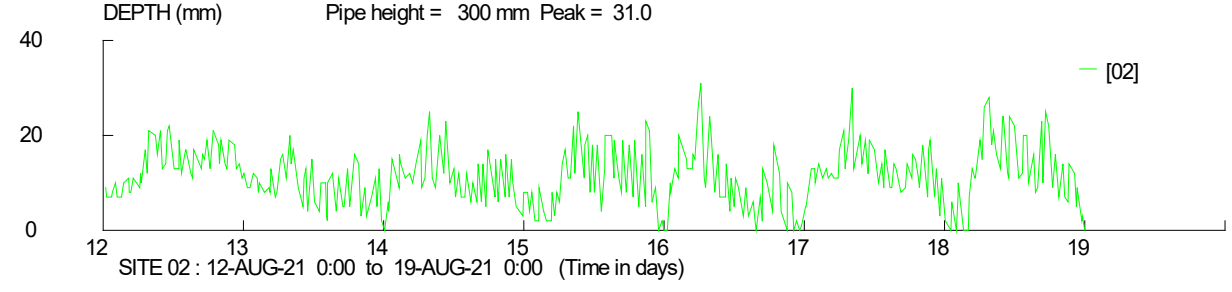


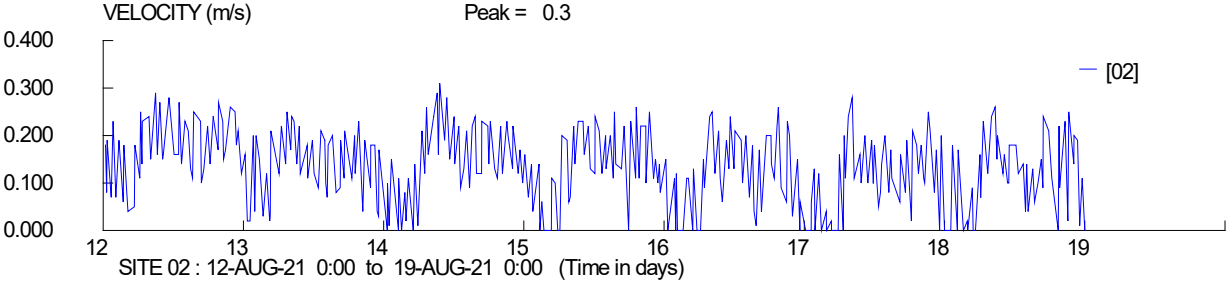


Portmarnock

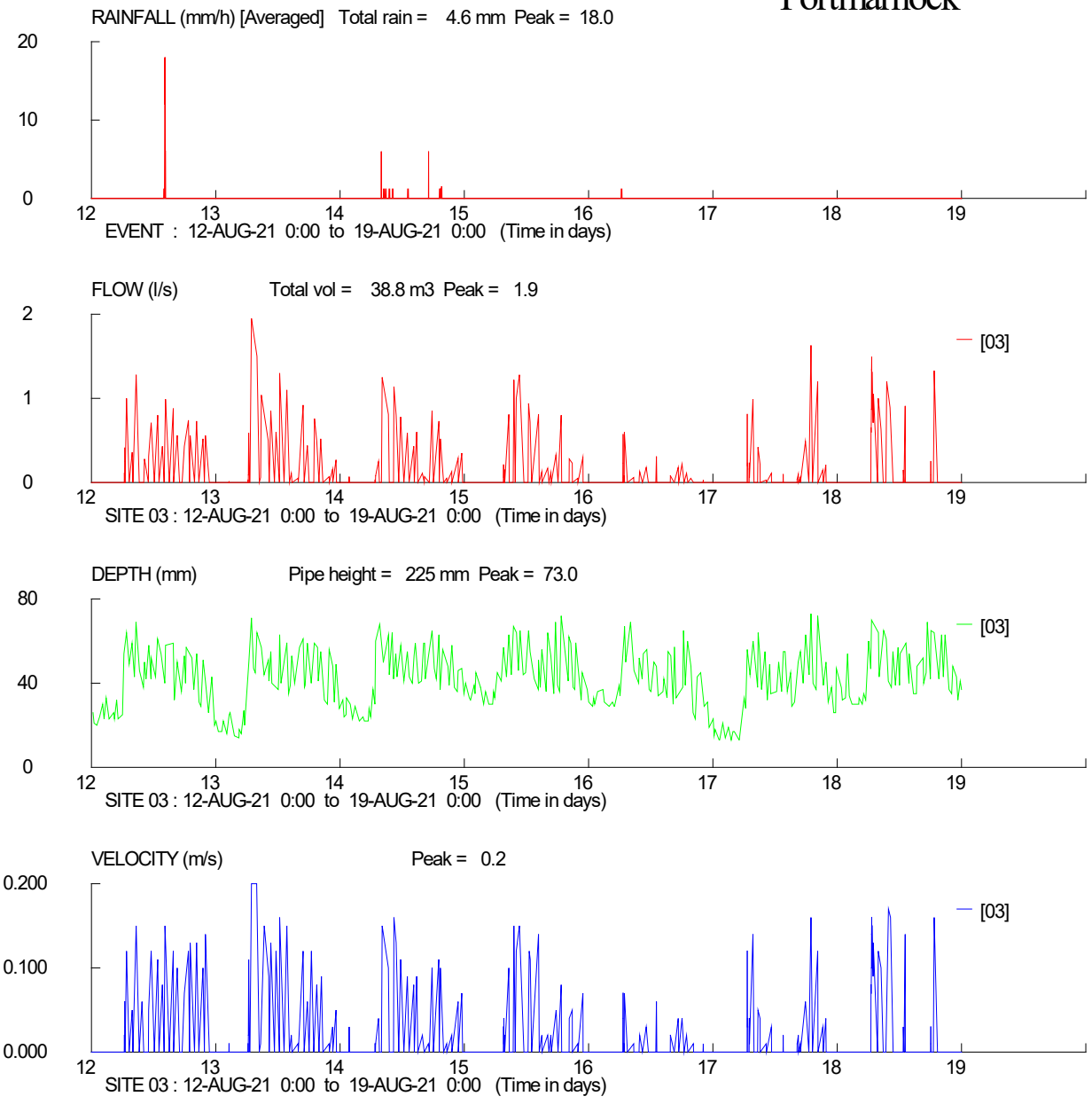








Portmarnock



Flow & Rainfall Survey

Interim Report 9
Portmarnock

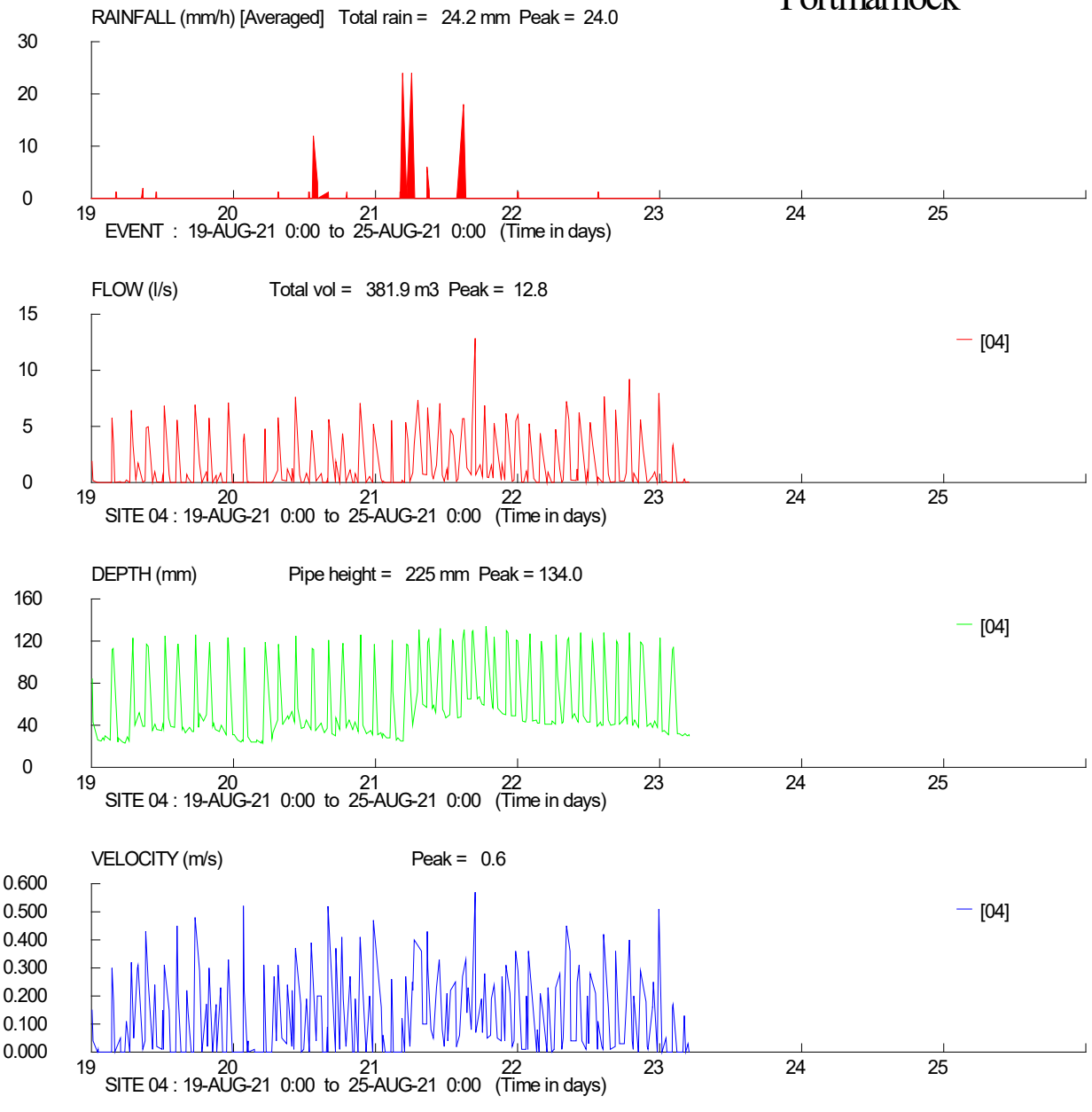
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	9
Rainfall Events Recorded	1 - 21/08/2021

capital water systems ltd.

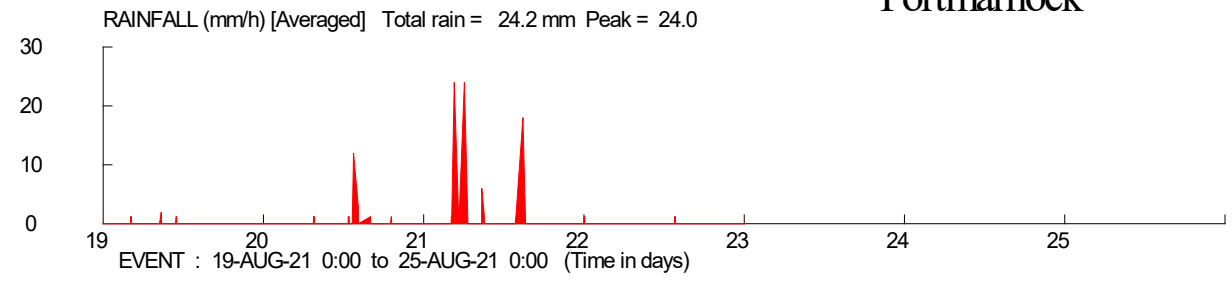
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

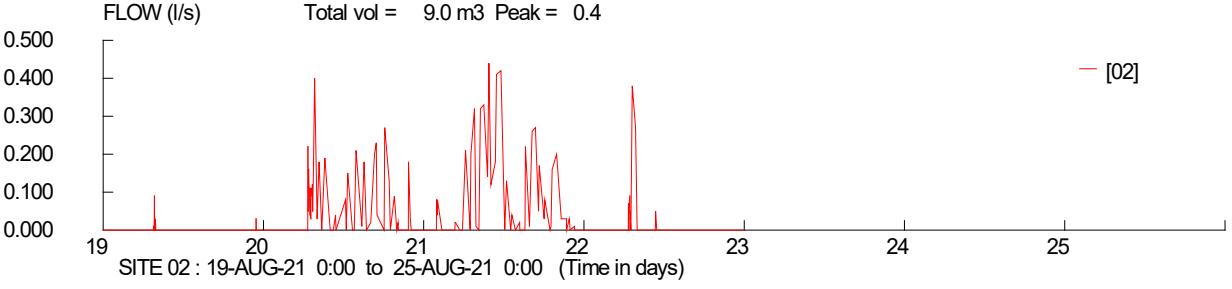
Interim Plots

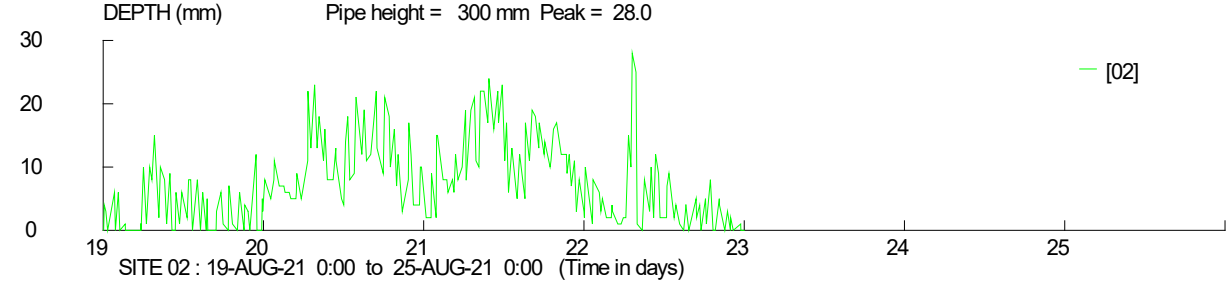
Portmarnock

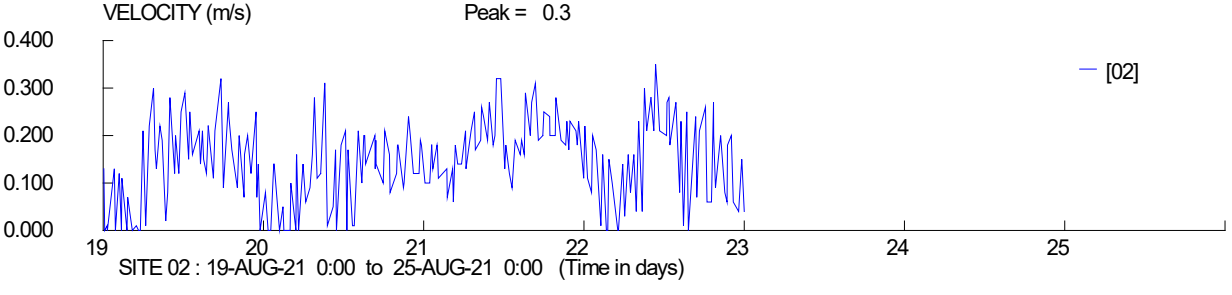


Portmarnock

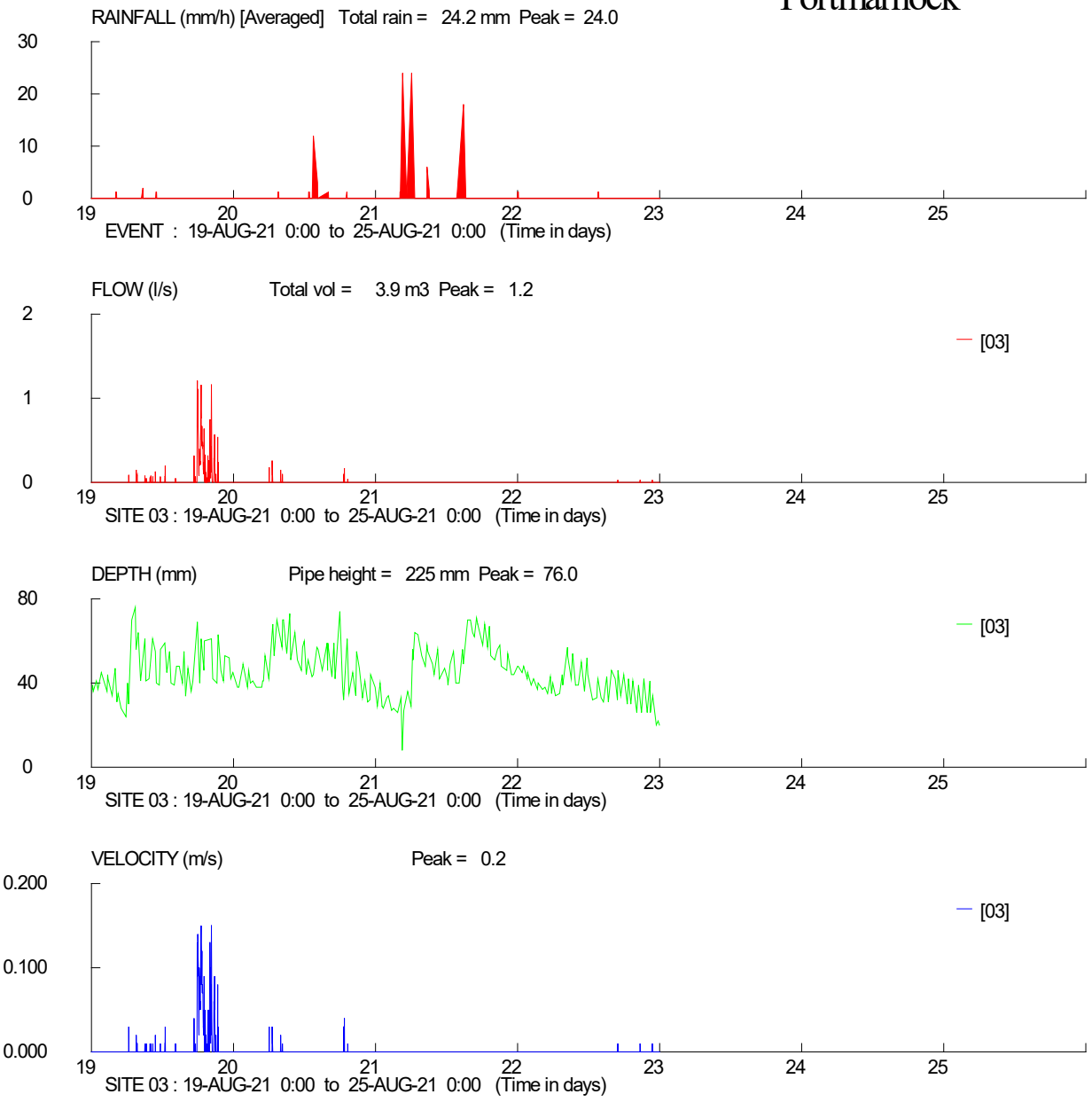








Portmarnock



Flow & Rainfall Survey

Interim Report 10
Portmarnock

Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	10
Rainfall Events Recorded	0

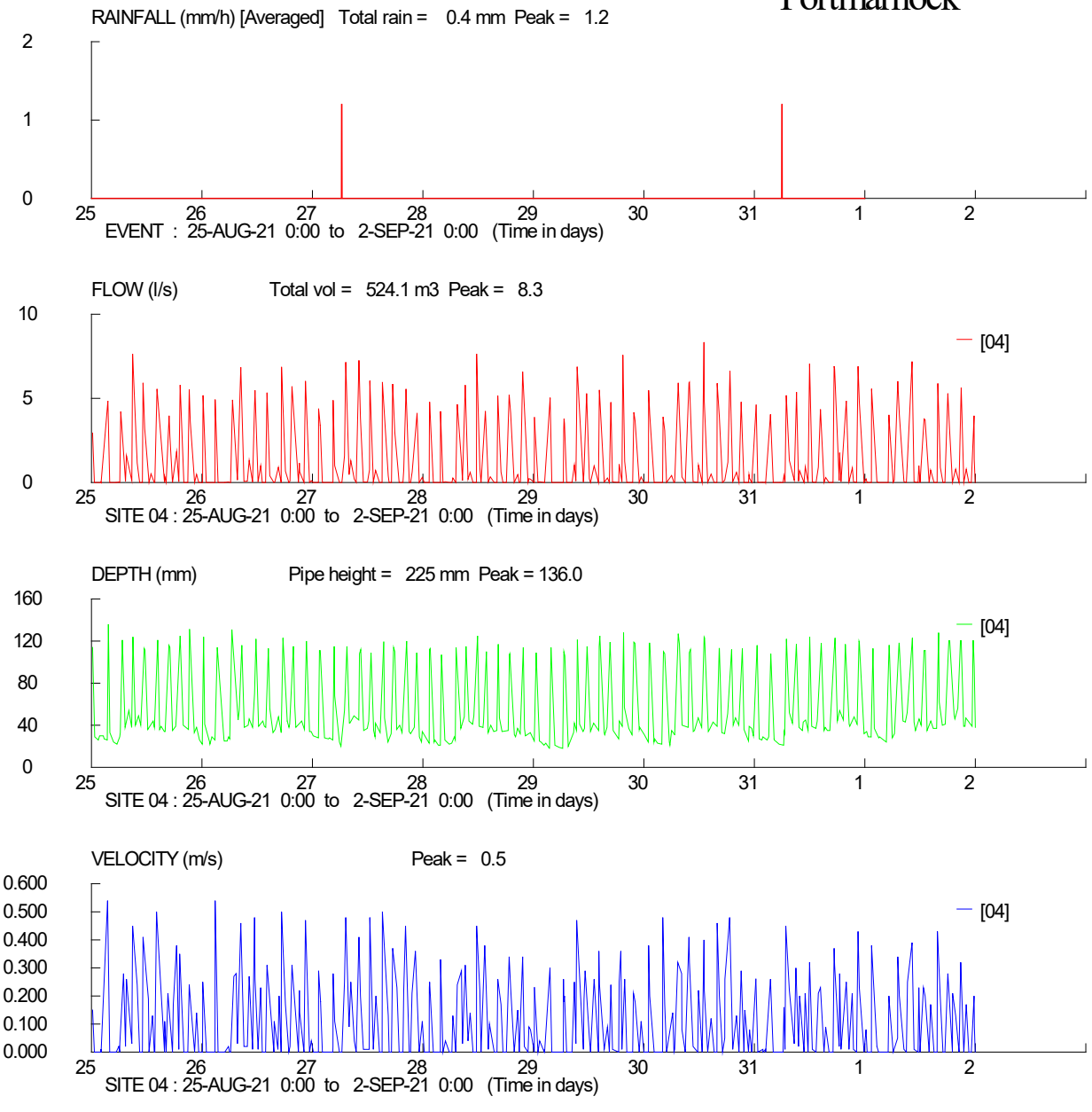
capital water systems ltd.

web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

Interim Plots

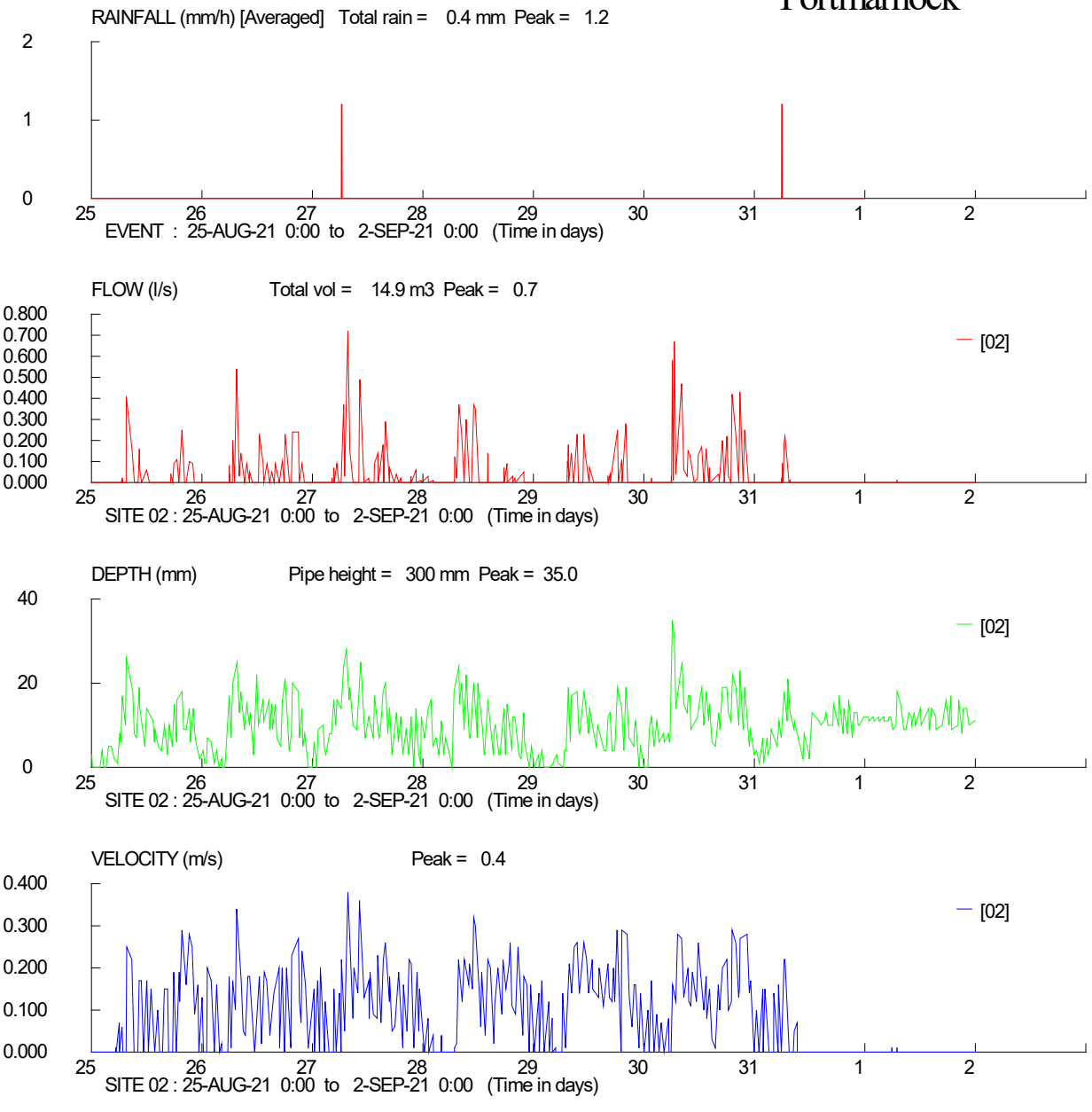
FM01A

Portmarnock



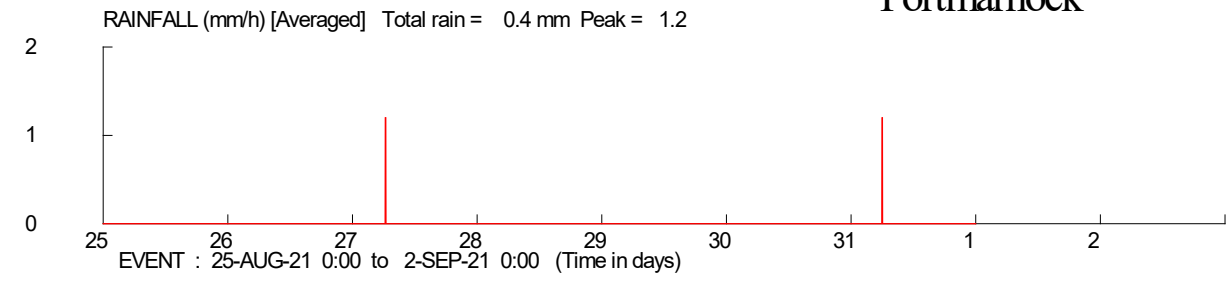
FM02

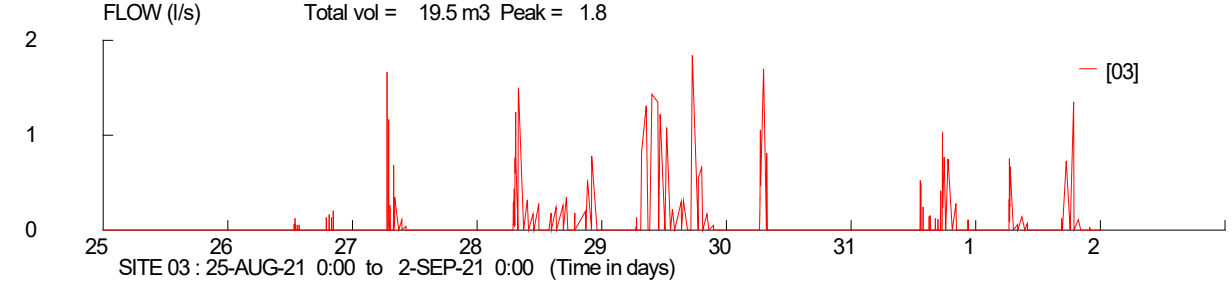
Portmarnock

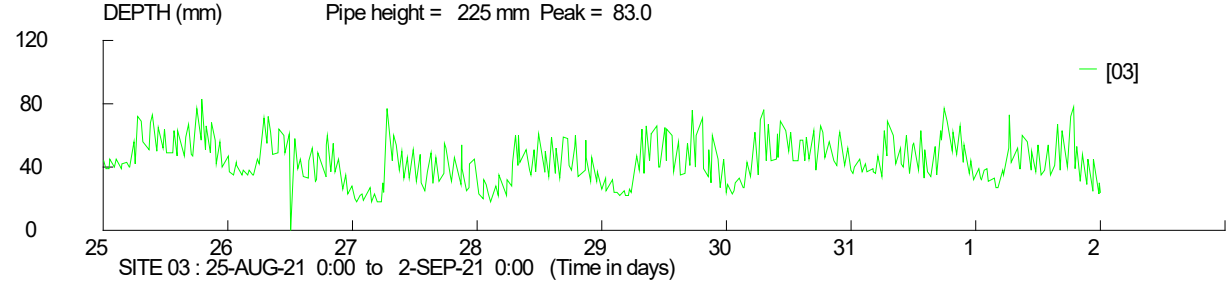


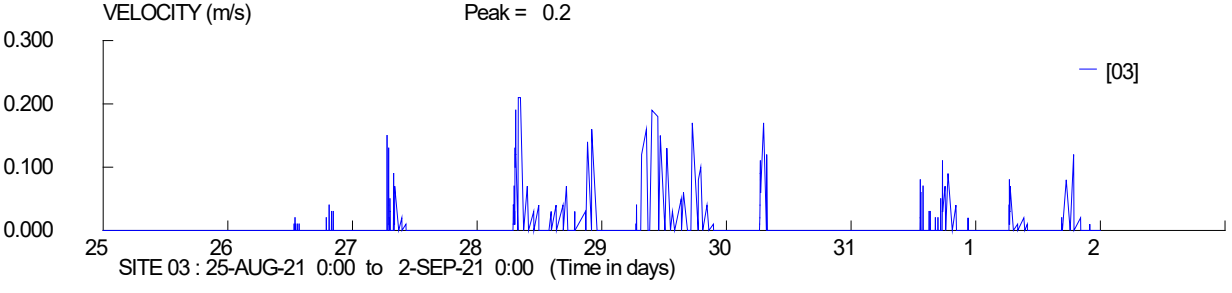
FM03

Portmarnock









Flow & Rainfall Survey

Interim Report 11
Portmarnock

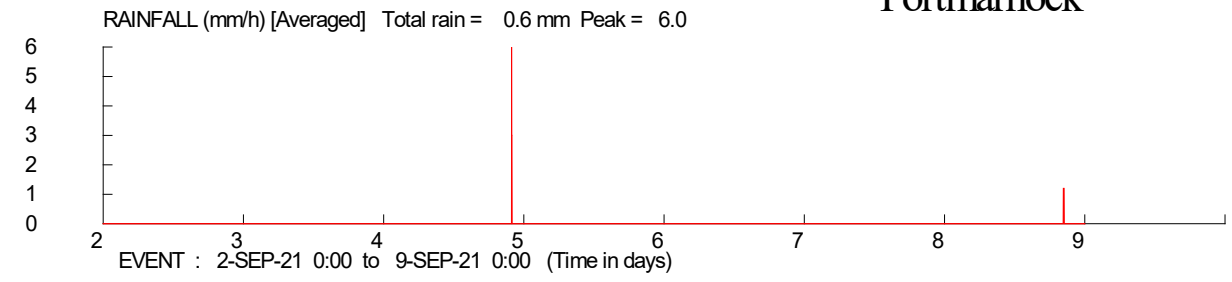
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	11
Rainfall Events Recorded	0

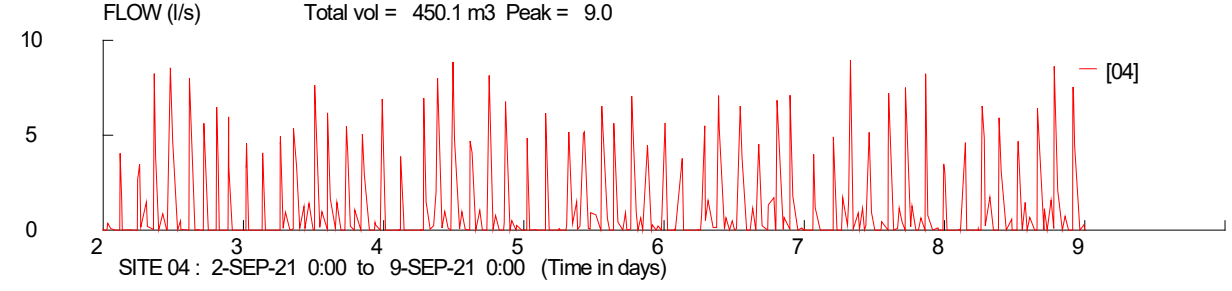
capital water systems ltd.

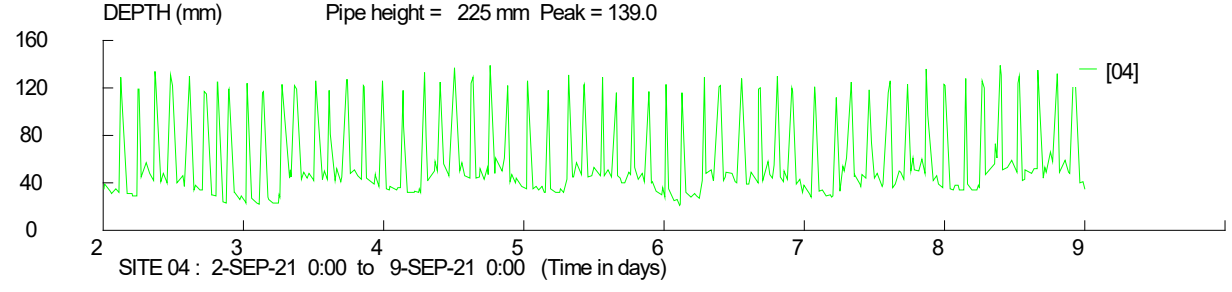
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

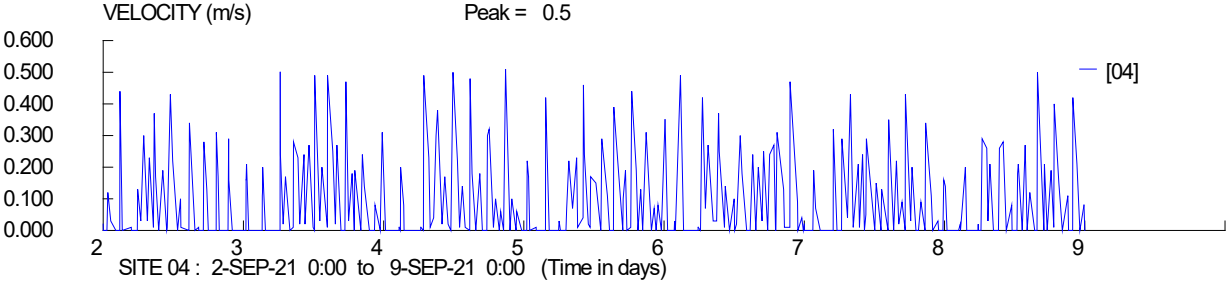
Interim Plots

Portmarnock

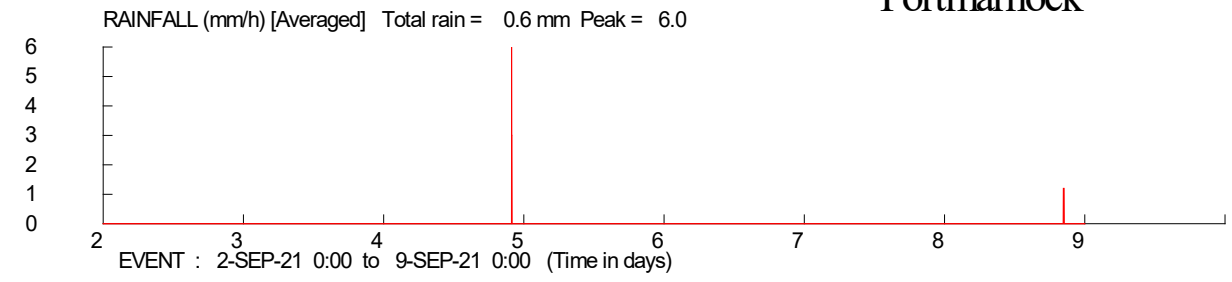


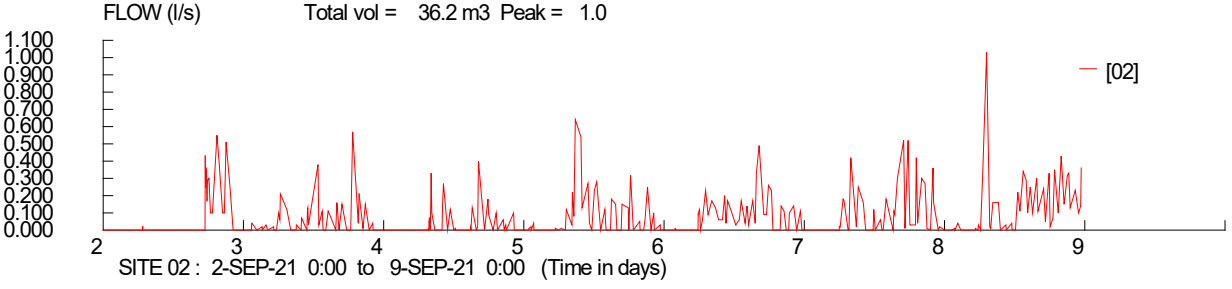


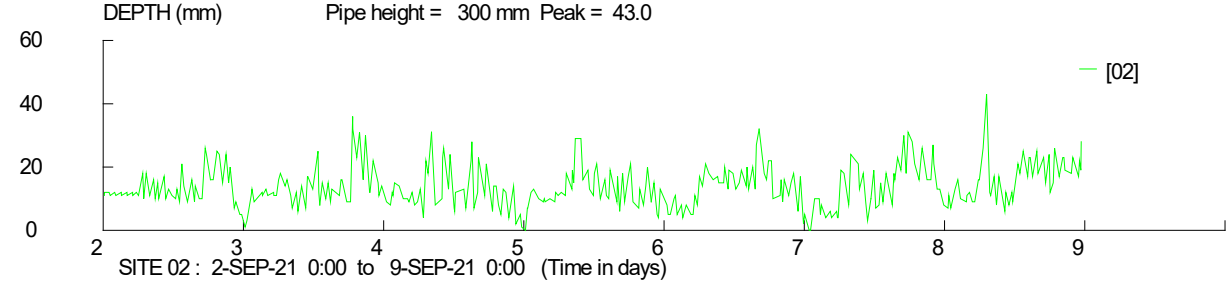


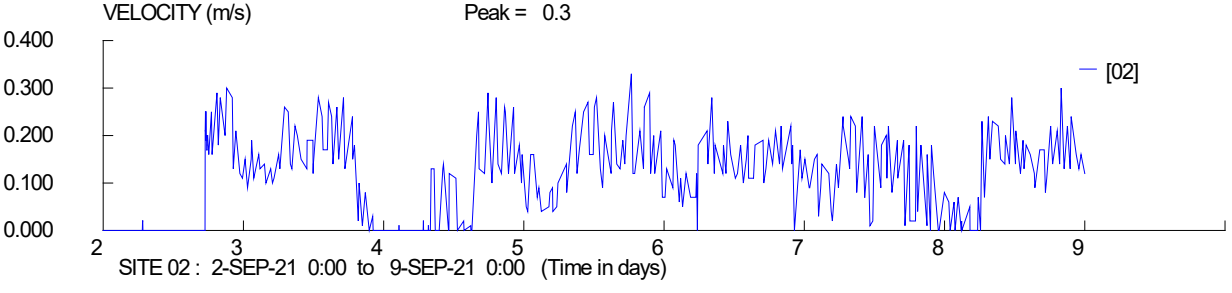


Portmarnock

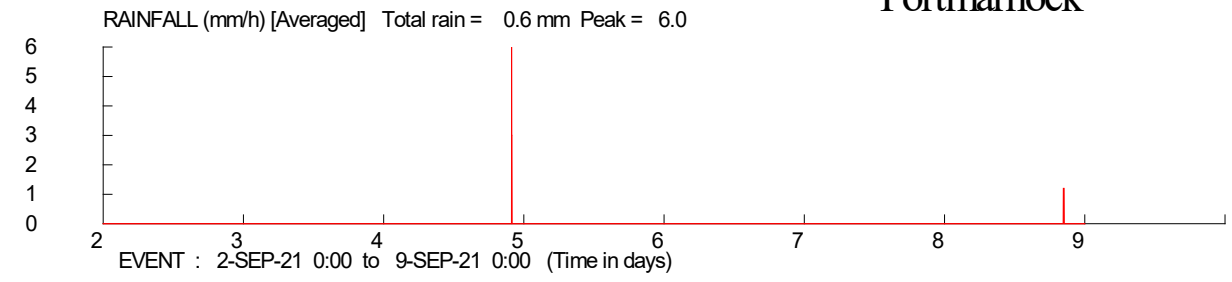


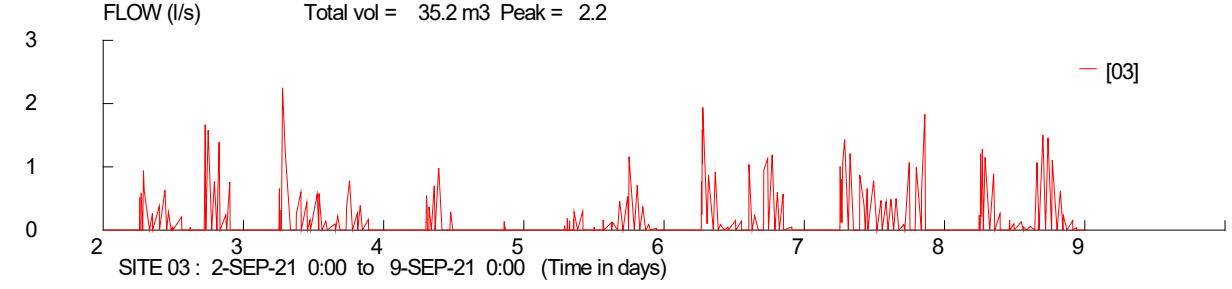


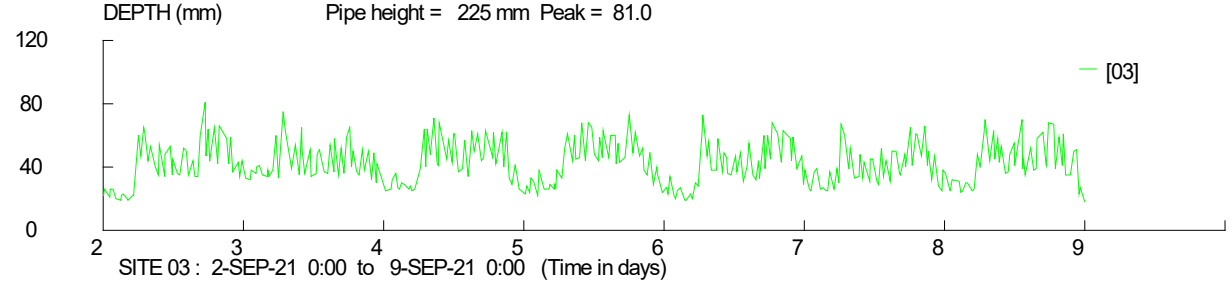


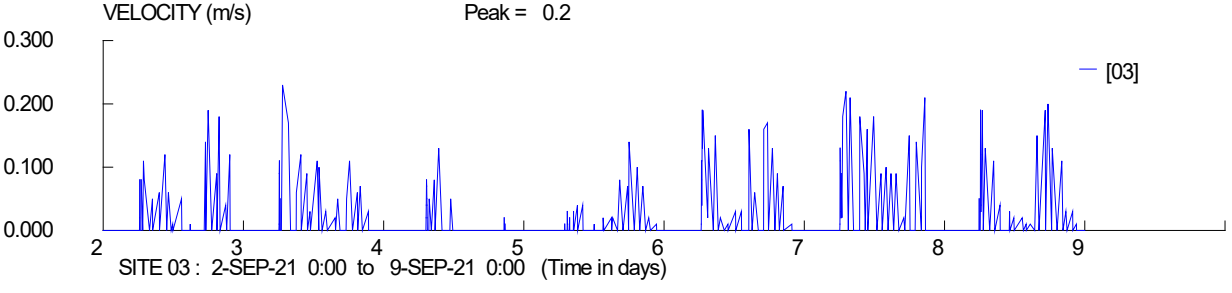


Portmarnock









Flow & Rainfall Survey

Interim Report 12
Portmarnock

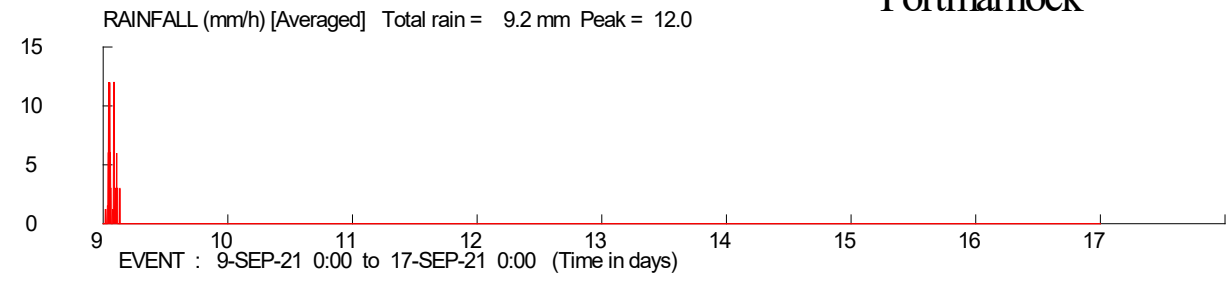
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	12
Rainfall Events Recorded	0

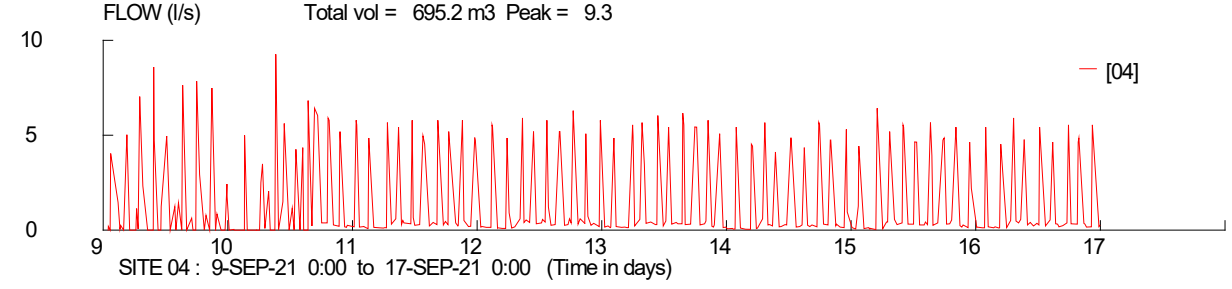
capital water systems ltd.

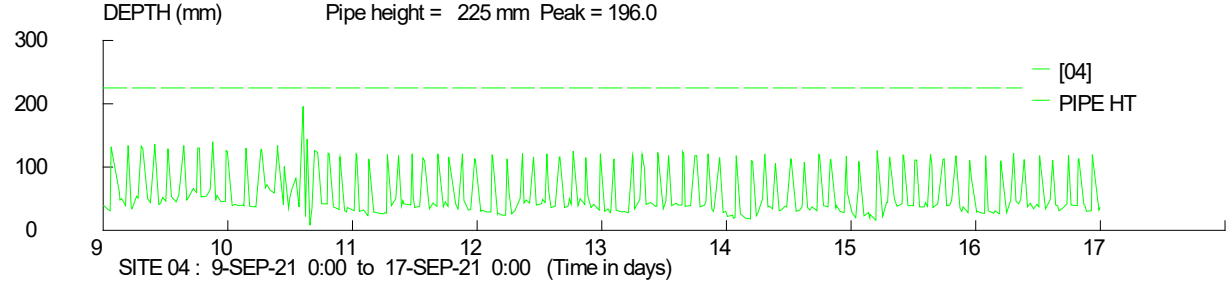
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

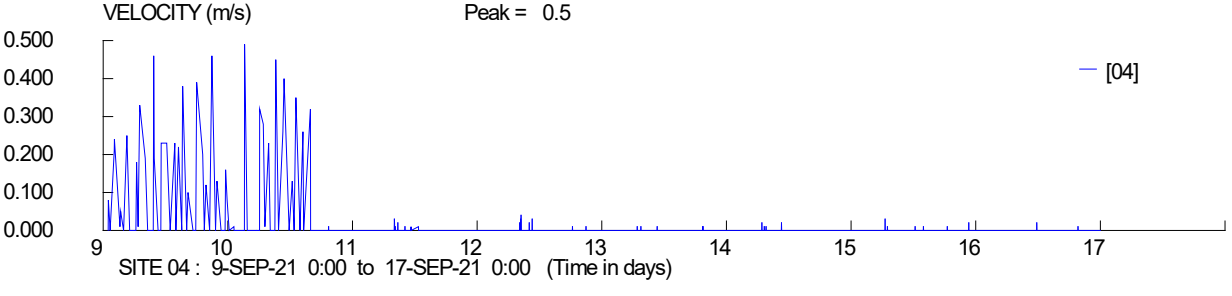
Interim Plots

Portmarnock

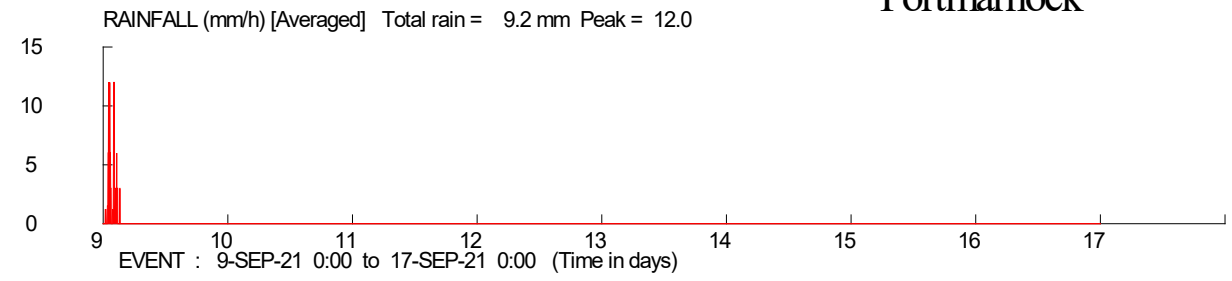


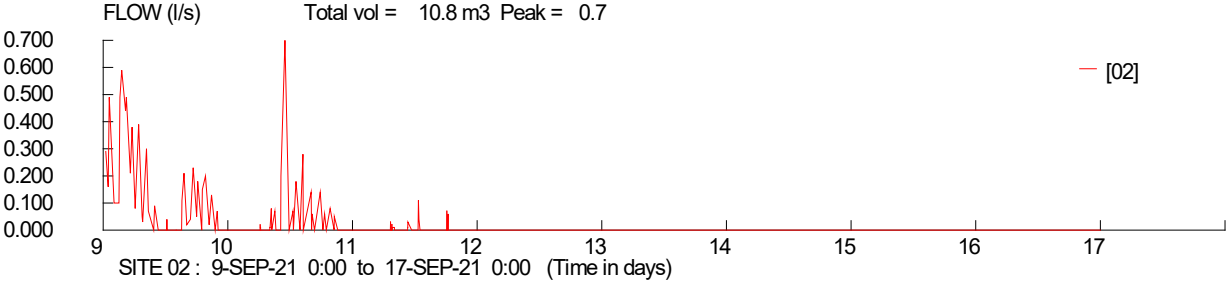


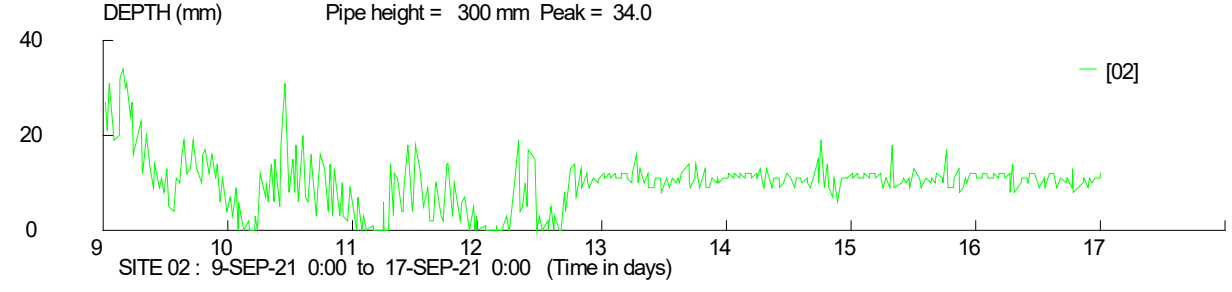


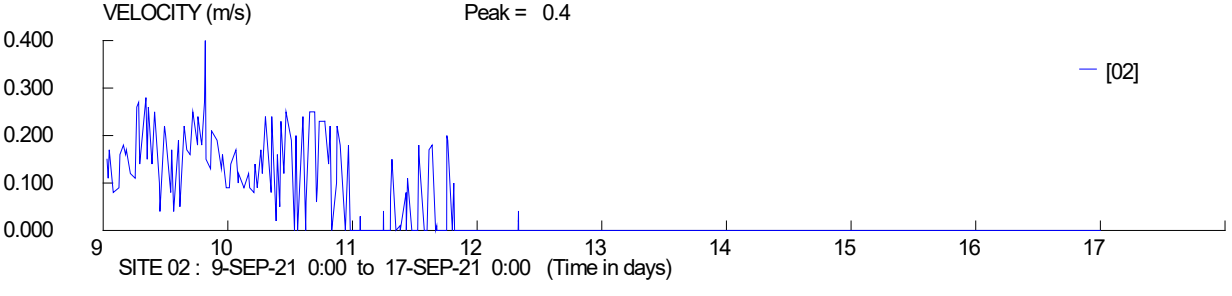


Portmarnock

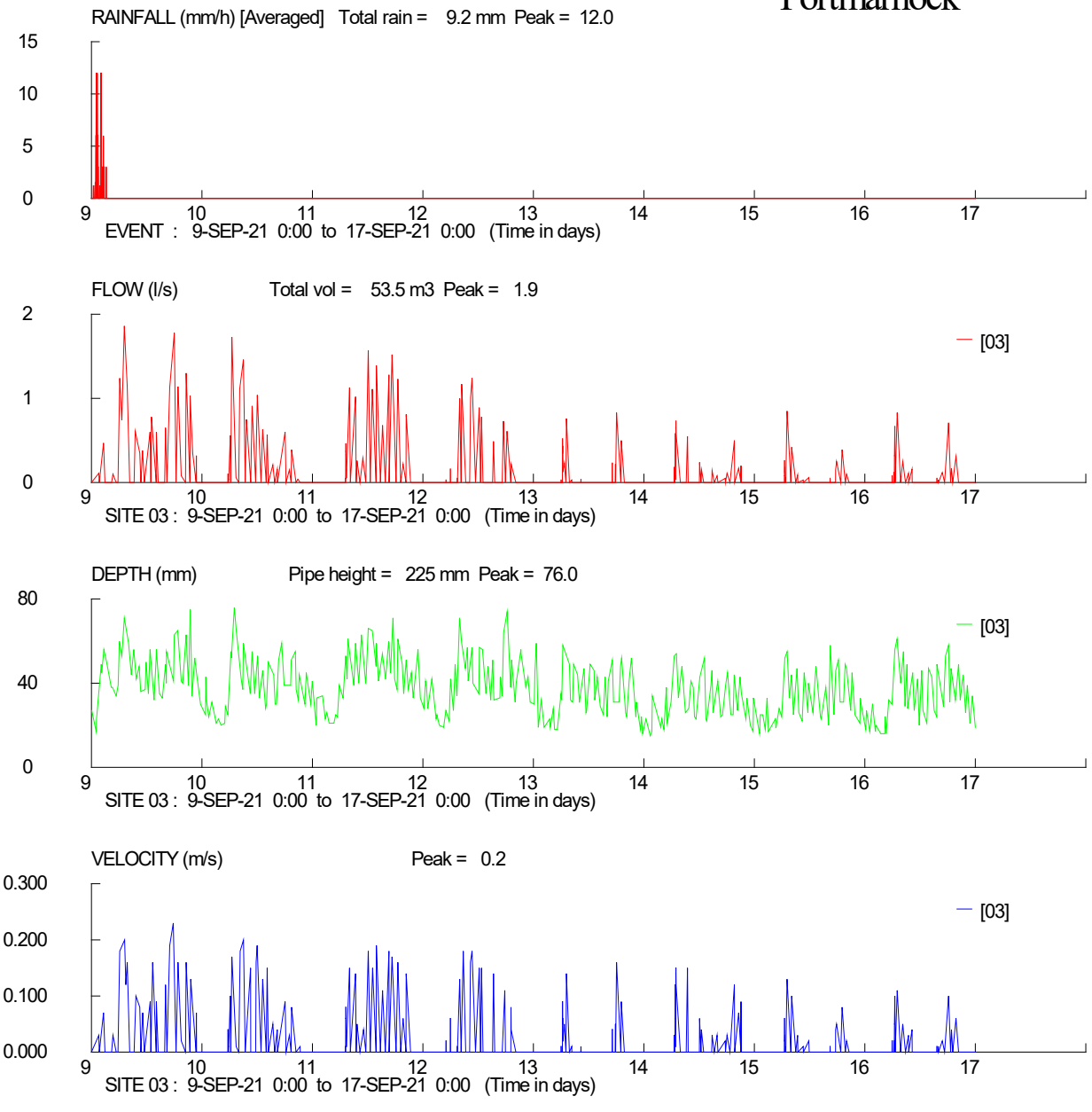








Portmarnock



Flow & Rainfall Survey

Interim Report 13
Portmarnock

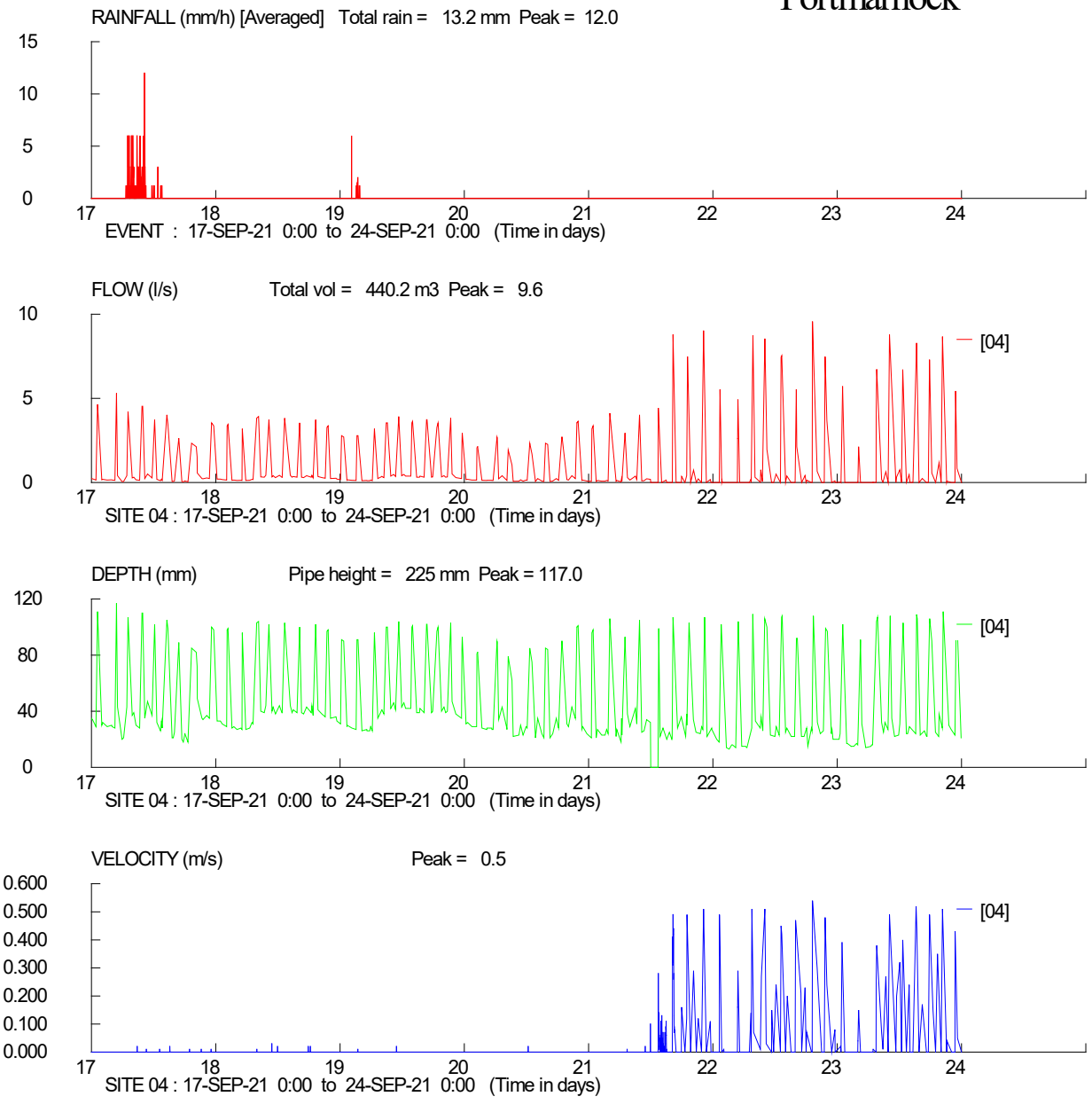
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	13
Rainfall Events Recorded	1 - 17/09/2021

capital water systems ltd.

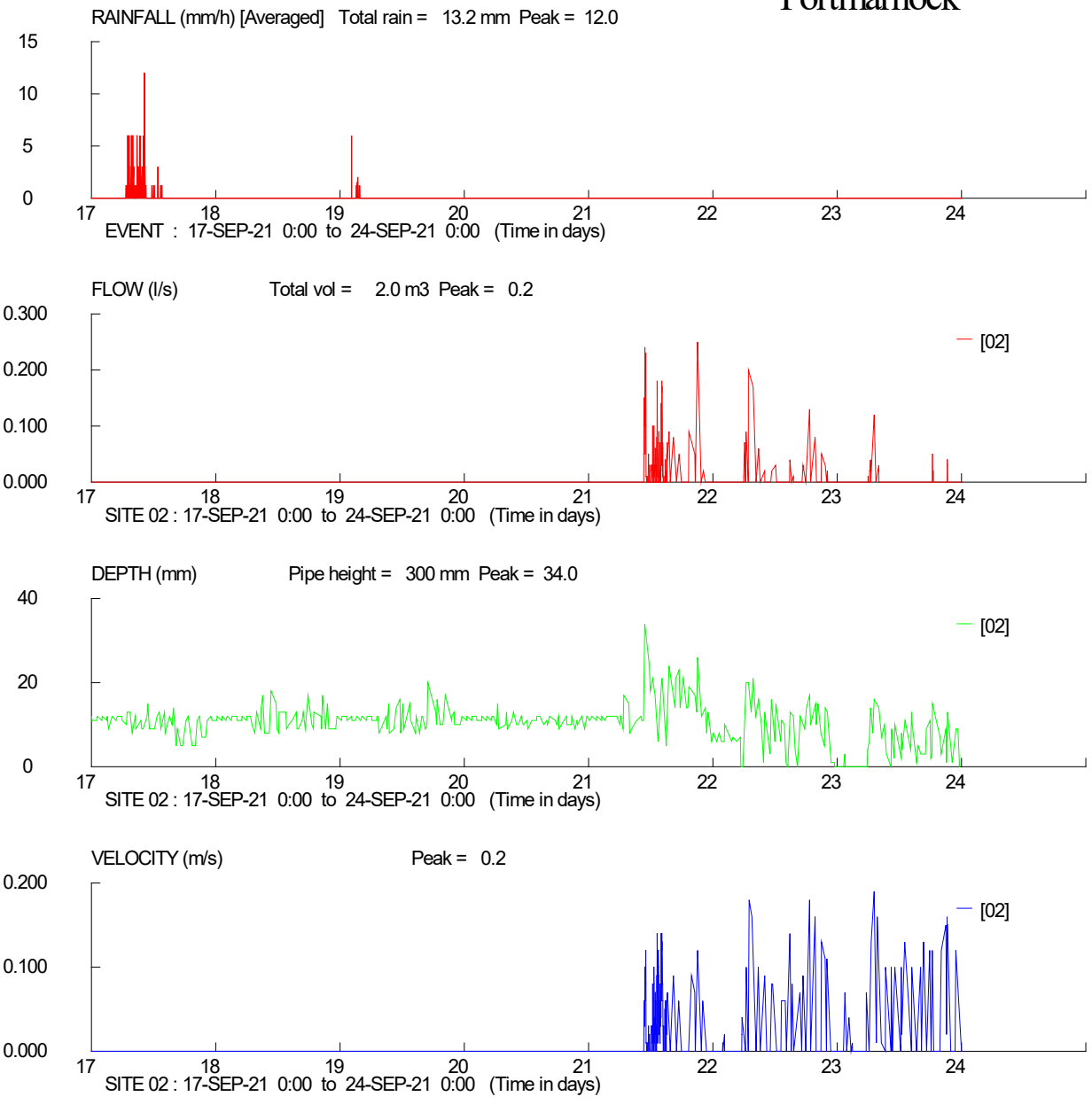
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

Interim Plots

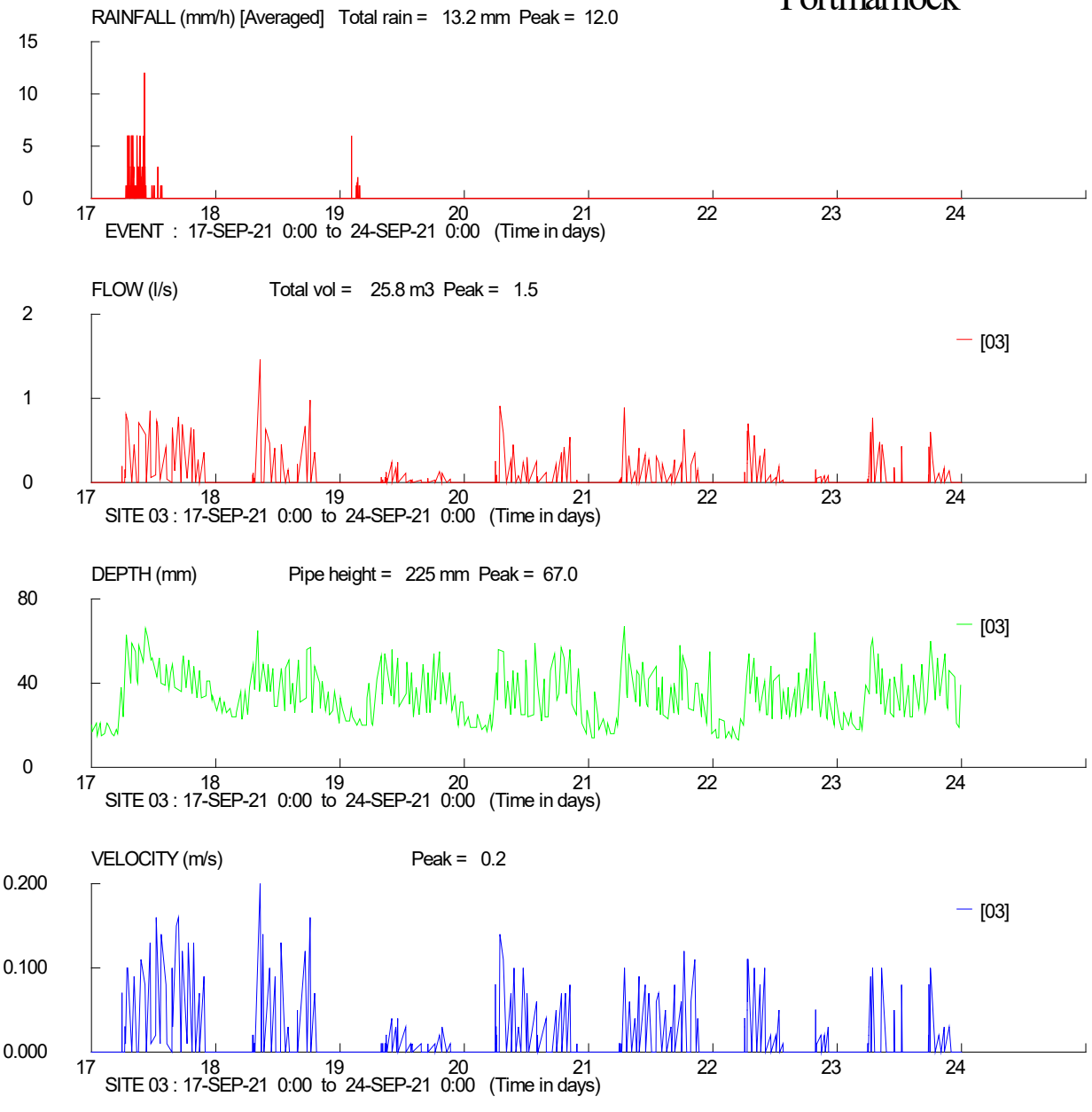
Portmarnock



Portmarnock



Portmarnock



Flow & Rainfall Survey

Interim Report 14
Portmarnock

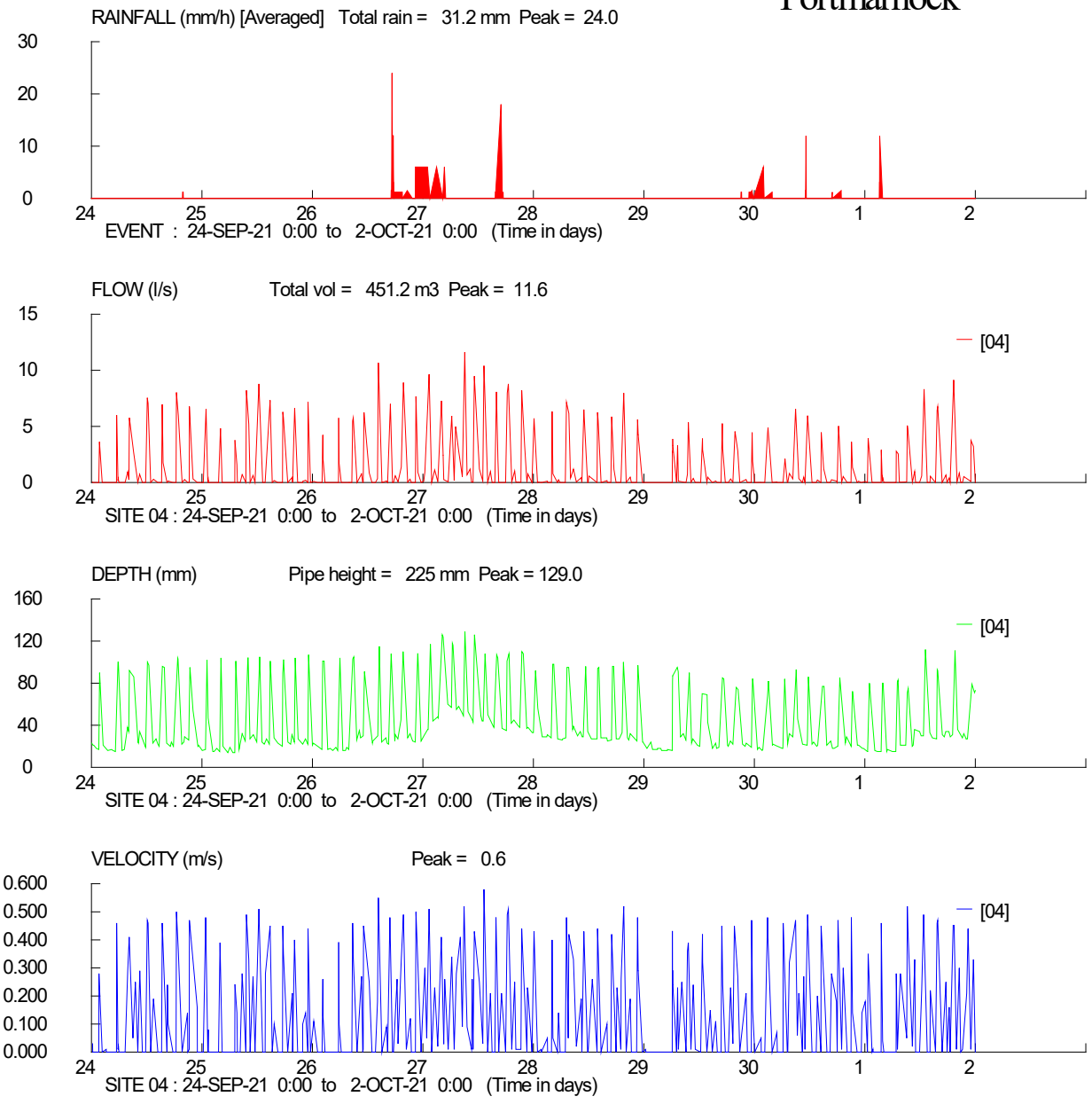
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	14
Rainfall Events Recorded	2 - 27/09 & 30/09

capital water systems ltd.

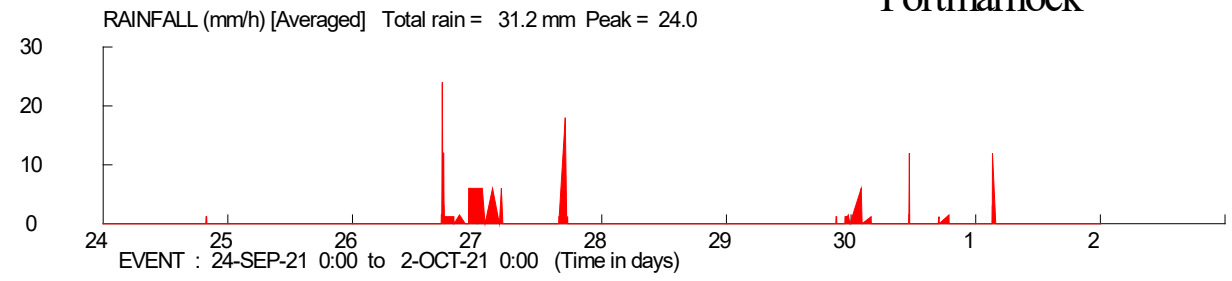
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

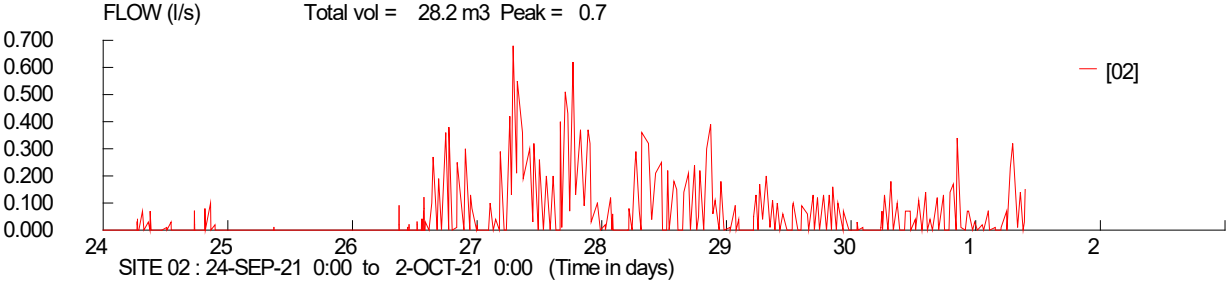
Interim Plots

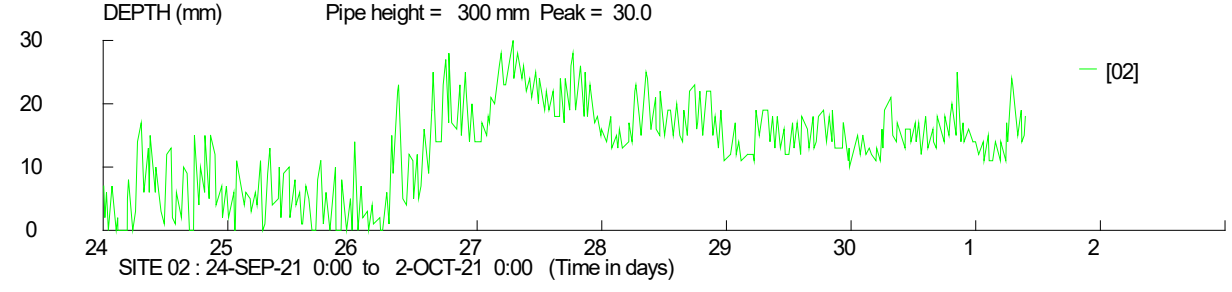
Portmarnock

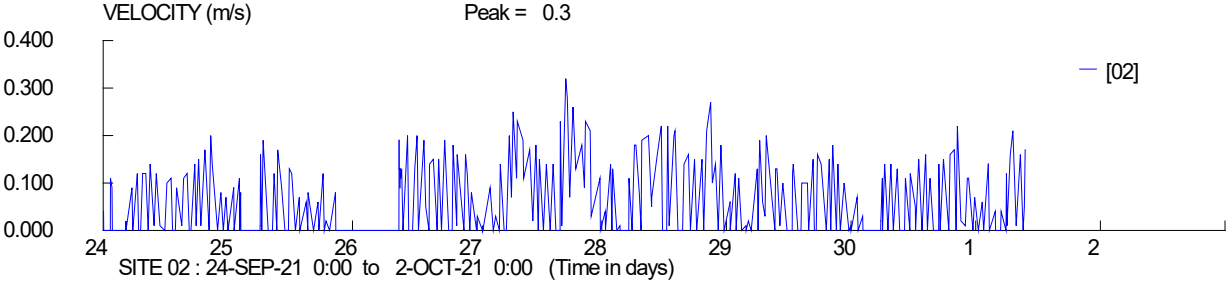


Portmarnock

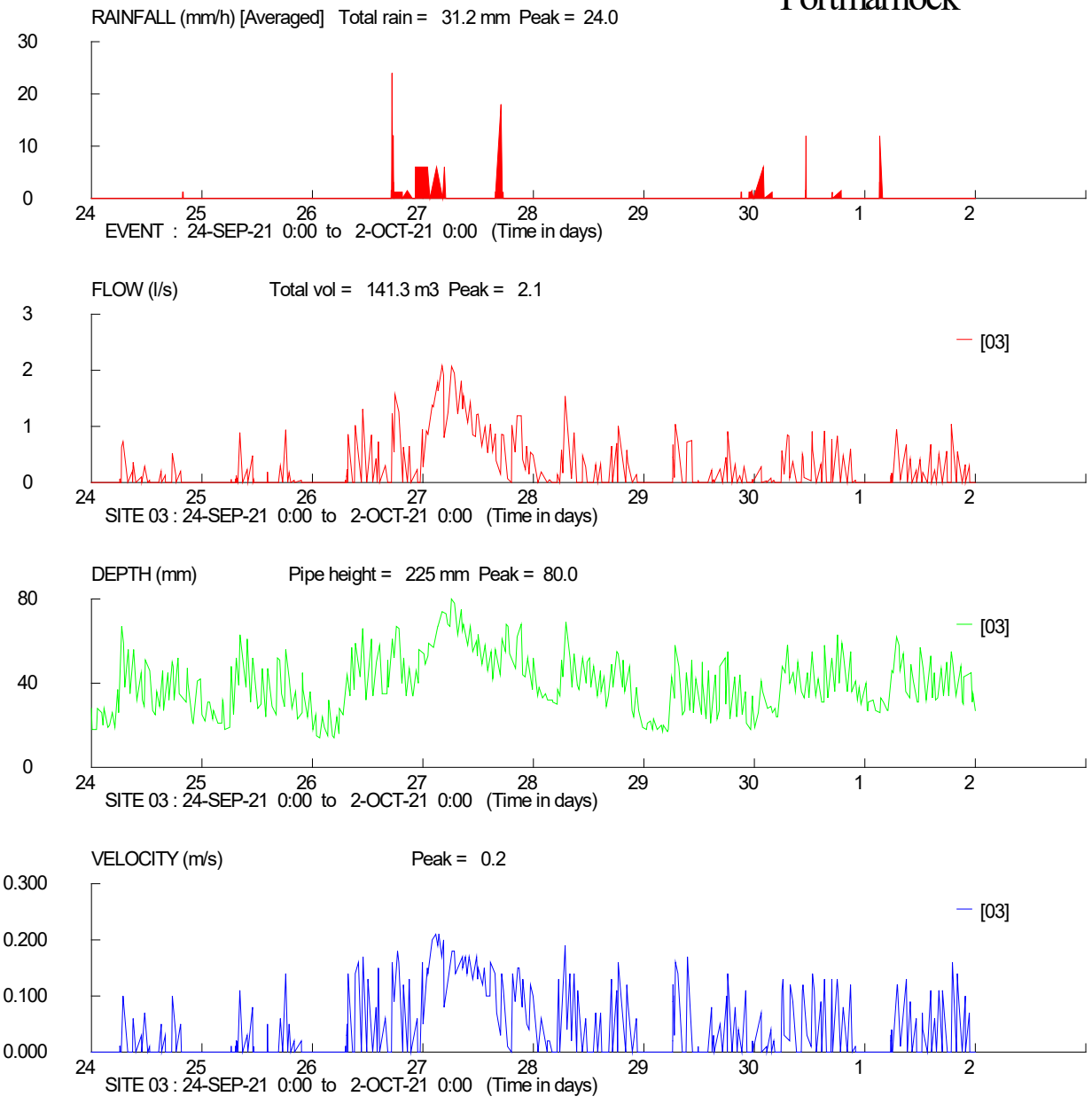








Portmarnock



PORTMARNOCK SOUTH

FLOW & RAINFALL SURVEY

FINAL REPORT - INTERIM 2

18.11.2021

CWSL

capital water systems ltd.

web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (0)1 460 5912

Contents

1 Introduction
2 Project Background
3 Survey Drivers
4 Scope of the Project
5 Instrumentation Installation
6 Weather Conditions
7 Tidal Influence
8 Other Influences
9 Events
10 Instrumentation
11 Data Processing
12 Site Locations

Appendices accompanying Final Report

Appendix A General Information
Appendix B Digital Data
Appendix C Site Sheets
Appendix D Flow Monitor Event Results Plots
Appendix E Irregular Conduit Shape Information
Appendix F Scatter Graph Plots
Appendix G Photographs
Appendix H Survey Drawings
Appendix I Equipment Specification

1. Introduction

CAPITAL WATER SYSTEMS LTD. received commission from the J.B Barry Ltd. to carry out a flow and rainfall survey at various locations around Portmarnock South, Co. Dublin.

3 Flow Monitoring sites & 1 Rain Gauge site were selected as part of this survey.

The Flow and Rainfall survey was conducted between the 24/06/2021 and the 18/11/2021.

Outlined in this report are the results from all the monitoring locations in this survey.

Capital Water Systems Ltd carry out Sewer Flow and Rainfall surveys as described in Irish Water Technical Document – Wastewater Network Short Term Flow and Rainfall Survey Standard and “A Guide to Short Term Flow Surveys of Sewer Systems” pub. WRc 1987.

All data and technical information relating to the monitoring locations is contained in the Appendices accompanying this report as per the project specification.

2. Project Background

N/A

3. Survey Drivers

N/A

4. Final Scope of the Project

Installation & maintenance of 3 Flow Monitors 1 Rain Gauge for an initial period of 5 weeks.
Weekly extensions on instruction from client
Weekly interim reporting of observations and data as per specification.
Final report as per specification.

5. Instrumentation Installation/Removal

Instrument	Installation Date	Removal Date
Rain gauges	24/06/2021	18/11/2021
Flow/Depth Monitors	24/06/2021	18/11/2021
Additional Loggers Installed/Loggers Moved		
FM01 relocated to FM01A on the 22/07/2021		
Loggers Removed During Survey following presurvey		
N/A		

6. Weather Conditions

See Appendix A Equipment Performance Matrix for information on weather conditions.

7. Tidal Influence

No Tidal Influence noted

8. Other Influences

Pumped flows at FM01 & FM01A

9. Selected Events – Interim 1 Period

Storm Event No.	1	2	3	4
Start	27/07/2021 14:30	30/07/2021 02:00	07/08/2021 09:30	21/08/2021 03:30
End	27/07/2021 21:00	30/07/2021 09:30	07/08/2021 13:00	21/08/2021 11:00
Rainfall Total mm	9.6	11.6	6.4	12.6
Rainfall Intensity mm/h	36	12	12	24

DWF	1	2
Start	25/07/2021	10/08/2021
End	26/07/2021	11/08/2021
Rainfall Total mm	0	0
Rainfall Intensity mm/h	0	0

9.1 Selected Events Interim 2 Period

Storm Event No.	5	6	7
Start	26/09/2021 16:30	20/10/2021 05:00	27/10/2021 17:00
End	27/09/2021 09:00	20/10/2021 14:00	28/10/2021 17:00
Rainfall Total mm	20.4	7	26
Rainfall Intensity mm/h	24	12	18

DWF	3	4
Start	12/10/2021	09/11/2021
End	13/10/2021	10/11/2021
Rainfall Total mm	0	0
Rainfall Intensity mm/h	0	0

10. Instrumentation

10.1 RAINFALL RECORDERS

Casella tipping bucket rain gauges together with Remote Sense data loggers were used in this survey. The rain gauges employ a 0.2 mm tipping bucket to record rainfall. Each rain gauge is connected to a self-contained battery powered data logger. The data is forwarded to a data hosting platform daily. This data is subsequently transferred to a PC for processing and analysis.

10.2 FLOW MONITORS

The flow monitors used in this survey were Area/Velocity survey loggers. These self-contained units are microprocessor controlled and are set to measure depth and velocity of flow at predetermined intervals. The data is stored on a logger device within the monitor. Data is sent daily to a hosting platform where signal allows. If no signal is available the data is extracted from the monitor via laptop on a weekly basis and subsequently processed using specialized software on a PC.

The flow monitor comprises two elements. The probe, which houses the depth and velocity sensors, is normally placed at least 300 mm from the face of the manhole where the hydraulic conditions are the most suitable for accurate flow measurement. A unit containing the data logger and power source is normally suspended at the top of the manhole. The two elements are connected via cables.

There is a cut off value unique to each monitor, which typically is in the range 10 mm to 15 mm. Below this depth, values are not recorded. In addition, a depth zero error is associated with each instrument which, although automatically compensated for during the data processing, can have the effect of raising the cutoff point above these typical values. Generally, these combined effects would not normally raise the cut off value above 40 mm of depth above the underside of the probe.
Velocity readings are of questionable accuracy when the depth of flow, above the underside of the probe, is below 75 mm. This is due to unstable flow conditions over the probe. Furthermore, the manufacturer advises that velocities of less than 0.20 m/sec are of lesser accuracy.

The recorded values of depth and velocity are average values taken over the recording interval which precedes the recording time. For this survey, the recording interval was taken as 2 minutes.
During each site inspection, insitu depth and velocity calibrations were carried out where flow characteristics permitted.
Calibrations for all equipment were performed before the survey in CAPITAL WATER SYSTEM'S own test tank, flume and workshops.

11. Data Processing

CAPITAL WATER SYSTEMS use STL's SSAS (Sewer Survey Analysis Software) package for processing both the rainfall and flow data.

11.1 RAINFALL DATA

The data is forwarded to a data hosting platform daily. The data is transferred from the hosting site to specialised analysis software in order to compute the rainfall intensities/event totals.

11.2 FLOW DATA

Data is sent daily to a hosting platform where signal allows. If no signal is available the data is extracted from the monitor via laptop on a weekly basis and subsequently processed using specialised software on a PC.
The processing consists of three stages editing, correction and flow computation.
Editing involves the examination of raw data, for each site, and should the need arise,

deleting any erroneous data. Correction for zero errors and response is then made prior to computation of flows.

Normally where depths above the underside of the probe are below 75 mm, velocity readings are ignored and hence flows are not calculated. However, for this survey a depth cut off of zero was used and all flows have been computed and included in the record. It should be noted that calculated flows where depths are less than 75mm above the underside of the probe should be treated with caution.

A velocity cut off of zero m/s was used in the processing but results processed where velocity values are below 0.2 m/s must be treated with caution.

12. Site Locations

See Appendix A - General Survey information for details

STATION ROAD

NEW FOUL CONNECTION TO PROPOSED NEW IW PUMPING STATION (APPROX Q3 2019). TEMPORARY PUMPING STATION TO BE DECOMMISSIONED THEREAFTER.

LOCATION OF IRISH WATER FOUL PUMPING STATION. SUBJECT TO PLANNING APPLICATION BY IRISH WATER

STRAND ROAD

PORTMARNOCK BRIDGE ROUNDABOUT

SEPTIC TANK

PRIVATE SIDE INSPECTION CHAMBERS

SPURS FOR FUTURE DEVELOPMENT

E723338.051 N742444.335

E723330.752 N742444.895

E723329.441 N742427.806

E723336.740 N742427.246

E723182.000 N742384.000

CAPPED FOR FUTURE CONNECTION

FOR FUTURE DEVELOPMENT

CAPPED FOR FUTURE DEVELOPMENT

PORTMARNOCK SOUTH PHASE 1A (ST. MARNOCK BAY)

RISING MAIN FROM TEMPORARY PUMPING STATION TO EXISTING 2250mm FOUL SEWER. THIS IS TEMPORARY UNTIL THE CONSTRUCTION OF NEW IW PUMPING STATION (APPROX. Q3 2019)

SECTIONS OF SEWER TO BE CONSTRUCTED / AMENDED AND EXISTING 2250mm FOUL SEWER TO COAST ROAD DECOMMISSIONED WHEN NEW TREATMENT PLANT IS OPERATIONAL (APPROX Q3 2019).

EXISTING 2250mm FOUL SEWER

FOR FUTURE DEVELOPMENT

LENGTH OF EXISTING SEWER DIVERTED AND DECOMMISSIONED

POSSIBLE 2ND LOCATION TO DISCOUNT PHASE 1A NETWORK IF DATA FROM INITIAL TEST IS HIGH.

POSSIBLE 3rd LOCATION TO ESTABLISH FLOW THAT ACTUALLY ENTER PUMPING STATION

RISING MAIN FROM PUMPING STATION GOES HERE

DRESCOMPOUND PROPOSED FLOW METER LOCATION

Ex F1.4

Meters 15 0 15 30

1:500

NOTES:

1. Figured dimensions only to be taken from this drawing.
2. All dimensions to be checked on site.
3. All levels are in metres O.D. and are related to Ordnance datum at Malin

NOTES

1 SEWER LAYING TO BE IN ACCORDANCE WITH IRISH WATER STANDARD DETAILS.

2 REFER TO ARCHITECTS LAYOUT FOR OVERALL SETTING OUT INFORMATION (BUILDINGS, ROADS, BOUNDARIES AND FOOTPATHS)

3 ALL PIPES WITH LESS THAN 1.2m COVER (ROAD) AND 0.9m (LANDSCAPED AREAS) SHALL BE ENCASED IN min 150mm CONCRETE SURROUND CI. 16/20

4 MANHOLE COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY CONCRETE PLINTH, 200MM ALL AROUND AND 100MM DEEP, IN COMPLIANCE WITH IW STANDARDS

5 SEPARATION DISTANCES FROM WATERMAIN TO BE IN COMPLIANCE WITH STD-WW-05 OF IW STANDARDS.

LEGEND:

EXISTING uPVC FOUL SEWER

PROPOSED uPVC FOUL SEWER

PROPOSED uPVC FOUL SEWER (APPROX Q3 2019)

PROPOSED INSPECTION CHAMBER

PROPOSED PE TEMPORARY RISING MAIN

Description:	Drawn	Date:	Rev.:
PUMPING STATION AMENDED. COORDINATES ADDED	SW	13/03/19	C5
LAYOUT AND NOTES REVISED	ES	25/02/19	C4
COVER LEVELS REVISED	SW	12/10/18	C3
COVER LEVELS REVISED	ES	31/08/18	C2
ISSUED FOR CONSTRUCTION	ES	22/08/18	C1
DRES SURVEY ADDED. F3.7a to F3.7 ADDED. F1.2A to F1.2 ADDED FOR FUTURE LANDS. F1.3 to F4 DIAMETERS AMENDED. HOUSE CONNECTIONS ADDED.	SW	31/07/18	P2
LAYOUT AMENDED	SW	31/05/18	P1
ISSUED FOR PLANNING	SW	14/12/17	F
LAYOUT & WETLAND AMENDED	SW	11/12/17	E
ISSUED FOR PRE-PLANNING APPLICATION TO A.B.P.	SW	22/09/17	D
GENERAL REVISIONS	SW	07/09/17	C
ISSUED FOR PRE-PLANNING	ES	03/08/17	B
INITIAL ISSUE FOR REVIEW	SW	28/07/17	A

Client:

St. Marnock's II DAC and Clear Real Estate Investments plc.

Project:

PORTMARNOCK SOUTH PHASE 1B.

Clients Representative:

J. B. Barry and Partners Limited Consulting Engineers

Classon House
Dundrum Business Park
Dundrum Road
Dublin 14

Tel: +353 1 485 1400
email: info@jbbarry.ie
web: www.jbbarry.ie

Drawn By:	Date:	Checked By:	Date:	Approved By:	Date:
SW	JULY 2017	SW	JULY 2017	JO'B	JULY 2017

Internal Project Ref: Y17205

Stage: CONSTRUCTION

Drawing Title:

FOUL SEWERS LAYOUT

Scales: 1:500 @ A1

Drawing. No.: Y17205-C-200

Rev: C5

Flow & Rainfall Survey

Interim Report 15
Portmarnock

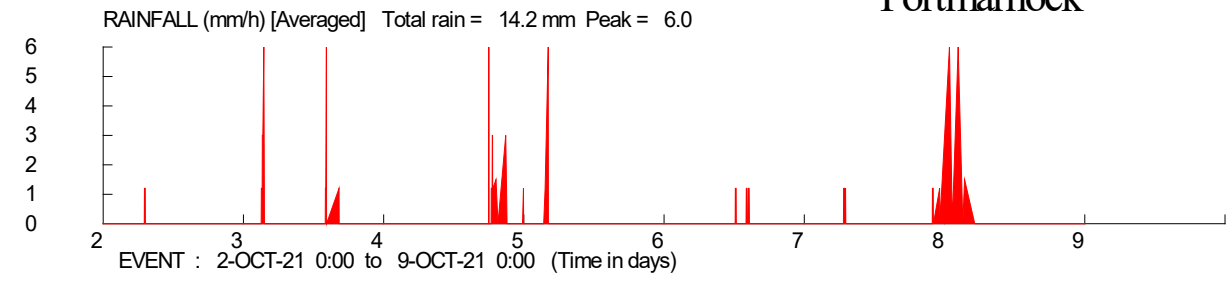
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	15
Rainfall Events Recorded	1 - 08/10/2021

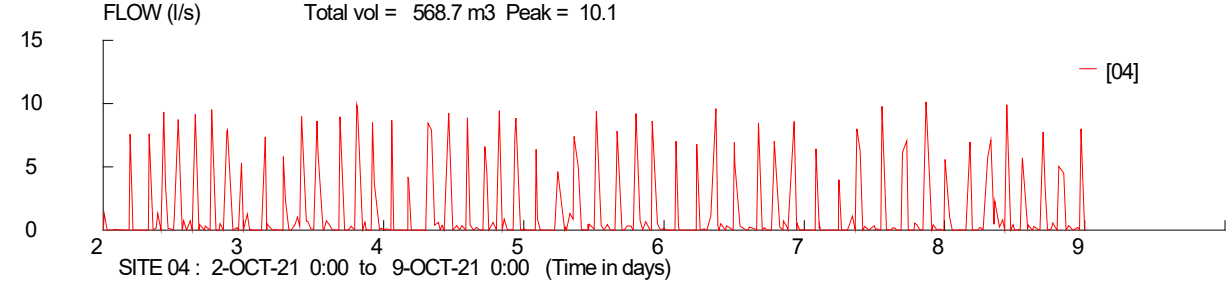
capital water systems ltd.

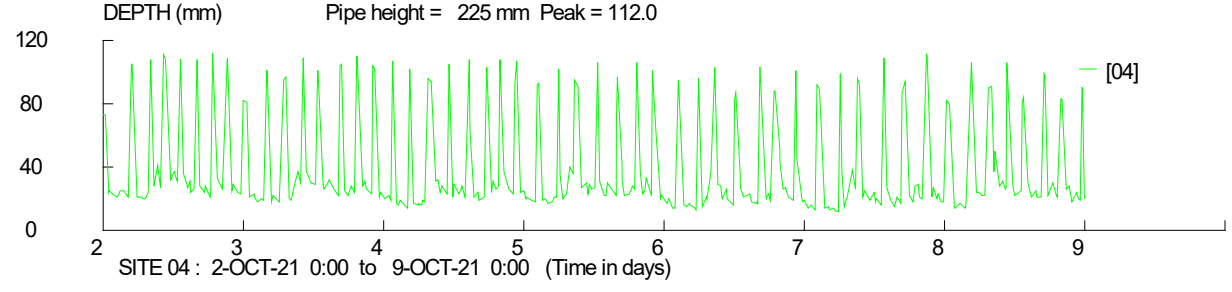
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

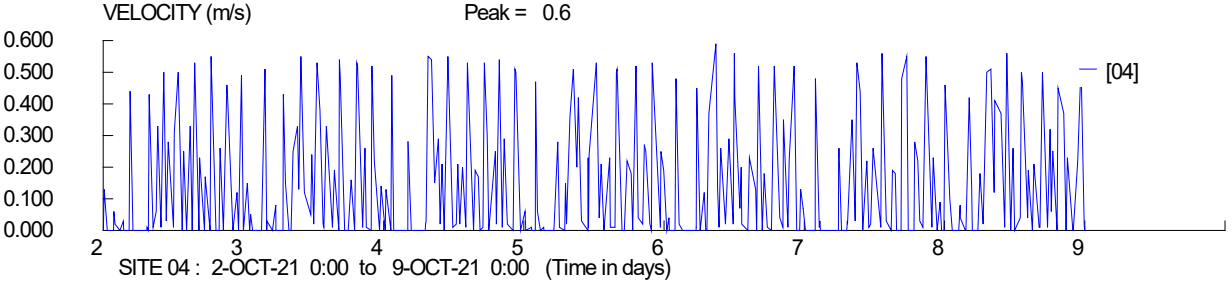
Interim Plots

Portmarnock

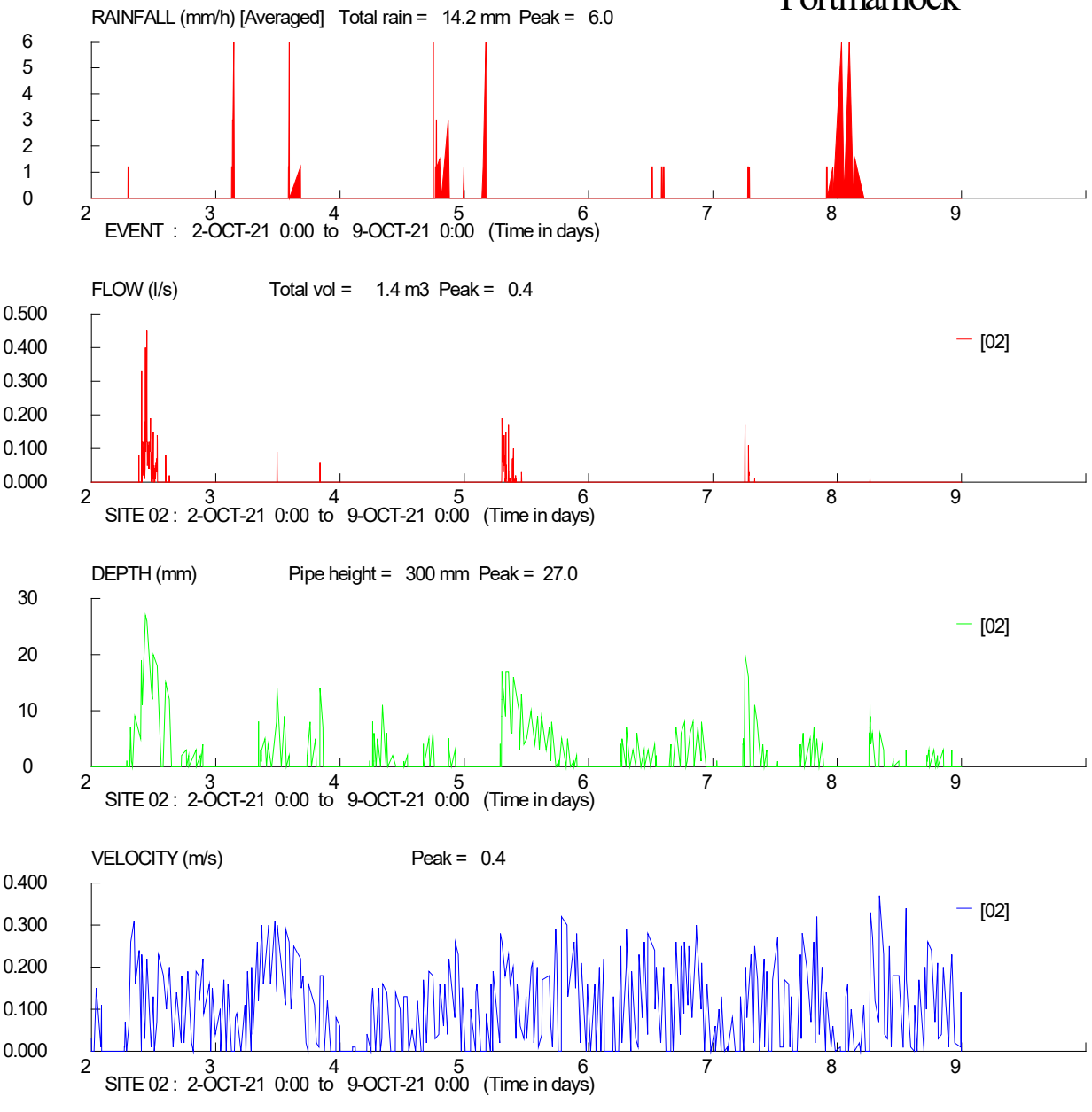




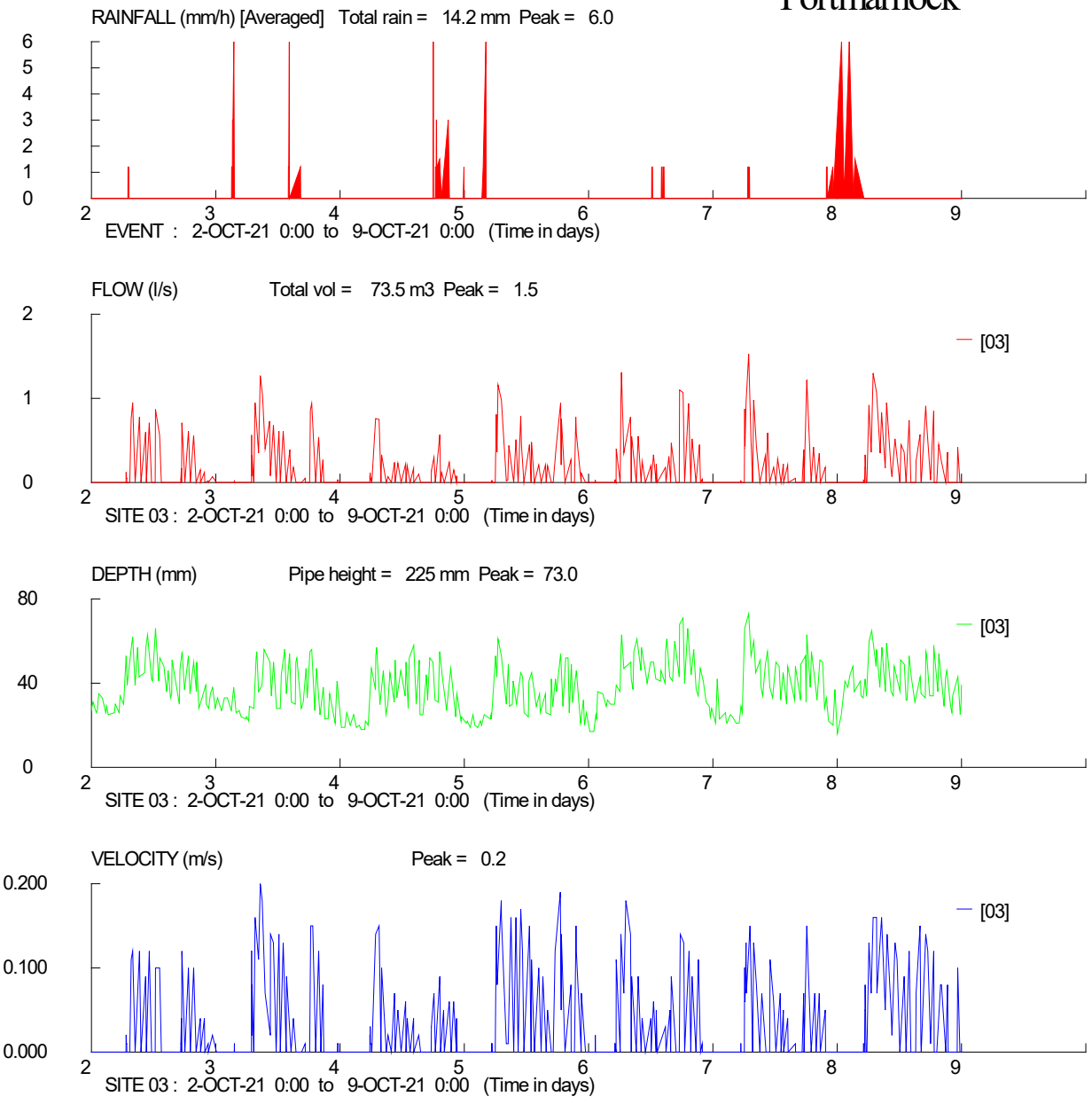




Portmarnock



Portmarnock



Flow & Rainfall Survey

Interim Report
16 Portmarnock

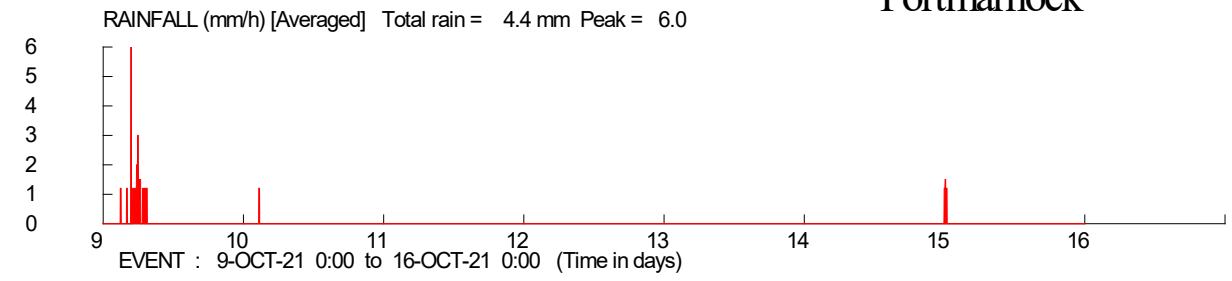
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	16
Rainfall Events Recorded	0

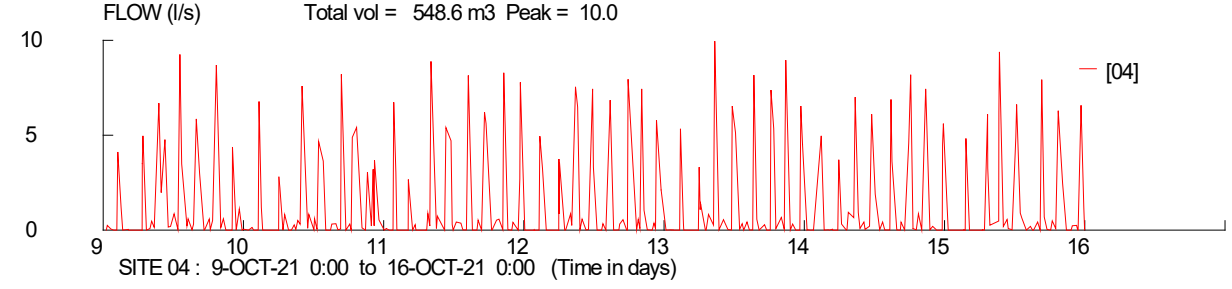
capital water systems ltd.

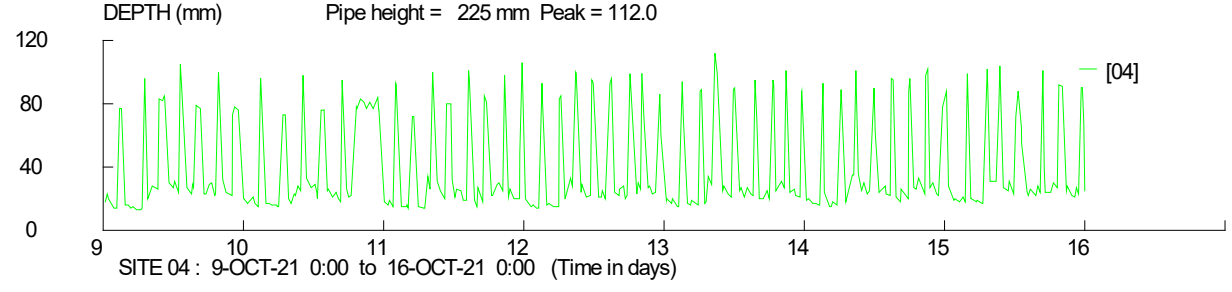
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

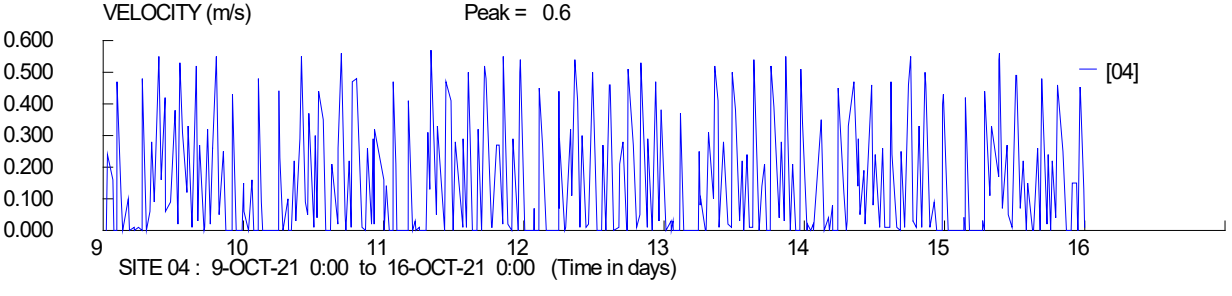
Interim Plots

Portmarnock

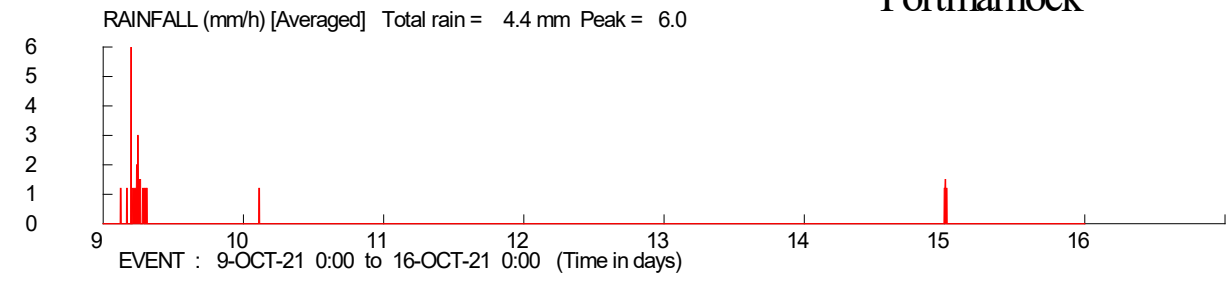


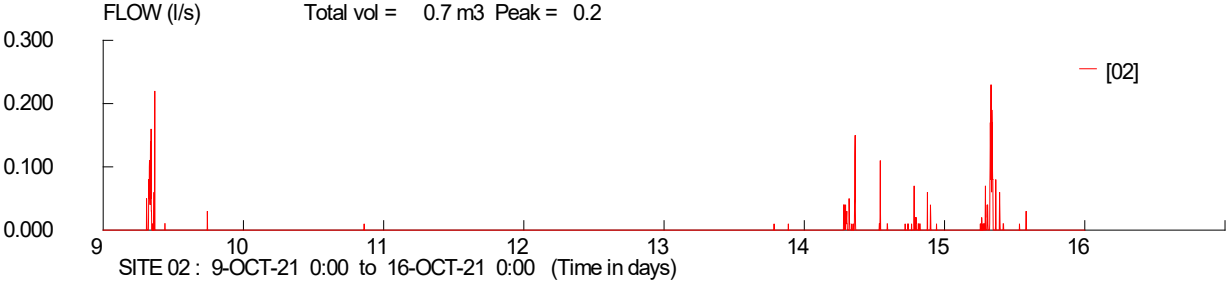


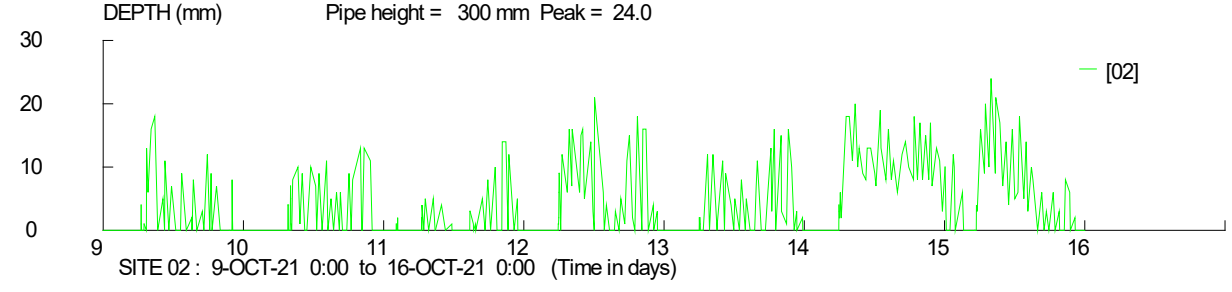


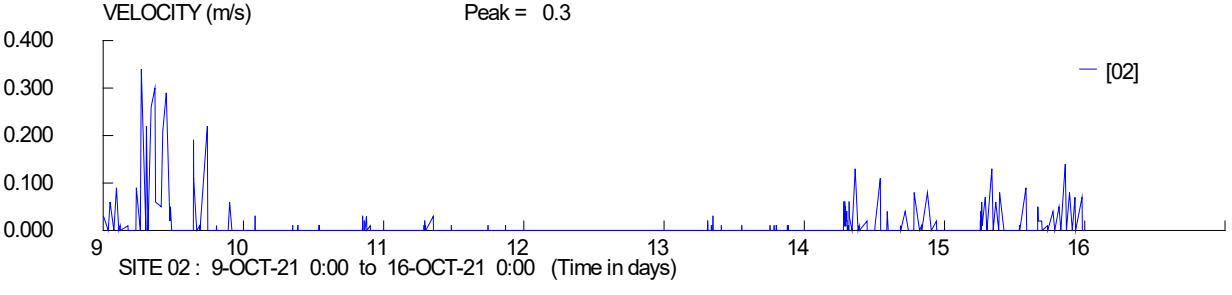


Portmarnock

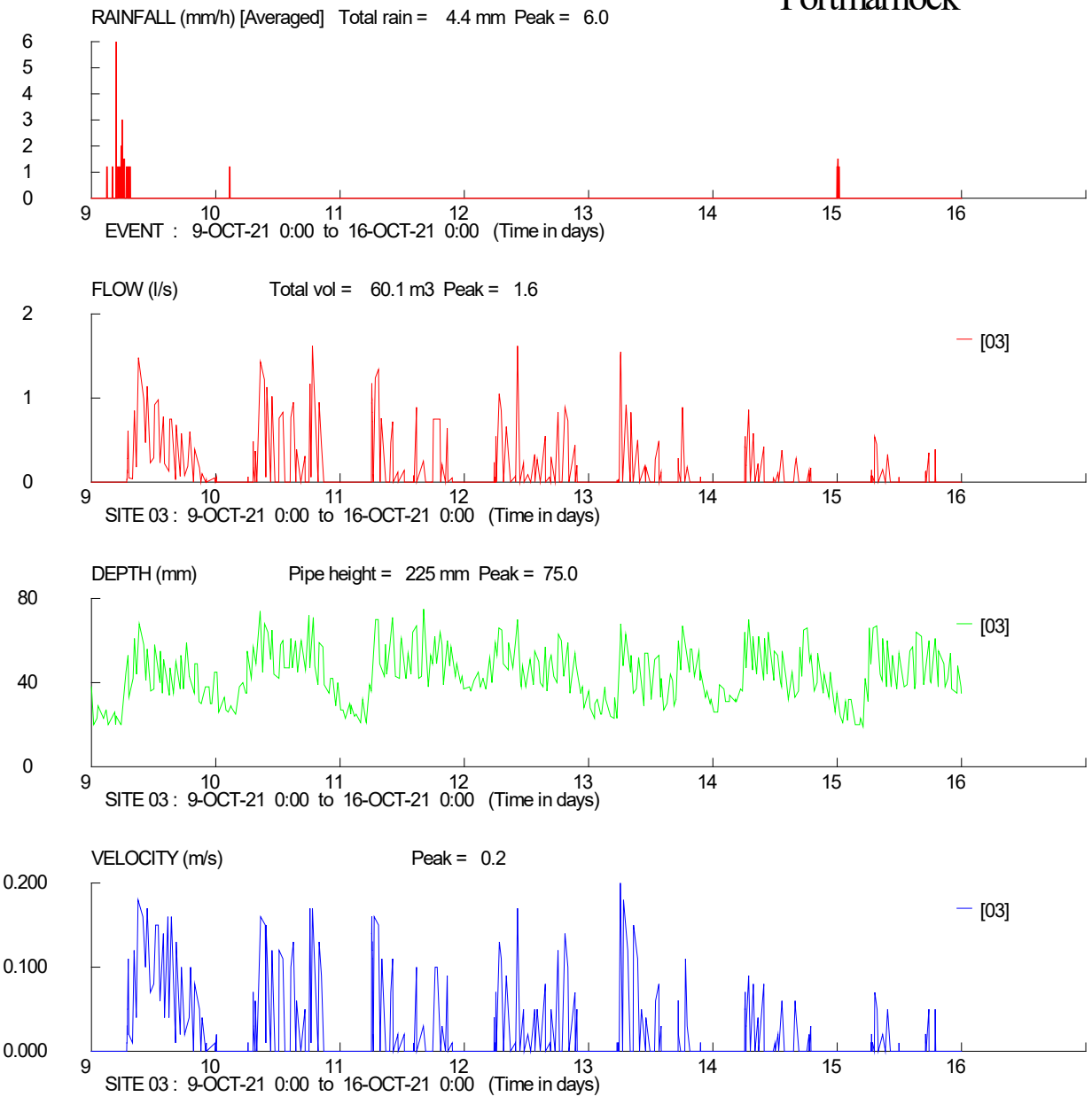








Portmarnock



Flow & Rainfall Survey

Interim Report 17
Portmarnock

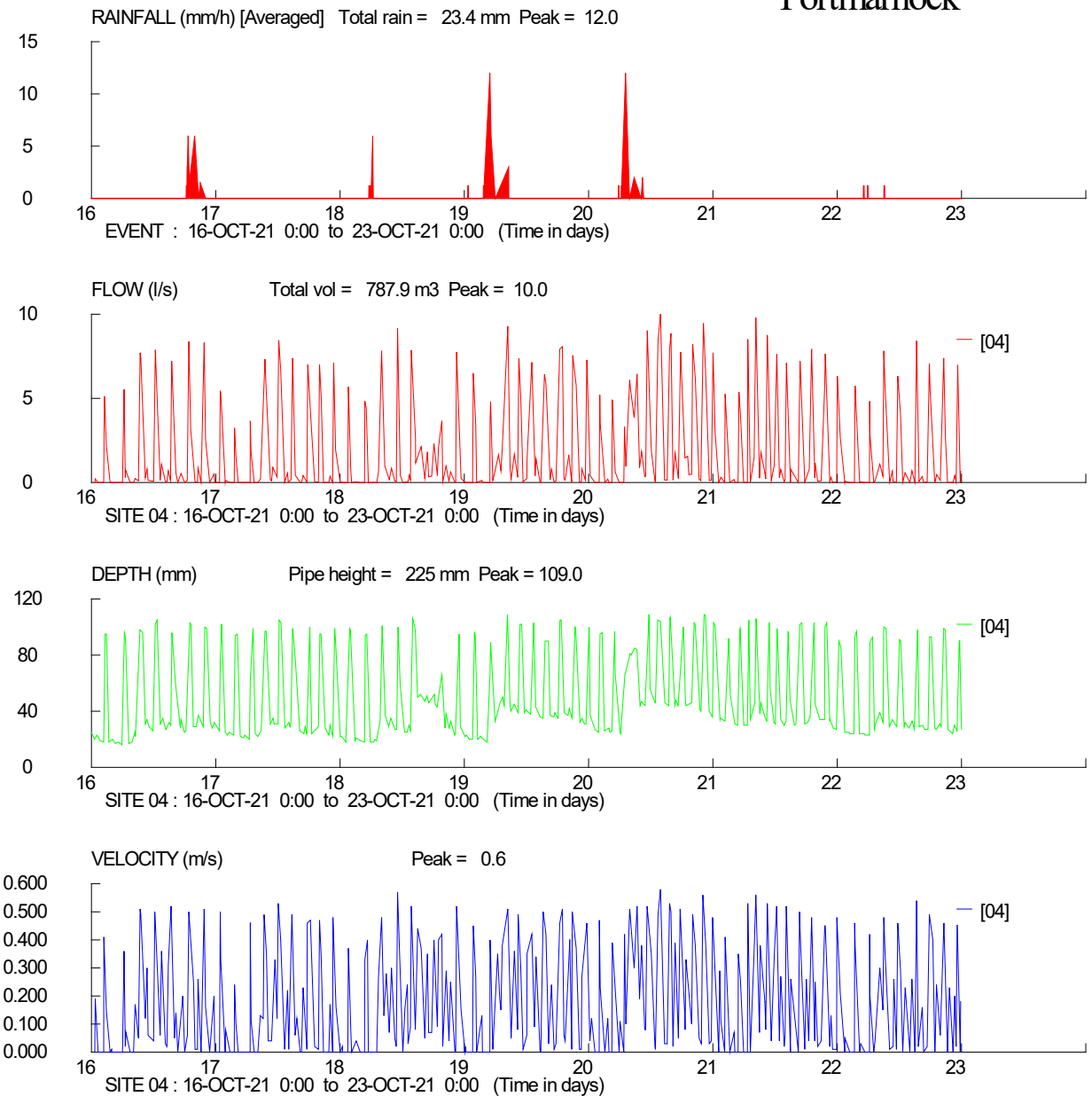
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	17
Rainfall Events Recorded	2 - 19/10 & 20/10

capital water systems ltd.

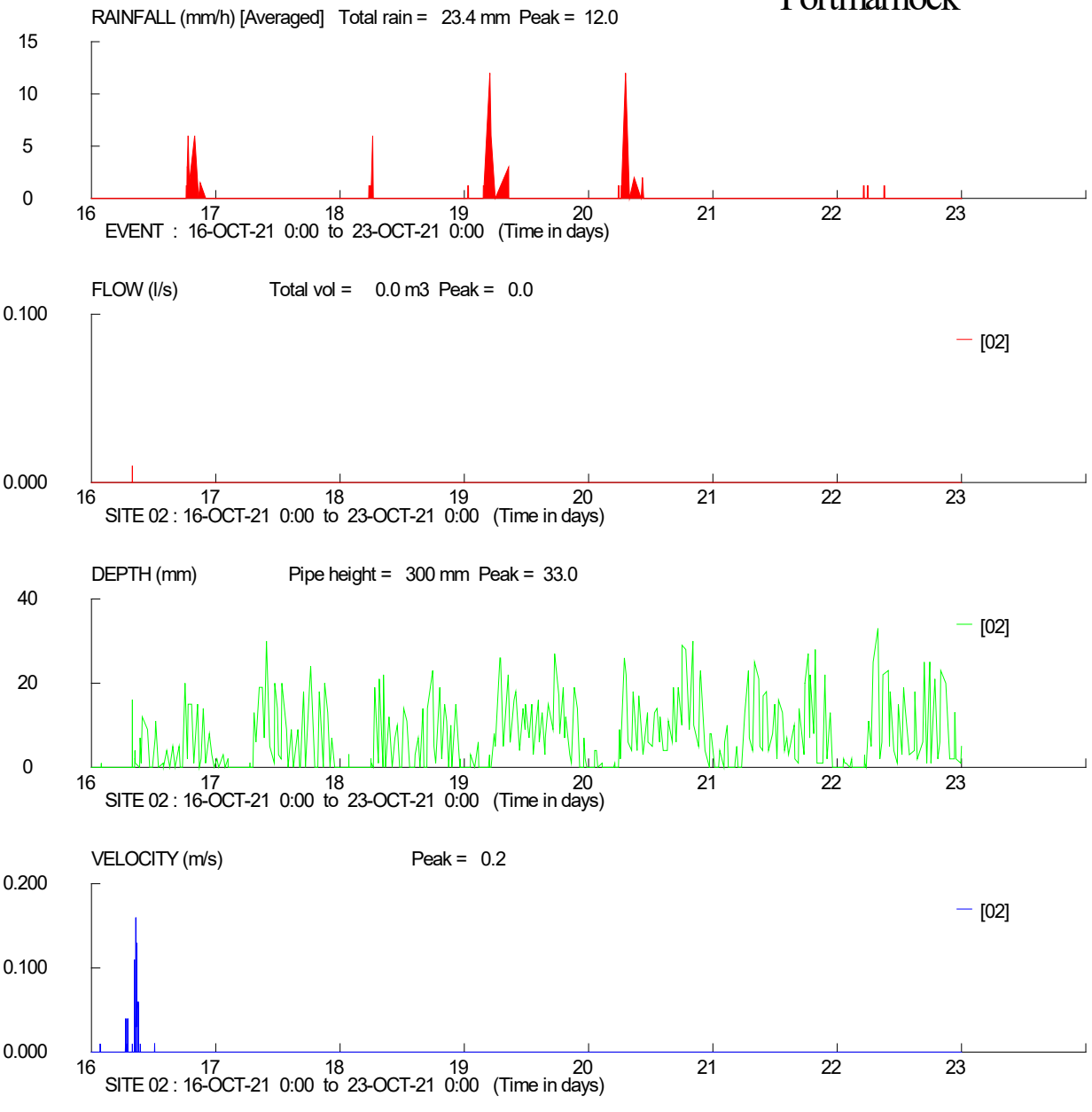
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

Interim Plots

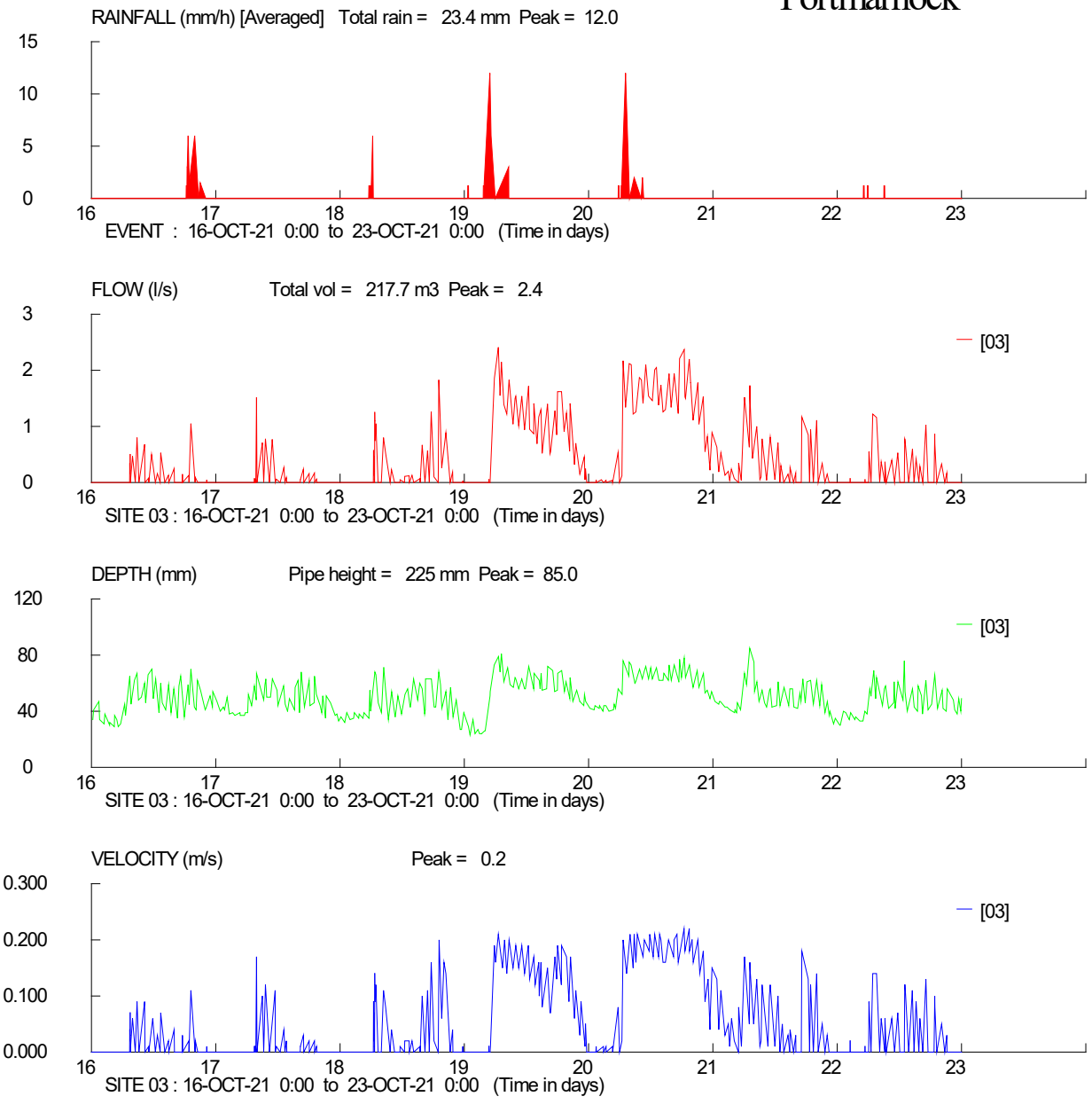
Portmarnock



Portmarnock



Portmarnock



Flow & Rainfall Survey

Interim Report 18
Portmarnock

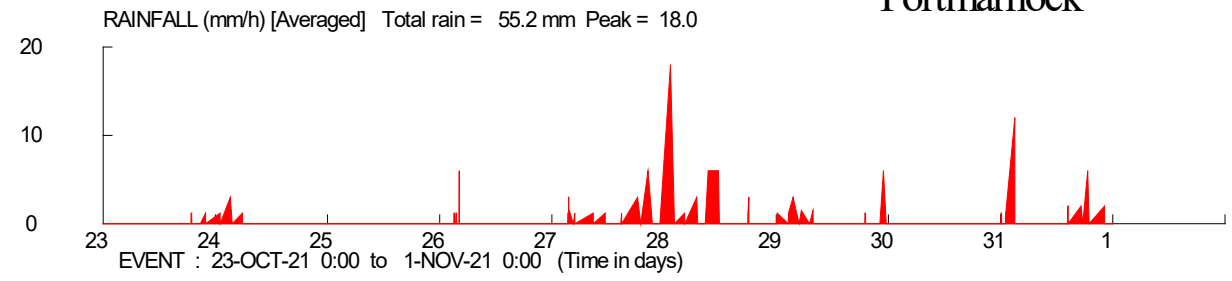
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	18
Rainfall Events Recorded	2 - 27/10 & 31/10

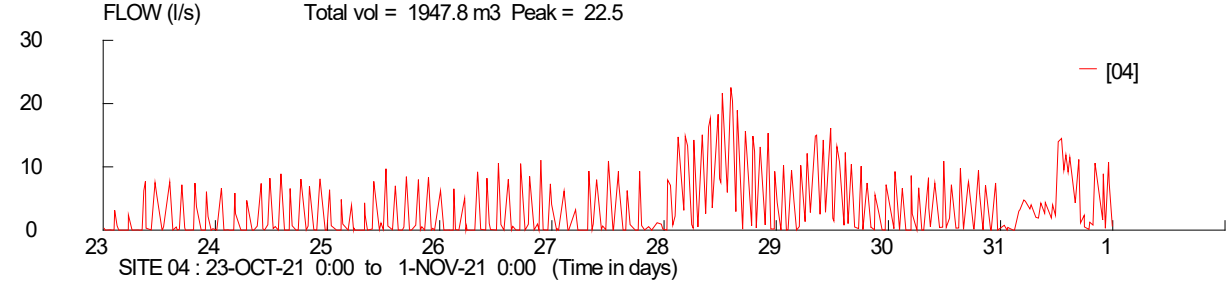
capital water systems ltd.

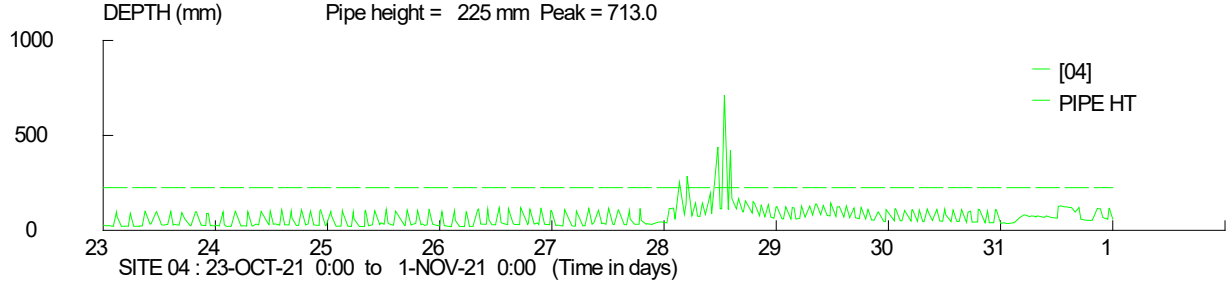
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

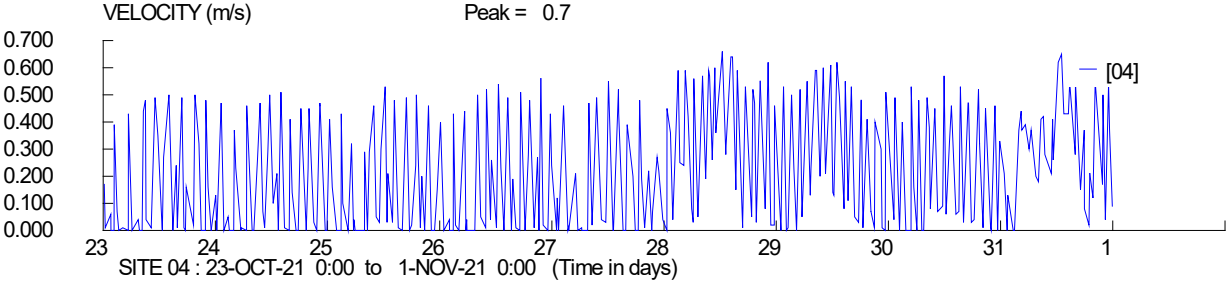
Interim Plots

Portmarnock

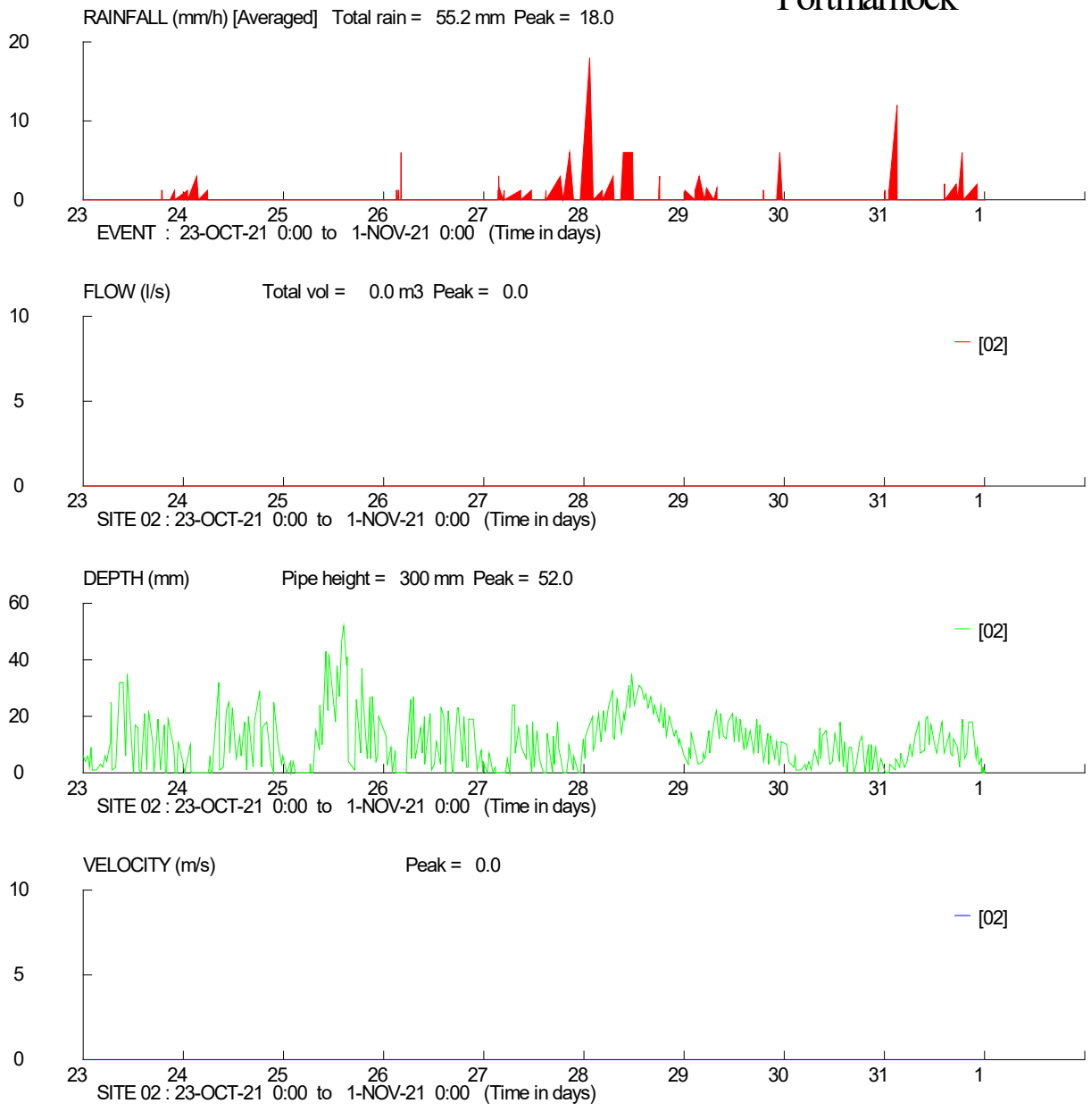




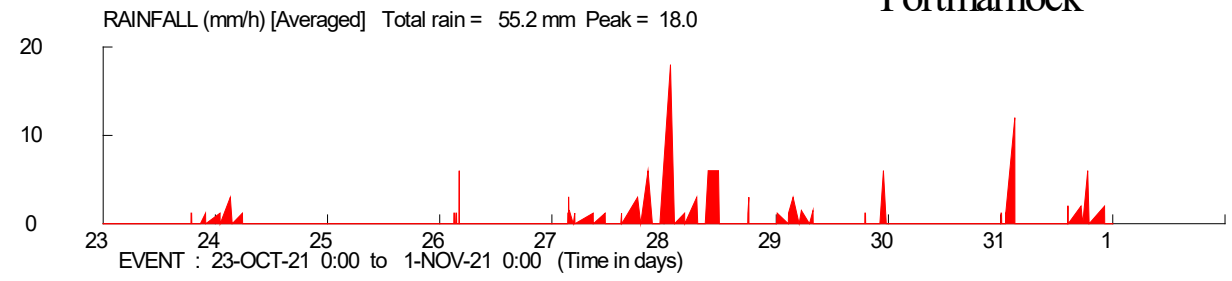


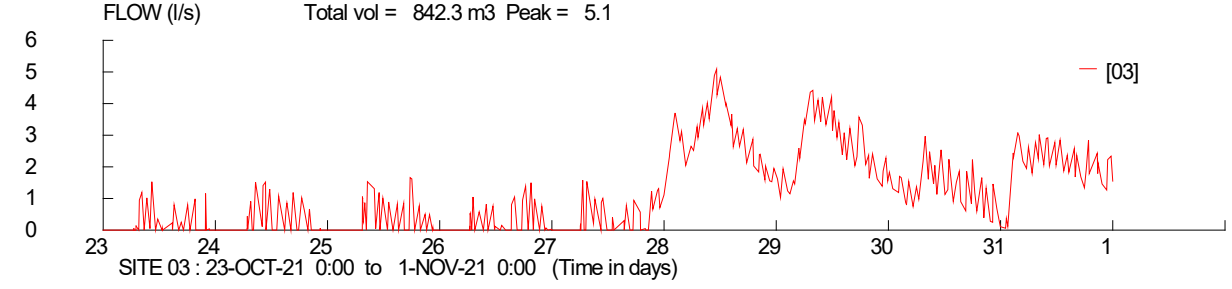


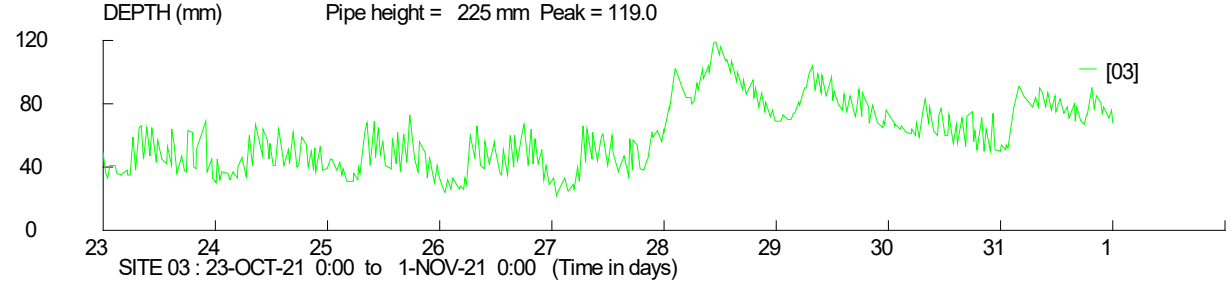
Portmarnock

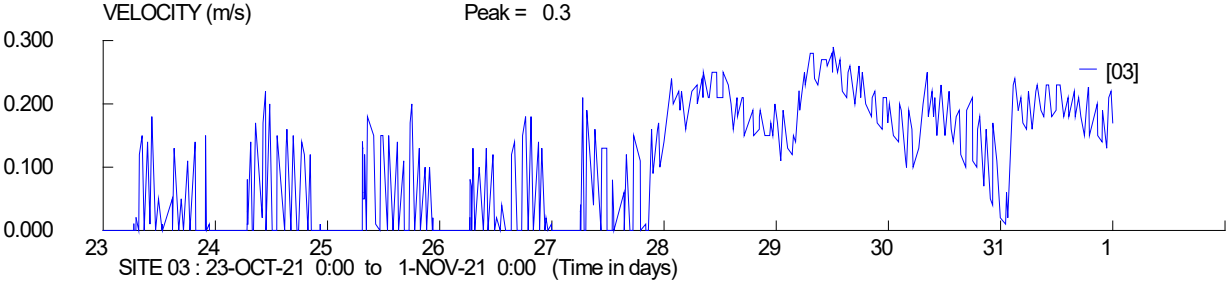


Portmarnock









Flow & Rainfall Survey

Interim Report 19
Portmarnock

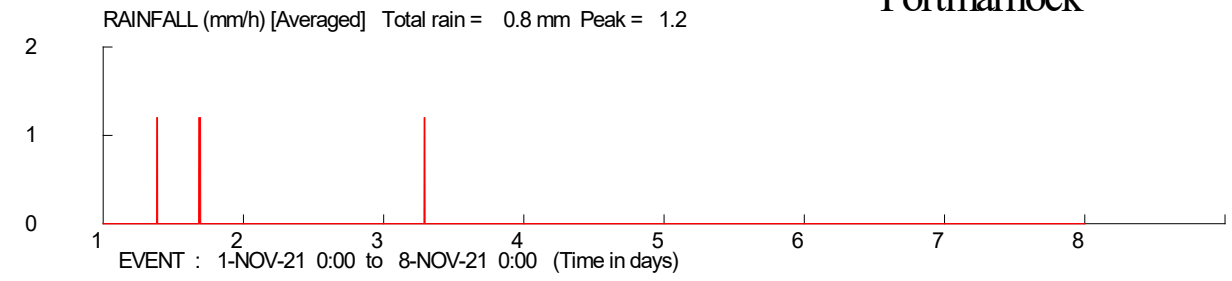
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	19
Rainfall Events Recorded	0

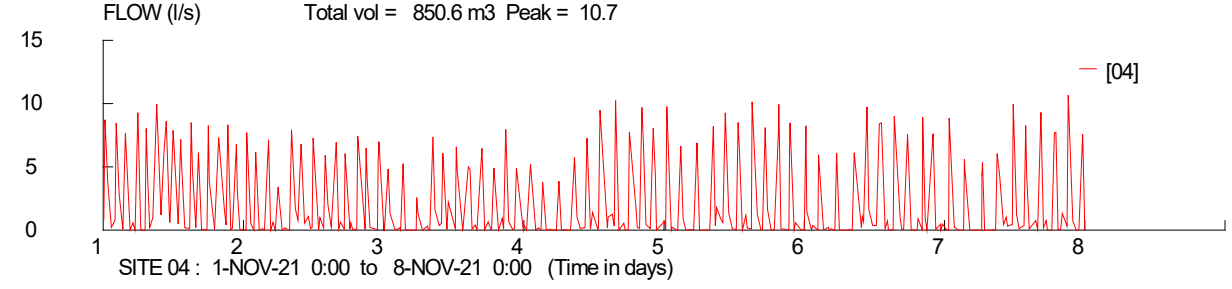
capital water systems ltd.

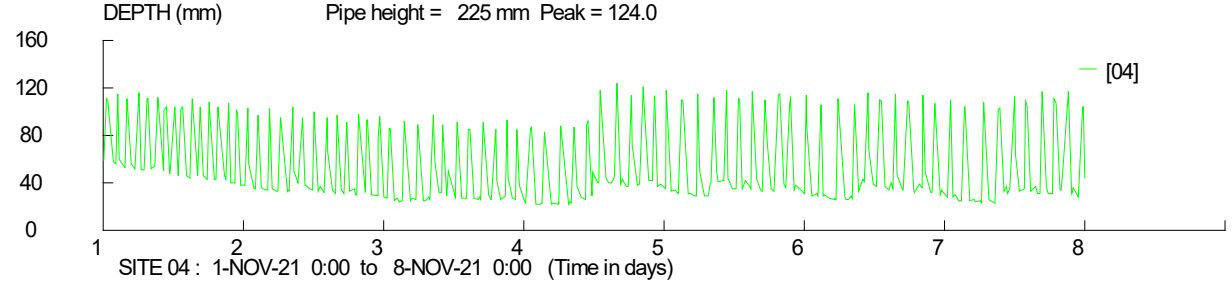
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

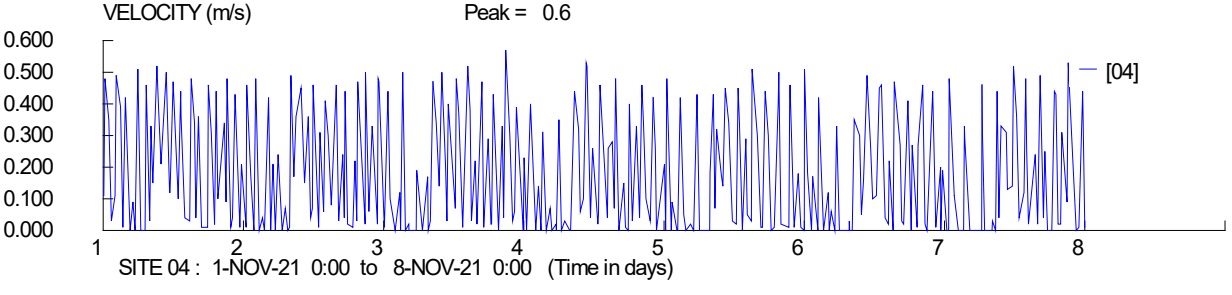
Interim Plots

Portmarnock

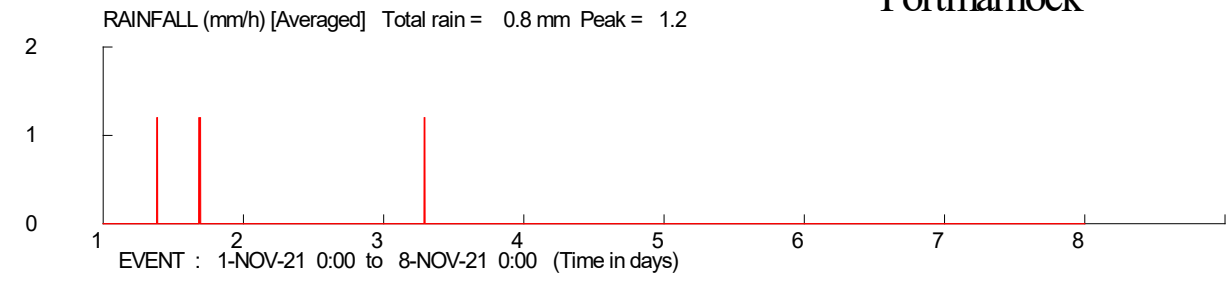


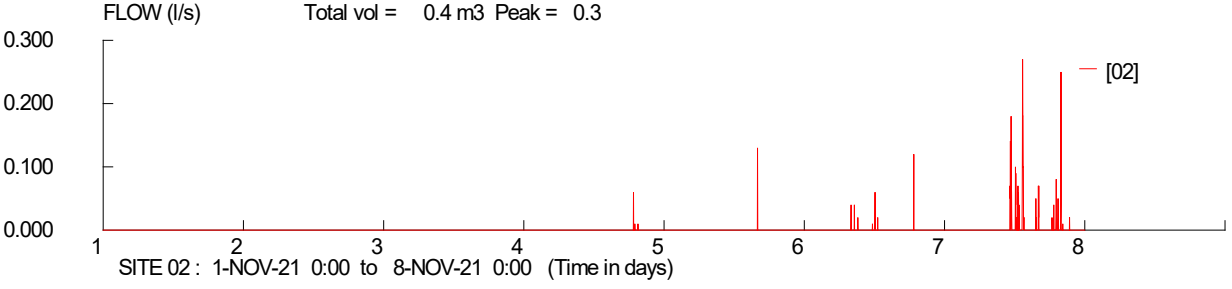


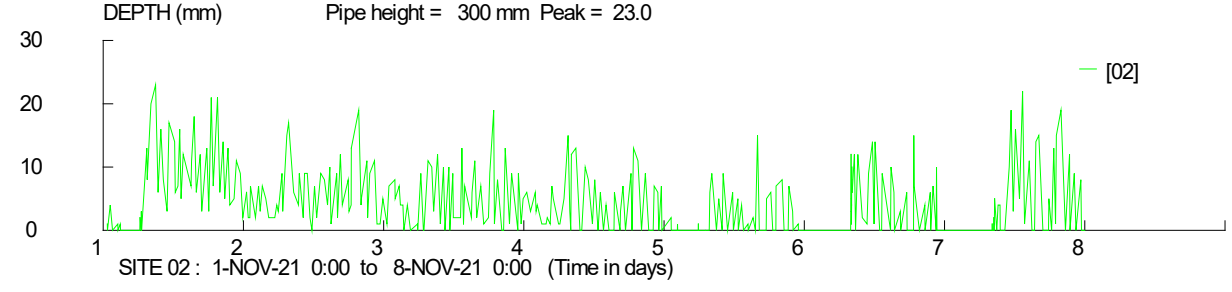


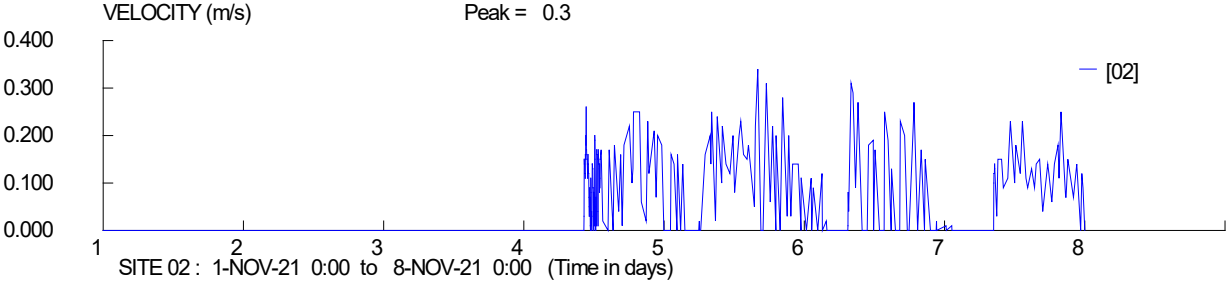


Portmarnock

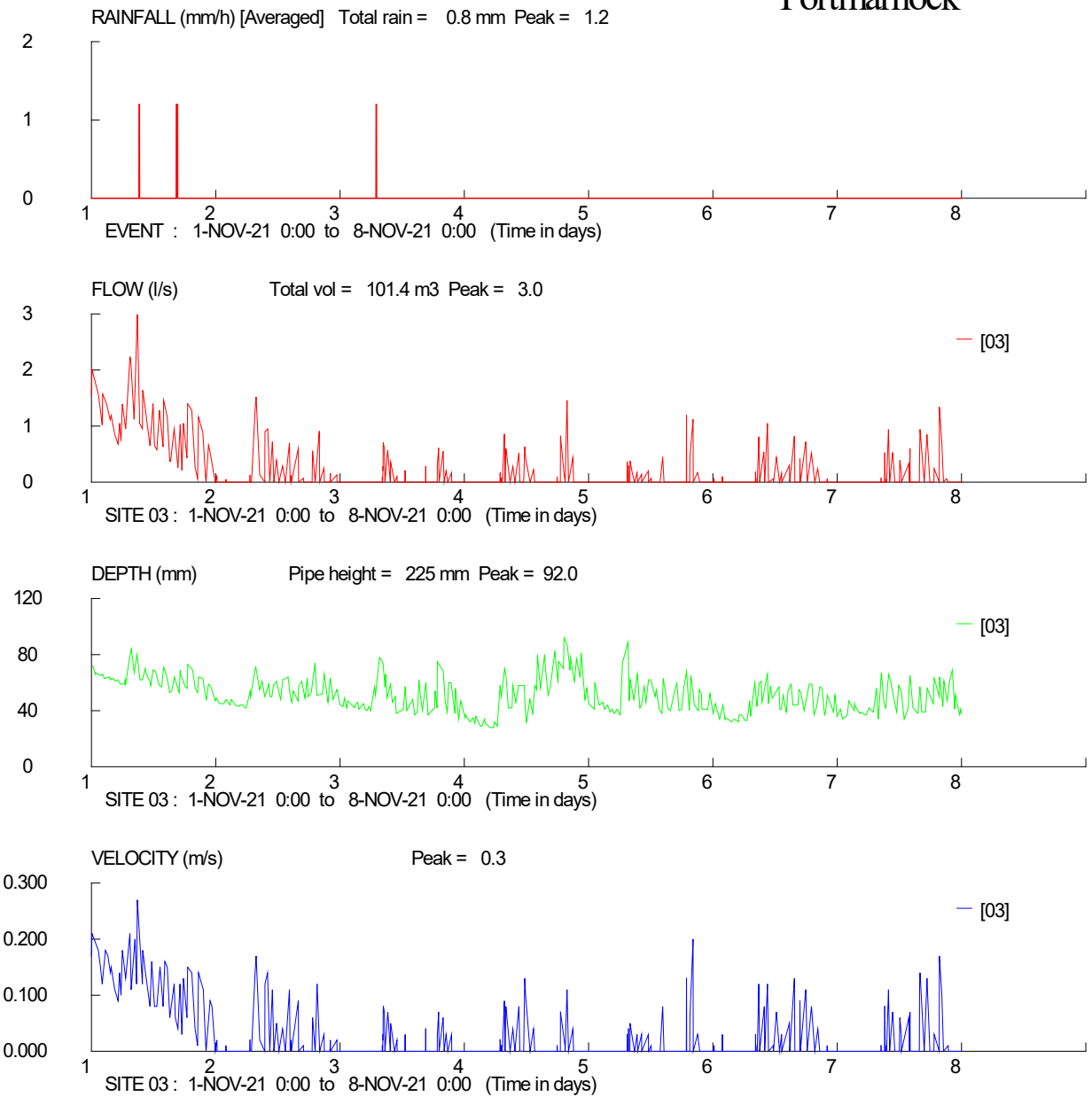








Portmarnock



Flow & Rainfall Survey

Interim Report 20
Portmarnock

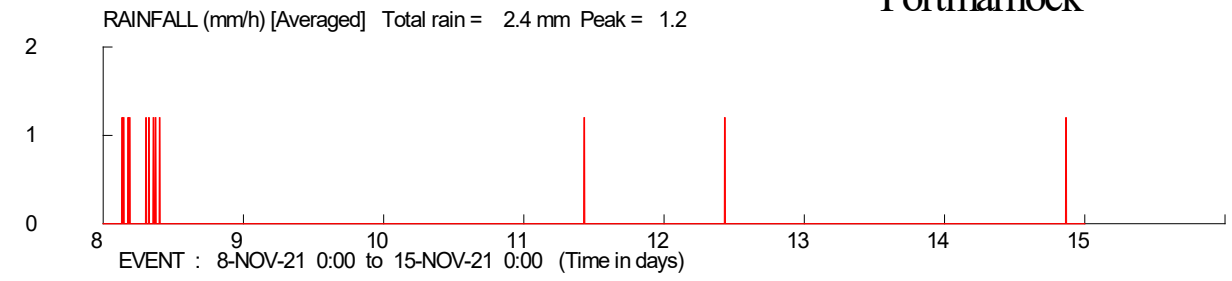
Catchment	Portmarnock
Client	N/A
Consultant	N/A
Interim No	20
Rainfall Events Recorded	0

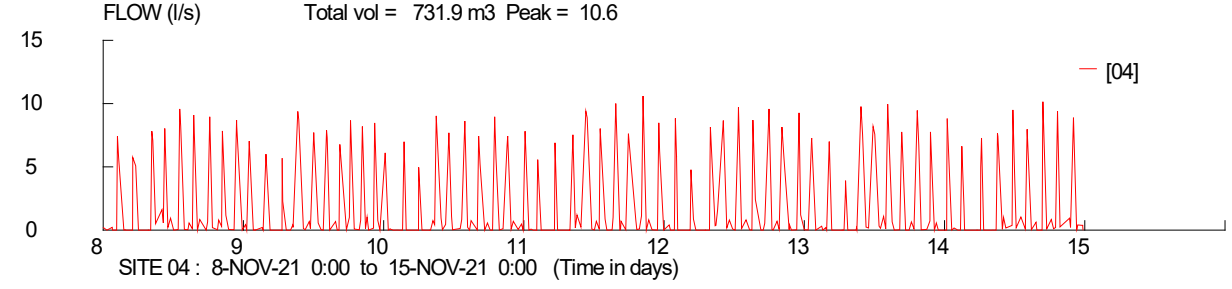
capital water systems ltd.

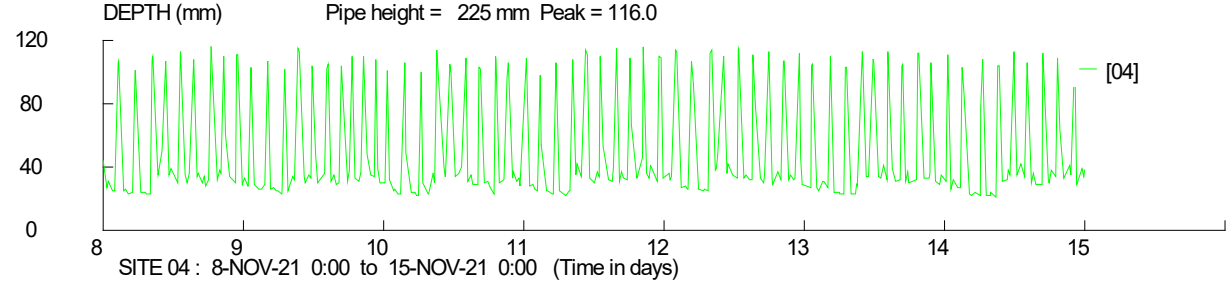
web	www.cwsl.ie
email	info@cwsl.ie
tel.	+353 (090) 6627616

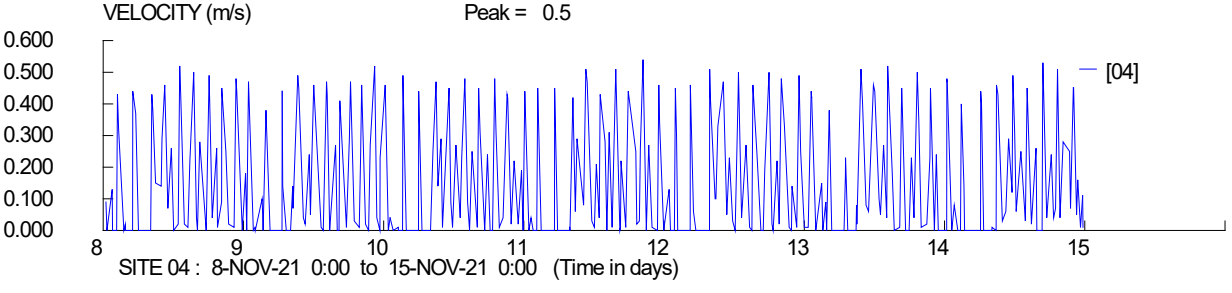
Interim Plots

Portmarnock

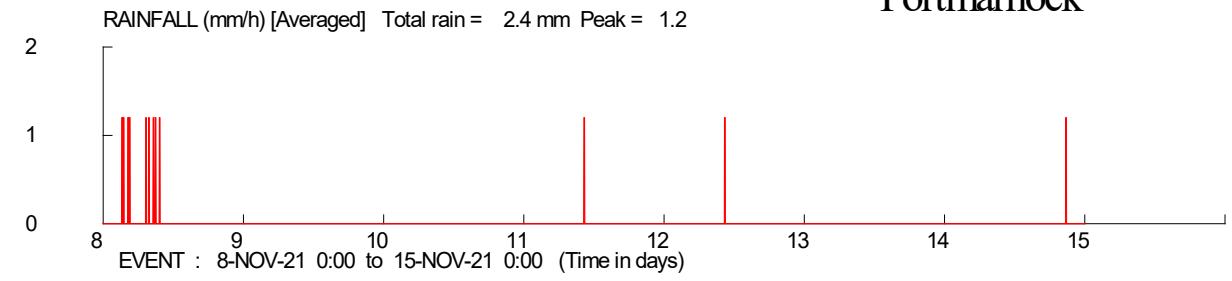


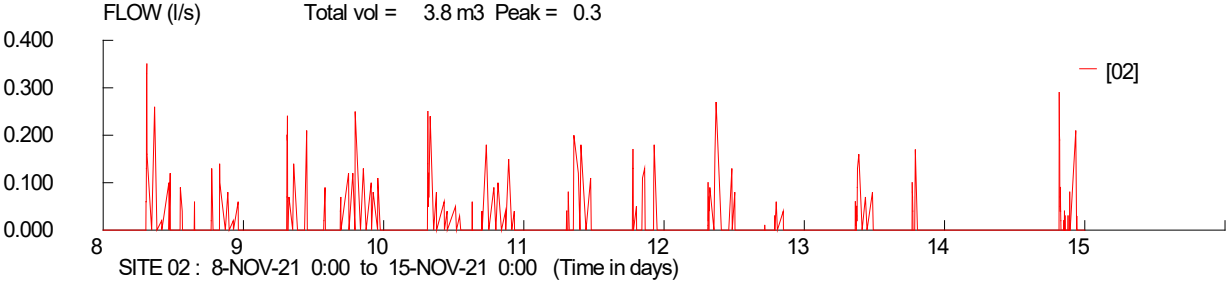


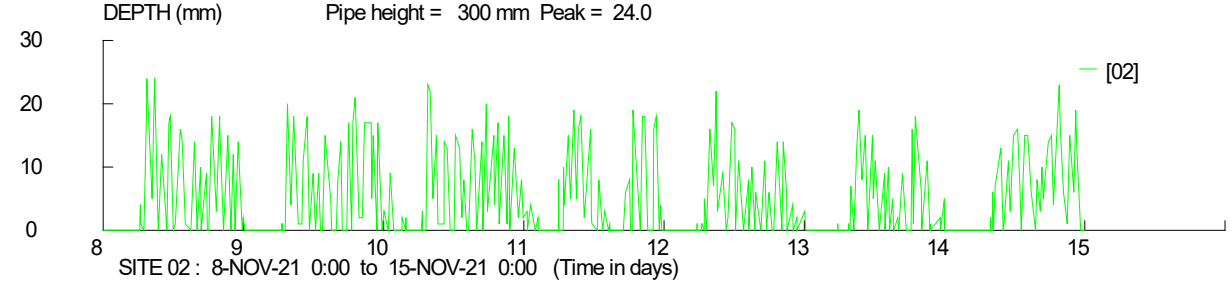


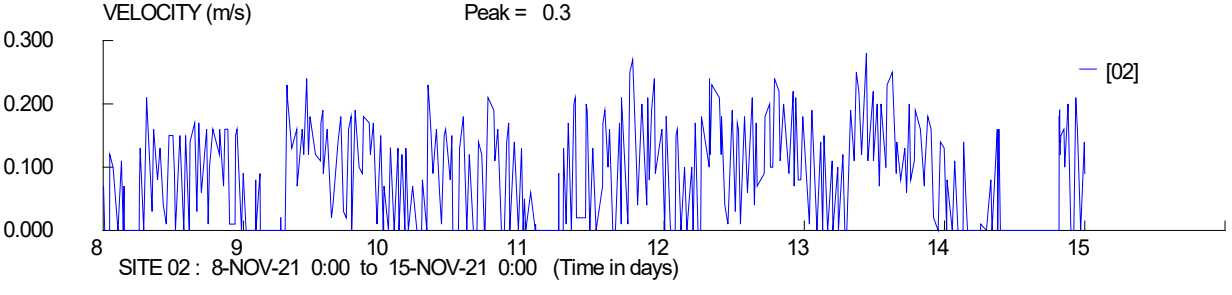


Portmarnock

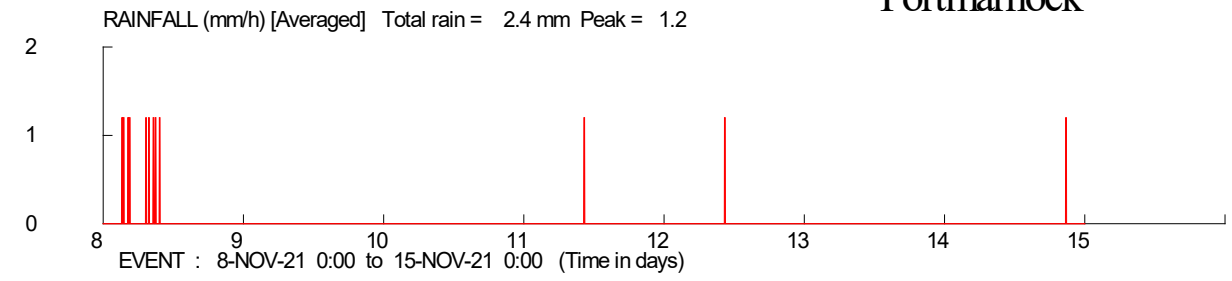


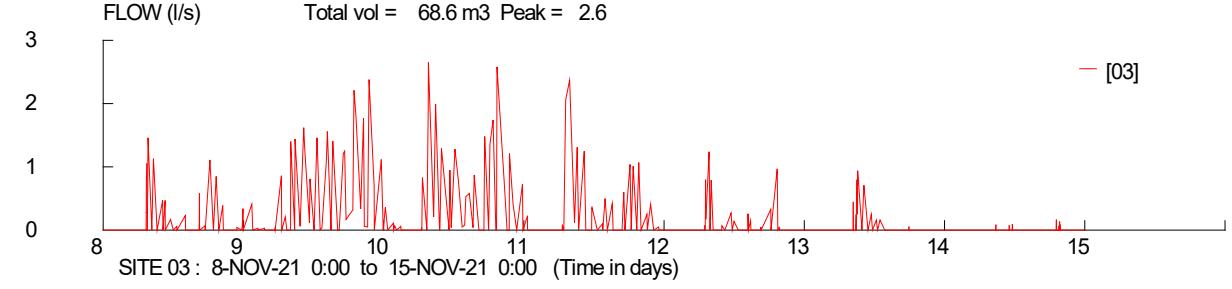


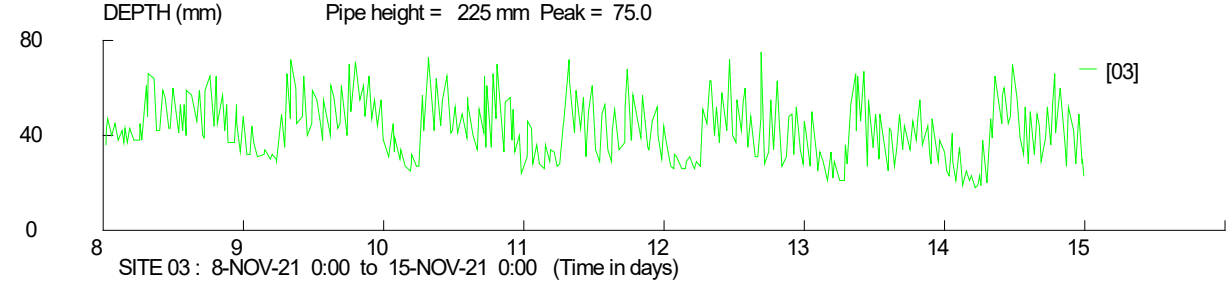


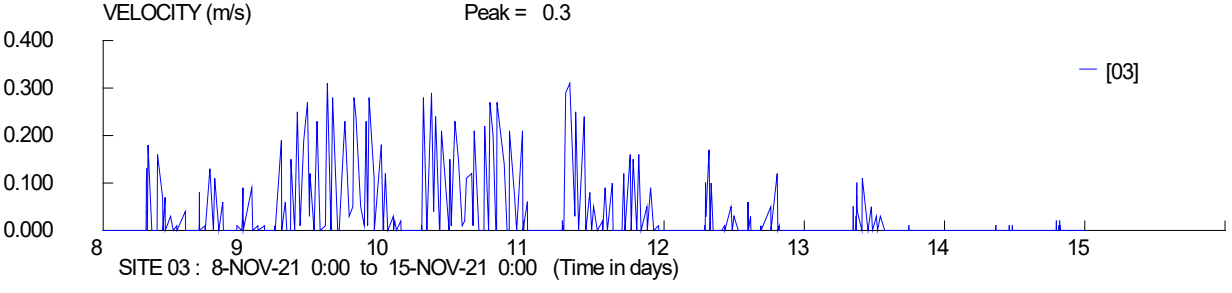


Portmarnock









APPENDIX 5

SuDS MEASURES CONSIDERED – GDSDS/CIRIA 522

FCC SuDS FORM

SuDS MEASURES CONSIDERED – GDSDS/CIRIA 522

In accessing the various "SuDS Systems and techniques available for use in the proposed development, the "Greater Dublin Strategic Drainage Study" (GDSDS) and "CIRIA Document 522 – Sustainable Urban Drainage Systems" were consulted to establish a suitable set of drainage features (**treatment train**). Details of the **SuDS measures considered in principle** are set out in the table below.

Type of System	Device	Primary Function	Primary Characteristics	Consideration	Comments
Source Control	Avoiding foul connections to storm systems	Avoid direct pollution of storm system	Maintaining principle of separate drainage systems	Incorporated	Separate foul and surface water drainage systems provided. CCTV survey and "As Built" mapping of drainage system on completion by Contractor to ensure adherence to this principle.
Pollution Prevention	Management of pollution sources	Prevention of polluted runoff.	Interception of pollutants in runoff	Incorporated	Discharge surface water flows to existing sewer through Class 1 Bypass Separator to remove any potential pollutants.
Source Control	Green-Roof	Minimize runoff and wash off of pollutants	Interception of pollutants in runoff and attenuation of flows	Not Incorporated	Not Incorporated due to construction types.
Infiltration Systems	Underground Detention/Infiltration System	Minimize runoff, flow attenuation encourage stormwater to soak into the ground while filtering pollutants	Permeable features allowing Infiltration and attenuation of flows	Not incorporated	Not considered feasible as subsoil is an impermeable boulder clay unsuitable for infiltration.
Source Control	Bio Retention	Minimize runoff, flow attenuation encourages stormwater to soak into the ground while filtering pollutants	Pervious surface adjacent to footpaths	Incorporated	Bio retention (tree) pits will be provided to cater for run-off from footpaths/pathways.
Source Control	Permeable Pavement. Minimising impermeable areas	Minimize runoff and wash off of pollutants	Pervious surface on parking areas.	Incorporated	House driveways.
Infiltration Systems	Infiltration trenches, swales	Encourage stormwater to soak into the ground while filtering pollutants	Permeable features allowing Infiltration	Incorporated	Swales are created in open space adjoining roads, when available to take some of the road surface water runoff.
Infiltration Systems	Ponds, Basins	Encourage stormwater to soak into the ground while filtering pollutants	Permeable features allowing Infiltration	Incorporated	The entire development including previous phases 1A ,1B and 1C and future phases including this Phase 1D will discharge to the Regional Wetland. The flows from the Regional Wetland to Baldoyle Estuary for the entire development will be restricted to 200 l/sec.
Source Control	Rainwater Harvesting	Rainwater Harvesting	Minimize runoff, flow attenuation, water re-use	Not Incorporated	Not incorporated

FCC SuDS FORM

SUDS/Green Infrastructure selection checklist –To be submitted in planning submission - Rev 1

Portmarnock Phase 1D 21205

Suds Measures	Measures to be used on this site	Rationale for selecting/not selecting measure	Checklist submitted? See no. 8 below
Source Control			
Swales	Yes	Kerb Outlets from roads to swales. This will convey flows to Storm system and provide water quality and attenuation measures.	
Tree Pits	Yes	Tree pits in open space areas.	
Rainwater Butts	Yes	For individual houses.	
Rainwater harvesting	No	Not considered suitable.	
Soakaways	No	Subsoil is an impermeable boulder clay unsuitable for soakaways.	
Infiltration trenches	No	Not considered feasible as subsoil is an impermeable boulder clay unsuitable for infiltration.	
Permeable pavement (Grasscrete, Block paving, Porous Asphalt etc.)	Yes	House driveways.	
Green Roofs	No	Not suitable for pitched roofs.	
Filter strips	Yes	Filter drains in conjunction with hard landscaping areas and footpaths.	
Bio-retention systems/Raingardens	Yes	Tree pits.	
Blue Roofs	No	Not suitable for pitched roofs.	
Filter Drain	Yes	Filter drains in conjunction with hard landscaping areas and footpaths.	

Site Control			
Detention Basins	No	Lack of space. Flows discharge to the existing wetland adjacent to Coast Road.	
Retentions basins	No	Lack of space. Flows discharge to the existing wetland adjacent to Coast Road.	
Regional Control			
Ponds	Yes	Discharge from Catchment 3 to outfall via ponds.	
Wetlands	Yes	Flows discharge to the existing wetland adjacent to Coast Road.	
Other			
Petrol/Oil interceptor	Yes	Petrol Interceptor(s) will be provided	
Attenuation tank – only as a last resort where other measures are not feasible	No	Attenuation provided in wetland	
Oversized pipes– only as a last resort where other measures are not feasible	No	Attenuation provided in wetland	

Note:

1. *Fingal has a preference for above ground Green Infrastructure rather than tanks or oversized pipes. Above ground flows through swales, basins etc are encouraged.*
2. *Demonstrate SUDS system will have sufficient Pollutant removal efficiency in accordance with Ciria Suds Manual C753*
3. *Basins sides should be no steeper than 1:4 and no deeper than 1.2m in the 1%AEP*
4. *Culverting shall be avoided where possible*
5. *De-culverting is encouraged.*
6. *Please submit evidence of infiltration rates*
7. *To account for climate change in the design of the drainage system rainfall intensities should be factored up by 20%*
8. *The Applicant must provide Suds checklists in accordance with the Appendix B of the Ciria Suds manual C753*

Appendix	**Name**	**Appendix**	**Name**	**Appendix**	**Name**	**Appendix**	**Name**
B3	Full planning	B6	Infiltration assessment	B11	filter drain	B16	pervious pavement
B4	Scheme design	B7	Proprietary treatment	B13	swale	B17	attenuation tank
B5	Health and safety	B9	filter strip	B15	bioretention	B19	basin
						B21	pond wetland