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Coed Darcy

Sitewide Surface Water Drainage Strategy PC22

St. Modwen Developments Ltd

March 2020

PC22 Report

Notice

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Executive Summary

This Report describes the general surface water drainage strategies for Catchments 2, 3, 4 and 5 (as identified by drawing “Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005” in Appendix A) of the Development and discusses the option to drain a part of Catchment 1 to Crymlyn Bog. On this basis, this report seeks to discharge the requirements of Condition 22 of the Outline Planning Permission Reference 2005/0393.

Drainage modelling has been carried out to appraise the options for the surface water drainage. The principles of the SuDS management train described in CIRIA C753, TAN 15: ”Development and flood risk” and current SuDS Approval Body (SAB) guidance “Statutory SuDS Standards” published by the Welsh Ministers, have been applied in developing the strategies.

The drainage strategy outlined within this document considers the emerging SABs process at a strategic level, considering that the detail design of SuDS on-plot features will be the responsibility of plot developers in a phasing basis. This is further discussed in section 4.5

The main proposals for the surface water drainage strategies, presented in drawings 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage strategy and 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls, are;

- The use of SuDS techniques, particularly infiltration drainage, has been investigated. Physical and geochemical/geo-environmental ground conditions are not generally favourable for the use of infiltration drainage. However, further investigation is advised for areas where the use of infiltration drainage may be possible. Residential, Commercial and Retail Developers of individual plots will be encouraged to incorporate sustainable methods such as rainwater harvesting and localised infiltration methods for the disposal of surface water runoff, where ground conditions permit.

  The use of strategic SuDS facilities in the form of attenuation ponds is proposed. These attenuation ponds are a combination of existing and proposed open water bodies within the Site.

- The Northern Area (North of the railway) is divided into Catchments 1, 3 and 3A. Catchment 3 and 3A will be attenuated within a number of proposed ponds, for onwards discharge to the Crymlyn Bog.

- The North Area is divided into Catchment 1 and 2, with Catchment 1 draining to the existing Surface Water Sewer (House Bridge Outfall) at the east and Catchment 2 to the South Site Reservoir (SSR). In order to drain to the Surface Water Sewer, attenuation facilities will be required within the sewerage network. The SSR will be improved, so that it will provide attenuation to the flows from the catchment prior to discharge to Crymlyn Bog.

- The South Area is divided into Catchment 4 and 5. Further on-Site investigations indicate that Catchment 5 partly drains into Crymlyn Bog (Refer to Section 3.6.2). For the drainage strategy to mimic the existing situation as close as possible, Catchment 4 has been increased to include the extent of Catchment 5 that discharges into Crymlyn Bog. Flows will be attenuated via multiple ponds throughout the South Site development, to alleviate large scale engineering and ecological works being required on South Bay and the Wetlands.

  These attenuation ponds have been sized based on the developable area discharging to each outfall location, and a restricted discharge rate to Crymlyn Bog of 5.5l/s/ha (**Circa 13% reduction from the calculated QBar of 6.3 l/s/ha**). This strategy will improve sustainability and ensure that there is no adverse effect on the regime of Crymlyn Bog as requested by Natural Resources Wales (NRW).

- Initiation of a SSR rehabilitation programme, as outlined in Section 4.1.3. Once rehabilitated, the SSR will be the permanent surface water drainage attenuation feature for the North Site catchment areas. It should be noted that a 2-year programme of works from design to construction is anticipated.

- The SSR will require a controlled outfall connection to the Tal-y-Fedw water course leading to the Crymlyn Bog (RAMSAR/SSSI). Rate of discharge has been agreed with NRW (Refer to meeting minutes ref 5041216-ENG-MN-0002022 - NRW 2nd Meeting Minutes in Appendix B) who have indicated that silt clearance from channels within the Bog is required before granting any permissions, to ensure protection of this important local habitat area. NRW stated that an increase in nutrient levels is likely to undermine the Special Areas of Conservation (SACs) objectives and, therefore, mitigation is required.

- For each reserve matters application, a detailed phase specific drainage scheme shall be submitted and approved in writing by the Local Planning Authority, as defined in the sitewide Planning Approval (2005/0393) Condition 50.

Glossary of Terms

Term	Meaning / Definition
BP	British Petroleum
CCW	Countryside Council for Wales
DCWW	Dwr Cymru Welsh Water
EAW	Environment Agency Wales
NPT	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
NSR	North Site Reservoir
SuDS	Sustainable Drainage Systems
SAC	Special Area of Conservation
SAR	Southern Access Road
SLR	Southern Link Road
SSR	South Site Reservoir
SSSI	Site of Special Scientific Interest

1. Introduction

1.1 Purpose of the Report

This purpose of this report is to address the Surface Water Drainage Strategy for the fully developed for Coed Darcy Development (Herein referred to as 'the Site'.) This Strategy builds upon the principles stated and agreed in Briefing Note 4 issued in December 2010.

This purpose of this document is to:

- Provide background information for the Site (including the definition of catchments) and to report on the current status of the site-specific Planning Conditions of Coed Darcy Planning Permission P2005/0393. These aspects are considered in Section 2 and particularly 2.4.
- Provide an update on the **Nutrient Management Plan** (NMP) status, demonstrating that the discharge flows maintain the nutrient levels below NRW standards (2mg/l). Refer to Section 2 and particularly 2.5.
- Define the **existing surface water drainage** arrangement and existing outfall points. Refer to Sections 2 and particularly 2.6.
- Provide an **updated surface water drainage strategy** for the Site, with which to contribute to the discharge of Planning Condition 22 (P2005/0393). Refer to Sections 2, 4 and 5.
- Demonstrate that the post development surface water flows to **Crymlyn Bog** replicate and where possible improve the existing flow regime. Refer to Sections 2, 4 and 5
- Provide an overview of the **South Site Reservoir** (SSR) with a commentary on the planned rehabilitation works to bring the facility back into use as a surface water storage and flow control feature. Refer to Sections 4.1.2. and 4.1.3**.**
- Present the approach of the surface water drainage strategy to the emergent **SuDS Approval Body (SAB)** process and define the different responsibilities. Refer to Sections 2 and 4.5.

2. Background Information

2.1 Site Location

The Site is located at the former BP Llandarcy Oil Refinery, off Junction 43 of the M4 Motorway within the County Borough of Neath Port Talbot.

2.2 Site History

Early historical maps (1845) record the Site to have been undeveloped and shown as woodland.

Llandarcy Oil Refinery was first developed in 1921 to produce motor spirit, lubricating oil and fuel oils from crude oil. The refinery continued to expand until the late 1970s. However, from the mid-1980s a series of rationalisations occurred with notice of closure given in 1997.

In 2008, St. Modwen Developments Ltd (St. Modwen) acquired the Site. Outline Planning Permission (P2005/0393) has been granted for the proposed redevelopment, which comprises a mix of residential, business and commercial uses including education and other community facilities, with associated transport and services infrastructure.

There are various phases of redevelopment include remediation, reclamation, reprofiling and construction works.

2.3 Site Description

The Site covers approximately 250 hectares of brownfield land and is bordered to the west by the Crymlyn Bog Site of Special Scientific Interest (SSSI). Crymlyn Bog is also designated as a Special Area of Conservation (SAC) and Wetland of International Importance (Ramsar Site).

The Site is in various phases of redevelopment, which entails remediation, reclamation, reprofiling and construction works.

Remedial works at the Site have predominantly involved the recovery of free phase hydrocarbons in conjunction with the excavation of hydrocarbon-impacted materials. Bioremediation of hydrocarbon-impacted soils has also been undertaken at the Site.

The Site, the proposed boundaries of which are currently fully fenced, is currently owned and managed by St. Modwen. For further details on the Site arrangement, please refer to drawing 5041216-ATK-GM-WS-DR-C-6038 Site Wide Earthworks Responsibilities in Appendix E.

The Site lies outside the floodplain, Figure 2-1 below shows in blue the areas NRW expect flooding to occur from river and sea.

Section 4.5.7 of Environmental Statement submitted by Parsons Brinckerhoff Ltd on February 2005, defines the basis of the catchment associated with the Coed Darcy Urban Village development as the following:

"It has been agreed with the Environmental Agency (EA) and Countryside Council for Wales (CCW) that the historical catchment areas (i.e. prior to the construction of the refinery) within the site, should be maintained and/or restored and the need to pump surface water would be avoided if at all possible. The historical and proposed catchments are shown on Figure 4.3. Flows from different catchments would be dealt with as follows:

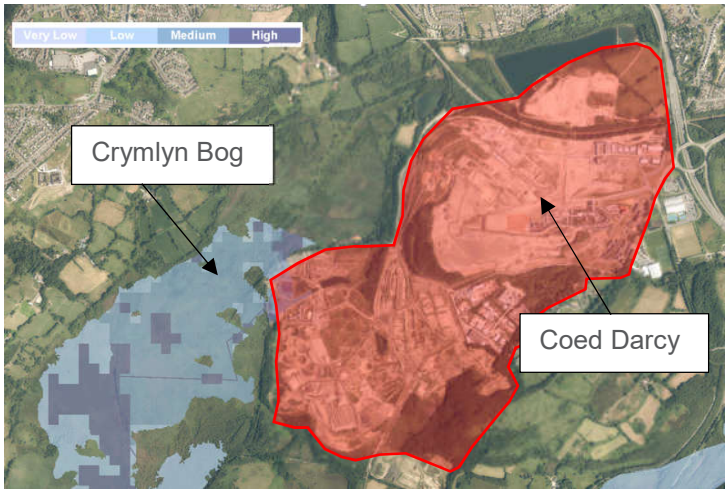


Figure 2-1 – Risk of flooding areas from river and sea

- *Flows from Catchment 1 would be attenuated and discharged into the existing public sewer which transmits flow to the River Neath*
- *Flows from Catchment 2,3,3A and 4 would be attenuated and discharged to Crymlyn Bog*
- *Flows from Catchment 5 would be attenuated and discharged into the existing watercourse north of LLandarcy Village"*

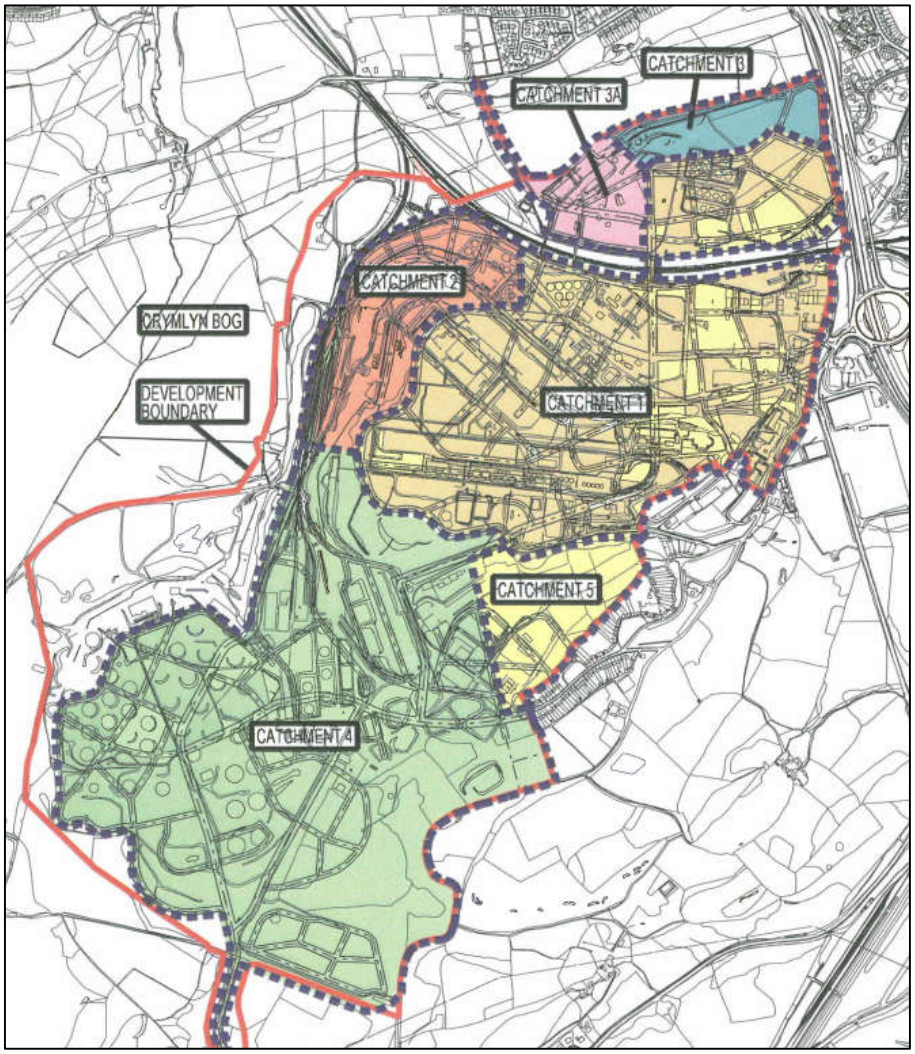


Figure 2-2 Extract of "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005"

2.4 Planning and Development Status

Outline planning permission was granted by Neath Port Talbot County Borough Council (NPTCBC) on February 2008 (Ref. P2005/0393) for the whole Coed Darcy scheme which will deliver up to:

- 4,000 dwellings
- Approximately 41,200 square m of B1 Business Uses
- 3,800 square m of Retail and;
- 8,000 square m of other commercial, education, community facilities, highways, drainage, services, infrastructure, car parking and landscaping.

The planning permission is based on a comprehensive submission which included an Environmental Statement (with the application being Environmental Impact Assessment (EIA)), a Masterplan and a number of other documents which explain the strategies and principles behind the creation of a new neighbourhood.

On behalf of St. Modwen Developments Ltd (SMD), Atkins has submitted a series of Briefing Notes (BN) to address issues raised by Planning Conditions (PCs) associated with the proposed development as well as defining the extension of the different Catchments within the Site. They have also covered the surface water drainage strategy across the catchments, with SuDS and infiltration (where feasible) discussed. Sitewide surface water drainage provision is bound to Conditions 21, 22 and 50 of Coed Darcy Planning Permission P2005/0393.

This document aims to outline the requirements of Planning Condition 22 of the Outline Planning Permission Reference 2005/0393. Planning Condition 22 says:

- *Planning Condition 22.*

  "Prior to the start of any works on Catchments 2, 3, 4 and 5 as identified in Fig. 4.3 of the Environmental Statement, (including any clearance, remediation or construction) full details of the strategic drainage system and surface water management for these catchment areas shall be submitted to and approved in writing by the Local Planning Authority. ***Refer to Sections 4 and 5***

  The submitted scheme shall give details of the location, design and capacity of the collection, delivery, storage and discharge systems, including the use of opportunities to maximise infiltration by 10% contribution to the ground water over and above the existing rates. ***Refer to Sections 4 (specifically 4.5) and 5.***

  The information should be in accordance with the principles and parameters as contained in the plans and reports which have been submitted with the outline application and give details of the range of flexibility and additional capacity which will be incorporated into the system, to deal with any unforeseen eventualities. ***Refer to Section 2.2***

  The submission shall also include the full details of the methodology for implementation, including the schedule of implementation of the drainage scheme within the timing for all other aspects of the development, as well as fully identifying all measures to be implemented during the remediation and construction phases to ensure that no additional contamination enters the proposed system. ***Refer to Section 4.6***

  Unless otherwise agreed in writing by the Local Planning Authority the approved scheme shall be fully implemented on Site as approved and in accordance with the approved methodology and schedule of works.

  Reason

  To ensure that the proposed strategic drainage system is designed and implemented in a manner that ensures that it would have no adverse impact upon the conservation objectives of Crymlyn Bog."

2.5 Nutrient Management Plan (NMP) status

2.5.1 Background

Crymlyn Bog (Cors Crymlyn) is an internationally important wetland with multiple nature conservation designations, part of which is owned by St Modwen, and is immediately adjacent to Coed Darcy (See Figure 2-3). It is designated as a Special Area for Conservation (SAC), a Wetland of International Importance (a Ramsar Site), a nationally important National Nature Reserve (NNR) and Site of Special Scientific interest (SSSi). Approximately one-third of Crymlyn Bog, and all of Pant-y-Sais (excluding the adjoining Tennant Canal), is declared as a National Nature Reserve (NNR). Pant-y-Sais is also a Local Nature Reserve (LNR).

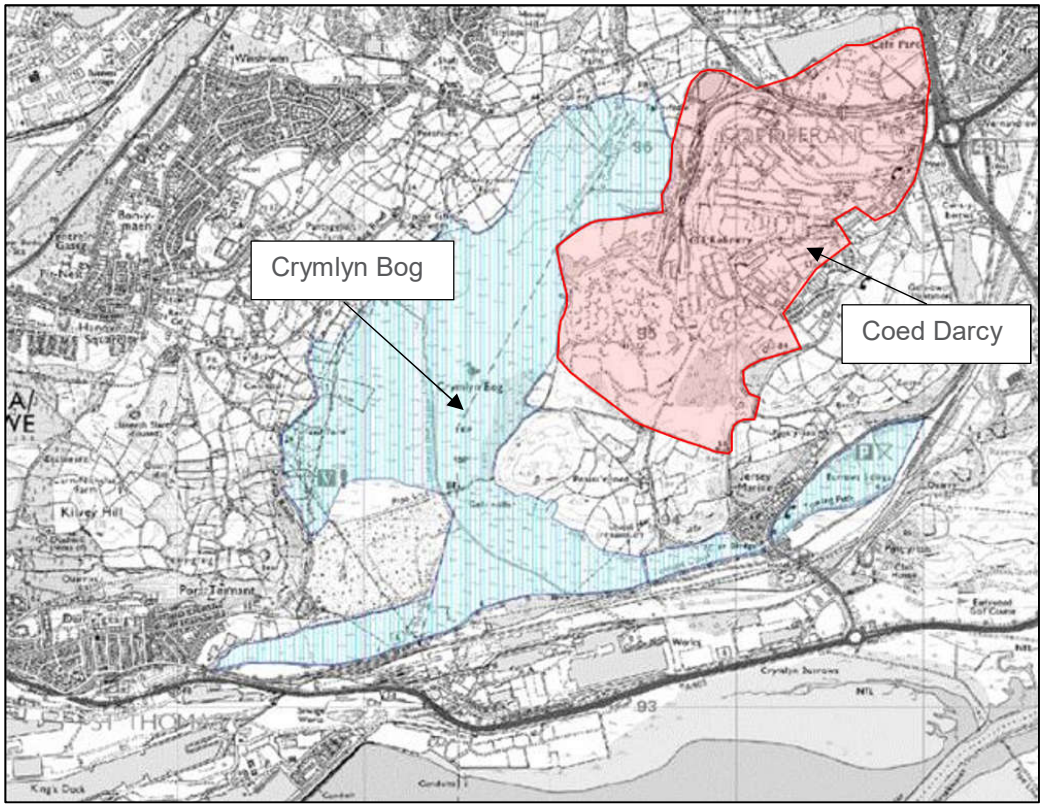


Figure 2-3 - Crymlyn Bog SAC and Ramsar Site©

St. Modwen holds five Environmental Permits for surface water discharges from the Site. Four of these (referenced W1 to W4) discharge into the Crymlyn Bog catchment, as shown on Drawing 5041216-RAP-DWG-1673 included in Appendix D. The fifth discharge (W5) lies outside the scope of the NMP as it discharges into the catchment of the River Neath rather than Crymlyn Bog.

Surface water drainage from the Site is expected to provide a high-quality input to this internationally important wetland. The lagoons associated with the four surface water discharge points to Crymlyn Bog will be enhanced. The drainage strategy of the Site has been developed to replicate as closely as possible the flow patterns that existed when the refinery was operational. The remediation of the Site will improve the quality of the run off and flows into the Bog through removal of source contaminants where possible.

In 2006, for the Coed Darcy application to progress through the planning process, the Countryside Council for Wales (CCW) advised that further information regarding the hydrological inputs to the Bog from the Coed Darcy Site was required. Consequently, a survey was carried out in January 2006 and is presented within Appendix A.

Meetings were held between Atkins and NRW on 11th March 2011, 14th February 2018, 21st November 2018 and 23rd January 2020 (See Appendix B), to discuss and obtain formal agreement on an approach to future surface water discharge to the Crymlyn Bog.

Sampling at all five of the discharge points is generally undertaken monthly by SMD and NRW for compliance purposes. It was agreed that a NMP would be required to provide details on how nutrients, specifically nitrates and phosphates, would be managed on the Site and, where necessary, treated prior to discharge into Crymlyn Bog. Latest NMP produced by Atkins can be found in Appendix D.

2.5.2 Conclusions

The relevant lab results indicate that the offsite sources the “M4 drain” and “Skewen drain” are the key sources of nitrate to the sampled point downstream of the SSR (W1), with nitrate concentrations remaining constant between the influent and effluent to the NSR drain.

Findings show a nutrient level at the SSR outfall point of 0.548 mg/l. This value is significantly below the trigger value of 2mg/l that was set by NRW to instigate further actions and investigations. Comparing the nutrient concentration values upstream and downstream of W1, the values are considerably reduced after the flows from the Site are discharged to the watercourse. This is a consequence of the flows from the SSR outfall diluting the nutrient concentration of the flows upstream of W1.

Therefore, based on what has been stated above, it was concluded that drainage from the Site is not considered to impact the nitrate concentrations.

2.5.3 Crymlyn Bog Channels

Meetings were held between Atkins and NRW on 11th March 2011, 14th February 2018 and 21st November 2018, to discuss and obtain formal agreement on an approach to future surface water discharge to the Crymlyn Bog. NRW advised;

- NRW have indicated that the discharge to Crymlyn Bog would be conditional of improvement works to the Crymlyn Brook and Tal-y-Fedw existing channels
- NRW indicated that any further development of the (Site-wide) surface water discharges into Crymlyn Bog would require a 'light touch' Habitats Regulations Assessment of the development and the surface water management plan
- NRW agreed to a 5.5 l/s/ha surface water discharge rate, based on the Qbar study (circa 13% reduction in runoff from the calculated QBar of 6.3 l/s/ha). This represents a significant reduction in the peak rate of runoff
- NRW have indicated that they would prefer not to have a diffused discharge from the SSR – they would like to utilise the existing primary channel. This would have the additional advantage of avoiding the need for alternative attenuation or nutrient reduction measures if they would otherwise be required.
- NRW stated that Planning Condition 21 will need to be reviewed following the cut of the reliance of the Site on the NSR.
- NRW acknowledge that SMD only have riparian responsibilities in relation to the brook courses.
- NRW have indicated that they have not yet considered all potential Surface Water discharge requirements from the Coed Darcy Site into the Crymlyn Bog (for example, from the south Site lagoons) and have indicated that they will look at the Site as a whole to provide information which will feed into future drainage strategies

2.6 Existing Surface Water Drainage

Please refer to drawings 5041216-ATK-GM-WS-DR-C-6038 Site Wide General Arrangement in Appendix E and Figure 4.3 Catchment Areas Parsons Brinckerhoff 2005 in Appendix A.

2.6.1 North Site

The North Site area represents catchment areas 1 and 2, as defined by drawing "Coed Darcy Environmental Statement, Figure 3.5 Catchment Areas, Parsons Brinckerhoff 2005" (See Appendix A and Figure 2-4):

	Gross Area	Outfall *	Definition
Catchment 1	58.40 ha.	Bridge House (O1)	Flows would be attenuated and discharged into the existing public sewer which transmits flow to the River Neath.
Catchment 2	15,70 ha.	Crymlyn Bog (Through SSR) (O5)	Flows would be attenuated and discharged to Crymlyn Bog.

*To be read in conjunction with Figure 2-4 and Atkins Drawing No. 5041216-ATK-GM-WS-DR-C-6042 in Appendix E

Table 2-1 - North Site Catchments Characteristics

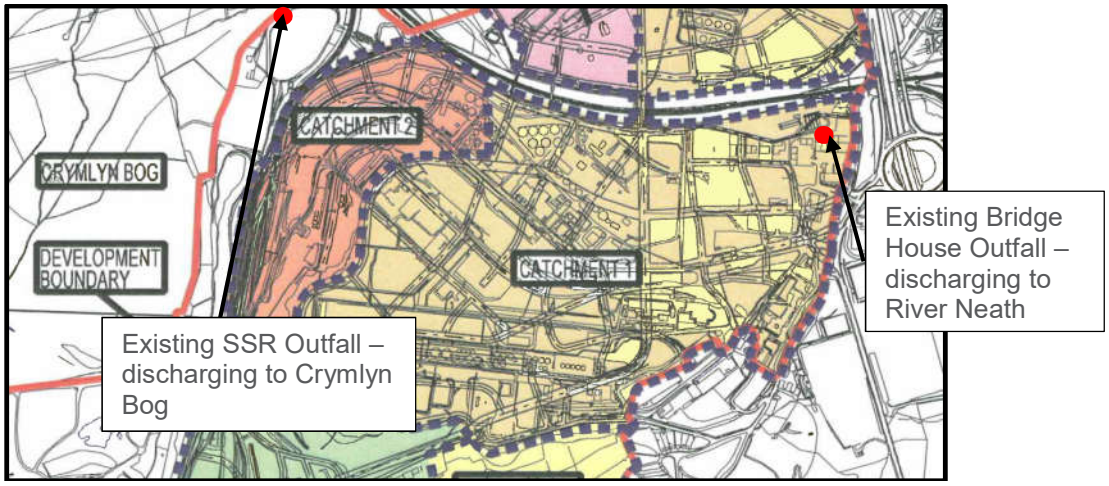


Figure 2-4 - Extract of "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005" showing Catchments 1 and 2.

1. Surface water sewers have been constructed within Roads 1, 80 and 90. These constructed sewers outfall into a lined trapezoidal channel at the junction of Roads 1 and 3, which conveys flows to a connection point with the old refinery large-diameter pipe network that leads to the NSR via a crossing of the railway. The large-diameter pipe is restricted to c.2000l/s. This is equivalent to the run off of the Persimmons Phase 1A, 1B, 1C and 1D during a 1 in 30-year storm.

2. Water levels within the NSR are controlled by means of a pumped discharge (rising main) into the surface water sewer network to the north-west of Llan Coed House, which leads via a private sewer network, maintained by Coed Darcy Limited (CDL), to the public surface water sewer outfall (DCWW) at Bridge House. Pump rates and control principles remain as described in Briefing Note 4 Section 3 and in line with the consent.

3. Surface water sewers within development zones have a dual purpose, serving development plots and highway infrastructure. Surface water sewers are owned and privately maintained by CDL. All constructed highway gullies and connecting pipework to primary surface water sewer networks are in the process of being adopted by the Local Highway Authority (NPTC) under a S38 (Highways Act) agreement.

4. An additional surface water sewer connection has been constructed, linking to the existing pipe infrastructure immediately downstream of the Bridge House public sewer outfall point, as a result of NAR/B4290 highway upgrades in 2014. This connection serves highway drainage within the corresponding NAR and B4290 catchment, with the majority of flows attenuated via an upstream underground tank, before being discharged at a controlled flow rate into sewer networks leading to the Bridge House outfall.

There are a number of other 'live' Site areas and developments that currently drain to the Bridge House public surface water outfall point (See drawing 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls);

- Darcy Business Park (and associated highways)
- Natural Resource Wales office accommodation (former Llandarcy refinery offices)
- Northern Access Road and B4290 (part)
- North Site Reservoir Pumped Discharge

The Public Sewer Outfall at Bridge House was formerly the surface and trade effluent outfall point for the Llandarcy Refinery and leads to the River Neath. Public sewer infrastructure downstream of Bridge House is owned and maintained by DCWW. The trade effluent discharge classification remained in place until mid-2015, when it was downgraded via application to DCWW and NRW, to a standard surface water sewer outfall (following completion of NSR and connected Site remediation works, and a period of several years post-remediation water testing at the Bridge House outfall point).

2.6.1.1 South Site Reservoir (SSR)

The South Site Reservoir (See Figure 2-5 and 2-6 below) located west of the old railway line is currently the existing outfall from catchment 2. A topographical survey of the Reservoir was carried out in June 2017.



Figure 2-5 - Plan View of SSR. August 2019



Figure 2-6 - View of Drained Down SSR. 2011

Table 2-2 - Operational Data Summer 2015

Estimated Water Capacity (Current)	31,670m^3 (Refer to table 4-1)
Indicative Depth Range	2.5m to 3m (Estimated, based on 'full' water level 18.55 mAoD)
Plan Area	1.46 hectares
Current Receiving Flows	i) Minor surface water source from former bitumen plant area (remnants of existing refinery drainage, now obsolete). ii) Springs within the reservoir bed.
Current Outfall	Brook course leading to the Tal-y-Fedw watercourse (Crymlyn Bog) via a weir, which was formed when the spillway was broken down to 'discontinue' the reservoir.
Emergency Drawdown	In conjunction with the Qualified Civil Engineer, proposals for control structures, spillway, etc. are to be provided. Direct discharge into the Crymlyn Bog via valve-controlled pipework. Operational status of said discharge control unknown

2.6.1.2 Existing Outfall Locations

Please refer to drawing 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls for outfall points in Appendix E.

South Site Reservoir Outfall (O5)

It is proposed to use the existing two culverts crossing the old railway line as the outfall for the North Site Drainage.

Following Atkins Site visit on the 13th November 2018, see Figure 2-7 below which defines the condition of the inlet structure to the South Site Reservoir and the main outstanding information required to progress with the detailed design of the surface water network.

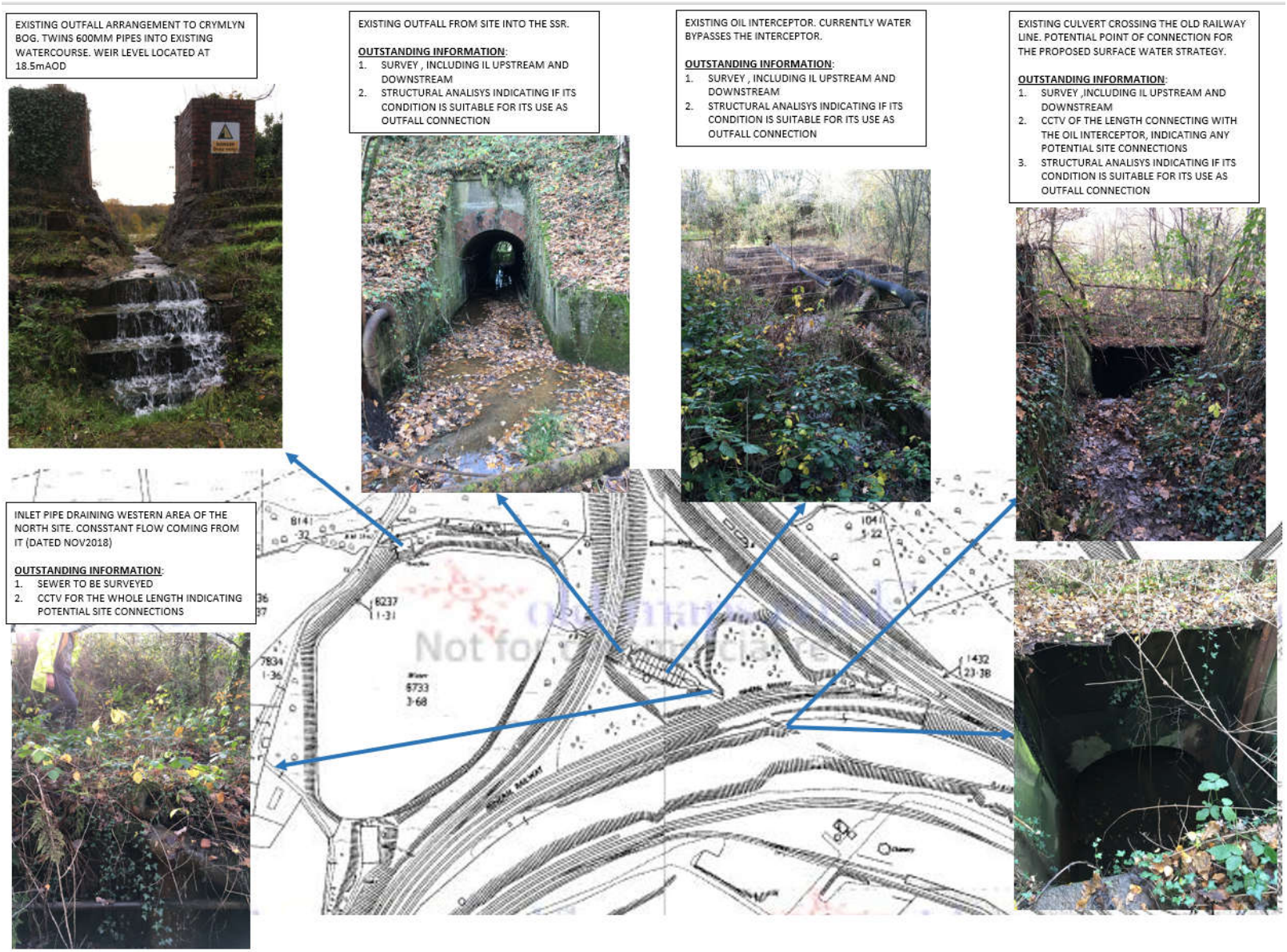


Figure 2-7 - Existing SSR inlet Hydraulic Features.

2.6.2 South Site

To be read in conjunction with drawing "Coed Darcy Environmental Statement, Figure 4.3-1a Catchment Areas, Parsons Brinckerhoff 2005" in Appendix A and historical Refinery Layout Drawing survey sheets (Available upon request).

The existing South Site area falls within Catchments 4 and 5, as defined by drawing "Coed Darcy Environmental Statement, Figure 4.3-1a Catchment Areas, Parsons Brinckerhoff 2005" (Figure 2-8). Catchments 4 will be further divided into sub-catchments. Coed Darcy South Site existing sub-catchments, surface water attenuation features and interim drainage ditches are shown on Atkins Drawing No. 5041216-ATK-GM-SS-DR-C-5004 (See Appendix E).

Table 2-3 - South Site Catchments Characteristics

	Gross Area	Outfall *	Definition
Catchment 4	103.4 ha	Crymlyn Bog (O7B)	Flows would be attenuated and discharged to Crymlyn Bog.

*To be read in conjunction with Figure 2-8 and Atkins Drawing No. 5041216-ATK-GM-WS-DR-C-6042 in Appendix E

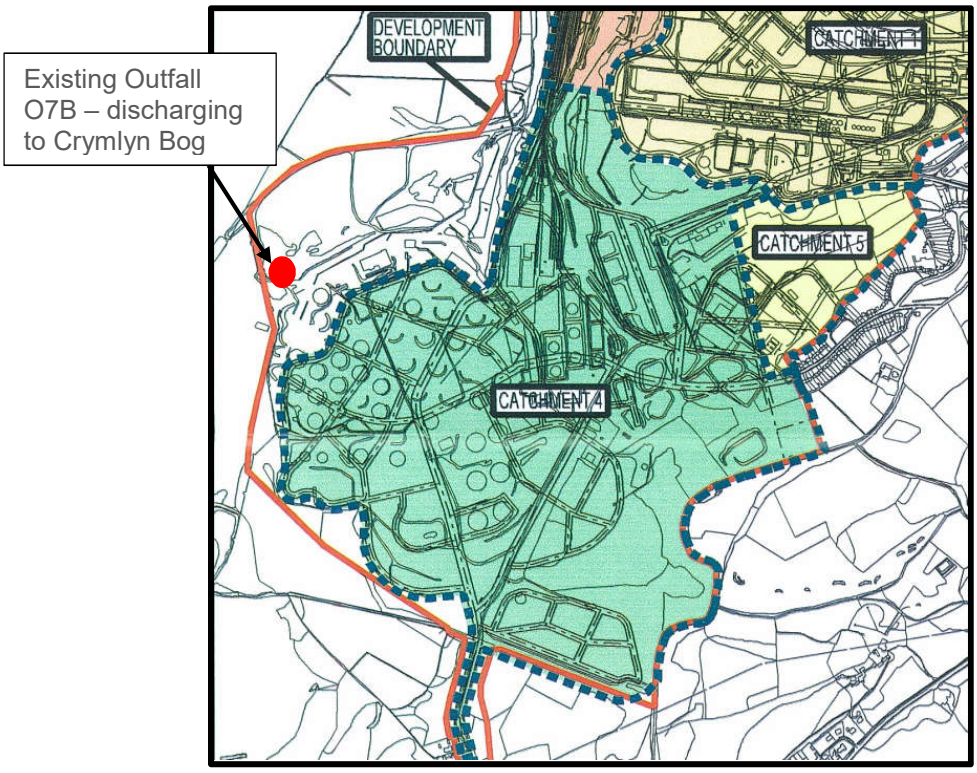


Figure 2-8 - Extract from "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005" showing Catchment 4.

Catchment 4 incorporates the southern tank farm area of the former BP Llandarcy oil refinery and outfalls to the west. This catchment is divided into 15 sub catchments (Refer to 5041216-ATK-GM-SS-DR-C-5004_Catchment 4 and 5 (South Site) Existing Surface Water Contributing Areas in Appendix E).

Catchment 5 is located in the north-east corner of the South Site south of Tank Farm Road. This catchment includes an existing industrial Site and vegetated landscaping. Catchment 5 is divided into two existing sub catchments: Sub-Catchment 5.1 and sub-catchment 5.2 (Refer to 5041216-ATK-GM-SS-DR-C-5004 in Appendix E). Sub-catchment 5.2 incorporates a number of drainage ditches which run to a culvert located to the east of the Site. The sub catchment 5.1 is understood to be discharging via gravity into the Crymlyn Bog and, therefore, has been considered to be part of Catchment 4 (Please refer to drawing and *5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls* in Appendix E).

An existing land drainage system comprising open ditches, springs, surface water attenuation features and piped sections will be maintained to manage overland flows from surrounding catchments. Existing catchments, land drainage systems and surface water attenuation facilities and features are shown on Atkins Drawing No. 5041216-ATK-GM-SS-DR-C-5004 (Appendix E).

The main land drainage features within the South Site are:

- the Llandarcy bog discharge, which drains to the east and outside of the Site.
- the open ditch that crosses South Site from south-east to north-west and discharges to the Crymlyn Bog via Crymlyn Lagoon.

The seasonal flow rates attributed to these have been considered in the drainage modelling by utilising summer and winter rainfall events.

It is noted that many of the existing drainage channels and ditches convey water containing ochre which, is likely to improve as the Site is remediated and the water within the ditches will be intercepted and diverted into the proposed drainage strategy. If necessary, surface waters to be conveyed by the permanent land drainage system from un-remediated areas of the Site will receive informal reed bed treatment prior to discharge into receiving watercourses and the Crymlyn Bog.

2.6.2.1 Existing Outfall Locations

Please see drawing 5041216-ATK-GM-SS-DR-C-5004_Catchment 4 and 5 (South Site) Existing Surface Water Contributing Areas and 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls in Appendix E.

Coed Darcy Wetlands (O7A and O7B)

The Coed Darcy Wetlands with an area of 2.385ha, largely comprises lagoons and access tracks (Figure 2-9). The Wetlands are located on the western margin of the former BP Llandarcy oil refinery. The principal features of the wetlands are three waterbodies; Crymlyn Bog Lagoon, West Bay and South Bay. Historically these wetlands formed part of the Site wide drainage system with a direct outflow into the Crymlyn Bog to the north of the Site (07A), via a derelict interceptor channel, which will be assessed for suitability and rehabilitated if required, and to the west (O7B) of the Site, via the existing South Site outfall. Since the closure of the refinery, the lagoons have been remediated and are proposed to be retained as wetland habitat in the masterplan.



Figure 2-9 - Looking south over the Wetlands

For the majority of the South Site, the Coed Darcy Wetlands are open bodies of water forming ready-made flow attenuation areas. The storage depths are restricted by the limited divergence between existing water

levels and the surrounding ground levels. Surface water flows from the following surrounding catchments contribute to Coed Darcy Wetlands:

- Sub catchments 4.1 – 4.5 (20.275ha) - Located in the western extents of the South Site area, surface water from these sub-catchments discharge by overland flow to Coed Darcy Wetlands.

- Sub-catchments 4.8 – 4.13 (42.720ha) - Discharge into Coed Darcy Wetlands via Ditch 8 and a series of smaller ditches. Surface water enters the existing land drainage system via inlets 3 – 6.

South Bay (O7A and O7B)

South Bay is 0.401ha and is located to the east of Coed Darcy Wetlands (Figure 2-10). South Bay has a water level of 9.3mAOD, and assuming a depth of 2m, has an approximate volume of 8,020m^3.



Figure 2-10 - Looking south east over South Bay





South Bay was originally installed as a large oil-water interceptor to prevent the uncontrolled discharge of free product from the southern tank farm into Crymlyn Bog Lagoon, and subsequently Crymlyn Bog. South Bay is fed by a drainage ditch from the southern tank farm, overland flow from surrounding sub-catchments (including land occupied by the Crymlyn Tip), and from groundwater base flow.

South Bay is connected to Crymlyn Bog Lagoon via an inverted siphon-type structure which is fed by a drainage ditch from the southern tank farm entering the lagoon from the south, storm drainage from the Demonstration Village adjacent to the east, and from groundwater base flow (Figure 2-11). Based on visual inspection, the diameter of the inverted siphon is circa 600mm.

Figure 2-11 - South Bay inverted siphon-type structure

Crymlyn Bog Lagoon (O7B)

Crymlyn Bog Lagoon has an area 1.854ha with a water level ranging between 8-8.5mAOD. A bathymetric survey carried out on behalf of BP in 1993 recorded the base of the lagoon to lie between 7.4mAOD and 8.3mAOD, with its deepest point being 7.26mAOD[1] with an approximate attenuation volume of 20,394m^3.

Crymlyn Bog Lagoon receives discharge by overland flow from adjacent sub-catchments and outfalls from South Bay and West Bay (Figure 2-12). South Bay feeds into Crymlyn Bog Lagoon via Musson's Channel. West Bay discharges via a siphon-type structure.



Figure 2-12 - Coed Darcy Wetlands looking north east over Crymlyn Bog Lagoon

West Bay (O7B)

West Bay (Figure 2-13), occupies approximately 0.130ha in the south west of Coed Darcy Wetlands. The water level across West Bay ranges between 8-8.5mAOD. A bathymetric survey, carried out on behalf of BP in 1993, reported the bed level to be between 7mAOD and 6mAOD with its deepest point at 5mAOD[2]. West Bay has an approximate attenuation volume of 2,600m^3.

West Bay was originally installed as a small oil-water interceptor to prevent the uncontrolled discharge of free product from oil spills in the far west part of the southern tank farm. West Bay discharges into Crymlyn Bog Lagoon which discharges to Crymlyn Bog.



Figure 2-13 - Looking north over West Bay

[1] Atkins Crymlyn Bog Lagoon Verification Report. December 2012. Report Ref: 5041216-RAP-RPT-000631

[2] Atkins West Bay Verification Report. May 2011. Report Ref: 5041216_RAP_000541

Ellen's Pond (O9)

The remainder of the southern part of the Development currently discharges into Freeman's Bund via Ellen's Pond (Figure 2-14). Ellen's Pond is fed by overland flow from surrounding catchments and natural drainage ditches. Freeman's Bund is 0.069ha, assuming a depth of 1m, Ellen's Pond has an approximate attenuation volume of 690m^3. Ellen's Pond was formed as part of the GCN translocation works and located within the GCN receptor Site acts as an attenuation feature before discharging directly into Crymlyn Bog.

Any works within the GCN receptor Site will require a GCN licence. NRW have also confirmed that Ellen's pond cannot be utilised as a drainage attenuation feature. On this basis, flows will be attenuated via an additional Pond bypassing the existing Ellen's Pond. (Refer to drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy in Appendix E).



Figure 2-14 - Ellen's Pond

Contractor's Yard

The Contractor's Yard has been divided into two existing sub-catchments (shown on 5041216-ATK-GM-SS-DR-C-5004 Catchment 4 and 5 existing surface water contributing areas shown in Appendix E), as follows:

- Sub-catchment 5.1 covers 10.59ha. According to historical records, this sub catchment utilises an existing land drainage system which outfalls into the open ditch that crosses south Site and discharges to the Crymlyn Bog via Crymlyn Lagoon.

- Sub-catchment 5.2 covers 4.03ha and drains in an eastward direction via infiltration.

2.6.3 Northern Site

To be read in conjunction with drawing "Coed Darcy Environmental Statement, Figure 4.3-1a Catchment Areas, Parsons Brinckerhoff 2005" in Appendix A and historical Refinery Layout Drawing survey sheets (Available upon request).

The Northern Site area represents catchment areas1, 3 and 3A, as defined by drawing "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005" (See Figure 2-15).

Table 2-4 - Northern Site Catchments Characteristics

	Gross Area	Outfall *	Definition
Catchment 1	15.76 ha	River Neath	Flows would be attenuated and discharged into the existing public sewer which transmits flow to the River Neath.
Catchment 3	6.22 ha	Crymlyn Bog	Flows would be attenuated and discharged to Crymlyn Bog
Catchment 3A	5.88 ha	Crymlyn Bog	Flows would be attenuated and discharged to Crymlyn Bog

*To be read in conjunction with Figure 2-15 and Atkins Drawing No. 5041216-ATK-GM-WS-DR-C-6042 in Appendix E

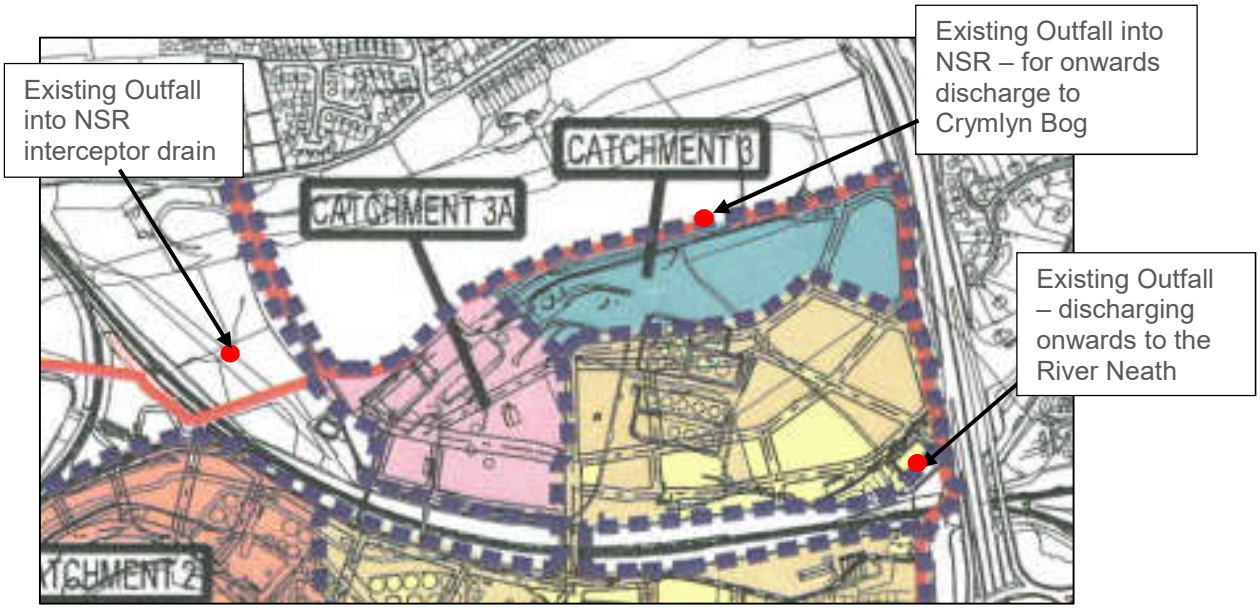


Figure 2-15 - Extract of "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005" showing Catchments 1, 3 and 3A.

In general terms the topography of Northern Site is a naturally raised area between North Site Reservoir and the railway line with a ridge linking it to the Motorway in the east. The majority of the Northern Site currently drains by gravity towards the North Site Reservoir and eventually into the Crymlyn Bog, bypassing the SSR. The south eastern corner of the area falls away from North Site Reservoir, draining ultimately to the River Neath., hence defined as Catchment 1.

The contribution from the Catchment 3 is intercepted by a concrete channel (See Figure 2-16) located along the south side of North Site Reservoir and discharges directly into the dam via a concrete cascade (See Figure 2-17).



Figure 2-16 – Concrete inlet and interceptor channel. Looking east.



Figure 2-17 - Concrete cascade outfall into NSR.

2.7 Groundwater

2.7.1 Sitewide

As stated in Table 1 of Part 1, Schedule 7 of the S106, a biannual programme of 'groundwater level and quality and product thickness monitoring' is required. The scope of these works was originally defined by URS and the associated monitoring has been continued by Atkins since 2008.

General information on groundwater levels and quality around the site are collected as part of the RAP Monitoring. Prior to remediation and engineering works within an area of the site, a review of existing information relating to the anticipated ground conditions and groundwater levels is carried out. The potential impact of groundwater and/or the presence of any mobile contamination, such as free product, can therefore be assessed in terms of any temporary works and/or mitigation measures required during the works. Such works could include the need for free product recovery, the use of oil/water separators and temporary drainage control using sumps and/or channels.

The quality of water discharged from the site is monitored monthly at the relevant discharge consent points, in conjunction with the NRW. This is then supplemented by daily and weekly inspections and sampling where works are carried out within the vicinity of existing waterbodies or where site works have the potential to impact on the quality of water within the existing site drainage network. An inspection programme modified from the time of BP occupation is still in place.

Groundwater will be assessed as development progresses. If contaminants are located within the groundwater and there is a risk of it permeating clean cover, then further consideration will be given to the means by which the contaminants could be controlled. The long-term discharges will be assessed and managed under environmental permits.

2.7.2 SSR

The South Site Reservoir has historically been affected by ochre with a distinctive orange colour noticeable on occasions. The recent emptying and de-sludging of the base of the reservoir has allowed an examination of the seepages. Some of these showed a degree of iron precipitation along the backwall spring-line.

The reservoir is now backfilling, primarily with groundwater and precipitation run-off. We intend to monitor ochre levels as the reservoir refills and observe water quality.

In the short term we propose to reinstate the surface feed from the site which historically flowed into the SSR and observe and monitor water quality over the coming months (NOTE - all flows and discharges are currently monitored and are currently controlled through the existing discharge point, no additional flows will be added to the Tal-y-Fedw point).

2.8 Policy Context

The Surface Water Strategy has been developed alongside the Planning Policy Wales and Technical Advice Note (TAN) 15 to direct new development with respect to flood risk. Together, they form a precautionary framework to guide planning applications.

3. Assumptions and Basis of Design

3.1 Assumptions

In preparing this Report, the following assumptions have been made:

- Schedule 3 of the Flood and Water Management Act 2010 makes SuDS a mandatory requirement for all new developments. SuDS will be designed and built in accordance with the Statutory SuDS Standards published by the Welsh Ministers and approved by the Lead Local Flood Authority (LLFA) acting in its role as SuDS Approval Body (SAB).
- The principles of the SuDS management, as described in CIRIA C753 – "The SuDS manual", TAN 15: "Development and flood risk" and "Statutory SuDS Standards" published by the Welsh Ministers will be the benchmark, with the SuD's hierarchy being applied across the entire development. Physical and geochemical/geo-environmental ground conditions will be taken into account when assessing the feasibility of these techniques. SuDS Schemes will be approved by the local authority acting in its SAB role, before construction work begins.
- The on-Site carriageway surface and structure (not including the surface water sewerage) will be adopted by Neath Port Talbot Borough Council (NPTC) as the local highway authority.
- Design standards and construction specification will be to current (i.e. Sewers for Adoption 7th Edition, DCWW regional addenda, Welsh standards TAN 15:" Development and flood risk" and Statutory SuDS Standards) adoptable practice.
- Although Briefing Note 2 showed that surface water from the entire area of Catchment 1 could be discharged to the Surface Water Sewer at the eastern boundary of the Site to the south of the railway (rear of Bridge House), this Strategy develops the assumption described in Briefing Notes 3 and 4 that this catchment can be divided so that surface water flows are discharged eastwards to the River Neath via House Bridge Outfall and westwards to South Site Reservoir.
- The Strategy outlined within this document contemplates the emerging SABs process at a strategic level. *"Application Form for Full Application Approval of SuDS on new developments",* will be used and demonstration that the Sustainable Drainage Hierarchy has been considered, encouraging the plot developers to use source control measures along with on-plot features techniques where appropriate and in a phasing basis. The infrastructure design and this strategy however does not rely upon these measures – the calculations for runoff and attenuation adopt the 'worst case' runoff position. The use of source control within the plots as they come forward for development will further enhance the benefits offered by this Strategy
- The developer will be responsible to provide a SAB's application (which will run parallel to the sitewide Planning Approval (2005/0393) Condition 50 submission) for each of the phases of the development
- Flows will be controlled such that the agreed maximum rates of discharge from the Site to the Surface Water Sewer and Crymlyn Bog are not exceeded. For the purposes of this Briefing Note, it has been assumed that surface water discharge to the Crymlyn Bog will be 5.5l/s per hectare. This discharge rate as well as the Catchments extents definitions were agreed at the meeting with NRW on the 21st November 2018 (Refer to minutes ref 5041216-ENG-MN-0002022 - NRW 2nd Meeting Minutes in Appendix B).
- The on-Site surface water sewer infrastructure will be operated and maintained by a management company rather than being offered for adoption to DCWW as public surface water sewers, or the highway authority for highway drains. This gives the advantage of allowing highway drainage and land drainage to be conveyed in the same piped system as surface water run-off from paved areas and roofs. However, as per the emergent SuDS Approval Body (SAB) process, it is proposed to enter discussions with the SAB regarding the potential adoption of the SuDS features. Whether the attenuation facilities are adopted by the SAB or remain in control of the management company, the future maintenance of this facilities will be secured in perpetuity.
- The topography of the Site has been taken from an aerial survey (dated August 2018). Drainage Strategy is based on drawing 5041216-ATK-GM-WS-DR-C-6026 Proposed Bulk Earthworks Levels (Sheet 1 of 2) and 5041216-ATK-GM-WS-DR-C-6027 Proposed Bulk Earthworks Levels (Sheet 2 of 2). It is recognised that the finished ground profile may vary in some areas from the existing as a result of the remediation works and to suit the requirements of the emerging development. Whilst the principles of the drainage strategy will remain, there may be minor adjustments as the detailed design progresses.

- South Site Reservoir will be used for strategic surface water flow storage/attenuation. Some additional works will be needed in order to refurbish and ensure its operation are fully compliant with the requirements of the Reservoirs Act.
- Ellen's Pond, West Bay and the Crymlyn Bog lagoon Wetlands are for the sole purpose of the translocation of Great Crested Newts, and will not be utilised as attenuation ponds.
- The existing open ditch running through the South Site Development will continue to discharge westwards and is of suitable size to accept the attenuated flows from the development.
- The Llandarcy Bog will continue to discharge eastwards.

3.2 Design Criteria

3.2.1 General

The proposed foul and surface water drainage systems will be designed in accordance with the principles of CIRIA C753 – "The SuDS manual" and the recommendations of Sewers for Adoption: 7th. Edition (and current DCWW regional addendums).

3.2.2 Surface Water Drainage

- A Nutrient Management Plan (NMP) is prepared every year to provide details on how nutrients, specifically nitrates and phosphates, will be managed on the Site and, where necessary, attenuated and treated prior to discharge into Crymlyn Bog. The latest NMP produced by Atkins can be found in Appendix D.
- Based on the QBar study presented in Appendix C, it has been assumed that surface water discharge to the Crymlyn Bog will be 5.5l/s per hectare. This discharge rate as well as the catchment extents definitions were agreed at the meeting with NRW on the 21st November of 2018 (Refer to minutes ref 5041216-ENG-MN-0002022 - NRW 2nd Meeting Minutes in Appendix B).
- The extents of the catchment areas, identified by numbers, are shown on Drawing No. 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls, which is included in Appendix E. Further details on the catchment definition is discussed in Section 3.6 of this document.
- It has been agreed with NPTC that the adoption of the highway network will not be prejudiced by potentially having infrastructure operated by the management company beneath the highway. The implications of adoption of the on-Site surface water infrastructure as a drainage system under the Flood and Water Management Act 2010 will continue to be discussed with the approving body.
- Surface water sewers have been designed to convey flows arising from the 1 in 1 year return period design rainfall event without surcharge, and from the 1 in 30 years return period rainfall event, plus an agreed allowance for climate change (40%[1]), without flooding.
- Flow attenuation facilities incorporated within the drainage system have been designed to accommodate volumes arising from the 1 in 100 years return period design rainfall event, plus 40%[1] allowance for climate change.
- Exceedance flows, i.e. flows in excess of those arising from the 1 in 30 years return period design rainfall event up to those arising from the 1 in 100 years return period rainfall event, plus an allowance of 40%[1] for climate change will be contained within the (Site) boundary.
- Gross areas of the development plots and highway corridors have been taken from the Site Masterplan drawing, or from available as-built digital data.
- The following permeability proportions have been used, and applied either to existing development within the North Site, or Site Masterplan proposals. The values show percentage impermeability;

  - Residential Development Parcels 65%
  - Commercial Areas 85%
  - Highway Areas 100%
  - Landscaping 25%

- Playing Pitches 50%

The obtained total average permeability proportion has been calculated to be 75% and has been applied overall the areas covering the proposed development Site.

[1] "Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales – Climate Change Allowances – Welsh Government – December 2017" – Change to extreme rainfall intensity (1961-1990 baseline) – Total potential change anticipated by the 2080s (Upper estimate)

3.3 Current Site Status (December 2019)

The following areas of the Site have been developed and/or remediated since the issuing of Briefing Note 4

- Site-wide remediation
- Atlantic Residential Development
- North Site Reservoir Remediation
- Primary Infrastructure Highway Corridors 1, 80 and 90
- Persimmon Phase 1 Residential Development (300 No. dwellings)
- Peakgen Electricity Generation/Peaking Plant
- Primary Infrastructure Highway Corridors 1 (extension), 50, and 80 (extension)

The following schemes are known to have either been submitted for technical or planning approval, or are at the detailed design stage within the North Site area at the time of preparing this briefing note;

- M4 Junction 43 Phase 1A

The remaining developable North Site areas are cleared of structures but are derelict, being prepared for future land sales.

3.4 Future Works

A phased approach to delivering the primary development infrastructure will be carried out in line with proposed land sale and built out programmes, taking cognisance of reclamation works where necessary.

4. Proposed Surface Water Drainage

In developing the drainage strategy, strategic drainage models have been prepared using WinDes software produced by MicroDrainage Limited. Utilising the "Source control" features within the WinDes suite of drainage design software, surface water drainage and attenuation features have been modelled to account for development. The models have been developed to incorporate surface water attenuation facilities available within the existing open water bodies. Refer to Figure 4-1 for proposed surface water catchment areas.

4.1 North Site

Please see drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy, 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls, 5041216-ATK-GM-WS-DR-C-6026 Proposed Bulk Earthworks Levels (Sheet 1 of 2), 5041216-ATK-GM-WS-DR-C-6027 Proposed Bulk Earthworks Levels (Sheet 2 of 2) and 5041216-ATK-GM-WS-DR-C-6038 Site Wide Earthworks Responsibilities.

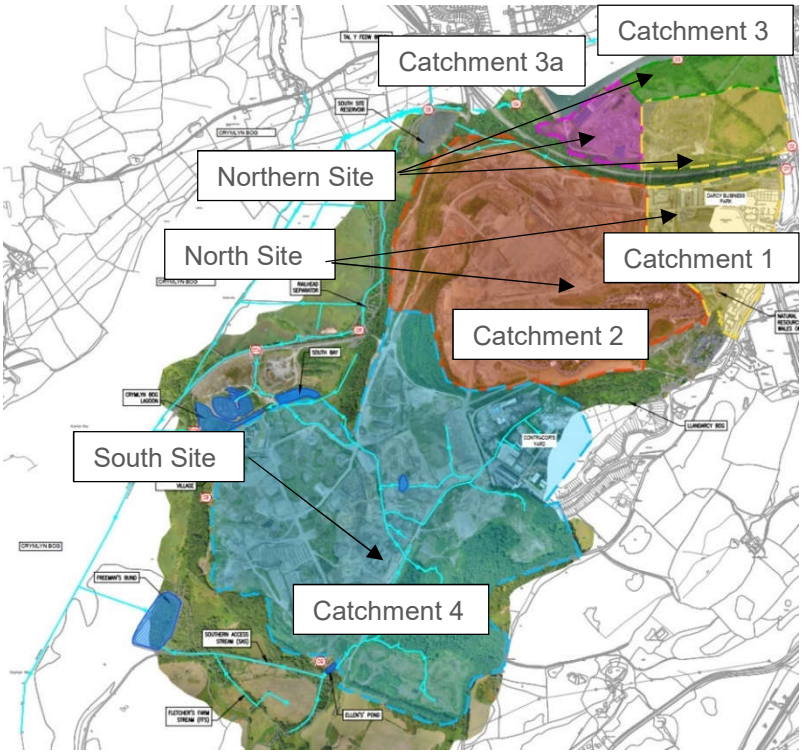


Figure 4-1 - Proposed Surface Water Catchment Areas

4.1.1 North Site Catchment 1 – Commercial Land east of Road 3

It is proposed that commercial properties within this Site area will drain eastwards by gravity to the Public Sewer Outfall at Bridge House (O1). The pipe infrastructure will be privately owned and managed by CDL Commercial plots will be required to have on-plot attenuation storage and a restricted discharge rate into newly constructed surface water sewer infrastructure. Storage requirements are shown on drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy.

Highways within this Site area will also drain to the new surface water infrastructure serving the commercial developments. The strategy for this area, as originally outlined within Briefing Note 4, has been followed and progressed with surface water sewers in part being designed and constructed to the rear of the Darcy Business Park leading to the Bridge House public sewer outfall ahead of any commercial development.

Exceedance flows from Commercial plots are proposed to be managed on-plot, for example utilising in-plot storage techniques within car parking and yard areas to pool shallow areas of water before draining back into plot drainage systems. This is due to the low permeability of the ground in Catchment 1 (Refer to Briefing Note 2). The design of these on-plot features will be the responsibility of plot developers.

The Public Sewer Outfall at Bridge House (O1) was formerly the trade effluent outfall point for the Llandarcy Refinery and leads to the River Neath. Public sewer infrastructure downstream of Bridge House is owned and maintained by DCWW. The agreed discharge rate to Bridge House Outfall is 583l/s.

4.1.2 North Site - Residential Development

It is proposed that the remaining North residential catchments area (please see drawing 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls) will drain westwards by gravity to a rehabilitated South Site Reservoir (for water storage/balancing). It will then be discharged at a controlled rate of 5.5 l/s/ha into Tal-y-Fedw /Crymlyn Bog. As per the catchment's definition in the ES, this catchment will now be included as part of Catchment 2. As a result, PC22 will need to be discharged for flows from the North Site Residential area prior to being discharged into the SSR. The drainage to SSR will be designed in line with the CIRIA C753 The SuDS Manual, National Planning Policy Framework (NPPF), TAN 15: "Development and flood risk" and current SuDS Approval Body (SAB) guidance "Statutory SuDS Standards" published by the Welsh Ministers.

A conceptual surface water hydraulic model has been created, and calculations can be found in Appendix F. Drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy in Appendix E, based on the conceptual hydraulic model, illustrates the proposed surface water network infrastructure to serve the North catchments.

No controlled discharge to the Crymlyn Bog could be achieved without an on-line attenuation storage provision. Therefore, South Site Reservoir, being an existing water feature is proposed to be used as the storage feature. The SSR will require rehabilitation before use as an attenuation feature, and the rehabilitation requirements are outlined within Section 4.1.3. The outflow from SSR has been defined by the total size of the Catchment 2, as defined on the "Coed Darcy Environmental Statement, Figure 4.3 Catchment Areas, Parsons Brinckerhoff 2005", based on the assumed discharge rate of 5.5 l/s/ha.

Open channels will be primarily located along the northern and western boundaries of the North Site area, adjacent to the railway line and Crymlyn Bog respectively. In addition to acting as the principal collection and carrier features for the connected networks, the ditches will also play an important role in controlling overland flows, preventing flows leaving Site in an uncontrolled manner and impacting off-Site areas. As discussed with NRW, flows could receive reed bed treatment prior to discharge into receiving watercourses and the Crymlyn Bog.

Outline hydraulic modelling has been undertaken to examine the potential volumes of water that the SSR is required to attenuate in different outfall level scenarios within the available reservoir capacity. The table below details storage volumes for the South Site Reservoir under different outfall level conditions;

Table 4-1 Reservoir Stored Volumes under different scenarios

Scenario	Water level (m AOD)	Current impounded volume (m^3)	Additional impounded volume (m^3)	Total volume (m^3)
Base of Reservoir	16.50	0	0	0
Current Operation	18.55	31,400	0	31,400
Reservoir full (with 400mm freeboard)	21.35	31,400	42,800	74,200
Reservoir's Overflow Weir Reservoir in use (200mm freeboard)	21.60	74,200	4,000	78,200

The surface area of the reservoir from the base of the vertical surrounding wall (approximately equal to the overflow crest level) is approximately 1.53ha hence for every 1.0m rise in water level above this, the impounded volume increases by approximately 15,300m^3.

The conceptual hydraulic model indicates the maximum water level will reach 21.35 mAoD (Refer to Hydraulic Results "pipe S1.037" shown in Appendix F and Figure 4-2 below), to attenuate the 1in 100 yr + 40%[1] CC flow. A total of 42,800 m^3 (74,200m^3 – 31,400m^3 = 42,800m^3) additional storage volume will be needed at the SSR.

[1] "Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales – Climate Change Allowances – Welsh Government – December 2017" – Change to extreme rainfall intensity (1961-1990 baseline) – Total potential change anticipated by the 2080s (Upper estimate)

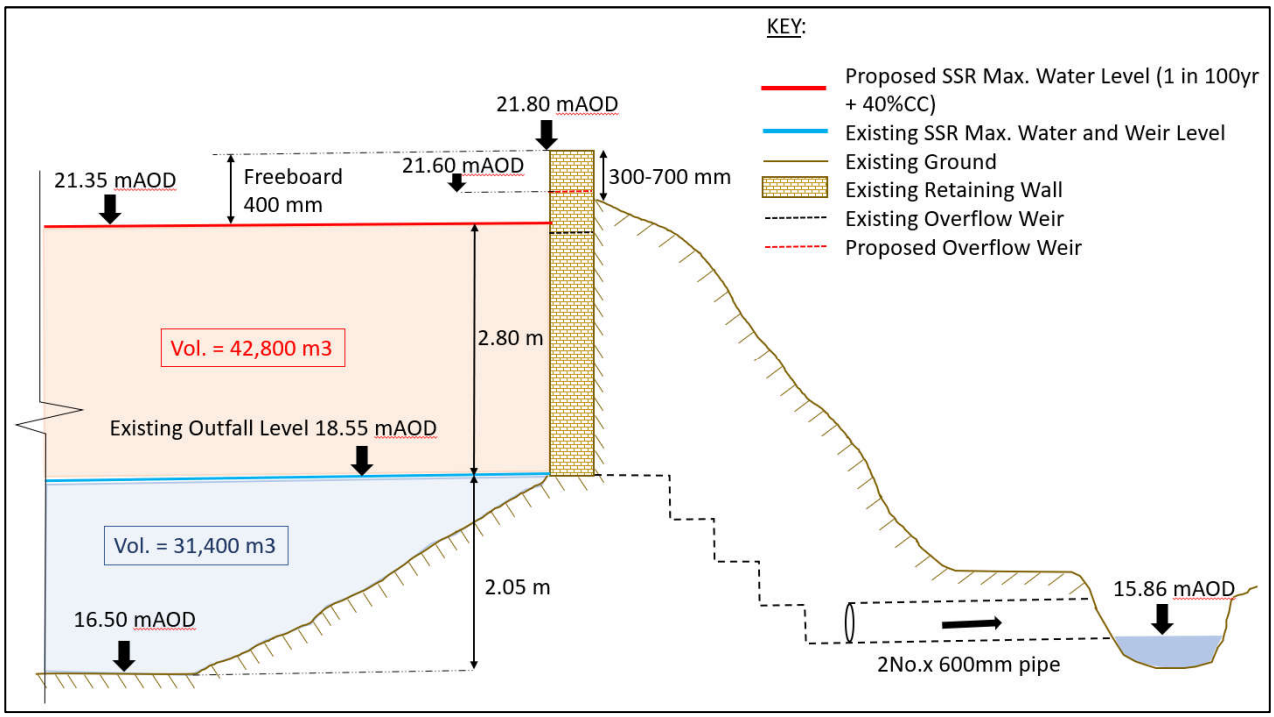


Figure 4-2 - SSR Cross Section (Not to scale/diagrammatic)

On this basis, and as advised by the Panel Engineer, the works which have been identified to the SSR in order to execute the proposed drainage strategy are:

- Flow control measures such as weir/hydrobrake to achieve the agreed discharge rate
- Increase existing Overflow Weirs levels (currently at 21.31mAoD) by circa 300mm.
- Maintaining the same standing water level as present (18.55mAoD) – allowing the level to rise only during rainfall events.
- Provision of formal control structures, inlet and outlet and to the receiving watercourse
- General maintenance of the walls and stone pitching, including removal of vegetation.

4.1.3 South Site Reservoir Rehabilitation

A meeting was held between Atkins and NRW on 17th February 2015 to discuss and obtain forward agreement on approach to S106 Schedule 7 RAP works obligations relevant to the SSR.

NRW observed that the SSR has become 'naturalised' since the closure of the refinery and any improvement works would be likely to degrade the establishing habitat. To avoid this from happening, the proposed strategic drainage system has been designed and implemented in a manner that ensures no adverse impact upon the conservation objectives of the SSR. Consequently, once the development is completed, the quality of the surface water runoff arriving at the SSR will be improved (Refer to Section 4.1.2).

Old refinery infrastructure (i.e. – pipes, cabling, railings) will be cleared, and works will be carried out to the current inlets/outlets to make it more 'formalised' (dependant on the final reservoir/drainage strategy adopted by the Client). The SSR outfall will be subject to resolution under the Reservoirs Act 1975.

4.2 South Site

Please see drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy, 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls and 5041216-ATK-GM-WS-DR-C-6038 Site Wide Earthworks Responsibilities.

4.2.1 South Site Catchment 4

It is proposed that the South Site area will drain by gravity to a number of ponds within the Site. It will then be discharged at a controlled rate of 5.5 l/s/ha into Tal-y-Fedw /Crymlyn Bog at a number of agreed points of outfall. The newly built surface water networks will be designed to Sewers for Adoption 7th Edition, DCWW regional variation standards, TAN 15: "Development and flood risk" and current SuDS Approval Body (SAB) guidance "Statutory SuDS Standards" published by the Welsh Ministers.

Catchment 4 and 5 boundaries, detailed in Figure 2-8, have been used for the development of a strategic surface water drainage model. For the purposes of this drainage model, Catchment 4 has been divided into eight sub-catchments based on Site investigations and historical drawings (refer to 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy in Appendix E).

To avoid any alteration to the current status of the Crymlyn Bog, all flows will be attenuated in the ponds prior to the discharge into Crymlyn Bog at the controlled rate of 5.5 l/s/ha. The results from preliminary drainage model calculations are included for information in Appendix F.

4.2.2 Proposed Outfall and Attenuation Locations

In advance of development, the existing South Bay pond will be expanded to accommodate the surface water runoff from the Site. In addition, eight more attenuation ponds (Ponds 1, 2, 3, 4, 5, 6, 8 and 9) are proposed to increase surface water attenuation capacity further before discharging into Crymlyn Bog. Attenuation features sizing is based on a 1 in 100-year return period rainfall event plus a 40% climate change allowance with discharge limited to 5.5l/s/ha.

As discussed within Section 2.6.2, the ES outlines the majority of the surface water runoff would be attenuated within Wetlands and South Bay areas.

4.2.3 Proposed Attenuation Features

Briefing Note 1 identified two outfall locations and provided likely storage volumes required to attenuate surface water flows. The "Coed Darcy Urban Village – Environmental Statement" (February 2005 by Parsons Brinkerhoff Ltd), provided an approximate storage volume requirement for South lagoons, part of Coed Darcy Wetlands excluding South Bay, of 19,000m^3. The existing attenuation feature volume and the estimated storage capacity, outlined in previous reports, are detailed in Table 4-2 and 4-3.

Table 4-2 Previously Reported Storage Estimates

Pond Structure	Pre-Development Volume (m^3)	Briefing Note 1 Estimate (m^3)	Environmental Statement Estimate (m^3)
South Lagoons	19,881	19,800 to 31,920	19,000

The South Site Catchment boundaries reflect the basic layout of new development and infrastructure. Development will require additional attenuation storage to take increased surface water runoff and meet discharge limits. Proposed catchments have been grouped with associated attenuation features as follows:

Table 4-3 Proposed South Site Storage Requirements*

Pond Structure	Pre-Development Volume (m^3)	Attenuation Volume Requirements (m^3)	Total Volume (m^3)
Pond 1**	N/A	3,100	3,100
Pond 2	N/A	1,900	1,900
Pond 3	N/A	8,300	8,300
Pond 4	N/A	6,000	6,000
Pond 5	N/A	6,000	6,000
Pond 6	N/A	4,300	4,300
South Bay	8,020	3,700	11,720
Pond 8	N/A	6,100	6,100
Pond 9	N/A	1,800	1,800
		41,200	**49,220**

*To be read in conjunction with Atkins Drawing No. 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy.
** Additional Pond to bypass Ellen's Pond
***Pond 8 will attenuate flows from 60% of Catchment 5 area (i.e. sub-catchment 5.1). The rest of Catchment 5 will outfall eastwards away from South Site.

South Bay

South Bay will receive a total impermeable area of 4 ha. South Bay currently attenuates approximately 8,020m^3 of surface water flows. To provide the additional capacity required for the development, South Bay will have to be either expanded by raising bank heights or enlarging its pond area to the south.

In order to avoid South Bay being designated as a reservoir under the Reservoirs Act 1975, the preferred option is to enlarge the pond area to the south. This is proposed taking consideration of the future stewardship and the enactment of the Flood and Water Management Act, which has redefined a "large raised reservoir" as holding 10,000m^3 of water above the natural level of any part of the surrounding land. South Bay in this scenario will increase its volume up to 11,720m3. However, and as highlighted above, this volume will not be above the natural level of any part of the surrounding land. The remainder of Coed Darcy Wetlands will not be changed in order to maintain the existing wetland habitat.

In addition to increasing attenuation pond volume, storage capacity can be increased by underground attenuation storage facilities, SuDS, source control, swales and filter strips. The full attenuation requirements are unlikely to be met by these methods therefore these techniques will be used alongside the existing and proposed attenuation facilities to reduce attenuation pond land-take. Refer to Section 4.5 for further details

4.3 Northern Site

Please see drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy, 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls and 5041216-ATK-GM-WS-DR-C-6038 Site Wide Earthworks Responsibilities

4.3.1 Northern Site – Catchment 1

Catchment 1 is located in the south east corner of the Northern Area.

It has already been established that ground conditions in Catchment 1 are not suitable for the use of strategic infiltration features (See Section 4.5). Consequently, SuDS Infiltration drainage techniques are unlikely to be efficient for this catchment.

The option for the surface water drainage in this catchment is the provision of a Railway crossing and a connection to the Surface Water Sewer at Bridge House (See drawing 5041216-ATK-GM-WS-DR-C-6041

Whole Site Drainage Strategy). An outfall exists in this location that will be further investigated in terms of its viability.

This option will need a railway crossing between Northern and North Site areas to house a sewer, which has its own long-term easement and maintenance cost implications to St. Modwen Developments. Utilising one of the existing infrastructure bridge crossings is the most efficient method of crossing the railway cutting and will be considered when finalising the development masterplan for North Site or ahead of any railway crossing abandonment discussions.

4.3.2 Northern Site – Catchment 3

As mentioned in Section 3.6.3, Catchment 3 currently discharges to the NSR via the existing concrete channel located north of the catchment. There are two options for draining this catchment:

- Option 1 - In order to mimic the existing catchment arrangement, flows from Catchment 3 will be attenuated via the new proposed Pond 10 for onwards discharge into NSR via the existing outfall O3 (Refer to drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy). Flows will be discharged at the agreed 5.5 l/s/ha rate, ensuring that no additional flows will be discharged into the Crymlyn Bog.
- Option 2 (preferred option) – In minimising the dependence on a pump catchment, the preferred option is to attenuate the flows via proposed pond 10, rehabilitate the existing carrier channel and convey the controlled peak flows to the SSR.

4.3.3 Northern Site – Catchment 3A

Flows from Catchment 3A will be attenuated via the new proposed Pond 11 for onwards discharge westwards into the Crymlyn Bog (Refer to drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy) at the agreed 5.5 l/s/ha rate, ensuring that no additional flows will be discharged into the Bog.

4.3.4 Proposed Outfall and Attenuation Locations

To be read in conjunction with Atkins Drawing No. 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy.

In advance of development some of the existing attenuation features will be expanded to accommodate surface water runoff from the Site. In addition, three more attenuation features are proposed to further increase surface water attenuation capacity before discharging into Crymlyn Bog. Attenuation features sizing is based on a 1 in 100-year return period rainfall event plus a 40% climate change allowance with discharge limited to 5.5l/s/ha.

As outlined within Section 3.4, the ES outlines the majority of the surface water runoff would be attenuated within Wetlands and South Bay area.

4.3.5 Proposed Attenuation Features

There are a number of constraints that have defined the location and shape of the proposed Ponds in the area, these are:

- North Site Reservoir dam
- Electricity pylons
- Land ownership boundaries,
- NSR Pumping station compound
- Steep topography

The sizing of these attenuation features has been calculated using Microdrainage software, as outlined in Table 4-4:

Table 4-4 Proposed Northern Site Storage Requirements

Pond Structure	Attenuation Volume Requirements (m^3)
Pond 10	1,800
Pond 11	2,000

4.4 Exceedance Flows

Flows arising from rainfall events in excess of the design event for the drainage system, and which cannot be accommodated within the drainage system are termed exceedance flows. These flows arising from the design events greater than the 1 in 100 years return period event, plus 40% climate change allowance, will be managed on-Site so that they do not adversely affect properties on and offsite.

A Construction Environmental Management Plan (CEMP) is to be prepared for each phase specific, as set out in Planning Conditions 39 and 41 of Outline Planning Application (P2005/0393). The CEMP will include a detailed breakdown of the construction activities as well as details of the proposed temporary protective measures to be carried out to protect the Crymlyn Bog.

4.4.1 North Site

Consideration will be required at the junction of Road 1 and Road 50. This is due to the gradient of the Site. The existing lined trapezoidal ditch course (running south-north to the west of the Road 3 embankment) has been designed as a temporary carrier to store exceedance flows from the Persimmon development, using highways and pedestrian corridors to undeveloped commercial area flows via gravity to this area/feature.

Due to the School Site development being located at the current location of the trapezoidal ditch, it is planned to relocate it and place it parallel to the railway line (Refer to drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy) in order to manage exceedance flows from the North Site development. This part of the development falls in a north westerly direction towards Crymlyn Bog. The exceedance flow channel has been proposed to direct flows along the crest of the railway cutting to the SSR to mitigate against surface flows cascading down the face of the cutting and onto the railway. These works will increase the catchment and storage of the ditch course to allow additional exceedance flows from the Site.

The proposed channel has been included as part of the drainage model and is capable of conveying flows in excess of those arising from the 1 in 30-year return period design rainfall event (conveyed by the piped surface water drainage system) and up to the 1 in-100 year return period event to discharge into SSR.

4.4.2 South Site

Development of the Masterplan will allow for paths for exceedance flows to be directed to main attenuation ponds and routed around properties to avoid flooding. Where possible, exceedance flows will be stored on Site within open spaces or paved areas. The storage of water on the ground surface relies on the proposed finished levels of the Site. As the Masterplan is developed, it will be possible to determine flow paths and areas for the storage of exceedance flows will be addressed as phase specific details are prepared.

To manage exceedance flows overland flow routes and landscaped swales, ditches or channels will be utilised. During detail design, flow velocities will be taken into account and measures installed to minimise the risks of erosion damage.

4.4.3 Northern Site

In general terms the topography of the Northern Site is a hill between North Site Reservoir and the railway with a ridge linking it to the Motorway in the east. On the northern side of the hill, exceedance flows will naturally run into the reservoir. To the south, exceedance flows could be intercepted by a landscaped ditch or swale flowing westwards along the crest of the railway cutting before turning to the north to enter the reservoir. Within the reservoir there will be enough capacity to store flows arising from the design exceedance event.

SMD wish to remove the reliance of the Northern Site with the NSR. The exceedance flows will therefore need to be intercepted following a similar arrangement as mentioned above, discharging in a controlled manner into the Crymlyn Bog.

Within Northern Site Catchment 1 is intended that exceedance flows will be managed within the sub catchment.

4.5 Sustainable Approval Body (SAB) Process

It is a part of the planning condition 22 that 10% of surface water flows are discharged to the ground in order to mimic and maintain the existing groundwater flows which recharge the Crymlyn Bog. Generally, the ground conditions within the Development are generally unsuitable for using infiltration drainage, although there may be some areas where this is feasible (See section 4.5.1)

Schedule 3 to the Flood and Water Management Act 2010 makes Sustainable Drainage System (SuDS) a mandatory requirement for all new developments. SuDS will be designed and built in accordance with the Statutory SuDS Standards published by the Welsh Ministers and approved by the local authority acting in its SuDS Approval Body (SAB) role, before construction work begins.

The drainage strategy outlined within this document contemplates the emerging SABs process at a strategic level, considering that the detail design of SuDS on-plot features will be the responsibility of plot developers in a phasing basis. Hence, the developer will be responsible to provide a SAB's application (which will run parallel to the sitewide Planning Approval (2005/0393) Condition 50 submission) for each of the phases of the development following 7th January 2020. A Site-specific example of responsibilities on the SAB process is presented below:

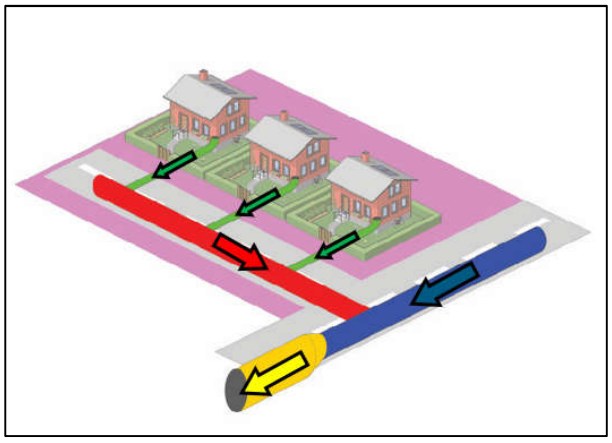


Figure 4-3 - SABs - Responsibilities

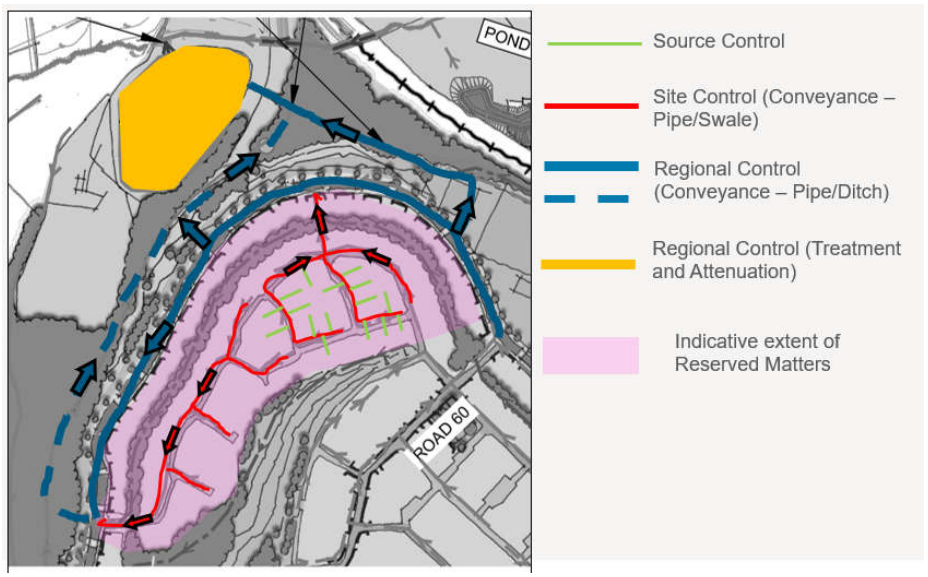


Figure 4-4 - SABs – Indicative schematic of SuDS feature interfaced

SuDS aim to manage rainfall in a way similar to natural processes, making use of the landscape and natural vegetation to control the flow and volume of surface water. SuDS can deliver multiple benefits including:

- flood risk reduction,
- improved water quality,
- opportunities for habitat creation,
- enhanced biodiversity,
- supporting well-being through bringing people closer to green and blue community spaces.

In addition, SuDS can provide habitats for wildlife in urban areas and increase the opportunities for the enhancement of biodiversity. SuDS methods for consideration are:

- Source control techniques
- Outlet control features (such as cascades)
- Infiltration Basins
- Permeable surfaces
- Soakaways
- Swales
- Filter strips.

There are several techniques available, which should be considered as part of a holistic approach to the drainage of the Site. The main types are discussed in the following paragraphs.

4.5.1 Infiltration Drainage

The use of infiltration drainage has been investigated with attention being paid to ground conditions and known contamination issues. The following relevant documentation should be referred to regarding general ground conditions:

- "Phase II Site Assessment – Final Data Assessment Report (DR786R)" – dated 24 August 1999 – by Dames & Moore
- "Final Factual Report for Whole Site Investigation – BP Llandarcy Refinery" – dated 12 August 2005 – by URS Corporation Ltd.
- "Coed Darcy – Outline Planning Application P2005/0393 – Planning Condition 21 Supplementary Information: Discharge Note – dated 7th February 2012 – by Atkins Ltd.

In general terms, ground conditions across the Coed Darcy Site comprise fill material (ash, clinker, brick, rubble, reworked natural soils) over natural soils (clayey material, peat, silt grade material, gravel, glacial drift) which overlies sandstone bedrock. The thickness of the layers varies greatly over the Site. Even though fill material might be expected to be suitable for infiltration drainage this may not be practicable in many places due to its very variable depth

As discussed on previous Briefing Notes, infiltration drainage is not planned for Catchment 1 area as, generally, the underlying ground conditions are not suitable for using infiltration drainage.

Catchment 2 is known to have similar ground conditions to Catchment 1 and therefore offer the same limited opportunities for infiltration drainage. The steep nature of Catchment 2 will also adversely impact the effective use of infiltration drainage systems.

Catchment 3 - it is proposed that SuDS techniques will be used in designing the surface water drainage within Catchment 3 and infiltration drainage will be adopted if ground conditions allow.

The remaining area covered by Catchment 4 comprises impermeable sandstone bedrock outcrops, or bedrock close to the surface. Ground investigations carried out for the SAR and from observations of Remedial Action Plan (RAP) activities suggest that the soils appear to be more granular in nature in Catchment 4 than elsewhere on Site. The granular nature of soils in this area may allow for infiltration drainage techniques to be utilised. Furthermore, the sandstone bedrock lying beneath this granular material is relatively impermeable; however,

fissures within the rock allow the movement of water. If such fissures can be located, then it may be possible to utilise infiltration drainage. This will involve in situ infiltration testing and in practice, can only be carried out at detail design stage when details of the Masterplan for each development area have been confirmed.

A large area of peat has been identified within Catchment 4, this area of peat is unsuitable for infiltration drainage due to its impermeable nature.

Ground conditions at Catchment 5 are unknown at present. Any development within this catchment will utilise SuDS techniques in surface water drainage design. Infiltration drainage is to be adopted if ground conditions allow.

4.5.2 Source control

Techniques here may include living roofs (Green Roofs), water butts and longitudinal soakaways according to design guidance.

The implementation of source control relies on the individual developer with operation and maintenance of the system being in the hands of the householder or building owner. Whilst soakaways (ground conditions permitting) serving individual properties are a well-established method of disposal of surface water and are known to operate successfully there may be some doubt about the operation and maintenance of water butts and rainwater harvesting systems which may be allowed to fill then overflow at every rainfall event.

4.5.3 Permeable Surfaces

Permeable surfaces allow for rainfall to flow through the surface and into the sub base. Here the water may be allowed to infiltrate into the ground or be stored and allowed to slowly discharge to piped or another disposal system. In this second case the permeable surface acts as a flow attenuation feature.

Whilst permeable surfaces can be constructed beneath public highways there are issues regarding the adoption of such roads and features by the highway and drainage authorities. Permeable surfaces can be installed as house driveways and used as soakaways or flow attenuation features but maintenance of the hydraulic flow control device my rest with the householder and could well be neglected.

4.5.4 Swales and Filter Strips

Specific design considerations produced by NPTC outline how swales and filter strips can be implemented. These drainage systems provide a treatment element as well as storing and conveyance of surface water, thus acting as flow attenuation features to store and gradually release flows of surface water.

4.5.5 Online Storage

Allowance has been made for individual development plots to have their own flow attenuation facilities, although this may be varied to suit the Masterplan or the overall development strategy, e.g. adjacent plots could make use of a single attenuation facility. It is also anticipated that as the development will follow sustainable building design, individual plots may incorporate methods such as rainwater harvesting and localised infiltration methods for the disposal of surface water runoff, where ground conditions permit.

4.6 Development

4.6.1 Phases and Related Planning Conditions

The Development will be delivered in phases and it is possible that some plots will be developed before the permanent infrastructure is complete. In this situation, temporary provision of surface water drainage may well be made, possibly utilising the existing former refinery surface water drainage system. To make such a connection an assessment of the existing drainage system will have to be made to ensure that its performance will be satisfactory. Temporary surface water drainage will be provided in the form of piped systems or open ditches which will be lined, if required, to avoid the ingress of contamination into Crymlyn Bog.

Wherever any temporary connection is made, the flow discharged to the Surface Water Sewer or Crymlyn Bog will not exceed the agreed rate.

Further details including all measures to be implemented during the remediation and construction phases to ensure that no additional contamination enters the proposed system can be found within the documents related to the following Planning Conditions (available upon request):

- Planning Condition 16 – Temporary Means of Enclosure
- Planning Condition 17 – Enclosures to Crymlyn Bog
- Planning Condition 39 – Phase Specific Environmental Management Plan
- Planning Condition 44 – Phase Specific Remediation Strategy
- Planning Condition 45 – Verification Report

4.6.2 The Phases

The proposed development phases as well as the required Infrastructure associated to each phase are shown on drawing 5041216-ATK-GEN-WS-DR-C-6061 PC22 Phasing in Appendix E.

5. Conclusions

5.1 North Site

- Flows from Catchment 1 will drain by gravity to the public surface water sewer outfall (DCWW) at Bridge House (See drawing 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls in Appendix E and DCWW Sewer Records in Appendix A). The pipe infrastructure will be privately owned and managed by CDL. Commercial plots will be required to have on-plot attenuation storage and a restricted discharge rate into newly constructed surface water sewer infrastructure

- It is proposed that for the long-term solution the flows from Catchment 2 (please see drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy) will drain by gravity to a rehabilitated South Site Reservoir (for water storage/balancing). It will then be discharged at a controlled rate of 5.5 l/s/ha into Tal-y-Fedw /Crymlyn Bog

- All attenuation features have been sized based on the developable area discharging to each outfall location and a restricted discharge rate to Crymlyn Bog of 5.5l/s/ha (Lower than the calculated QBar of 6.3 l/s/ha).
- NRW observed that the SSR has 'naturalised' since the closure of the refinery and any softening works would be unlikely to further enhance the establishing habitat. Old refinery infrastructure (i.e. – pipes, cabling, railings) will need to be cleared, and works may be required to the current outfall to make it more 'formalised' (dependant on the final reservoir/drainage strategy adopted by the Client). NRW to confirm position in writing.
- Refer to Section 3.5.2. for further NRW conclusions/recommendations.

- The (Atkins's) Nutrient Management Plan (NMP) will be prepared every year to provide details on how nutrients, specifically nitrates and phosphates, will be managed on the Site and, where necessary, attenuated prior to discharge into Crymlyn Bog. See Appendix D.

5.1.1 Initiate SSR rehabilitation programme as outlined in Section 4.1.

Section 3.3 details an indicative program of actions, spanning 18 months from design and permission negotiation to construction and operation, to rehabilitate the SSR to a functioning North Site attenuation feature. There are significant temporary works and ongoing operational costs in utilising the SSR long term for surface water discharge for the corresponding North Site gravity catchment.

Initiation of the SSR rehabilitation needs to be factored into the future land sales programme given the lead-in times from instruction to operation. Consideration of the long term SMD reservoir, railway crossing and temporary works plans for the Site, and its required operational start date will need conclusion before initiation.

5.1.2 Crymlyn Bog channel improvement works with NRW

Section 3.5.3. details NRW discussions in relation to the Crymlyn Bog.

NRW have indicated the discharge to Crymlyn Bog would be conditional on improvement works to the Crymlyn Brook and Tal-y-Fedw existing channels. NRW are looking to progress with these works as part of the EU-LIFE funding bid.

5.1.3 Progress with revised Planning Condition 21 application

As stated, after the meeting carried out on the 14th November 2018 with NRW and Atkins. NRW stated that Planning Condition 21 (discharged by Neath Port Talbot Borough Council during February 2012) needs to be revised. This is due to the new strategy where flows will no longer drain by gravity across a railway pipe bridge to the NSR, but to the east and into the Bridge House outfall. Flows will be attenuated within the Site prior to discharge.

5.2 South Site

- Partially attenuate Catchment 5 surface water flows into Pond 8 sized to attenuate **6,100m^3**. The remaining surface water flows may be discharged into an existing surface water drainage system to the east. Converting land use from commercial to residential will increase permeability and therefore reduce capacity requirements that are already being met. Capacity within the existing network will therefore not be an issue. Further investigation into the arrangements for surface drainage of this area are required.

- Provide storage capacities as shown on drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy to attenuate flows from Catchment 4.

- Increase the storage capacity of South Bay by **3,700m^3**. This will be achieved by increasing the pond area of South bay to the south.

- All attenuation features have been sized based on the developable area discharging to each outfall location and a restricted discharge rate to Crymlyn Bog of 5.5l/s/ha (lower than the calculated QBar of 6.3 l/s/ha).

To further inform recommendations the following additional works will be conducted:

- An understanding of the source of the remaining water within the existing attenuation ponds is also required.

- additional attenuation ponds. Their impact on developable area and masterplan needs to be considered.

5.3 Northern Site

Based on the proposed Earthworks Levels (As shown on drawing 5041216-ATK-GM-WS-DR-C-6027 in Appendix E), surface water from Catchment 1 (draining to the bowling club corner) cannot drain by gravity to North Site Reservoir. Options for the surface water drainage in this catchment are:

- Infiltration drainage, which would be subject to the ground conditions being favourable.
- Attenuation with a connection to the public foul/combined sewer located north of the railway line. DCWW asset SW MH 0201 (SS71969204)
- Railway crossing and connection to the Surface Water Sewer at Bridge House (See drawing 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy).
- Leave Catchment 1 undeveloped, merely constructing an access road to allow further development progress at Catchment 3.

All attenuation features have been sized based on the developable area discharging to each outfall location and a restricted discharge rate to Crymlyn Bog of 5.5l/s/ha (Lower than the calculated QBar of 6.3 l/s/ha).

5.3.1 Remove reliance on NSR

For both the North and Northern Sites, the strategy has been developed to remove the reliance on the existing situation. Currently flows drain by gravity across a railway pipe bridge to the NSR for the North Site. Alternatively, flows will now flow westwards to the SSR.

6. References

The most relevant documents referred to are as follows;

- "Llandarcy Urban Village – Surface Water Drainage Strategy – Design Note" – dated March 2004 – by Ove Arup & Partners Ltd
- "The Urban Village Project, Llandarcy – Infrastructure Strategy Report" – dated June 2004 – by Ove Arup & Partners Ltd
- "Coed Darcy Urban Village – Environmental Statement" – dated February 2005 – by Parsons Brinkerhoff Ltd
- "Modelling Assessment Report" – dated June 2006 – by Hyder Consulting (UK) Ltd for Morrison Construction on behalf of DCWW.
- "Coed Darcy – Surface Water Drainage Attenuation Strategy for Discharge into Crymlyn Bog – Design Note" – dated October 2006 – by Ove Arup & Partners Ltd
- "Coed Darcy Urban Village Development – Surface Water Drainage Strategy – Briefing Note" – dated October 2008 – by Atkins Limited
- "Coed Darcy Urban Village Development – Surface Water Drainage Strategy – Briefing Note 2 – Strategy for Catchment 1" – dated May 2009 – by Atkins Limited
- "Coed Darcy Urban Village Development – Drainage Strategy – Briefing Note 3 – Options Appraisal" – dated June 2010 – by Atkins Limited
- "Coed Darcy Urban Village Development – Drainage Strategy – Briefing Note 4 – Surface Water Drainage Strategy for Northern and North Areas and Preliminary Foul Drainage Strategy – Dated December 2010 – by Atkins Limited.
- "Coed Darcy – Revised Masterplan – Drg No. 1332/400/MP/SK/TERT Rev H" – by Alan Baxter & Associates LLP.
- Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales – Climate Change Allowances – Welsh Government – December 2017"
- "Coed Darcy – Proving Layout Area 1 – Drg No. 8243-SK501A" – by Roberts Limbrick.

Appendices

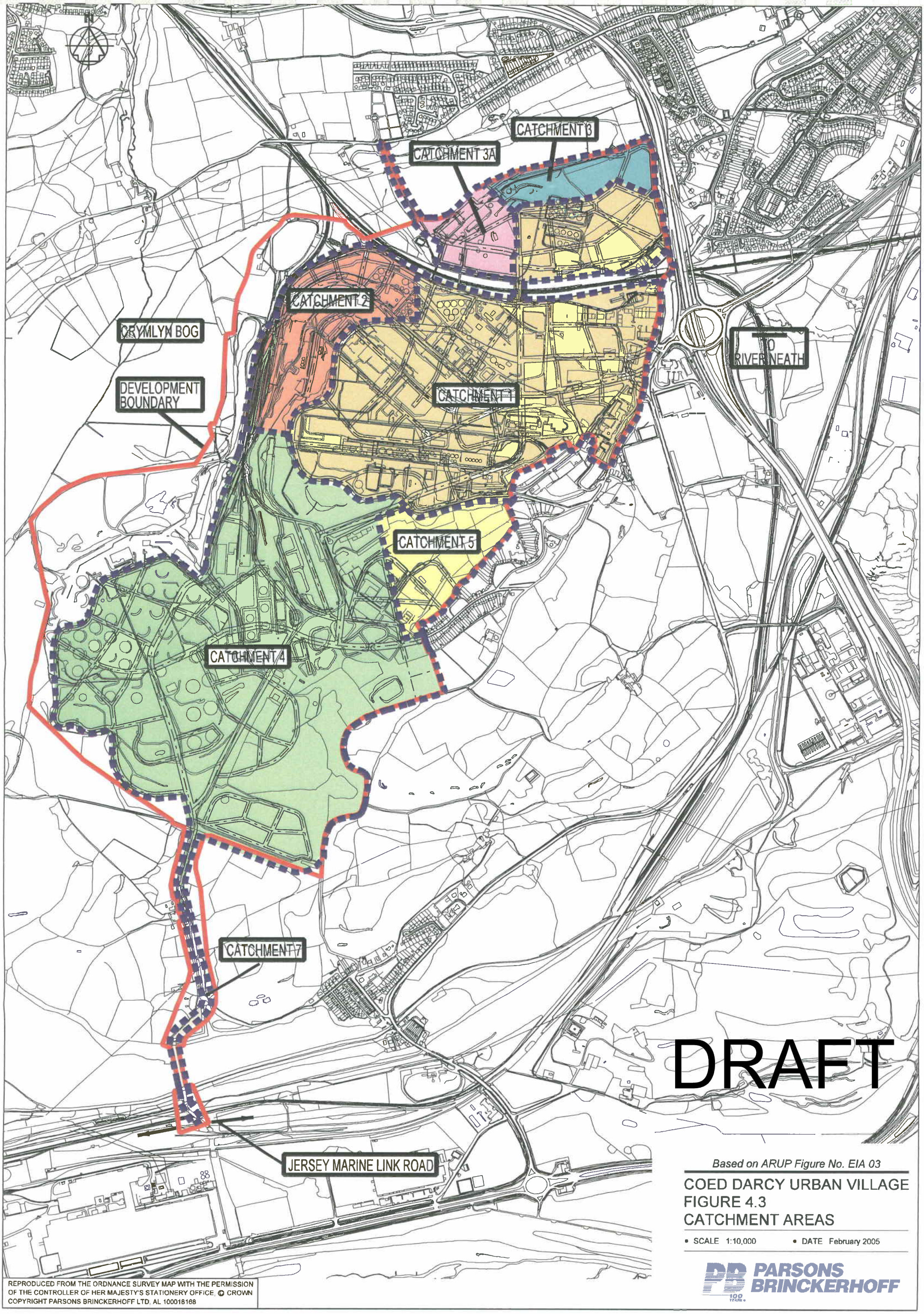


Appendix A. Historical Information

A.1. Coed Darcy Environmental Statement, Figure 4.3 – Catchment Areas (Parsons Brinckerhoff 2005, from S106 documentation)

A.2. DCWW Sewer Records

A.3. Hydrological Features along the Crymlyn Bog (Jan 2006)



REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE, © CROWN COPYRIGHT PARSONS BRINCKERHOFF LTD, AL 100018168

Based on ARUP Figure No. EIA 03

COED DARCY URBAN VILLAGE
FIGURE 4.3
CATCHMENT AREAS

- SCALE 1:10,000
- DATE February 2005

PARSONS BRINCKERHOFF

Dŵr Cymru
Welsh Water

Coed Darcy Surface water removal opportunities Drawing

Opportunity;
Remove S.W. flows from combined using RainScape interventions on the high-way (see catchment visual summary doc) direct flows to 750mm SW sewer discharging to Neath. New SW line over bridge in high-way required to remove risk of increasing flows across Railway.

School Attenuation / Disconnection opportunity to remove approx 14,000m2 area of roof and hard standing. Reduce flows to Pentrffynon so increasing capcity to pump forward from Dynefor lif pumps allow.

Opportunity;
Disconnect S.W. from highways and roofs using Rainscape and direct flow to reservoir, so reducing risk of increased flows to the SW system over the railway.

RISK;
Manholes blow on the highway during rainfall events.
High flows have been identified from the Crymlyn Road top and Skewen.

RISK;
Combined sewer crosses railway in an open metal trough which forms part of network rails asset base and conveys the surface water from the seperate system to the east of the motorway.
Aditional flows into this surface water line could lead to expensive investment on the existing asset due to capacity issues and increased risk to network rails assets.

RISK;
Historically an illegal CSO from combined into the SW line existed. - Operations to inform if CSO still exists.

RISK;
Dynevor SPS in a poor state of repair. No investment made to date (See Dynevor Pre scheme investigation report) No investment identified in AMP 6 plan.

Opportunity;
Remove S.W. flows from combined using RainScape interventions on the highway (see catchment visual summary doc) direct flows to 750mm SW sewer discharging to Neath. New SW line over bridge in highway required to remove risk of increasing flows across Railway.

SW. Flows go to Pentreffynnon SPS - this links into Dynefor rising main so reduces capacity for Dynefor.

SW. flows are connected into combined and go direct to Dynefor.

Green space with potential for attenuation

Green space with potential for attenuation

Development area

M 4 motorway

SA106YN

SKEWEN (SCIWEN)

The Park

Depot

D'Arcy Business

Leisure Complex

Swimming Pool

Tennis Courts

Playing Fields

Cefn Parc

Pen-yr-bedol

Pentreffynnon

Business Park

Foot Bridge

Tennant Canal

Scrap Yard

Scrapyard

Tank

Conveyor

Pipeline

Pond

Ponds

Depot

Sinks

Issues

Gantry

Mast

Chy

Dovecote Barn

Cwrt-y-bettws

Barn 2

Refuse Tip

Jersey Marine Loop Track

River Neath

Mean High Water

River Neath (Afon Nedd)

Mud and Shingle

Shingle

Drains

Resolved by better information DFL.002794: Skewen (New Road)

Resolved by better information DFL.002796: Skewen (Park Avenue)

Active DFL.002799: Skewen (Pen-yr-allet Avenue)

Active DFL.002792: Skewen (Bay View Gardens)

Active DFL.002793: Skewen (Neath Abbey Wharf)

Active DFL.002798: Skewen (Pentreffynnon SPS)

S1044 SPS: NEATH LONLAS SKEWEN

52655 SPS: SWANSEA CRYMLYN ROAD TOP

S1160 SPS: NEATH SOUTHAM AVENUE

53036 SPS: PENTREFFYNNON

53025 SPS: DYNEVOR (NR NEATH)

R2029



Legend

AGA_Risks
- a <all other values>

Status
- i RiskAddressed

BGA_Risks
- a <all other values>

Status
- i RiskAddressed
- sampling_sites_wims_wa_open
- DFL_160712
- SPS_layer
- Current_CSOs
- Surface_Water_Entering_Non_Surface_Manhole
- Culverts Polygons
- sde_MAGIC_magswwa
- WW_BW_poly_Sep2012
- SSSI (English Nature)
- Ancient Monuments
- Nature Reserves
- Annotation
- Unclassified
- Tidal water
- Buldings and Structures
- Landform and General Surface
- Road, track rail and paths
- Natural Environment
- Inland Water

DRAFT FOR INFORMATION

This drawing is for internal information purposes and not to be shared outside of DCWW.

Drawn by L. Davis
Issued: 03.11.14

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref:	COED DARCY
Map scale:	1:3,318
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Printed on:	23/10/2014

DRAFT REPORT TO ERM

SURVEY OF HYDROLOGICAL FEATURES ALONG THE CRYMLYN BOG-COED DARCY INTERFACE AND THEIR INFLUENCE ON THE ECOLOGY OF CRYMLYN BOG SSSI

By

Dr Alistair Headley

Date: November 2005

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SURVEY OF HYDROLOGICAL FEATURES ALONG THE CRYMLYN BOG-COED DARCY INTERFACE AND THEIR INFLUENCE ON THE ECOLOGY OF CRYMLYN BOG SSSI

1. INTRODUCTION

1.1. Location and Background

The Coed Darcy proposed development site occupies the former Llandarcy BP Oil Refinery site, to the east of Crymlyn Bog. It is proposed to develop an Urban Village on this site. This development will affect some of the water courses and other hydrological features which come from the site and drain in to Crymlyn Bog. Crymlyn Bog is designated as a Site of Special Scientific Interest (SSSI), Special Area of Conservation, (SAC), Wetland of International Importance (Ramsar Site) and part National Nature Reserve (NNR). Crymlyn Bog is the largest lowland fen in Wales with the mire expanse covering an area of approximately 266 ha and is located in a small valley (1119 ha) on the South Wales coast between Swansea and Neath.

1.2. Features of conservation interest

Crymlyn Bog has several notified features which are of community importance under the European Union's Habitats Directive. These features are alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* and finally transition mires and quaking bogs. Crymlyn Bog SSSI is also important as the largest lowland fen in Wales and having extensive stands of fen vegetation which are uncommon or absent from the rest of Wales. As Crymlyn Bog is a wetland it is in part dependent for its water supply and therefore nutrient supply on the land where there is the proposed Urban Village development.

For the Coed Darcy application to proceed through the planning process the Countryside Council for Wales (CCW) have advised that further information regarding the current hydrological inputs to the Bog from the Coed Darcy site is required. Alongside this, the detailed design for the Coed Darcy surface water discharges to the Bog will need to be informed by the key hydrological features. Consequently these features need to be identified on the ground and their importance for the maintenance of receiving habitats within Crymlyn Bog SSSI.

1.3. Scope of the report

This report therefore describes the results of a survey of the hydrological features that may be influenced by the proposed development and how they currently affect the ecology of Crymlyn Bog.

2. METHODS

2.1. Survey of the Hydrological features

The strip of land between 10 and 100 metres wide along the eastern margin of Crymlyn Bog was surveyed on 21st and 22nd November 2005 for any hydrological features. The areas surveyed are shown in Figure 1. The features examined included streams, ditches, ponds, springs, seepages and flushes. The approximate discharge was estimated visually and the route taken by the water towards and into Crymlyn Bog was noted. The location of the feature was established using a Garmin Geko 201 GPS receiver. Where ambient light conditions allowed photographs of the features and vegetation were taken with a Nikon coolpix 4500 digital camera. Notes were taken of the type of vegetation present within and/or around the type of water feature and which vegetation types it discharge into on Crymlyn Bog.

3. RESULTS

A total of 17 hydrological features were identified along the 4.5 km of 'high' ground on the eastern margin of Crymlyn Bog. There are two major streams which come from the Coed Darcy proposed development site, the combined North and South Site Reservoir outflows (Tal-y-Fedw Brook) and Freeman's Bund outflow. The Tal-y-Fedw Brook does receive some water from the north a very small water course that runs alongside a track that descends from near Caer-hendy by Crymlyn Road.

Freeman's Bund stream receives water from much of the Penisa'r-Coed farm and from the southern area of the proposed development on what used to be the tank farm of the refinery complex. Much of the water reaches Freeman's Bund via channelised streams and ditches, some of which are fed by rises and issues that come from within the area of the proposed development. The water passes through a separator before it enter Freeman's Bund proper and then flows into Crymlyn Bog through two pipes in the bund wall.

The only other source of water that discharges water in any significant quantity is that from the lagoon outfall. This enters Crymlyn Bog via a valve and pipe system that is fed from a series of lagoons. The water issues into an area of open water on the margin of Crymlyn Bog and then passes around the margins of the lagoon and along the eastern side of a spur of made ground that projects out into the mire. Although the quantities of water discharged from this point are not known they probably do not make a significant contribution to the overall hydrological budget of the site at present. This does not mean that it did not make a very significant contribution to the site when the refinery was in operation when the outfall was contributing in the region of between 30 and 50 litres s^{-1} (Gilman 1990, Headley 2004).

Four small springs were identified that flow via ill defined channels directly into Crymlyn Bog and disperse into the mire without connecting directly with a particular man-made channel. The only water feature that connects direcly with a man-made channel is the one at the old Tal-y-Fedw farm. This spring is in poor condition due to poaching by horses and partly disperses into an area of pasture, but ultimately feeds into a drain that runs down on to Crymlyn Bog where it joins the Tal-y-Fedw brook.

There are a few areas of seepage around the eastern margins of Crymlyn Bog where the water disperses into the fen vegetation. There are several seepage areas around the margin of Lousy Hill and some at the edge of the old Tank Farm and one at the foot of the slope just to the south of Tal-y-Fedw. These particular seepages contribute exceedingly small quantities of water and therefore insignificant to the hydrological budget of the mire, but the ones around Lousy Hill are important for maintaining the wet heath and transitional type vegetation between the dry ground and the adjacent rich fen habitat in Crymlyn Bog.

Most of the old refinery site margin is surrounded by catch ditches which intercept any overland flow, but most importantly do not connect with water courses on the mire, except those indicated in Figure 2.

4. DISCUSSION

4.1. Importance of hydrological features

Of the water features surveyed those that are of greatest importance to the hydrological budget of Crymlyn Bog is the combined discharge of Tal-y-Fedw brook and the stream at

Freeman's Bund. Although the quantities of water coming from the consented discharge point at the lagoon outfall are not known observations suggest that it is not sufficiently large to affect significantly the ecology of the SSSI, except through the maintenance of reedswamp (*Phragmites australis* swamp and reed-beds S4).

The various springs and flushes around the eastern margin feed directly into wet woodland with a canopy dominated by a mixture of alder (*Alnus glutinosa*), downy birch (*Betula pubescens*) and grey willow (*Salix cinerea*). They invariably have an understorey dominated by greater tussock sedge (*Carex paniculata*) which places these woodlands in the *Alnus glutinosa-Carex paniculata* woodland (W5) of the National Vegetation Classification (NVC) (Rodwell 1991). This type of woodland qualifies as the priority habitat 'alluvial forest with *Alnus glutinosa* and *Fraxinus excelsior*' under the EU habitats directive (European Commission DG Environment 2003).

The seepages and spring waters feeding into this habitat are not considered to be important in terms of quantity, because the peat surface in which they are rooted is within the height range to which the water table across Crymlyn Bog achieves on a regular basis. The quality of the water input may be significant if it encourages the growth of vigorous herbaceous plants indicative of nutrient enrichment, such as nettle (*Urtica dioica*). Nettle is unlikely to out compete the much larger tussocks of grater tussock sedge and therefore increased nutrient loading is unlikely to have a significant impact on this habitat. Also the trees are unlikely to be adversely affected in terms of growth or species composition as this type of habitat is a productive climax community. A change of vegetation from a W5 woodland to a *Alnus glutinosa- Urtica dioica* woodland (W6) is unlikely to change its status as an 'alluvial forest with *Alnus glutinosa* and *Fraxinus excelsior*' (European Commission DG Environment 2003).

The very narrow marginal band of 'wet heath' vegetation around the margins of Lousy Hill where it merges with rich-fen habitat is dependent on acidic low nutrient seepage water coming from the high ground. However this area is highly unlikely to be affected by the Coed Darcy development. and understorey as the is unlikely to be affected significantly by extra nutrients.

4.2. Recommendations for hydrological monitoring

It is recommended that the flow in the combined North Site and South Site Reservoir overflows into the stream at Tal-y-Fedw is monitored using a weir system. This can be put in place where the track to Tal-y-Fedw crosses over on the upstream side of the bridge. The other consented discharge that needs flow monitoring is that at Freeman's Bund. This is probably best placed as a weir where the water discharges out of the separator via a series of five or six pipes by breaking these out and putting in place a weir.

With the exception of the lagoon outfall, no other consented discharges or other water courses are sufficiently large discharge or suitable to warrant the installation of flow monitoring equipment. Although the quantities of water coming from the consented discharge point at the lagoon outfall are not known observations suggest that it is not sufficiently large to warrant flow monitoring. It would also be possible to install a simple flow meter on this outfall to quantify total outputs, but it would not give information on the flow response to rainfall events. The catchment that feeds this outfall is wholly man-managed and it is difficult to ascertain the exact catchment which feeds this outfall and it would therefore be of limited value to monitor the discharge from the lagoon outfall.

There is no value in trying to monitor the flow on any of the springs or seepages that were observed in this survey as their flows are too low to affect significantly the ecology of Crymlyn Bog and it would be technically very difficult or impossible to monitor flows.

4.3. Other recommendations for future survey and/or monitoring

As the proposed development is likely to result in significant disturbance of soils within the Coed Darcy development it is suggested that the nutrient loading of the streams is monitored. This is because several of the habitats within Crymlyn Bog SSSI are dependent on the supply of nutrient poor water. It would therefore be appropriate to monitor concentrations of nitrogen (ammonium and nitrate) and phosphate (dissolved and organic) in the streams as well as suspended solids.

5. REFERENCES

EAW 3rd October 2005. Coed Darcy Urban Village: surface water drainage monitoring.

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Rodwell, J.S. (ed.) 1991. British Plant Communities. Volume 1. Woodlands and scrub. Cambridge: Cambridge University Press.

ACKNOWLEDGEMENTS

I wish to thank Mr Charles Fletcher for his assistance and cooperation during the survey and to BP Llandarcy for providing access to the site.

Table 1. The results of the survey for water features along the Coed Darcy-Crymlyn Bog interface.

		Water source					Receiving Waters and habitats		
Location name	date	easting	northing	Type of feature	Estimated discharge ($l\ s^{-1}$)	Vegetation Type in/over feature	easting	northing	Receiving habitat
St Margaret's well	21/11/2005	70603	93905	stream	c. 1	W10a with *Ranunculus repens* in stream	70632	93850	disperses into W5a with *Iris, Oenanthe crocata* and *Ligustrum vulgare*
Lousy Hill	21/11/2005	69970	94040	stream/seepage (ephemeral)	<0.1	W10a with *Ranunculus repens* in stream	69970	94015	disperses into W5b with *Dryopteris carthusiana*
Lousy Hill	21/11/2005	69835	94103	seepage line at base of slope	<0.1	M16b? At base of slope with *Ulex europaeus* scrub upslope	69835	94091	disperses into M25a/c - with *Osmunda*
Lousy Hill to	21/11/2005	69672 to 69777	94312 to 94463	seepage line at base of slope	<1	M16b? At base of slope with *Ulex europaeus* scrub upslope			disperses into W5a with *Dryopteris carthusiana, Osmunda regalis*
Freeman's Bund	21/11/2005	69869	94577	man-made pool	0 (c. 6m x 8m)	*Juncus effusus* and *Glyceria fluitans*			
Freeman's Bund	21/11/2005	69947	94639	stream from separator	5 to 15	W10a with *Betula* & *Salix* canopy	69904	94722	pool with Iris, Juncus effusus and Carex paniculata in W5a
North and South site reservoirs	22/11/2005	70833	96390	streams and outflows	5 to 15	W10a with *Quercus* canopy			stream with ochre on bottom
Tal-y-fedw	22/11/2005	70720	96250	spring - badly poached	<1	*Ranunculus repens* & *Juncus effusus*			pasture
Tal-y-fedw	22/11/2005	70633	96085	seepage area at base of field	<1	MG10c rush-pasture	70627	96089	disperses into S4b with *Carex paniculata*
Railhead separator	22/11/2005	70630	95768	ditch	c. 1	S3 swamp under a *Salix cinerea & Betula pubescens canopy*	70613	95760	enters a S4a swamp filled ditch
Crymlyn Brook	22/11/2005	70113	95615	ditch	?	S4 with *Carex paniculata*	70113	95615	S4 choked ditch/stream with *Carex paniculata*
Lagoon outfall	22/11/2005	70059	95354	pipe	1-5?	not applicable	70059	95354	catch ditch with *Potamogeton polygonifolius* surrounded by S4
	22/11/2005	70054	95029	seepage	<0.05	W5	70034	95030	S4b
	22/11/2005	70059	95035	seepage	<0.05	W5	70017	95032	S4b
	22/11/2005	70068	95065	spring	c. 0.1 - 0.3	W5 with *Iris pseudacorus*	70025	95067	S4b
	22/11/2005	70079	95134	ditch with water	0 (stagnant)	W10a			

Figure 2. Map showing the water features (dark blue lines) found during the survey of the interface between Crymlyn Bog and the proposed Coed Darcy development. Arrows indicate directions of flow.

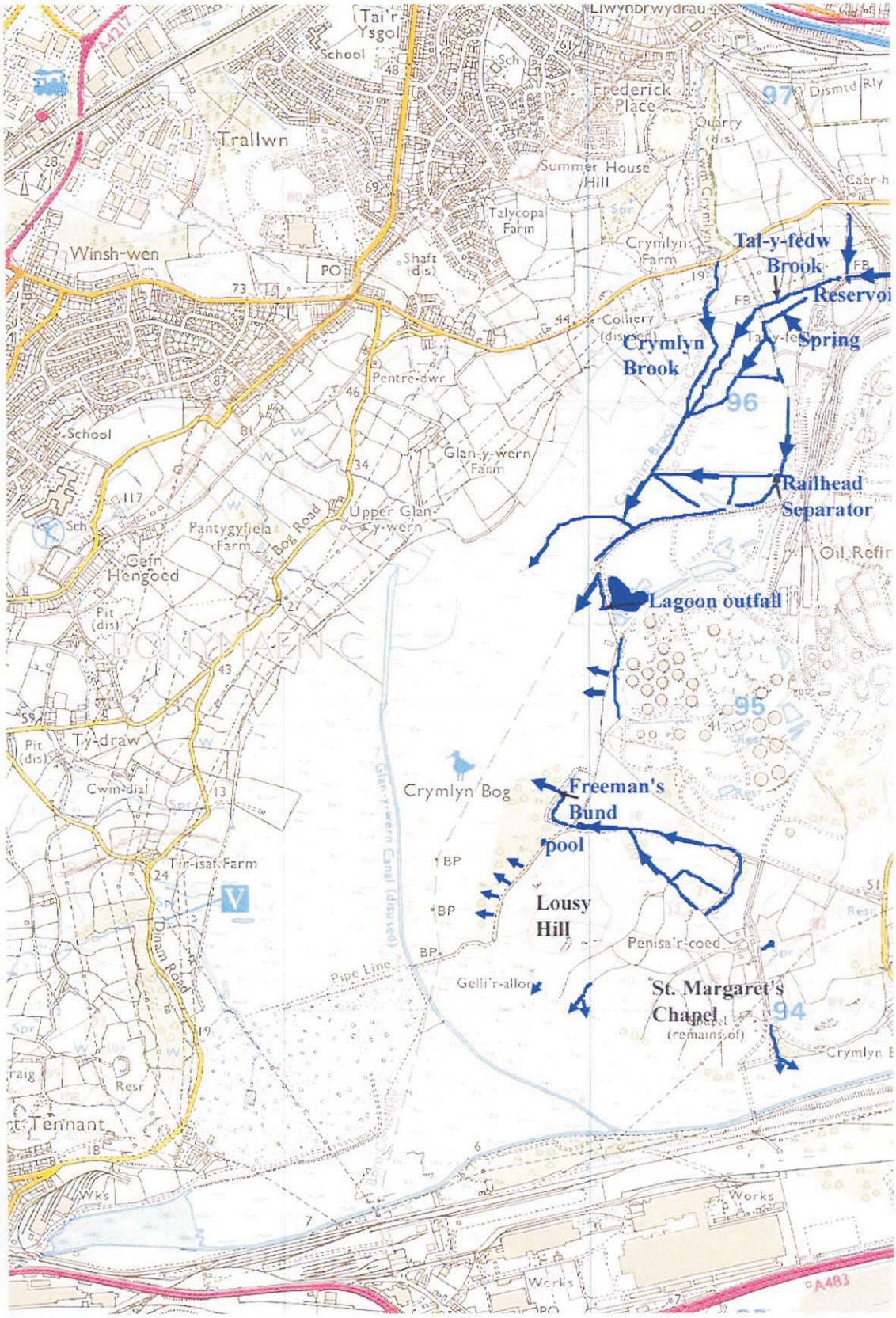
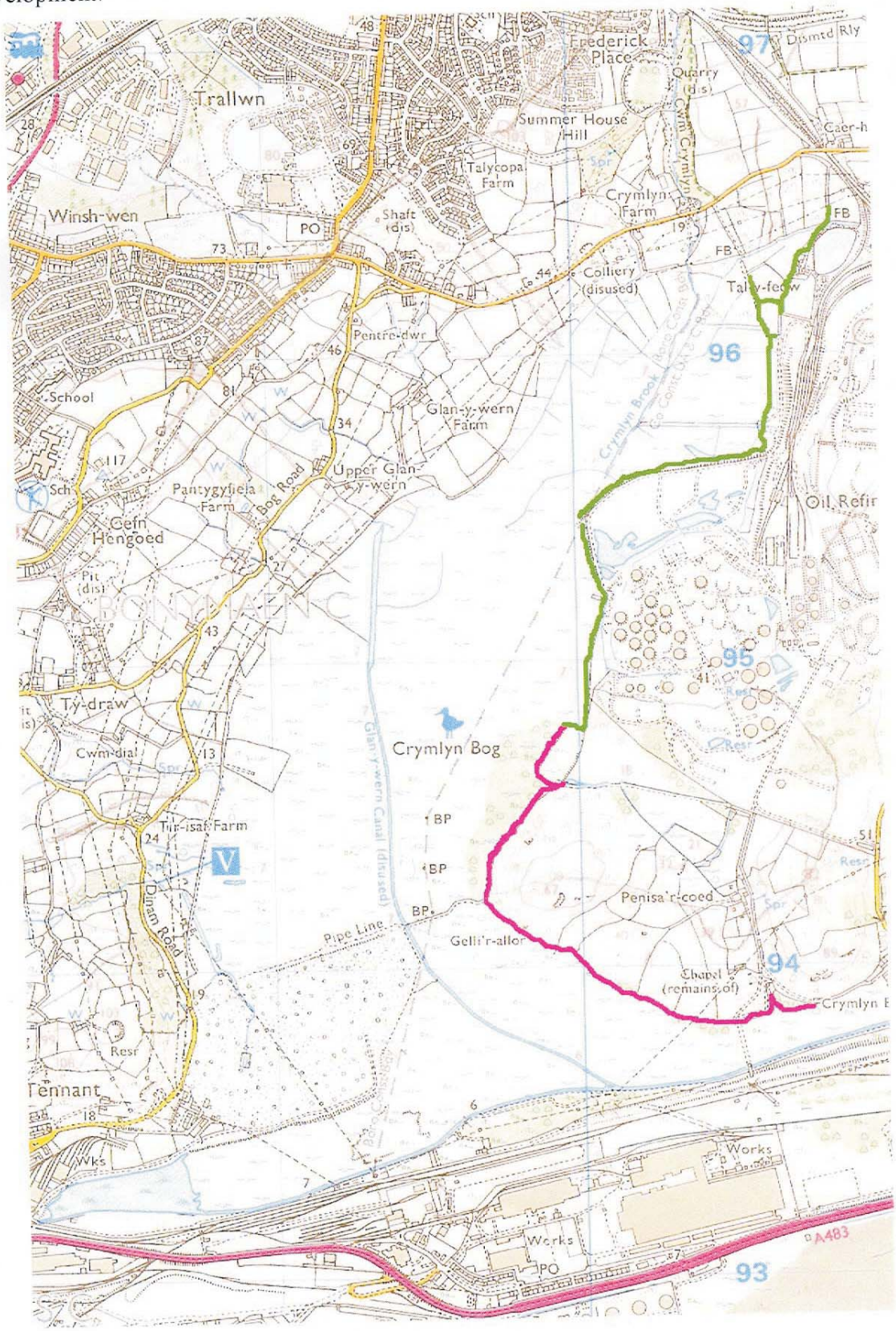


Figure 1. Map showing the areas surveyed on 21st (purple line) and 22nd (green line) November 2005 along the interface between Crymlyn Bog and the proposed Coed Darcy development.



Appendix B. NRW Meeting Minutes

B.1. NRW Meeting Mar11

B.2. NRW Meeting Feb18

B.3. NRW Meeting Nov18

B.4. NRW Meeting Jan20

ATKINS

Minutes of Meeting

Project:	Coed Darcy	**Subject:**	Drainage - Briefing Note 4
Date & Time:	11th March 2010 @ 12:00pm	**Meeting No.:**	1
Meeting Place:	CCW Offices, Swansea	**Minutes By:**	Richard Engledow

Present:

Gideon Carpenter – EAW

Mike Launder – CCW

Becky Wright – CCW

Peter Jones (via video link) – CCW

Justin Griffiths –NPT Highways

Steve O'Rourke – NPT Highways

Ian Harper – Atkins

Richard Engledow - Atkins

Next Meeting:	On site – date to be arranged		
Distribution:	Neil Williams – SMD Lee Owen – Prosurv Jon Hurley – Savills Melissa Hall – NPT Dave Adlam - NPT Gareth Davies - EAW Mike Poland – Atkins Steve Novak – Atkins Michelle Lee – Atkins		
Date Issued:	15 March 2011	**File ref:**	50421216

NOTE TO RECIPIENTS:-
These minutes record Atkins understanding of the meeting and intended actions arising therefrom. Your agreement that the minutes form a true record of the discussions will be assumed unless adverse comments are received in writing within five days of receipt of these minutes

		ACTION
	Aims of Meeting 1. Clarify requirements to fully discharge of Planning Condition (PC) 21 – clarify wording relating to site wide ground water strategy; 2. Seek agreement that PC 22 is partially discharged by Briefing Note 4; 3. Re-affirm principle to re-establish the natural catchment of the Crymlyn Bog (the Bog); 4. Discuss proposal and seek agreement to drain a greater proportion of the development site into the Bog than originally proposed; 5. Discuss and seek agreement on method of diffused discharge from proposed balancing facilities draining into the Bog; 6. Discuss and gather opinions regarding routeing foul water pumping main adjacent to and over (on Southern Access Road viaduct) the Bog; 7. Discuss Atkins' recent proposals regarding PC 33 (monitoring of nitrates, phosphates and electrolytes) and seek to clarify wording of PC 32 (automated monitoring station?); 8. Explore issues around the proposal to lay private surface water sewers under public adopted highways and the potential influence of the Flood and Water Management Act on SUDS. **Discussion and Actions/Decisions (in bold)** **Items 1 to 5** Although ground water infiltration methods would be preferred, it was accepted that there are few opportunities for this within the Central Site/Catchment 1 due to ground conditions and the risk of mobilising pollutants in ground water. **Therefore it was agreed that the requirement of PC 21 in relation to this catchment regarding infiltration could not be achieved. The proposed approach, to balance flows strategically (Regional Control as described in the SUDS Management Train CIRIA 697) and for developers to incorporate appropriate source control methods within their developments, was accepted.** It was acknowledged that when the catchment to the south was examined in detail Atkins would seek to maximise infiltration opportunities across the catchment, provided ground conditions are suitable. This would dealt with under PC 22 A recently completed high level plant survey of the Bog is now available to CCW and this will help to inform the design of methods of discharging into Bog. As remediation of South Site	**All to note**

		ACTION
	Reservoir (SSR) is underway and it will be necessary to develop the design of the SSR as a strategic balancing facility **it would be timely for CCW to review the survey data as soon as possible.**	**CCW**
	A site meeting of the key people is to be arranged for mid to late April at which methods of diffuse discharge into the Bog will be examined in more detail.	**Atkins**
	As stated in the Coed Darcy Urban Village Environmental Statement (February 2005), there is already agreement that the historical catchment areas (i.e. prior to the construction of the refinery) should be restored. A 'Water Balance Study of the Crymlyn Bog' (Appendix 15.B Coed Darcy Urban Village Environmental Statement) was undertaken by URS Corporation Ltd in which the impact of restoring the historic catchment was assessed. BN 4 proposes that an additional area (over and above that considered by the URS report) of the Central Site /Catchment 1 is drained towards the Bog. The additional 13.5ha area is approximately 1% of the total catchment area of the Bog. Calculations during the meeting suggested this could equate to an additional mean flow of 2 l/s into the Bog.	
	It was accepted that this was thought to be not likely to be significant but confirmation of the exact figure would be required in order to demonstrate to NPT Planners, CCW and EAW that re-directing surface water flows from the additional area into the Bog would not have additional effects required for consideration under Regulation 61 (provided the extra flow [including peak flow] can be attenuated to maintain the desired hydrograph profile)	**Atkins**
	Although it is unlikely that there would be a significant impact, there was some discussion about possible methods of mitigating the effect of greater flow entering the Bog through water management within the site. This could involve improvements and installation of control structures (such as timber weirs) to the Crymlyn Brook running through to the Bog PJ expressed CCW's desire to undertake wider and larger restoration projects on the Fen. **The possibility of funding of a scheme(s) by SMD was raised by CCW and Atkins agreed to raise with them to prompt direct dialogue between CCW and SMD.**	**Atkins/SMD**
	The agreed approach to discharge PC 21 and progress towards the partial discharge of PC 22 was as follows: **Atkins/Savills to make a submission to NPT Planners explaining why PC 21 should be considered as a stand-alone Condition and discharged, as agreed during the**	**Atkins/Savills**

		ACTION
	meeting. The reasoning is that Atkins have demonstrated that surface water from the original Catchment 1 can be discharged entirely to the River Neath outfall with flows balanced within the proposed development, as required by this Condition. Furthermore it has been established that there is no opportunity to use infiltration methods to dispose of surface water in this catchment and that the ground water strategy for the remaining site area will be covered under PC 22; i.e. a site wide ground water strategy is not relevant to PC 21.	
	Atkins/Savills will confirm to NPT that PC 22 is now the Condition that will encompass the changes to the Bog catchment boundary and the resultant increase in flow to the Bog.	**Atkins/Savills**
	Using this information, Atkins/Savills would present a case to NPT Planning to demonstrate that there is no significant impact on the Bog as a result of the catchment boundary change and therefore no need to re-visit the Appropriate Assessment.	**Atkins/Savills**
	Item 6	
	No major objections were raised.	
	Atkins agreed to issue plan of proposed route through the proposed development and along the SAR to Swansea STW to prompt further comment.	**Atkins**
	Item 7	
	EAW and CCW will respond to the technical submission made this week regarding discharging PC 33.	**EAW/CCW**
	It was agreed that the reference in PC 32 to a 'Field Monitoring Station' is used to describe a formal sampling point rather than an automated monitoring station.	**All to note**
	Following the amendment of the Discharge Consents related to the Bog (under PC 33) Atkins/Savills will seek to discharge PC 32 by confirming that the additional determinants are now included in the regular monthly sampling and reporting programme for the relevant Discharge Consent points and that there are formal field monitoring stations in place from which sample can be taken.	**Atkins/Savills**
	Item 8	
	JG and SO sought assurance that surface water from roof and yard areas will not be allowed to flow onto the surface of the	

		ACTION
	public highway. Atkins confirmed that all surface water from these sources plus highway runoff water would be drained into a piped system with adequate hydraulic capacity. SW flow from this piped system will either be discharged to the River Neath outfall or to the Crymlyn or Llandarcy Bogs after being attenuated. SO suggested that the SW system should be designed for the 1 in 100 year event. Atkins confirmed that the SW system will be designed in accordance with Sewers for Adoption. **It was agreed that the details of how exceedance flows will be managed along and over public highways will be developed in consultation with NPT Highways as the design progresses. Allowance is being made in the ground level validation exercise for exceedance flow routes.** **Other Matters** <u>Northern Access Road</u> Atkins highway drainage proposals for the Northern Access Road were discussed. Atkins confirmed that discharge rate from the proposed highway drainage system will be balanced to equal the current discharge rate of the existing layout to the same outfall, therefore surface water run-off from the new highway drainage will not increase flood risk downstream. SO accepted this but stated that the proposals have been referred to SWTRA for comment as the highway drains into the motorway drainage system. NPT's responsibility (as land drainage authority) takes over again where the motorway drainage discharges to downstream watercourses. <u>Base line water monitoring across the site</u> BW asked to see base line water monitoring records for the site (boreholes etc). **Atkins agreed to raise this with the appropriate team and report back.**	**Atkins/NPT Highways** **Atkins**

Cyfoeth Naturiol Cymru Natural Resources Wales

Meeting note

Title of Meeting:	**Coed Darcy Development, drainage maeeting**				
Date of Meeting:	14th Feb 2018	Time:	10.00	Venue:	NRW Llandarcy Office
Present:	Andres Gonzalez-Vizcaino (Atkins), Joe Fellows (Atkins), Hazel Thomas (NRW, Species team), Ed Davies (NRW, Neath Port Talbot Bridgend NRM team), Kerry Rogers (NRW, Swansea NRM Team)				
Apologies:	Owen Caughlin, Claire Bryant, Emma Brown, Matthew Timmins				

Item No:	Item	Action
1.	**Southern Access Road (SAR) progress** The SAR proposals have now been submitted to Neath Port Talbot planning for approval. There are minor changes to the road location/design but work is planned to start this summer with an 18 month programme. (Note: since the meeting NRW have been formally consulted on the SAR proposals). One of the details to be confirmed is the management of drainage from land ajoining the line of the SAR on the north side of the canal.	NRM teams to feed in any comments on the final SAR proposals through the planning consultation process Atkins to provide detailed drawings of proposals to manage drainage run off north of the canal and NRW to provide comments
2.	**Phase II of site development** Validation work being carried out to enable phase II to proceed. One of the main issues for NRW is the management and disposal of surface water from this area of the site. Currently almost all the surface water enters the North Site Reservoir (NSR) and is then pumped to the River Neath (via DCWW system). However, the original proposals were for future phases of development to restore the surface water catchment to Crymlyn Bog. Currently, proposals are while Phase II is being completed surface water from Phase II will	Atkins to supply water quality monitoring data from SSR and nutrient management plan to NRW (Ed Davies/Owen Coughlin)

	continue to be channelled to the NSR/River Neath for an interim period of 4-5 years and then switched to the Crymlyn catchment. Water quality monitoring data is available for the discharge from the South Site Reservoir (SSR) which is used to inform the annual nutrient management plan. There are potential issues that need to be resolved with this (see below)	
3.	**Potential impacts on Crymlyn Bog Special Area of Conservation (SAC)**	
	In the initial planning application, it was proposed to restore the surface drainage of the Crymlyn Bog catchment resulting from Phase II and subsequent phases of development. This was to be signed off pending the completion and agreement of the detailed surface water drainage plans for the various development phases. There remained one outstanding issue which related to the elevated nutruient levels in waters flowing into the north of Crymlyn Bog from the Coed Darcy site. An increase in nutrient levels was likely to undermine the SACs conservation objectives and, therefore, some form of mitigation would be required. Proposals at the time involved improving the flow through the northern part of the Bog along the Crymlyn Brook, which would prevent nutrient enriched waters flowing onto the sensitive areas of the bog and lower potential residence times (see attached briefing note). However, subsequent monitoring evidence has shown an increase in water levels in the centre part of the Bog which would now potentially limit the effectiveness of such mitigation measures and further mitigation is therefore likely to be required before the surface drainage from Phase II could be channelled back into the Bog without potentially undermining the site's conservation objectives. A number of potential options/solutions were discussed but these need to be further developed once there is more detail on the surface water management proposals	NRW to send original Crymlyn Brook proposals Atkins to provide further detail on surface water management proposals for Phase II Atkins and NRW to hold further discussions on HRA of Surface Water Management Plans and potential mitigation measures NRW to share results of hydrological studies being carried out in relation to the Tenant canal
4.	**Newt Mitigation issues from the drainage proposals**	
	Though they still need to be assessed, the potential impacts of channeling surface water into the southern half of the Bog are likely to be less significant on the sensitive SAC features. However, the southern area of the site is still important in terms of mitigation for the impacts on great crested newts. The water quality,	Atkins to provide further details on southern surface water drainage and

		particularly potentially high nutrient levels, may be an issue if any of it is likely to enter the mitigation ponds. Further mitigation to treat such water may be necessary. Further discussions with NRW species Team (Claire Bryant) will also be required to confirm whether species surveys are adequate/appropriate.	how it may effect the newt mitigation ponds when available. NRW to provide advice on water quality parameters for newt ponds. Atkins to liaise with Claire Bryant over species surveys for road
	5.		

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Meeting Notes

Project:	Coed Darcy		
Subject:	PC22 - Meeting with NRW		
Meeting place:	24, Ffordd Coed Darcy, Skewen, Neath SA10 6FG	Meeting no:	2
Date and time:	21 November 2018	Minutes by:	Andres Gonzalez
Present:	Andres Gonzalez Chris Brown Sarah Bennett Jaime Bevan Tony Brown Owen Cofflin Kerry Rogers Darren Herbert Emma Brown	Representing:	Atkins Atkins NRW NRW NRW NRW NRW NRW NRW

ITEM	DESCRIPTION AND ACTION	DEADLINE	RESPONSIBLE
1.	Introduction All attendees introduced themselves, and described their roles within Coed Darcy project		
2.	Background Atkins described the definition of Catchments as identified in *Fig. 4.3 of the Environmental Statement.*		

Next meeting:			
Distribution:			
Date issued:	22 November 2018	File Ref:	

NOTE TO RECIPIENTS:
These meeting notes record Atkins understanding of the meeting and intended actions arising therefrom.
Your agreement that the notes form a true record of the discussion will be assumed unless adverse comments are received in writing within five days of receipt.

3.	Surface Water Strategy Atkins presented the drainage strategy as shown on drawing ref *5041216-ATK-GM-SS-DR-C-6041 Whole site Drainage strategy.* 1. Northern Site -Atkins presented the strategy to be followed, dividing the site into 3 different Catchments. The Catchments have been defined to mimic those identified by drawing “Coed Darcy Urban Village, Figure 4.3 Catchment Areas” of the Coed Darcy Urban Village – Environmental Statement” dated February 2005 – by Parsons Brinkerhoff Ltd. -Outfall locations were agreed with NRW -A sewer capacity study should be undertaken by DCWW for the outfall point located at the eastern point. **Atkins to contact DCWW.** -NRW state that Tenant Canal Company are the owners of the North Site Reservoir (NRW) and therefore, they are responsible for its maintenance. -No major concerns were raised 2. North Site -Atkins presented the strategy to be followed, dividing the site into 2 different catchments. - As previously discussed within the precedent Briefing Notes submissions, Atkins presented both Interim and Long-term surface water arrangements. It was discussed how Catchments 1 and 2 will change following the South Site Reservoir rehabilitation. The Catchment arrangement for each situation is presented in drawings 5041216-ATK-GEN-WS-DR-C-6043 and 5041216-ATK-GEN-WS-DR-C-6042 (which were tabled during the meeting). NRW agreed to the changes on Catchment presented and highlighted that any increase to the existing discharge flow into the Crymlyn Bog may create an issue due to the current status of the Bog. -Atkins stated that the proposed discharge rate (5.5 l/s/ha) is below the calculated Qbar (6,3 l/s/ha), hence the proposed discharge flow will not exceed the existing one, and, therefore, no additional flows will be discharged into the Crymlyn Bog. Discharge rate was agreed. **Atkins to issue the Qbar study to NRW** -NRW stated that Planning Condition 21 (PC21) may need to be reviewed following the change in the drainage strategy when the catchments are amended and the cutting the reliance with the NSR. To ease the process, it was agreed that this could be included as part of PC22 submission, **Atkins to review PC21.**	December 2018 December 2018 January 2019	Atkins Atkins Atkins

ITEM	DESCRIPTION AND ACTION	DEADLINE	RESPONSIBLE
	-NRW stated that The Habitat Regulation Assessment (HRA) issued by Atkins was provisional and, therefore, needs to be revised again with the new information. The HRA will need to take into account the infiltration status of the Bog (as currently the Bog is too wet). For this Atkins will use the Crymlyn Bog SAC Management Plan which included the latest monitoring investigations **NRW to issue updated information on the Crymlyn Bog (Including Plans, vegetation survey and formal SAC monitoring in 2013)**. **Atkins to review the HRA.** **-**NRW confirmed that the high levels of pollutants and nutrients at the SSR outfall were likely due to flows coming from the M4 and not from the development site. However, any additional flows may help spread these pollutants beyond the channels in the Bog.	December 2018	NRW/Atkins
	3. South Site -Drainage Strategy was discussed, outlining that Atkins has proposed a number of ponds within the development so the existing discharge rate from the site (6,3 l/s/ha according to the Qbar study) will never be exceeded. Atkins' discharge rate applied has been 5,5 l/s/ha. -Outfalls locations were discussed, and no major objections were raised.		
	4. Contractor's Yard -NRW stated that any design should follow pollution prevention guidelines due to the incoming flows from the industrial development. - **NRW to issue any existing information on the current arrangement of the drainage at the Contractor's Yard.**	December 2018	NRW

ITEM	DESCRIPTION AND ACTION	DEADLINE	RESPONSIBLE
4.	Overall Comments - Discussion on the type of SUDS that may be designed through the site to provide landscaping and visual amenity as well as hydraulic storage and conveyance. -Nitrogen and Ammonia levels are major concern problems for NRW stating that any increase in flow into the Crymlyn Bog will aggravate the action of the pollutants . Atkins stated that discharge rate will always be kept below the Qbar, and pollutants removal features will be incorporated on the design before discharging into the Bog. -NRW confirmed the existence areas within the Crymlyn Bog with SAC designation of Calcareous Fen and Transition Mire. **NRW to provide any additional information available.** - NRW stated that the Crymlyn Bog and other water channels are not currently being maintained. Access for maintenance is a problem, particularly for machinery. Suggestions were made to investigate the re-opening of the Glanwern Canal to transfer water through the Bog more quickly. Abstraction from the Tenant Canal will need to consider how that may impact the Bog in the future. **NRW to issue information regarding existing channels within Crymlyn Bog (including names, status, locations ,etc.).** - NRW stated that there are multiple stakeholders involved on the Crymlyn Bog drainage (Tenant Canal Company, Baglan Industrial estate). They are to be informed in order to identify and define any requirements at the Crymlyn Bog.	December 2018 December 2018	NRW NRW
5.	Next Meeting -NRW informed Atkins that there will be a Regulators Meeting in December 2018. **Atkins confirm that one of the drainage team members will assist.**		
6.	Documents attached - 5041216-ATK-GEN-WS-DR-C-6043 Interim Arrangement of Catchments and Outfalls -5041216-ATK-GM-WS-DR-C-6042 Long Term Arrangement of Catchments and Outfalls -Figure 4.3 Catchment Areas Parsons Brinckerhoff 2005		

ST MODWEN – COED DARCY DEVELOPMENT

23/1/20 MEETING NOTES

Attendees:

NRW

Selby Le Roux – Neath & Port Talbot Environment Team (Water quality)

Nicola Broadbridge **–** Neath & Port Talbot Environment team (conservation)

Sarah Bennett – Swansea Environment Team (water quality)

Gareth Bowen - Swansea Environment Team (conservation)

Jonathan Scott – Planning

Lisa Jones – Planning

Rhys Jones – Nature reserve management

David Morgan – Permitted waste sites & illegal waste disposal

Matthew Ellis - Protected Species licensing

Atkins: Jonathan Morgans

Matthew Bowell

PGA: Mike Powell

The main purpose of the meeting was as follows:

- To bring NRW staff up to date following the NRW reorganisation

Jonathan Morgans gave a presentation about the site, including the planning situation from 2005 onwards.

There was a brief discussion about contaminated land and potential pollution during the construction phase.

Concern was raised by NRW staff about potential hydrocarbon contamination of the water in the South Site Reservoir. The smell of hydrocarbons has been detected at the outfall from the reservoir by several people on different occasions.

Action: St Modwen to supply evidence that there are no hydrocarbons in the reservoir and to account for the odour.

Mike Powell explained that the permitted waste site (EA/EPR/AP3990LR/V002 – Crymlyn tip) would remain in the ownership of St Modwen and ultimately would remain as `green space'.

Action – Dave Morgan to liaise with Mike Powell about the tip and to ask for a revised closure & aftercare management plan.

There is a requirement of St Modwen to submit an annual nutrient management plan in connection with potential impact on Crymlyn bog.

Action – Selby Le Roux to request the latest report.

Jonathan Morgans explained the approach to surface water management on the Coed Darcy development site with emphasis on flow attenuation. The current thinking is that by attenuating the peak flow of surface water from the Coed Darcy site getting into the Crymlyn Brook the brook would `overspill' into the bog far less often which would result in the bog becoming less wet. Additionally, when each developer applies for detailed planning permission it is expected that they will include SUDS proposals which will provide additional reduction in surface water leaving the site. It was pointed out by Rhys Jones that the bog is too wet and NRW would have concerns about any increase in water going to the bog as this would result in the bog staying in unfavourable condition and leave a risk of infraction proceedings. Jonathan Morgan suggested exploring the possibility of variable flow control for the surface water leaving the Coed darcy site as this could be the best way of managing the bog.

Action – Selby Le Roux to request that St Modwen carry out survey work to enable them to produce a hydrogeological model demonstrating the impact of the surface water from the Coed Darcy site on Crymlyn bog.

Rhys Jones gave a brief summary of the LIFE project bid and explained that NRW were looking to secure funds to enable significant management work to be carried out in the bog. The focus of the work is to improve the flow of water out of the bog.

Action – Selby Le Roux to request that St Modwen supply written confirmation that, as part landowners of Crymlyn bog, St Modwen supply written confirmation that they support the project in principal and will allow access for work to be carried out.

There was a brief discussion about a series of ponds on the Coed Darcy site that are planned to be built to assist with surface water attenuation. When the issue of leachate discharging into the Crymlyn Brook from an historic landfill north of Crymlyn road was raised it was suggested that there might be a better option to attenuate the surface water flow from the Coed Darcy site than the 10 proposed ponds. Maybe a reedbed could be used which would have the added benefit of treating the landfill leachate.

Action – Selby Le Roux to arrange a meeting with St Modwen/Atkins to discuss this further

The requirement for a new updated Habitats Regulation Assessment (HRA) was discussed but it was agreed that the competent authority to make this decision would be Neath & Port Talbot CBC. However, NRW are of the opinion that a new one is needed. Atkins, raised the concern about timing as they are planning for groundworks to be carried out for the next phase of the development by late Summer. It was suggested that it might be possible for St Modwen/Atkins to produce an HRA precursor document that could ultimately be used to inform an HRA. The HRA would probably need to consider emissions to air due to the construction of the new STOR power plant at Coed darcy.

Action – Selby Le Roux to arrange a discussion with NPTCBC and St Modwen/Atkins to consider how to take forward a decision on an HRA.

Matthew Timmins outlined concerns about the impact of the development on populations of Great Crested Newts. He encouraged future dialogue about the great Crested Newts and also for St Modwen/Atkins to collect appropriate data about GCN's.

Action – St Modwens/Atkins to upload GCN data to database

Action - Selby Le Roux to arrange a meeting between NRW and St Modwen/Atkins to discuss the Great Crested Newt issue further

Appendix C. QBar Study

Technical Note

Project:	Coed Darcy		
Subject:	QBar Study		
Author:	Atkins		
Date:	28/01/2019	Project No.:	5041216
Distribution:		Representing:	

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Author-ised	Date
Rev 1.0	To provide verification of QBAR used on the drainage design to date	JJ	PJB	RR	CB	29/08/19

Client signoff

Client	
Project	Coed Darcy
Project No.	5041216
Client signature / date	

1. Introduction

The Coed Darcy site covers approximately 250 hectares of brownfield land, and bounds the Crymlyn Bog to the west, which is a site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Wetland of International Importance (Ramsar site).

Planning Condition 22, is one of three planning requirements outlined as part of the planning permission and relates to ensuring the proposed surface water drainage strategy is designed in a manner that would have no adverse impact on the Crymlyn Bog.

The purpose of this document is to provide clarity regarding the maximum allowable surface water discharge rate that has been used for the drainage design to date. The intention is to demonstrate that the existing surface water discharge rate for the site is greater than the rate used to design the surface water drainage network.

This has been achieved by calculating the greenfield equivalent mean annual maximum flow rate (QBAR) for the site.

2. Calculating QBar

In order to calculate the QBAR for the site, the natural overland surface water catchments and contributing areas were reviewed and quantified. The 'Source Control' module of MicroDrainage was used to calculate QBAR.

2.1. Surface Water Catchments

Contours and existing site levels were reviewed using a drone survey performed in 2018 and GoogleEarth images, to identify the natural drainage routes across the site. Areas beyond the site boundary were also considered to ensure the whole catchment was included in the contributing areas, as shown in Figure 2-1.

The catchment containing the existing industrial area has not been considered in this assessment as it drains away from the Crymlyn Bog, refer to Figure 2-1

Figure 2-1 - Derived Catchments

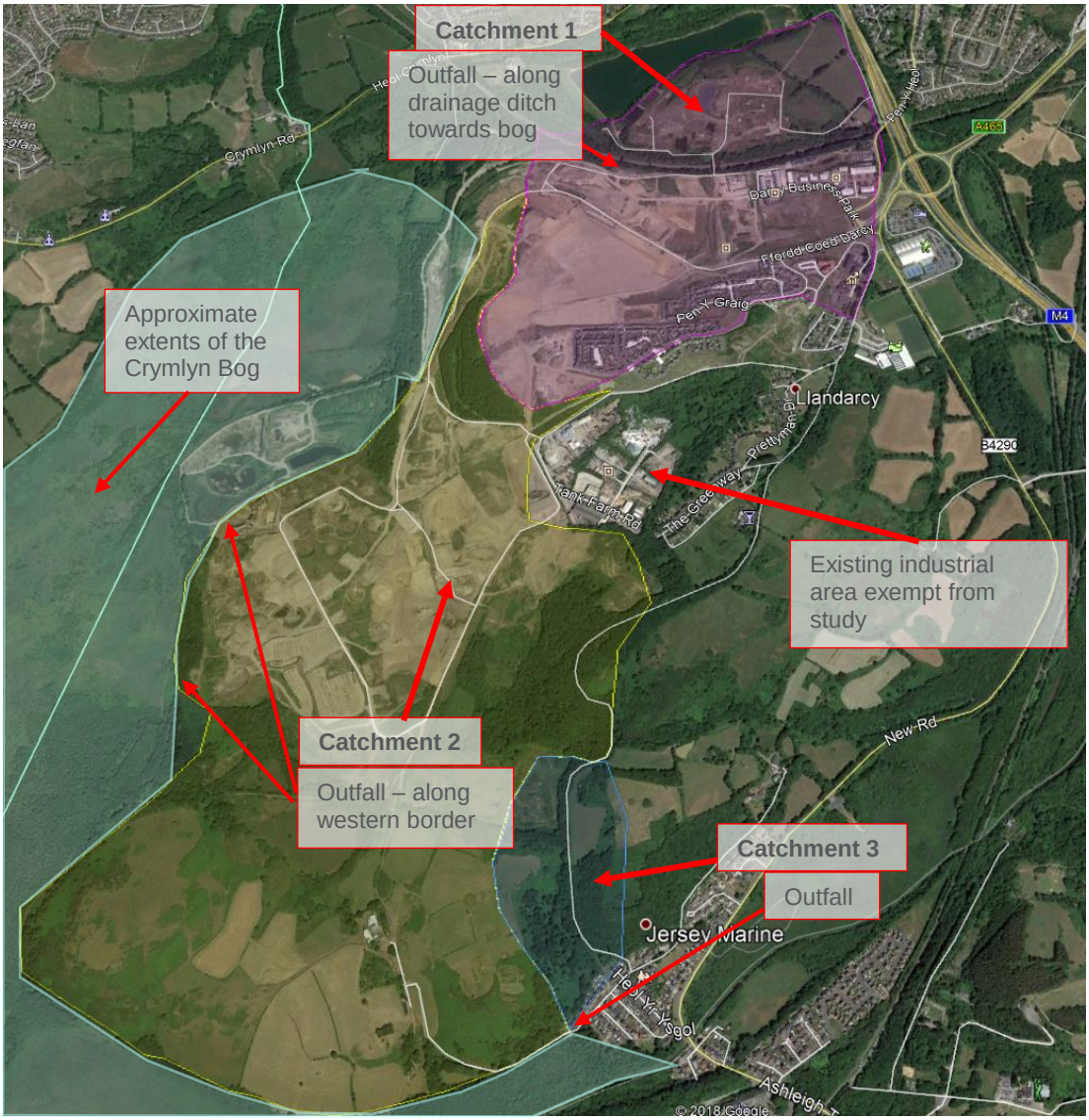


Table 2-1 lists the catchment areas measured from the contour mapping.

Table 2-1 - Contributing Areas

Catchment	Area (ha)
Catchment 1 (Pink)	89
Catchment 2 (Yellow)	169
Catchment 3 (Blue)	14

2.2. Greenfield Runoff Calculations

MicroDrainage Source Control – Rural Runoff Calculator was used to calculate the greenfield equivalent runoff rate using the IH124 method. This was chosen as it is generally accepted that this method of calculation is applicable to catchments with an area exceeding 50ha.

Catchment 3 has an area less than 50ha (14ha); therefore, the ICP SUDS modification to the IH124 method has been used to calculate the greenfield equivalent runoff rate.

2.2.1. Input Parameters

The following parameters shown in Table 2-2 were used to determine the greenfield equivalent QBAR run-off rate for the site.

Table 2-2 - Source Control input parameters

Factor	Value	Comment
Area	As defined in Table 2-1	Contributing catchment area (ha).
Return Period	1 in 100 years	Not relevant to QBAR calculation.
SAAR	As defined in Table 2-3	Standard Annual Average Rainfall as obtained from Rural Runoff Calculator mapping.
SOIL	As defined in Table 2-3*	As obtained from Rural Runoff Calculator mapping.
REGION	9	Wales is located within Region 9.
URBAN	As defined in Table 2-3	Only Catchment 1 has urbanised areas according to mapping shown in Figure 2-1. Factor estimated based on proportion of developed area in catchment.

*No adjustments to the SOIL factor identified in the Rural Runoff Calculator mapping has been undertaken. The site has some steep gradients which may affect the speed and infiltration of the soil. Therefore, by not adding an adjustment factor, the resulting QBAR rate is considered conservative.

2.3. QBAR Results

Following the input of data as outlined in Table 2-2 and Table 2-3, the greenfield run off equivalent was assessed. The resulting QBar and the per hectare rate can also be found in Table 2-3.

Table 2-3 - Catchment Data and QBar Results

Catchment	Area (ha)	SAAR (mm)	SOIL	URBAN	QBAR (l/s)	QBAR rate (l/s/ha)
1	89	1200	0.4	0.3	796.3	**8.95**
2	169	1257	0.4	N/A	939.3	**5.60**
3	14	1200	0.4	N/A	89.5	**6.40**

The Standard-period Average Annual Rainfall (SAAR) values are derived from Met Office data, in 1km grids. The SAAR values shown in Table 2-3 show that Catchment 2 falls in a different grid and therefore has a different amount of average annual rainfall. This along with differing catchment areas, results in different QBAR values.

The results show that all catchments have a QBAR rate that is higher than rate of 5.5l/s/ha, which has been used within the surface water drainage design.

Results from the runoff assessment are included in Appendix A.

2.4. Conclusion

The surface water drainage design to date has been based on a maximum allowable surface water discharge rate of 5.5l/s/ha. Following the assessment presented above, the greenfield equivalent discharge rate for the catchments draining into the Crymlyn Bog is between 5.60 and 8.95/s/ha.

Therefore, using the rate of 5.5l/s/ha represents a betterment in terms of the existing situation and should ensure that the existing flows into the Crymlyn Bog are not exceeded.

The following should be noted:

- The IH 124 method is considered to under-estimate run-off rates hence the actual existing greenfield equivalent run-off rates may actually be higher. Therefore, the degree of betterment achieved by using 5.5l/s/ha may be greater.
- The steep gradients within and around the site would increase runoff flow rates; however, this effect is not been accounted for in the IH124 calculation methodology. Therefore, the actual existing flow rates could be higher hence the use of 5.5l/s/ha represents a greater amount of betterment.

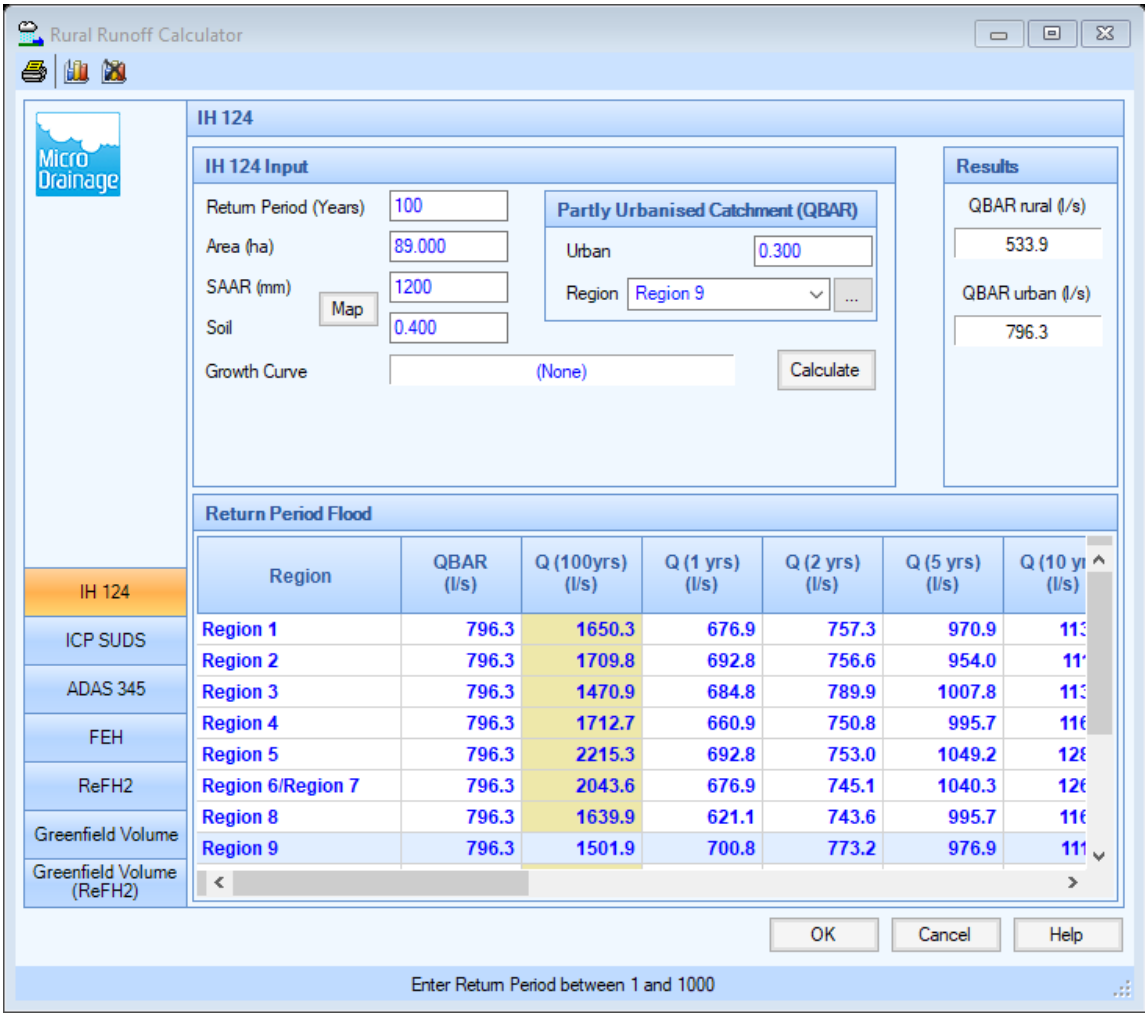
In summary, the use of 5.5l/s/ha as the maximum allowable surface water discharge rate for the proposed development represents a betterment and avoids detrimental effects on the Crymlyn Bog as a result of increased flow rates.

Appendices



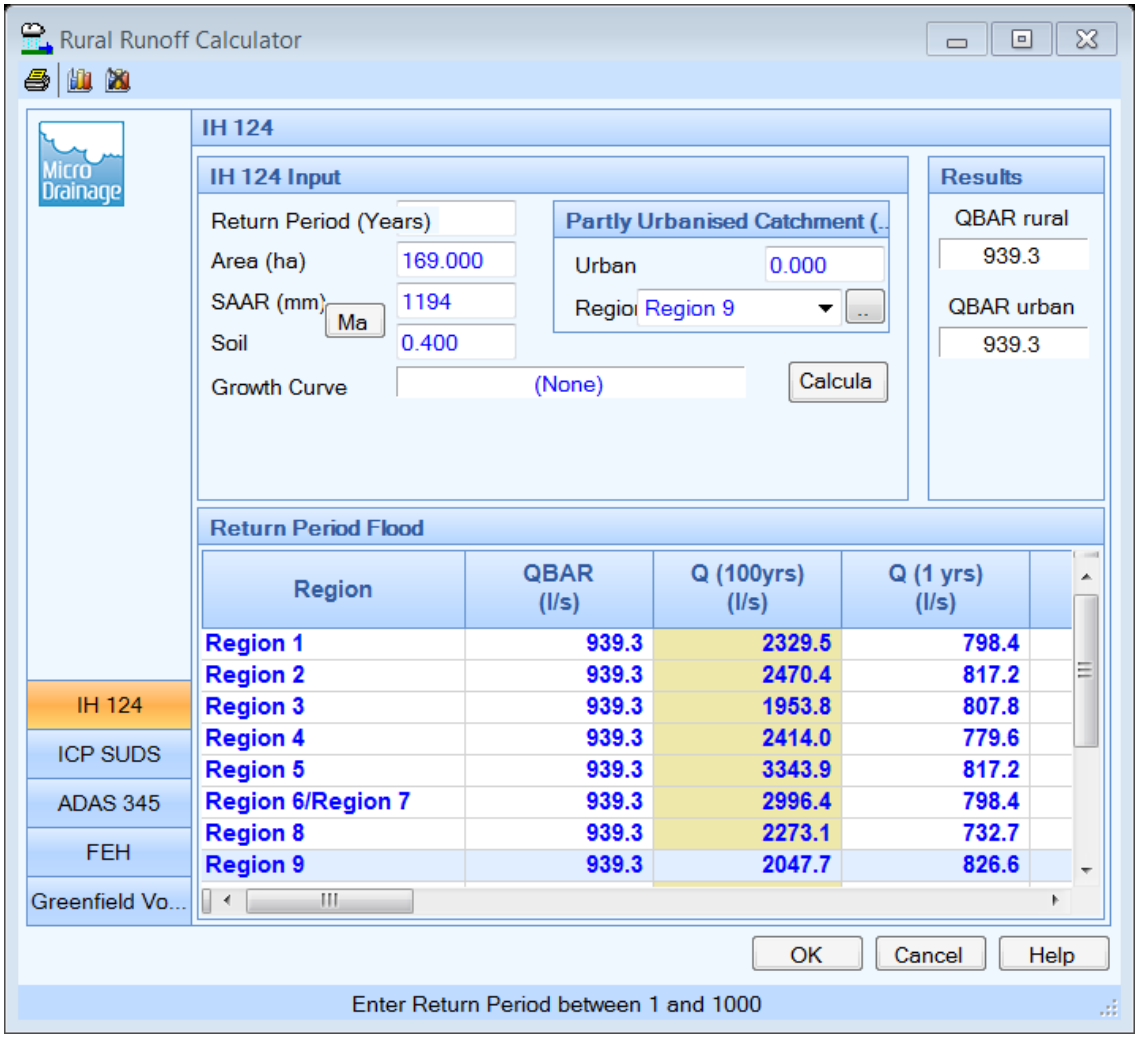
Appendix A. Run-off Calculator Results

A.1. Catchment 1

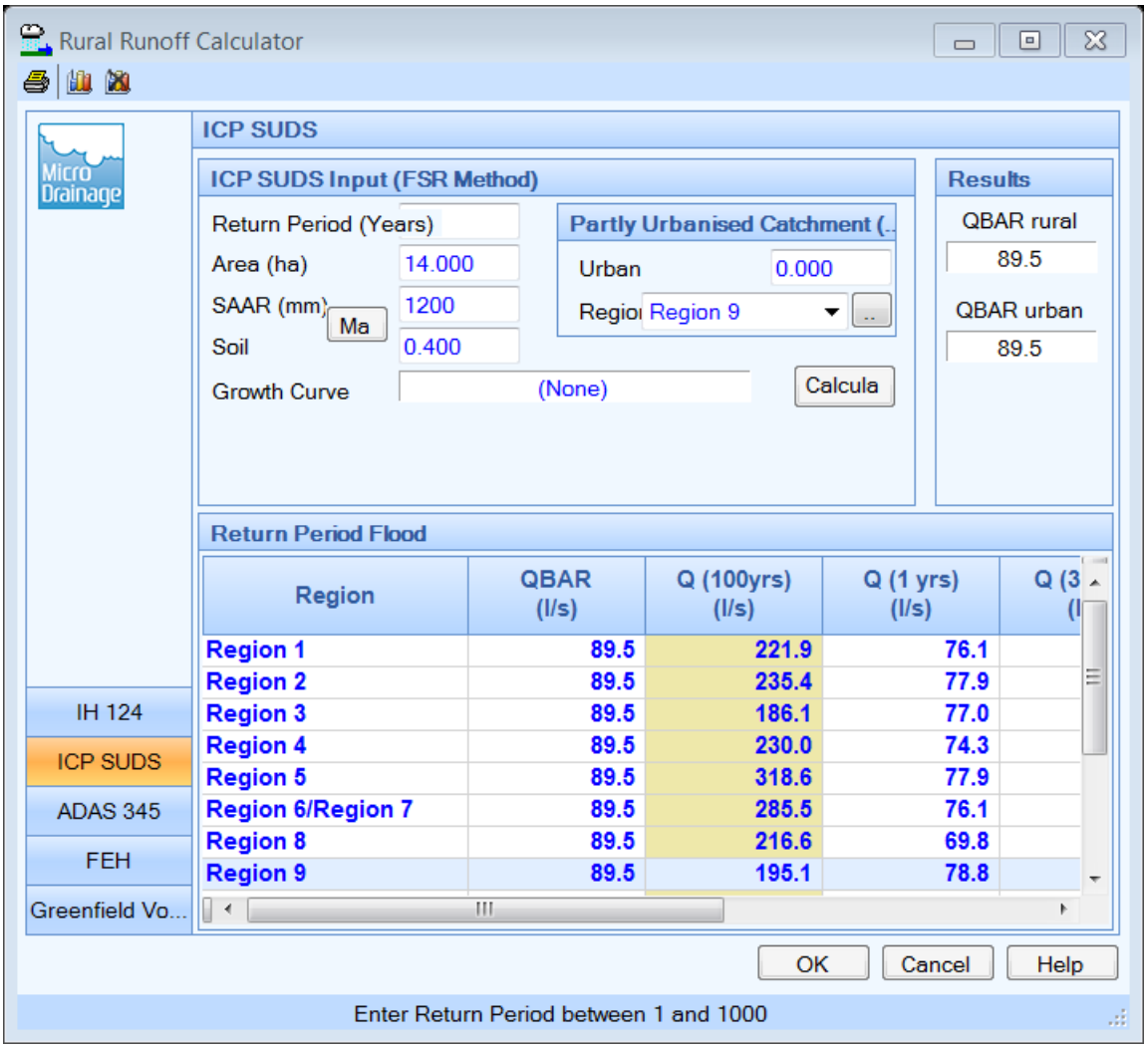


Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yr (l/s)
Region 1	796.3	1650.3	676.9	757.3	970.9	113
Region 2	796.3	1709.8	692.8	756.6	954.0	11
Region 3	796.3	1470.9	684.8	789.9	1007.8	113
Region 4	796.3	1712.7	660.9	750.8	995.7	116
Region 5	796.3	2215.3	692.8	753.0	1049.2	128
Region 6/Region 7	796.3	2043.6	676.9	745.1	1040.3	126
Region 8	796.3	1639.9	621.1	743.6	995.7	116
Region 9	796.3	1501.9	700.8	773.2	976.9	111

A.2. Catchment 2



A.3. Catchment 3 (ICP SUDS)



Appendix D. NMP 2018 Study

D.1. Nutrient Management Plan – 2018 Study

D.2. 1673 - RAP Location of Discharge Points

Coed Darcy

Nutrient Management Plan Annual Report January 2018 - December 2018

St. Modwen Developments

22 February 2019

Notice

This document and its contents have been prepared and are intended solely as information for St. Modwen Developments and use in relation to Coed Darcy.

SNC-Lavalin assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	Issue	HW	JRA	CRS	TP	22/02/2019

Client signoff

Client	St. Modwen Developments
Project	Coed Darcy
Job number	5122307
Client signature / date	

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Glossary of Terms

Term	Meaning / Definition
BOD	Biological Oxygen Demand
DAIN	Dissolved Available Inorganic Nitrogen
DAIP	Dissolved Available Inorganic Phosphorous
EMP	Environmental Monitoring Plan (Phase specific)
NMP	Nutrient Management Plan
NPTCBC	Neath Port Talbot County Borough Council
NRW	Natural Resources Wales
RAP	Remedial Action Plan
SAC	Special Area of Conservation
SSR	South Site Reservoir
SSSI	Site of Special Scientific Interest
TSS	Total Suspended Solids

1. Introduction

1.1. Background

The Coed Darcy development at the former BP Llandarcy Oil Refinery in Neath, South Wales, is herein referred to as 'the site'.

The site covers approximately 250 hectares of brownfield land and is bordered to the west by the Crymlyn Bog Site of Special Scientific Interest (SSSI). Crymlyn Bog is also designated as a Special Area of Conservation (SAC) and a Wetland of International Importance (a Ramsar site).

In 2008, St. Modwen Developments Ltd (St. Modwen) acquired the site and is responsible for its ongoing remediation and redevelopment. Outline Planning Permission (P2005/0393) has been granted for the proposed redevelopment, which comprises a mix of residential, business and commercial uses including education and other community facilities, with associated transport and services infrastructure.

The site is in various phases of redevelopment, which entails remediation, reclamation, reprofiling and construction works.

Remediation works at the site have predominantly involved the recovery of free phase hydrocarbons in conjunction with the excavation of hydrocarbon-impacted materials. Excavated hydrocarbon–impacted soils have undergone bioremediation at the site as part of the treatment and re-use of site won materials.

Surplus and treated materials generated at the site are temporarily placed in stockpiles prior to re-use. The movement, storage and re-use of excavated materials at the site is audited in line with a site-wide Materials Management Plan, implemented in accordance with the CL:AIRE Code of Practice (The Definition of Waste).

All of the above works involving the excavation, movement, treatment and storage of materials have the potential to result in the release of nutrients to ground or surface water at or in the vicinity of the site.

1.2. The Nutrient Management Plan

In line with the requirements of Planning Condition 33 of the Outline Planning Permission for the site, St. Modwen are required to implement monitoring for nitrogen and phosphorus at all discharge points from the site into the catchment of Crymlyn Bog.

Further to discussion with the Environment Agency Wales, now Natural Resources Wales (NRW), regarding the implementation of the additional monitoring, it was agreed that a Nutrient Management Plan (NMP) would be required to provide details on how nutrients, specifically nitrates and phosphates, would be managed on the site and, where necessary, attenuated prior to discharge into Crymlyn Bog.

The NMP focuses on site-wide measures to minimise and monitor the release and potential migration of nutrients from the site. As part of each phase of the redevelopment works, a phase-specific Construction Environmental Monitoring Plan (CEMP) has also been developed which details the need for any additional monitoring during specific phases of works.

The main objectives of the Nutrient Management Plan are to:

- ensure that suitable monitoring is conducted to identify/monitor the release of nutrients from the site;
- ensure that the locations of all proposed monitoring points are applicable to the assessment of water quality discharging from the site (and from specific works) into Crymlyn Bog;
- ensure that relevant mitigation and preventative measures are in place to minimise the release of nutrients during works within the site;
- identify the scope of possible treatment/management options, if required, in the long term; and
- prevent adverse effects on Crymlyn Bog from excessive nutrient loading.

Full details of the site wide monitoring and inspections to be carried out and the mitigation measures to be implemented are provided in the NMP document agreed under Planning Condition 33 of the Outline Planning Permission for the site.

The adopted water quality values to be used as a trigger to instigate further actions and investigations are presented in Table 1-1 below.

Table 1-1 - NMP Trigger Levels for Nitrogen and Phosphorous

Determinand	Trigger Concentration
Nitrogen - Measured as Dissolved Available Inorganic Nitrogen (DAIN)	2.0 mg/l
Phosphorus - Measured as Dissolved Available Inorganic Phosphorus (DAIP)	0.05 mg/l

1.3. Environmental Permits to Discharge

St. Modwen holds five Environmental Permits for surface water discharges from the site, referenced W1 to W5. Four of these (referenced W1 to W4) discharge into the Crymlyn Bog catchment, as shown on Drawing 5041216-ENG-DWG-1144 included in Appendix A. The fifth discharge location (W5) lies outside the scope of the NMP because it discharges into the catchment of the River Neath rather than Crymlyn Bog.

Sampling at all five discharge points is undertaken through the year by Atkins and NRW on a monthly basis. for compliance purposes.

1.4. Scope of Report

The NMP was formally agreed between NRW, Neath Port Talbot County Borough Council (NPTCBC) and Atkins (on behalf of St. Modwen) and was first implemented in June 2012.

In advance of this agreement, but in line with the requirements of Planning Condition 33, Atkins commenced monitoring at the discharge points for nitrogen and phosphorus in 2010. Formal NMP inspections commenced on agreement of the NMP in June 2012.

The first Annual Report for the NMP was issued in November 2013 and covered the period June 2012 to November 2013. The second annual NMP report was issued in April 2015 and covered the period from December 2013 to November 2014. The third report covered the period from December 2014 to December 2016 (a period of two years) and was issued in January 2017. The fourth annual report covered the period from January 2017 to December 2017. This is the fifth annual report, which covers the period from January 2018 to December 2018.

The scope of this report is to provide the following:

- A summary of site works conducted during the monitoring period (January 2018 to December 2018) and their applicability or potential impacts to the nutrient monitoring;
- Assessment of the water quality data against the NMP trigger levels presented in Table 1-1; and
- Conclusions and recommendations for the upcoming year (January 2019 to December 2019) with respect to ongoing compliance with the NMP.

2. Site Works

2.1. Works

Reclamation, remediation and redevelopment works at the site are generally undertaken in distinct phases/packages of works. The works listed below have been carried out in the 12-month period from January 2018 to December 2018 and their location/extent are indicated on Drawing 5041216-ATK-GEN-WS-DR-C-6045, in Appendix A:

- Ground investigation within Phase 2 of the proposed residential development;
- Contaminant hotspot removal within Phase 2 of the proposed residential development;
- Earthworks within Phase 2 of the proposed residential development;
- Removal of Japanese knotweed within Phase 2;
- Vegetation clearance across the main north site and the central/east section of south site;
- Stockpile re-location across the site.

The following long-term works were ongoing during 2018:

- Oil recovery at the peripheral trench adjacent to Crymlyn Bog, undertaken by Hydrock Ltd; and
- Import and stockpiling of suitable subsoil and topsoil from donor sites for use in plot preparation.

Section 2.2 provides details of the works undertaken during the monitoring period and summarises the potential for these works to have adversely impacted Crymlyn Bog, based on their location.

A summary of works undertaken during the monitoring period is presented in Table 2-1 below.

Table 2-1 - Summary of Site Works (2018)

Dates	Work Area	Details	Catchment	Monitoring Locations for NMP
January 2018 to April 2018	Containment Area	Recovery of free phase hydrocarbons.	Crymlyn Bog	W2 & W3
January 2018 to December 2018	North Site	Import and stockpiling of subsoils and topsoils from verified donor sites.	North Site Reservoir / River Neath	W1
January 2018 – October 2018	Site Wide	Relocation of treated site-won soils from the biopad treatment area. Soils relocated across site in stockpiles as part of plot preparations.	Crymlyn Bog	W2 & W3
January 2018 – April 2018	North Site	Phase 2 contamination hotspot removal, and the removal of Japanese Knotweed, identified pipework and substructures. Placement of excavated material on Southern Tank Farm Treatment Area.	North Site Reservoir / River Neath / Crymlyn Bog	W1, W2, W3 and W4
April 2018 – June 2018	Site Wide	Stockpile relocation and placement as part of the Phase 2 earthworks	North Site Reservoir / River Neath	W1
September 2018	North Site	Vegetation clearance across the main north site and central / east section of south site.	North Site Reservoir / River Neath	W1

2.2. Works Water Management

2.2.1. Soil Treatment Area

The Southern Tank Farm treatment pad has previously been operated under an Environmental Permit by Hawk for the treatment of hydrocarbon-impacted soils generated during remedial and plot preparatory works across the former refinery. The facility is lined and bunded to allow for the management of surface water run-off.

Run off from the Southern Tank Farm treatment area is collected in a holding lagoon, from which samples are collected to determine water quality prior to discharge to ground.

Excavated hydrocarbon-impacted soils were placed on the treatment pad during January 2018 and February 2018. There has been no active treatment of the impacted soils on the treatment pad during 2018.

Monitoring samples have been taken from W2, W3 and W4 throughout 2018.

2.2.2. Containment Area

Recovery of free-phase hydrocarbons from the Containment Area was carried out between January and April 2018. These works related to the ongoing Remedial Action Plan (RAP) requirements, as defined in Schedule 7 of the Section 106, and ongoing progression towards the eventual surrender of the Environmental Permit.

Monitoring of W2 and W3 has taken place throughout the duration of works in this area, the results of which are discussed within Section 3.

2.2.3. Stockpile Relocation

In January 2018, treated site won material was relocated from the biopad treatment area and placed within the southern tank farm. There was the potential for these stockpile relocation works to impact W2, W3 and W4 due to their proximity to the western boundary of the site.

Following this relocation works (which occurred between January 2018 and October 2018) stockpiles of varying classification were relocated as part of plot preparations for Phase 2 to the Railhead and southern tank farm.

The works described had the potential to impact W1, W2, W3 and W4. The results of monitoring at these monitoring locations are discussed within Section 3.

2.2.4. Phase 2 Remediation

The remediation of Phase 2 within the north of the site involved the excavation of identified contamination hotspots. Approximately 55,000 m^3 of excavated material was transported to and stockpiled to the treatment pad in the southern tank farm.

The works described had the potential to impact W1, W2, W3 and W4. The results of monitoring at all locations is discussed within Section 3.

2.2.5. Phase 2 Earthworks

The desired formation levels for the Phase 2 Earthworks were achieved by June 2018 through the excavation and placement of general cut material sourced within the Phase 2 boundaries and validated material stockpiled in the southern tank farm and north site.

The works described had the potential to impact W1, W2, W3 and W4. The results of monitoring at all locations are discussed within Section 3.

3. Monitoring Results

3.1. General

The following sections provide a summary of the monitoring undertaken at the four permitted discharge points from site into Crymlyn Bog (W1-W4) between January 2018 and December 2018. These dates shall be referred to as 'the monitoring period'. The discharge and monitoring points are shown on Drawing 5041216-ENG-DWG-1144 in Appendix A.

3.2. Monitoring Regime

3.2.1. Visual Assessments

A visual inspection was carried out on a weekly basis at each discharge point. Surface water at each location was monitored for the following:

- High turbidity or suspended solids;
- Organic odour (or other);
- Floating scums and foams; and
- Dead or decaying flora or fauna.

For the majority of weekly inspections, the above parameters were recorded as not being present. Occasionally foam, scum or evidence of naturally occurring ochre deposits was identified on the water surface.

3.2.2. Sampling and Testing

Chemical testing and assessment of the water was carried out on a monthly basis. The following parameters were analysed:

- Nitrogen as Dissolved Available Inorganic Nitrogen (DAIN) which is the sum of the concentrations of Nitrite as [NO 2-], Ammoniacal Nitrogen as [NH_4 +] and Nitrate as [NO_3 -];
- Phosphorus as Dissolved Available Inorganic Phosphorus (DAIP) which is the concentration of orthophosphate ions [PO_4 3-];
- Conductivity;
- pH;
- Biological Oxygen Demand (BOD); and
- Total suspended solids (TSS).

The data obtained during the monitoring period is presented in Appendix C and discussed in the following sections. Data gaps from W1 in July and W4 in June and July are due to an insufficient level of water required for sampling which occurred during a period of notable hot and dry weather.

3.3. Tal y Fedw (W1)

3.3.1. Background

W1, shown on Drawing 5041216-ENG-DWG-1144 in Appendix A, is located on the north-west of the site and was established to monitor the quality of water flowing from two locations - the Tal y Fedw oil-water interceptor and from the South Site Reservoir (SSR). Water from these two locations flows into the north of Crymlyn Bog via Crymlyn Brook.

Previous Atkins investigations (5041216-ENG-TN-000672, September 2011) established that water reaches W1 from two additional sources, as indicated on drawing 5041216-ENG-DWG-0001046:

- The M4 motorway and other highway surface water drainage leading into the North Site Reservoir interception drain (non-site sourced discharge); and
- Highway surface water drainage from the Skewen estate (non-site sourced discharge).

Based on previous investigations, sampling and testing of discharge water from these two additional sources regularly detect notable concentrations of DAIN, whilst site-sourced DAIN is generally less than the laboratory method detection limits.

To support this historical assessment, an additional sampling round was conducted in December 2018 to target the sources of DAIN from site sources as well as the previously mentioned offsite sources. Samples were taken at points along the site drainage prior to discharge to Crymlyn Brook. W1A was taken from surface water originating from site prior to entering the SSR and W1B was sampled from a small flow of water that diverged at W1A and seeped below ground into Crymlyn Brook. W1D was sampled from the discharge of the SSR prior to the confluence with Crymlyn Brook that leads to W1 and is considered to be the primary contribution of site sourced surface water to W1. The monitoring of W1D was also included within the December monitoring round to distinguish the contribution of DAIN from the Coed Darcy Development. The monitoring points assessing the water quality contributing to W1 are provided in Drawing 5041216-ATK-GEN-NS-DR-C-4169.

3.3.2. Results

Inorganic Nitrogen results for the monitoring period at W1 indicate consistent concentrations of DAIN (min: 0.564 mg/l; mean: 6.98 mg/l; max: 11.3 mg/l). Of the eleven samples tested during the monitoring period, the NMP trigger level for DAIN (2 mg/l) was exceeded in ten samples. The DAIN concentrations over the monitoring period are presented graphically in Figure 3-1.

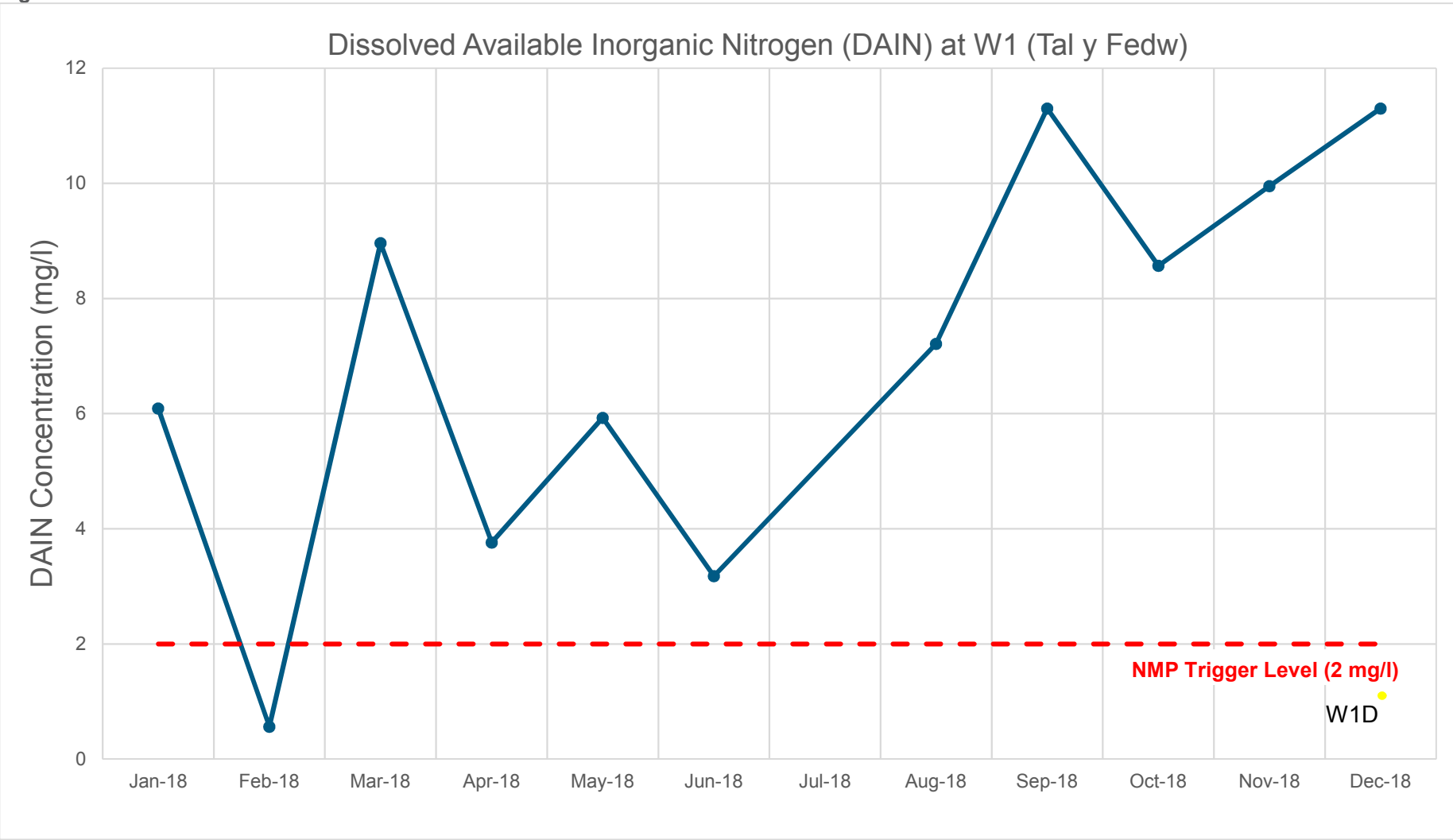
For the samples tested, the primary source of inorganic Nitrogen was detected as Nitrate [NO_3-], which exceeded the NMP trigged levels in ten samples. Nitrite as [NO 2-] was detected within two samples with a maximum noted concentration of 0.056 mg/l and nine samples below the limit of detection. Ammoniacal Nitrogen as [NH_4+] was reported below the limit of detection in all eleven samples.

Based on previous assessments, as discussed above in Section 3.3.1, it is believed that the elevated levels of DAIN at this location relate to off-site sources. These off-site sources were discussed in more detail in Atkins' technical note 5041216-ENG-TN-000672. This technical note is included as Appendix C.

To support the historical assessment of off-site sources of DAIN, samples were collected in December 2018 from the off-site sources of Skewen Estate (W1E) and the M4 motorway (W1C). The concentrations of inorganic nitrogen sampled within the surface water from these sources was 35.3 mg/l (W1E) and 10.7 mg/l (W1C), respectively. Within the same monitoring round, three samples were collected from locations along the South Site Reservoir (SSR) discharge to W1. It is understood that the discharge of the SSR into Crymlyn Brook is the primary contribution of surface water from Coed Darcy to the Crymlyn Bog discharged at W1. The concentrations from W1A (1.05 mg/l), W1B (0.82 mg/l) and W1D (0.55 mg/l) are all below the NMP trigger level for DAIN suggesting that the elevated inorganic Nitrogen does not originate from Coed Darcy. The results are presented within Appendix B and sample locations are shown on Drawing 5041216-ATK-GEN-NS-DR-C-4169.

No exceedances of the DAIP NMP trigger level were recorded between January 2018 and December 2018 and all recorded DAIP concentrations were below the testing laboratory method detection limit.

Figure 3-1 - DAIN Concentrations at W1



3.4. Crymlyn Bog (W2)

3.4.1. Background

Discharge point W2, shown on Drawing 5041216-ENG-DWG-1144, is one of two Environmental Permits relating to discharge from the Containment Area (former landfill), located along the south-west site boundary.

This consent does not specifically represent a point discharge from the site but represents a sampling location within Crymlyn Bog which was implemented to monitor diffuse water quality flowing northwards from the Containment Area.

Water from the Containment Area collects in a channel that runs around the northern perimeter of this area and is separated from the bog by a floating plywood board which acts as an oil separator. This channel is known as the 'peripheral trench'.

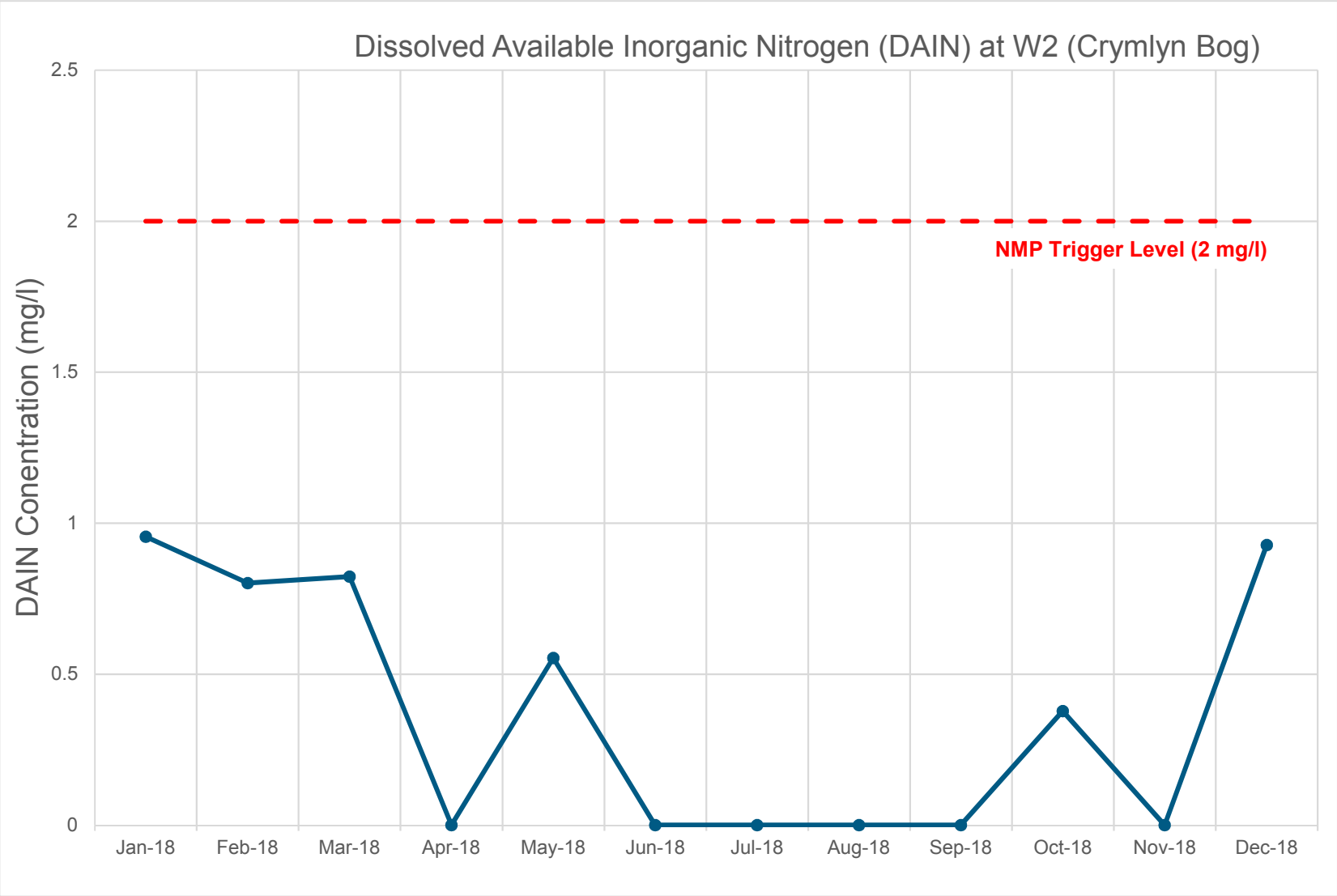
3.4.2. Results

Consistent with the previous monitoring rounds, water quality results for the monitoring period at this location indicate low levels of DAIN, with no exceedances of the NMP trigger level (min: below Limit of Detection; mean: 0.37 mg/l; max 0.96 mg/l). The DAIN concentrations during 2018 are presented graphically in Figure 3-2.

Of the twelve samples collected from W2, none exceeded the NMP DAIN trigger level of 2.0 mg/l.

For inorganic Phosphorous, there was no exceedances of the NMP DAIP trigger level of 0.05 mg/l and all samples were reported below the testing laboratory method limit of detection.

Figure 3-2 - DAIN concentration at W2



3.5. Crymlyn Bog Lagoon (W3)

3.5.1. Background

The location W3, shown on Drawing 5041216-ENG-DWG-1144 is located at the outflow of Crymlyn Bog Lagoon to Crymlyn Bog SSSI. The outflow at this location discharges through a siphon valve and an oil water interceptor prior to entering Crymlyn Bog.

The water flowing to Crymlyn Bog Lagoon and discharge point at W3 originates from multiple areas in the south of the site as listed below:

- Former Southern Tank Farm – consisting of a series of constructed ditches and drains collecting surface water from the former tank farm area. This area predominately drains to the north west towards Crymlyn Bog Lagoon;
- Former Railhead – the location of the former railway sidings, this area was historically used by Celtic Technologies for the treatment of sludges recovered from site waterbodies. There are two drains from the railhead, one draining north towards the Tal-y-Fedw catchment and one draining south towards W2 and W3;
- Contractors' yard – A drain thought to originate from the contractors' yard off Tank Farm Road is culverted through part of the site and joins the central Southern Tank Farm drainage before flowing into Crymlyn Bog Lagoon; and
- South Bay and West Bay – waterbodies adjacent to Crymlyn Bog Lagoon, South Bay being rainwater-fed and West Bay fed via both the Southern Tank Farm drainage and rainwater.

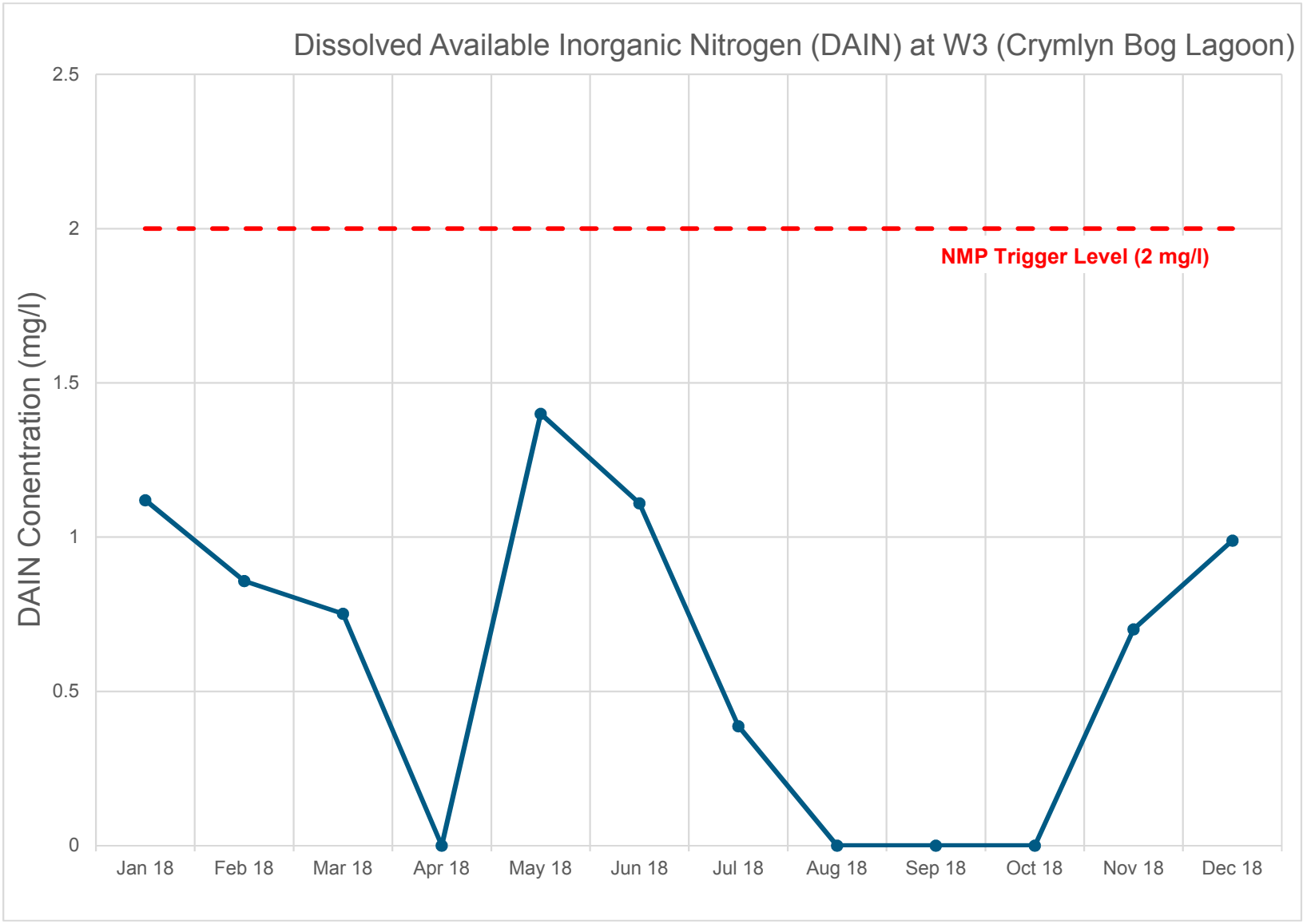
3.5.2. Results

Water quality results from the monitoring period at this location reveal low levels of DAIN with no exceedances of the NMP trigger level (min: below Limit of Detection; mean: 0.61 mg/l; max 1.40 mg/l). The DAIN concentrations are presented graphically in Figure 3-3.

Of the twelve samples taken over the last year, none exceeded the NMP trigger level value of 2 mg/l.

For inorganic Phosphorous, there were no exceedances of the NMP DAIP trigger level of 0.05 mg/l and all samples were reported below the testing laboratory's limit of detection.

Figure 3-3 - DAIN Concentrations at W3



3.6. Freemans' Bund (W4)

3.6.1. Background

The location W4, shown on Drawing 5041216-ENG-DWG-1144, is located to the south of the site and was implemented to monitor water quality flowing towards Freemans' Bund.

Freemans' Bund is a bunded area within Crymlyn Bog, emplaced in order to intercept oil before it enters Crymlyn Bog. Water flows from the south west part of the site through a redundant interceptor (Pond 29) before entering Freemans' Bund. Water from Freemans' Bund discharges into Crymlyn Bog via a set of siphon valve pipes.

Water at discharge consent point W4 originates from the following sources, as marked on Drawing 5041216-ENG-DWG-1144; these are:

- Freemans' Stream: previously termed the 'Southern Access Gate Stream', this is site-sourced drainage, which originates from diffuse surface water run-off from low lying areas of the south of the site.
- Fletchers Farm Stream: a stream originating from surface water run-off from agricultural land (Fletchers Farm) and moorland to the south of the site.
- Various drains from the Southern Tank Farm: a series of unrecorded drains have been identified along the site boundary draining into Freemans Stream; these are believed to be from natural springs and overland surface water flow from the south of the site.

3.6.2. Results

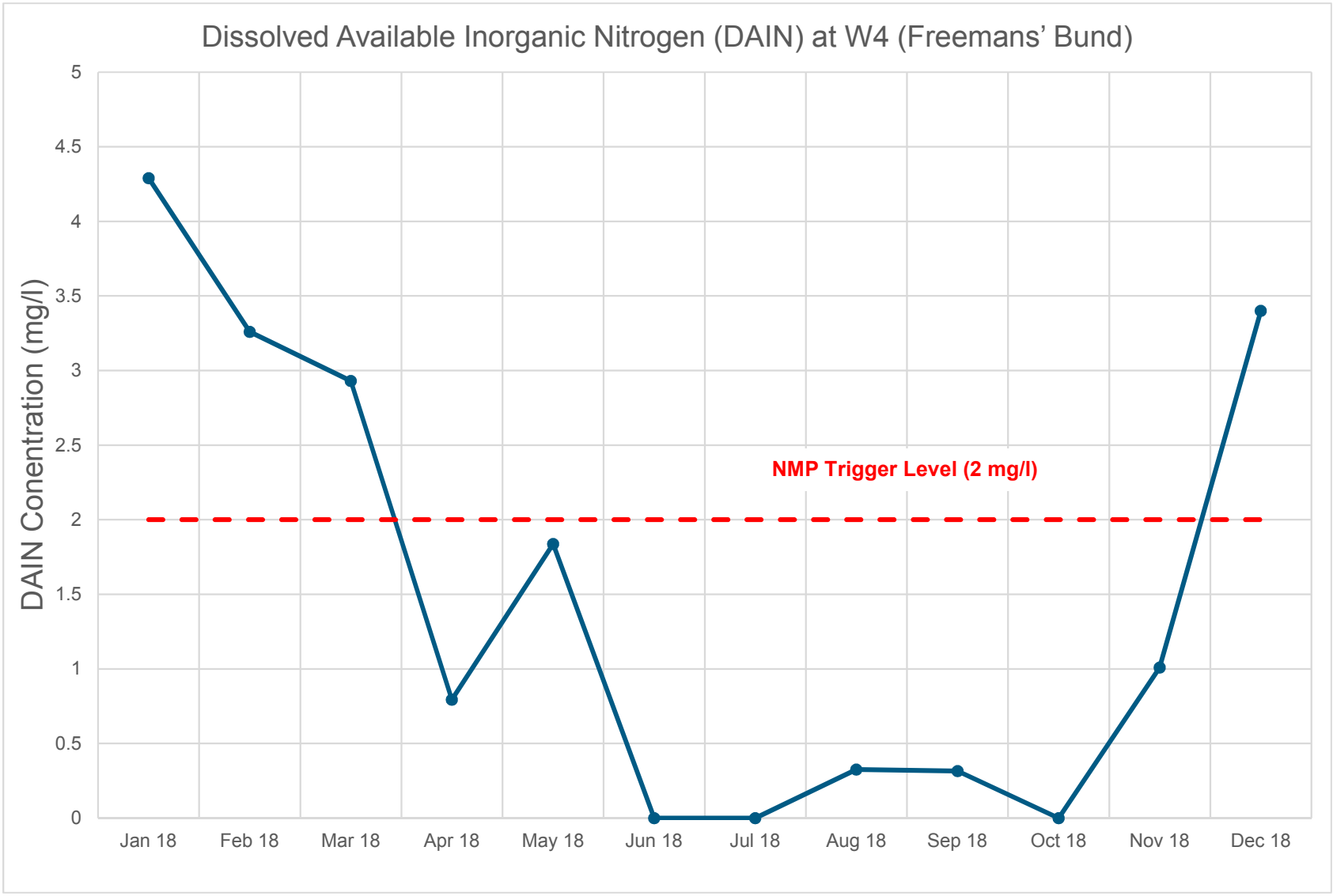
Water quality results during the monitoring period at this location reveal levels of DAIN from January to March 2018 slightly above the NMP trigger level of 2 mg/l, ranging from 2.93 mg/l to 4.29 mg/l. From April 2018 onwards, no further exceedances were recorded, (min: 0.0 mg/l; mean: 1.33 mg/l; max: 3.40 mg/l) with the exception of December 2018 where DAIN was recorded at 3.4 mg/l. No samples were collected in the June and July monthly monitoring rounds because the water flow towards Freemans' Bund had ceased due to the unusually dry summer months. Of the ten samples taken at W4 during the monitoring period, four results exceeded the NMP trigger level value of 2 mg/l. The DAIN concentrations during 2018 are presented graphically in Figure 4.

For the samples which exceeded the NMP trigger level, nitrite as NO2- was below the laboratory limit of detection in all four samples and ammoniacal nitrogen as NH4+ was below detection limit in three of the four samples. This shows that the primary determinand driving the DAIN exceedances in the winter months was nitrate as NO3-.

The exceedances were recorded in the winter months of January, February, March and December 2018, which is in line with observations made in previous years. Additional monitoring locations previously sampled around W4 in the winter of 2015 and 2016 have shown there to be exceedances of DAIN in Pond 29 and Fletchers Farm Stream, both external to the site, but not from Freemans' Stream (Southern Access Gate Stream) which drains from within the site.

No exceedances of the DAIP NMP trigger level were recorded during 2018 and all recorded concentrations of DAIP were below the testing laboratory limit of detection.

Figure 3-4 - DAIN Concentrations at W4



4. Summary

This annual report has been produced by Atkins in line with the requirements of the Nutrient Management Plan (NMP), agreed under Planning Condition 33 of the Outline Planning Permission for the site.

This report documents the works that have been undertaken across the site which may have impacted upon water quality and summarises the water quality results from locations W1 to W4 for the monitoring period between January 2018 and December 2018.

DAIN concentrations have mostly been recorded below the NMP trigger level of 2 mg/l throughout the monitoring period at the four monitoring points (W1 – W4) with the exception of results from W1 and W4 within the winter months.

In line with previous annual and biennial reports, it is inferred that the elevated DAIN levels could result from one or more natural factors including:

- Natural seasonal die back of vegetation resulting in nutrient release;
- Reduced uptake of nutrients by plants during winter months;
- Use of fertilisers on off-site farmland; and
- Repeated freeze-thaw cycles resulting in increased breakdown of plants and organic matter and subsequent nutrient release.

Concentrations of DAIP in 2018 have not been recorded above laboratory detection limits.

A summary of the pertinent identified trends of DAIN and DAIP and recommended actions are provided in sections 4.1 to 4.4, and conclusions are provided in section 5.

4.1. W1: Tal y Fedw

Concentrations of DAIN have been consistently above the NMP trigger value (2 mg/l) at W1. In line with previous investigations reported in Atkins' technical note 5041216-ENG-TN-000672, elevated nitrates resulting in exceedances of the DAIN trigger level are considered to be attributable to off-site sources at this location. This is supported by the results of the December 2018 monitoring during which samples were taken from additional locations to assess both the on-site and off-site sources contributing to W1, as discussed in section 3.3.

Ongoing monitoring rounds at W1 will be accompanied by future samples taken from the discharge of the SSR (W1D) to provide a robust data set assessing the impact on DAIN at W1 from site drainage during future development.

There were no exceedances of the DAIP NMP trigger level at W1 during the monitoring period.

4.2. W2: Crymlyn Bog

Concentrations of DAIN at W2 were below the laboratory limit of detection and no exceedances of the NMP trigger level were recorded during the monitoring period.

There were no exceedances of the DAIP NMP trigger level at this location during the monitoring period.

No further works are proposed at this location other than continued monitoring.

4.3. W3: Crymlyn Bog Lagoon

Concentrations of DAIN at W3 in 2018 were recorded at levels below the NMP trigger level during the monitoring period.

There were no exceedances of the DAIP NMP trigger level during the monitoring period.

No further works are proposed at this location other than continued monitoring.

4.4. W4: Freeman's Bund

Concentrations of DAIN at Freemans' Bund have been variable, with exceedances of the NMP trigger level recorded in January, February, March and December 2018. Data from previous additional sampling presented within the Nutrient Management Plan Biennial Report 5041216-OSW-RPT-0001778 suggested that elevated concentrations of DAIN may have originated from an off-site source, at the nearby Fletchers Farm.

Fertilisers and animal manure (which are both rich in nitrogen and phosphorus) are the primary sources of nutrient pollution from agricultural sources. Fletchers Farm is a livestock farm keeping cattle and sheep. Nutrients from animal manure can be washed from fields and discharge to local watercourses in periods of heavy and/or prolonged rainfall which are more common in winter. This may be the cause of the elevated DAIN concentrations recorded during the winter period at W4.

No exceedances of the DAIP NMP trigger level were recorded at W4 during the monitoring period.

Atkins will discuss with NRW continued monitoring at the W4 location as well as the addition of another sampling point on-site upstream of W4 to further understand the impact of the site drainage on DAIN levels at W4.

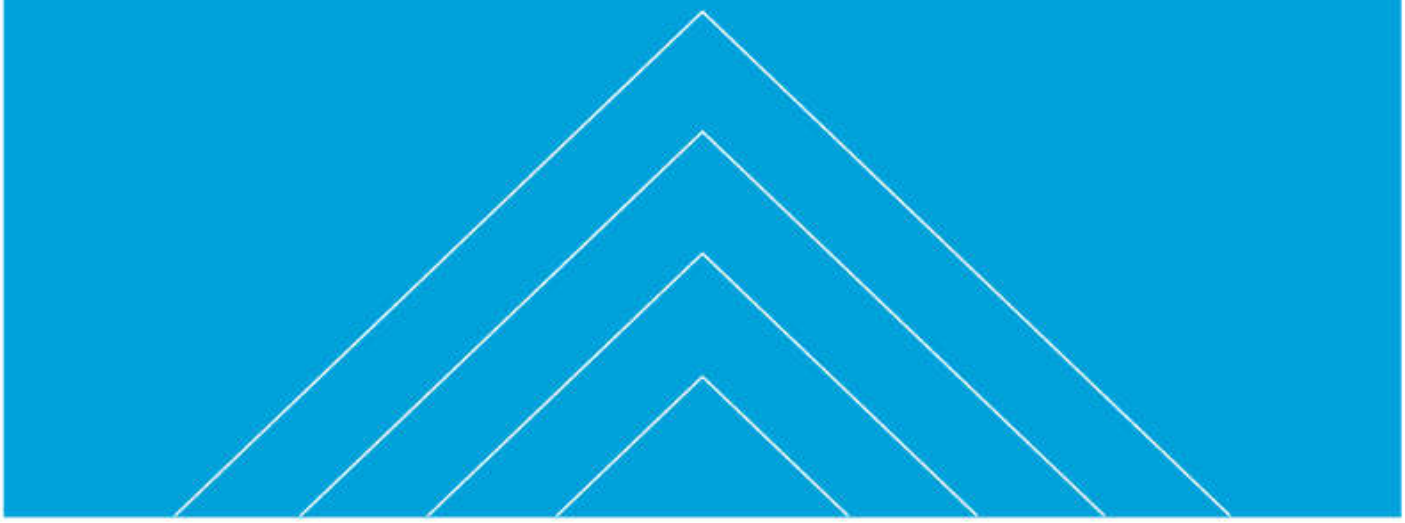
5. Conclusions

Atkins will continue to monitor the relevant sampling locations, in line with the requirements of the NMP. Site works will continue to be conducted using best practice techniques, with water management practices defined and monitored by Atkins throughout all intrusive (or other) site works.

Additional monitoring was carried out in 2018 to determine the contribution of nutrients from onsite and offsite sources to W1. The monitoring of W1D will be continued in conjunction with the monthly sampling of W1 to demonstrate the contribution of nutrients from site.

The consistent exceedances of DAIN at W4 in winter months have been previously attributed to offsite sources. In 2019, additional sampling of the potential water sources to W4 will be conducted to further support this explanation.

Appendices



Appendix A. Drawings

DO NOT SCALE

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STOCKPILE RELOCATION & VEGETATION CLEARANCE

CONTAINMENT AREA (PRODUCT RECOVERY)

PHASE 2 WORKS

STOCKPILE RELOCATION & VEGETATION CLEARANCE

SOUTHERN TANK FARM AREA

SOUTHERN TANK FARM TREATMENT PAD

Drawing file: P:\GBBMA\DE2\Div7\5504\5041216 Coed Darcy\DWG_CIVIL\SDR\Whole Site (6000)\5041216-ATK-GEN-WS-DR-C-6045 - Site Works Summary 2018.dwg

Rev.	Date	Description	By	Chk'd	App'd
P1	15/02/19	FOR INFORMATION	RE	HW	CS

Drawing Status: FOR INFORMATION

Suitability: S2

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: SITE WORKS SUMMARY 2018

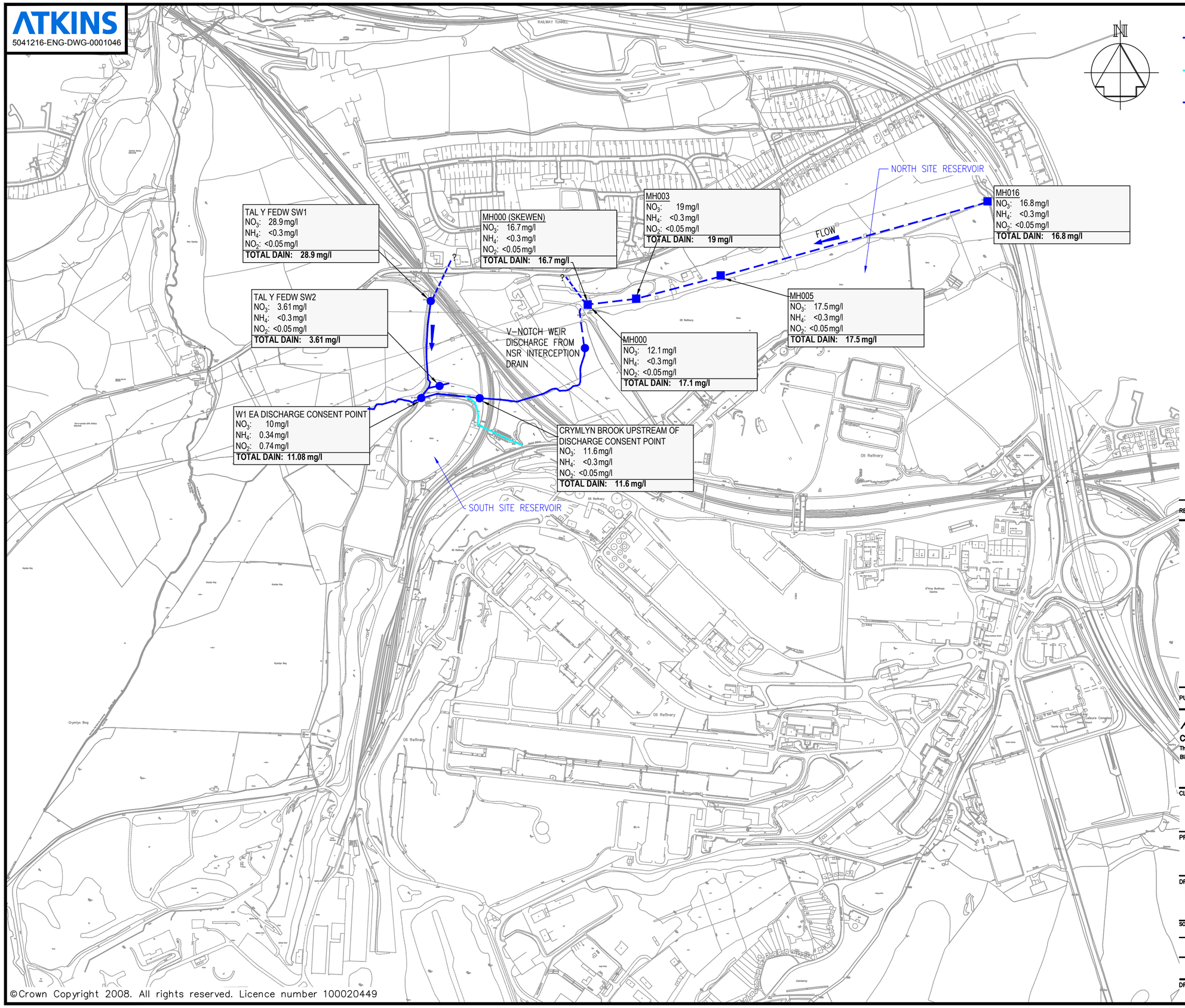
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A1	13/02/19	13/02/19	14/02/19	15/02/19

Drawing Number: 5041216-ATK-GEN-WS-DR-C-0006045

Revision: P 1

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5041216-ENG-DWG-0001046



KEY:

- APPROXIMATE LOCATION OF NSR INTERCEPTION DRAIN
- SITE DERIVED WATER INPUT TO DISCHARGE CONSENT POINT
- NON-SITE DERIVED WATER INPUT TO DISCHARGE CONSENT POINT
- MANHOLE
- SURFACE WATER MONITORING POINT

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REVISIONS	Drawn By	Checked By	Date

PURPOSE OF ISSUE	Rev.	Authorised for issue	Date

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CLIENT: ST.MODWEN

PROJECT: COED DARCY URBAN VILLAGE

DRAWING TITLE: NORTH SITE RESERVOIR INTERCEPTION DRAIN WATER QUALITY SURVEY

SCALES	DRAWN	CHECKED	CO-ORD CHECK
1:5000	JH	SB	–
	DATE 03/10/11	DATE 03/10/11	DATE 03/10/11

0 250m | SHEET A2 | PLOT DATE 06/10/11

DRAWING NO: 5041216-ENG-DWG-0001046 | REV: -

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5041216-ENG-DWG-1144

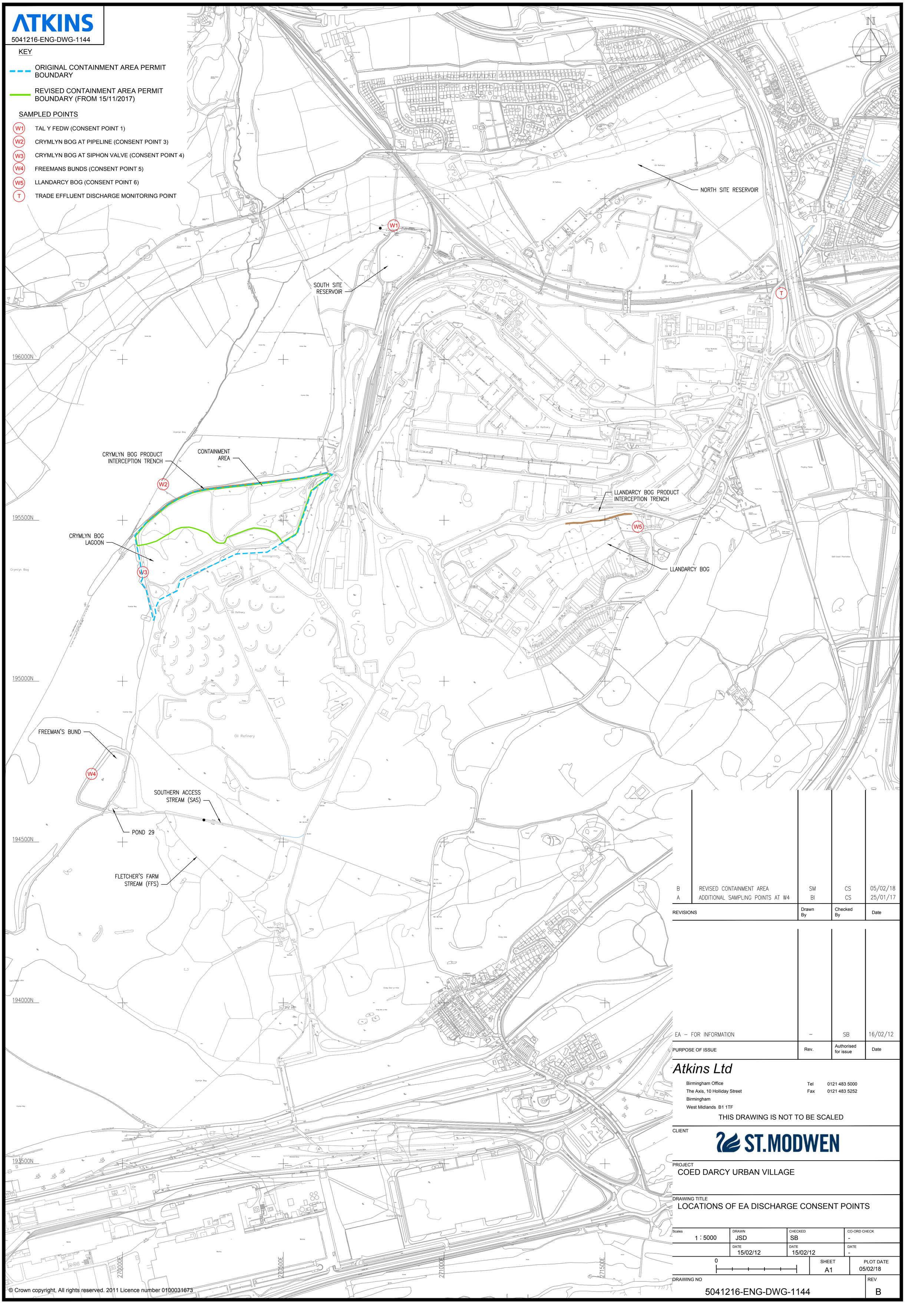
KEY

ORIGINAL CONTAINMENT AREA PERMIT BOUNDARY

REVISED CONTAINMENT AREA PERMIT BOUNDARY (FROM 15/11/2017)

SAMPLED POINTS

- W1 TAL Y FEDW (CONSENT POINT 1)
- W2 CRYMLYN BOG AT PIPELINE (CONSENT POINT 3)
- W3 CRYMLYN BOG AT SIPHON VALVE (CONSENT POINT 4)
- W4 FREEMANS BUNDS (CONSENT POINT 5)
- W5 LLANDARCY BOG (CONSENT POINT 6)
- T TRADE EFFLUENT DISCHARGE MONITORING POINT



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REVISIONS		Drawn By	Checked By	Date
B	REVISED CONTAINMENT AREA	SM	CS	05/02/18
A	ADDITIONAL SAMPLING POINTS AT W4	BI	CS	25/01/17

PURPOSE OF ISSUE	Rev.	Authorised for issue	Date
EA – FOR INFORMATION	–	SB	16/02/12

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CLIENT

ST.MODWEN

PROJECT

COED DARCY URBAN VILLAGE

DRAWING TITLE

LOCATIONS OF EA DISCHARGE CONSENT POINTS

Scales	DRAWN	CHECKED	CO-ORD CHECK
1 : 5000	JSD	SB	-
	DATE 15/02/12	DATE 15/02/12	DATE -

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SHEET	PLOT DATE
A1	05/02/18

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DO NOT SCALE

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SKEWEN ESTATE
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W1C
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W1A
M4 MOTORWAY
Oil Refinery
Oil Refinery
Mineral Railway
Mineral Railway
Mineral Railway
Water
Pond
Tal-y-fedw
Trough
Sinks
Overflow
Lighting Tower
Sloping masonry
Mwyn Drain
Path Drain
Moes-y-gwllod
Sluice
Post
Tk
BM 16.34m
BM 31.45m
16.5m
18.2m
27.1m
27.62m
39.0m
42.7m
47.2m
MP.75
Issues
Track
Drain
ETL
SP
SM
FB

KEY

- SITE DERIVED WATER INPUT TO DISCHARGE CONSENT POINT
- NON-SITE DERIVED WATER INPUT TO DISCHARGE CONSENT POINT
- OFF-SITE SOURCES OF SURFACE WATER
- ON-SITE SOURCES OF SURFACE WATER
- W1 DISCHARGE CONSENT POINT

Rev.	Date	Description	By	Chk'd	App'd
P1	20/02/19	FOR INFORMATION	RE	HW	CS

Drawing Status: FOR INFORMATION
Suitability: S2

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: W1 DISCHARGE CONSENT
WATER QUALITY SURVEY 2018

Scale	Designed	Drawn	Checked	Authorised
1:1000	HW	RE	HW	CS
Original Size	Date	Date	Date	Date
A1	13/02/19	13/02/19	18/02/19	20/02/19

Drawing Number: 5041216-ATK-GEN-NS-DR-C-4169
Revision: P 1

Appendix B. Technical Note 5041216-ENG-TN-000672

Technical Note 672

ATKINS

Subject:	EA Discharge consent point W1: Water Quality Survey of off-site sources of nitrate		
Reference:	5041216-ENG-TN-000672	**Revision:**	0
Author:	Selina Bamforth	**Checker:**	Ross Goodchild
Issued to:	Neil Williams	**Reviewer:**	Richard Engledow
Date:	17/10/11	**Authoriser:**	Mike Poland

1. Introduction

Atkins Limited (Atkins) was commissioned by St. Modwen Developments Ltd (SMD) to undertake a survey of the potential off site source(s) of nitrate that are impacting upon the Environment Agency (EA) discharge consent point (W1). Previous investigations had suggested that there were two key sources of nitrate to the EA discharge consent point; these were the North Site Reservoir (NSR) interception drain and a drain discharging from a railway embankment culvert in Skewen.

This work is required as part of the amendment of the EA discharge consent in line with the discharge of a Planning Condition (PC 33; Neath and Port Talbot Planning Application P/2005/393; Outline Application for an Urban Village).

The survey was carried out over 2 days in September 2011 with representative water samples taken along the NSR drain and from downstream sources around the discharge consent point.

2. Background and Rationale

There are thought to be two key sources of elevated nitrate to the EA discharge consent point; these are the NSR interception drain and drainage discharging from an agricultural drain north of the consent point.

The NSR drain was installed circa 2003 in order to reduce the volume of surface and other waters entering the NSR and hence the costs associated with pumping water from the NSR to the site trade effluent point. It is understood that these works were undertaken following consultation between EAW and the previous site owners BP. The effluent from the drain has been regularly monitored and is noted to be elevated in nitrate (against the proposed discharge limits), which would impact the EA discharge consent point downstream.

The drain, which is constructed as a French drain, was originally designed to collect surface water runoff from the north of the NSR. However, there were thought to be additional inputs to the drain, with evidence suggesting that the drain also picks up water from the M4 drainage and from a surface water drain from Skewen. As built plans which show the connections are not available, therefore a survey was required to fully understand the source of water to the drain.

The source of the agricultural drain that enters Crymlyn Brook upstream of the DC point is currently unknown; however regular monitoring results have demonstrated that this is a recurring source of nitrate to the DC point. Therefore, further investigation was required in this area to investigate this drain and a possible link to the Skewen drainage system.

The object of this work was to clearly demonstrate the source of the nitrate as being from an offsite source rather than from infiltration from the ground north of the NSR.

3. Survey Results

The aim of the survey was to identify the main sources of water to the NSR drain. The weather conditions were dry on the day of the survey, which followed a period of relatively dry weather.

Due to dense vegetation, the whole length of the NSR trench was not inspected; however the connection between the M4 surface water drainage and the interception trench was located and inspected at MH016

(see Drawing 5041216-ENG-DWG-0001046 and Plate 1). The connection is made at the far easterly end of the trench. Cross reference of the M4 drainage plans and the available interception drain plans confirms that this drain collects water from a 450m length of motorway. The motorway drain feed is understood to consist of French drains along both carriageways and along the central reservation. These fall to the west towards the discharge point at MH016.

From the western end of the NSR interception trench, 6 manholes were identified. MH000, which is the final manhole along the interception drain, had a 300mm connection from the north. This is believed to originate from the Skewen estate directly north of the sample point (see Drawing 5041216-ENG-DWG-0001046 and Plate 2). A further 5 manholes were inspected running eastwards along the trench; 3 of these had minor secondary pipes (approx 100mm) entering the manholes from the north. These pipes did not appear to be flowing at the time of inspection.

On the day of the inspection, it was noted that the flow rate from the M4 drainage was roughly equal to that at the end of the trench in MH000, suggesting that there was minimal additional flow entering the trench from surface water infiltration. The flow from the Skewen estate was roughly equal to that from the interception trench (see Plate 2).

Investigation of the agricultural drain which enters Crymlyn Brook at the DC point was also carried out. The drain was traced back to a railway culvert to the north of the DC point, however no further evidence was found up gradient of the culvert. See Plate 3 of the water discharging from the culvert.

4. Water Quality Results

The pertinent lab results, in relation to compliance with the EA discharge consents are presented on Drawing 5041216-ENG-DWG-0001046. The results clearly demonstrate that the M4 drain and the Skewen drain are the key sources of nitrate to the interception drain, with nitrate concentrations remaining constant between the influent and effluent to the NSR drain. It is anticipated that even in wet weather, when there could be some surface water inflow to the drain from ground adjacent to the NSR that the nitrate loading from this source will be statistically insignificant in comparison to the M4 and Skewen drainage.

A water sample taken from the railway culvert was also high in nitrate (Tal y Fedw SW1; 29mg/l) and will also have a significant impact on the discharge consent point. The source of this water to the culvert is currently unknown.

5. Conclusions

These observations and results confirm Atkins opinion that there are three key off site third party sources of nitrate to the site discharge consent point. These are:

- M4 drainage
- NSR Skewen (drain discharging into the NSR drain)
- Railway culvert Skewen (presumed surface water drainage)

Drainage from the site is not considered to impact on discharge consent point W1 with respect to nitrate and therefore any breach of the consent limit at W1 is not SMD's responsibility.



Plate 1. Manhole 016. M4 drainage manhole flow right to left.



Plate 2. Manhole 000. Skewen drainage to the left, NSR drain to the right.

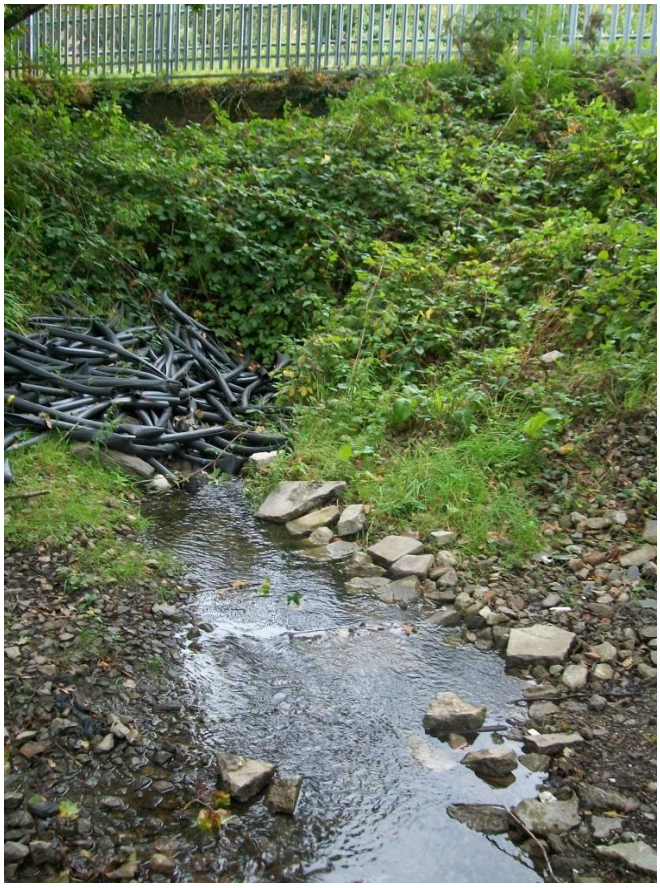


Plate 3. Drain at railway line discharging towards DC point

Appendix C. Monitoring Results

	Location	Sample Date	Month	Conductivity @ 20 deg.C	Nitrite as NO2	pH	Ammoniacal Nitrogen as NH4	Phosphate (ortho) as PO4, (DAIP)	Nitrate as NO3	BOD, unfiltered	Suspended solids, Total	DAIN
Units				mS/cm	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LOD				<0.005	<0.05	<1	<0.3	<0.05	<0.3	<1	<2	<0.4
	W1	24/01/2018	Jan-18	0.196	0.051	7.7	<0.3	<0.05	6.04	<1	5.15	6.091
	W1	22/02/2018	Feb-18	0.45	<0.05	7.88	<0.3	<0.05	0.564	<1	7.8	0.564
	W1	23/03/2018	Mar-18	0.265	<0.05	7.72	<0.3	<0.05	8.96	<1	<2	8.96
	W1	27/04/2018	Apr-18	0.199	<0.05	7.79	<0.3	<0.05	3.76	<1	4.5	3.76
	W1	30/05/2018	May-18	0.279	0.056	8.28	<0.3	<0.05	5.87	<1	3.4	5.926
	W1	29/06/2018	Jun-18	0.333	<0.05	7.99	<0.3	<0.05	3.18	<1	8.55	3.18
	W1	04/09/2018	Aug-18	0.322	<0.05	7.88	<0.3	<0.05	7.21	<1	<2	7.21
	W1	28/09/2018	Sep-18	0.336	<0.05	7.58	<0.3	<0.05	11.3	<1	<2	11.3
	W1	26/10/2018	Oct-18	0.327	<0.05	7.77	<0.3	<0.05	8.57	<1	<4	8.57
	W1	16/11/2018	Nov-18	0.305	<0.05	7.74	<0.3	<0.05	9.95	<1	<4	9.95
	W1	12/12/2018	Dec-18	0.269	<0.05	7.78	<0.3	<0.05	11.3	<1	<2	11.3

Statistical analysis of result over the last year									
Min		<0.05	7.58	<0.3	<0.05	0.564		<2	0.564
Mean of samples above LOD		0.054	7.83	N/A	N/A	6.97		5.88	6.98
Max		0.056	8.28	<0.3	<0.05	11.30		8.55	11.30
Number of samples		11	11	11	11	11		11	11
Trigger Level					0.05			50	2
Exceedances of trigger level					0			0	10

	Location	Sample Date	Month	Conductivity @ 20 deg.C	Nitrite as NO2	pH	Ammoniacal Nitrogen as NH4	Phosphate (ortho) as PO4, (DAIP)	Nitrate as NO3	BOD, unfiltered	Suspended solids, Total	DAIN
Units				mS/cm	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LOD				<0.005	<0.05	<1	<0.3	<0.05	<0.3	<1	<2	<0.4
	W1A	11/12/2018	Dec-18	-	<0.05	7.5	<0.2	-	1.05	<1	<2	1.05
	W1B	11/12/2018	Dec-18	-	<0.05	7.95	<0.2	-	0.823	<1	2.75	0.823
	W1C	11/12/2018	Dec-18	-	<0.05	7.79	<0.2	-	10.7	<1	<2	10.7
	W1D	11/12/2018	Dec-18	-	<0.05	7.89	<0.2	-	0.548	<1	4.1	0.548
	W1D	12/12/2019	Dec-18	-	0.053	7.76	0.351	<0.05	0.454	<1	3.8	0.858
	W1E	11/12/2018	Dec-18	-	<0.05	7.59	<0.2	-	35.3	<1	<2	35.3
	W1	11/12/2018	Dec-18	-	<0.05	8.17	<0.2	-	8.45	<1	<2	8.45

Statistical analysis of result over the last year									
Min		<0.05	7.5	<0.2	<0.05	0.454		<2	<3
Mean of samples above LOD		0.053	7.81	0.35	N/A	8.19		3.55	8.25
Max		0.053	8.17	0.35	<0.05	35.30		4.10	35.30
Number of samples		7	7	7	7	7		7	7
Trigger Level					0.05			50	2
Exceedances of trigger level					0			0	3

	Location	Sample Date	Month	Conductivity @ 20 deg.C	Nitrite as NO2	pH	Ammoniacal Nitrogen as NH4	Phosphate (ortho) as PO4, (DAIP)	Nitrate as NO3	BOD, unfiltered	Suspended solids, Total	DAIN
Units				mS/cm	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LOD				<0.005	<0.05	<1	<0.3	<0.05	<0.3	<1	<2	<0.4
	W2	24/01/2018	Jan-18	0.31	<0.05	7.67	0.397	<0.05	0.558	4.75	<2	0.955
	W2	22/02/2018	Feb-18	0.315	<0.05	7.75	<0.3	<0.05	0.802	<1	5.75	0.802
	W2	23/03/2018	Mar-18	0.521	<0.05	7.63	<0.3	<0.05	0.823	<1	<2	0.823
	W2	27/04/2018	Apr-18	0.514	<0.05	7.82	<0.3	<0.05	<0.3	2.44	11.9	0
	W2	30/05/2018	May-18	0.52	<0.05	8.48	0.554	<0.05	<0.3	3.55	10	0.554
	W2	29/06/2018	Jun-18	0.501	<0.05	7.35	<0.3	<0.05	<0.3	8.66	17.1	0
	W2	20/07/2018	Jul-18	0.496	<0.05	7.43	<0.3	<0.05	<0.3	12	18.4	0
	W2	04/09/2018	Aug-18	0.638	<0.05	7.06	<0.3	<0.05	<0.3	3.37	74.9	0
	W2	28/09/2018	Sep-18	0.473	<0.05	7.21	<0.3	<0.05	<0.3	<1.67	2.55	0
	W2	26/10/2018	Oct-18	0.499	<0.05	7.21	0.378	<0.05	<0.3	2.55	2.3	0.378
	W2	16/11/2018	Nov-18	0.477	<0.05	7.44	<0.3	<0.05	<0.3	4.35	<2	0
	W2	13/12/2018	Dec-18	0.553	<0.05	7.7	0.625	<0.05	0.303	5.49	<2	0.928
	Statistical analysis of result over the last year											
	Min				<0.05	7.06	<0.3	<0.05	<0.3		<2	0
	Mean of samples above LOD				N/A	7.56	0.49	NA	0.62		17.86	0.37
	Max				<0.05	8.48	0.63	<0.05	0.82		74.90	0.96
	Number of samples				12	12	12	12	12		12	12
	Trigger Level							0.05			50	2
	Exceedances of trigger level							0			1	0

	Location	Sample Date	Month	Conductivity @ 20 deg.C	Nitrite as NO2	pH	Ammoniacal Nitrogen as NH4	Phosphate (ortho) as PO4, (DAIP)	Nitrate as NO3	BOD, unfiltered	Suspended solids, Total	DAIN
Units				mS/cm	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LOD				<0.005	<0.05	<1	<0.3	<0.05	<0.3	<1	<2	<0.4
	W3	24/01/2018	Jan-18	0.288	<0.05	7.9	<0.3	<0.05	1.12	<1	44.1	1.12
	W3	22/02/2018	Feb-18	0.554	<0.05	7.75	0.451	<0.05	0.407	2.95	17.5	0.858
	W3	23/03/2018	Mar-18	0.316	<0.05	7.81	<0.3	<0.05	0.752	<1	5.85	0.752
	W3	27/04/2018	Apr-18	0.334	<0.05	7.72	<0.3	<0.05	<0.3	2.46	8.5	0
	W3	30/05/2018	May-18	0.445	<0.05	8.48	1.4	<0.05	<0.3	3.31	3.45	1.4
	W3	29/06/2018	Jun-18	0.543	<0.05	7.59	1.11	<0.05	<0.3	2.54	<2	1.11
	W3	20/07/2018	Jul-18	0.504	<0.05	8.2	0.387	<0.05	<0.3	2.39	6.85	0.387
	W3	04/09/2018	Aug-18	0.467	<0.05	7.61	<0.3	<0.05	<0.3	<1	2	0
	W3	28/09/2018	Sep-18	0.462	<0.05	7.79	<0.3	<0.05	<0.3	<1	4.8	0
	W3	26/10/2018	Oct-18	0.462	<0.05	7.73	<0.3	<0.05	<0.3	<1	4.05	0
	W3	16/11/2018	Nov-18	0.419	<0.05	7.44	<0.3	<0.05	0.701	2.38	<4	0.701
	W3	13/12/2018	Dec-18	0.331	<0.05	7.56	<0.3	<0.05	0.989	<1	3.15	0.989
	Statistical analysis of result over the last year											
	Min				<0.05	7.44	<0.3	<0.05	<0.3		<2	0
	Mean of samples above LOD				N/A	7.80	0.84	N/A	0.79		10.03	0.61
	Max				<0.05	8.48	1.40	<0.05	1.12		44.10	1.40
	Number of samples				12	12	12	12	12		12	12
	Trigger Level							0.05			50	2
	Exceedances of trigger level							0			0	0

	Location	Sample Date	Month	Conductivity @ 20 deg.C	Nitrite as NO2	pH	Ammoniacal Nitrogen as NH4	Phosphate (ortho) as PO4, (DAIP)	Nitrate as NO3	BOD, unfiltered	Suspended solids, Total	DAIN
Units				mS/cm	mg/l	pH Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
LOD				<0.005	<0.05	<1	<0.3	<0.05	<0.3	<1	<2	<0.4
	W4	24/01/2018	Jan-18	0.176	<0.05	7.56	<0.3	<0.05	4.29	<1	4.5	4.29
	W4	22/02/2018	Feb-18	0.204	<0.05	7.57	<0.3	<0.05	3.26	<1	<2	3.26
	W4	23/03/2018	Mar-18	0.2	<0.05	7.56	<0.3	<0.05	2.93	<1	<2	2.93
	W4	27/04/2018	Apr-18	0.181	<0.05	7.58	<0.3	<0.05	0.794	<1	4.5	0.794
	W4	30/05/2018	May-18	0.219	<0.05	7.77	0.338	<0.05	1.5	<1	2.95	1.838
	W4	29/06/2018	Jun-18									
	W4	20/07/2018	Jul-18									
	W4	04/09/2018	Aug-18	0.414	<0.05	6.99	<0.3	<0.05	0.326	2.31	<2	0.326
	W4	28/09/2018	Sep-18	0.274	<0.05	7.05	<0.3	<0.05	0.315	<1	<2	0.315
	W4	26/10/2018	Oct-18	0.24	<0.05	7.12	<0.3	<0.05	<0.3	<1	<4	0
	W4	16/11/2018	Nov-18	0.21	<0.05	7.19	<0.3	<0.05	1.01	<1	<2	1.01
	W4	13/12/2018	Dec-18	0.177	<0.05	7.15	<0.3	<0.05	3.4	<1	<2	3.4
	Statistical analysis of result over the last year											
	Min				<0.05	6.99	<0.2	<0.05	0.315		<2	0.00
	Mean of samples above LOD				N/A	7.35	0.34	N/A	1.98		3.98	1.82
	Max				<0.05	7.77	0.34	<0.05	4.29		4.50	4.29
	Number of samples				10	10	10	10	10		10	10
	Trigger Level							0.05			50	2
	Exceedances of trigger level							0			0	3

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5041216-RAP-DWG-1673

SAMPLED POINTS

- W1 TAL Y FEDW (CONSENT POINT 1)
- W2 CRYMLYN BOG AT PIPELINE (CONSENT POINT 3)
- W3 CRYMLYN BOG AT SIPHON VALVE (CONSENT POINT 4)
- W4 FREEMANS BUNDS (CONSENT POINT 5)
- W5 LLANDARCY BOG (CONSENT POINT 6)
- T TRADE EFFLUENT DISCHARGE MONITORING POINT

KEY

- PLANNING BOUNDARY
- ST. MODWEN LAND OWNERSHIP BOUNDARY

N

W1

T

CRYMLYN BOG PRODUCT INTERCEPTION TRENCH

W2

LLANDARCY BOG PRODUCT INTERCEPTION TRENCH

W5

W3

W4

REVISIONS	Drawn By	Checked By	Date
For Information	–	MT	28/01/14
PURPOSE OF ISSUE	Rev.	Authorised for issue	Date

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THIS DRAWING IS NOT TO BE SCALED

CLIENT

ST.MODWEN

PROJECT

COED DARCY

DRAWING TITLE

Locations of Discharge Consent Points

Scales	DRAWN	CHECKED	CO-ORD CHECK
1 : 5000	BS	MT	MP
	DATE 28/01/14	DATE 28/01/14	DATE 28/01/14

0

SHEET	PLOT DATE
A1	28/01/14

DRAWING NO 5041216-RAP-DWG-1673

REV -

Plotted by: shin4086

ot date: Jan 31, 2014 - 9:40am

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Appendix E. Drawings

E.1. 5041216-ATK-GM-SS-DR-C-5004_Catchment 4 and 5 (South Site) Existing Surface Water Contributing Areas

E.2. 5041216-ATK-GM-WS-DR-C-6026 Proposed Earthworks Levels (Sheet 1 of 2)

E.3. 5041216-ATK-GM-WS-DR-C-6027 Proposed Earthworks Levels (Sheet 2 of 2)

E.4. 5041216-ATK-GM-WS-DR-C-6038 Site Wide Earthworks Responsibilities

E.5. 5041216-ATK-GM-WS-DR-C-6041 Whole Site Drainage Strategy

E.6. 5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls

E.7. 5041216-ATK-GEN-WS-DR-C-6061 PC22 Phasing



KEY

- CATCHMENTS CONTRIBUTING AREA
- SUB-CATCHMENT CONTRIBUTING AREA
- EXISTING SURFACE WATER CHANNEL
- EXISTING ATTENUATION FEATURES TO BE RETAINED

NOTES

1. CATCHMENT AREAS TAKEN FROM "COED DARCY URBAN VILLAGE, FIGURE 4.3 CATCHMENT AREAS, PARSONS BRINCKERHOFF 2005"
2. DISCHARGE RATE OF 5.5 l/s/ha USED TO CALCULATE CATCHMENT RUN OFF

Rev.	Date	Description	By	Chk'd	App'd
P01		FOR ISSUE	TM	JWF	TB

Drawing Status: FOR INFORMATION

Suitability: S2

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Client: ST.MODWEN

Project Title: COED DARCY

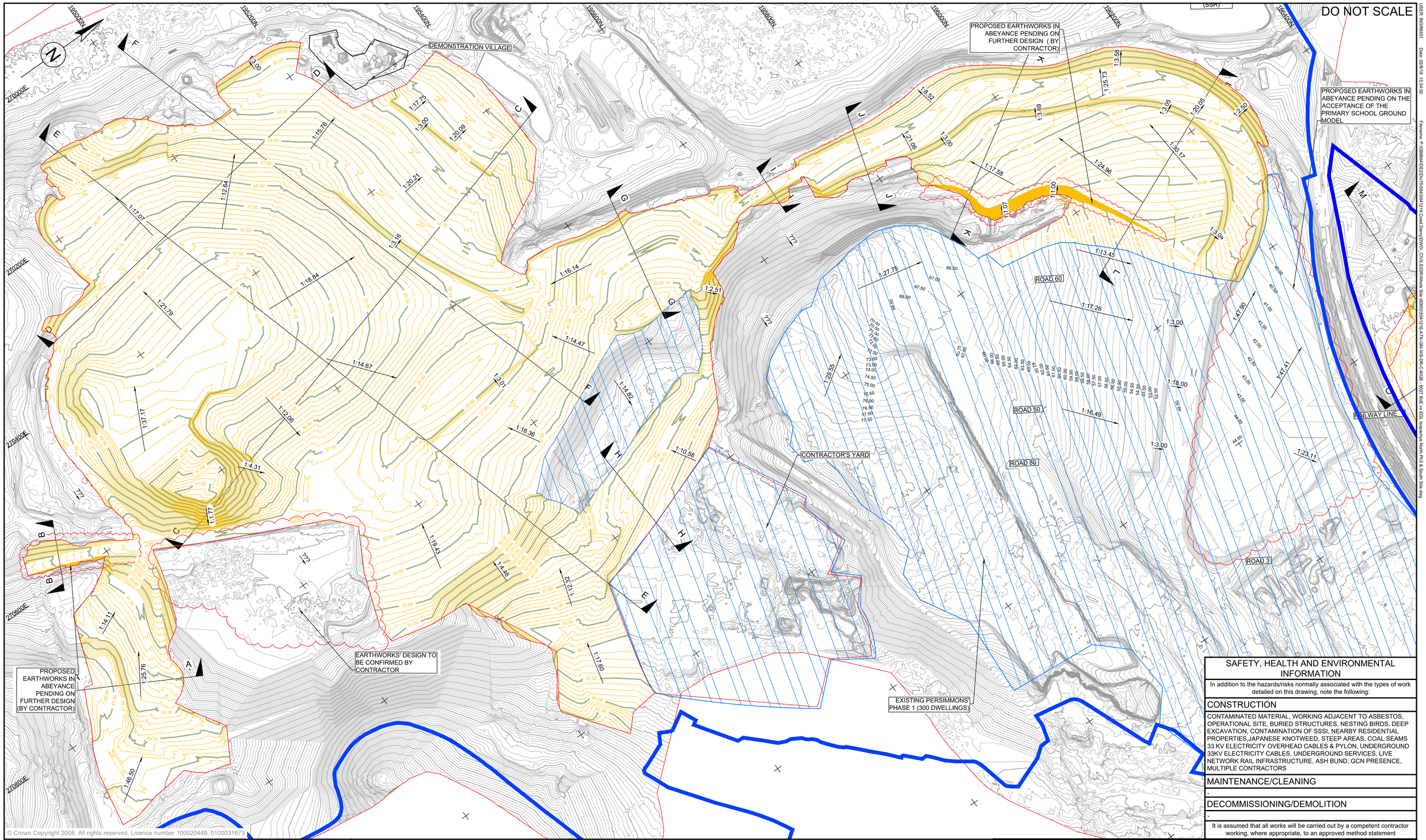
Drawing Title: CATCHMENT 4 AND 5 (SOUTH SITE) EXISTING SURFACE WATER CONTRIBUTING AREAS

Scale	Designed	Drawn	Checked	Authorised
1:2,500	TM	TM	JWF	TB
Original Size: A1	Date: 07/08/17	Date: 07/08/17	Date: 14/08/17	Date: 14/08/17

Drawing Number: 5041216-ATK-GM-SS-DR-C-0005004

Revision: P01

USER: MEAL4252
Date: 09/11/17 16:57:46
Filename: P:\GEBMAIDE\Div7\5\5041216\Coed Darcy\DWG_CIVILS\DR\South Site (4000)\5041216-ATK-GM-SS-DR-C-6004_Catchment 4 and 5 (South Site) Existing Surface Water Contributing Areas.dwg



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KEY:

- EXTENT OF WORKS BOUNDARY
- EXTENT OF BULK EARTHWORKS
- AREAS EXCLUDED FROM WORKS BOUNDARY
- 30.00 PROPOSED BULK EARTHWORKS LEVEL MAJOR (2.5m) CONTOUR (mAOD)
- 30.00 PROPOSED BULK EARTHWORKS LEVEL MINOR (0.5m) CONTOUR (mAOD)
- 30.00 EXISTING GROUND LEVEL CONTOUR 2018 (mAOD)

NOTES

1. ALL PROPOSED DIMENSIONS SHOWN ARE FOR INDICATIVE PURPOSES ONLY, AND ARE SUBJECT TO FURTHER DEVELOPMENT.
2. TOPOGRAPHICAL SURVEY DRONE SURVEY UNDERTAKEN DURING AUGUST 2018.
3. PROPOSED BASE OF EXCAVATION LEVELS TAKEN FROM MODELS 5041216-ATK-GM-NA-M3-C-7000 BoE (P01), 5041216-ATK-GM-NS-M3-C-4017 Base of Excavation Level (P06) AND 5041216-ATK-GM-SS-M3-C-5001 BoE Levels (P02).
4. DRAWING TO BE READ IN CONJUNCTION WITH DRAWINGS
   5041216-ATK-GM-NS-DR-C-6027
   5041216-ATK-GM-NS-DR-C-5013
   5041216-ATK-GM-NS-DR-C-4100
   5041216-ATK-GM-WS-DR-C-6052 , 6053 AND 6054.
5. PROPOSED CONTOUR LEVELS ARE SUBJECT TO AGREEMENT WITH St. MODWEN DEVELOPMENT
6. PROPOSED EARTHWORKS BASED ON THE ASSUMPTION THAT PERMANENT ATTENUATION PONDS WILL BE FORMED FOLLOWING THE COMPLETION OF THE BULK EARTHWORKS
7. FOR FURTHER INFORMATION REFER TO:
   - SITEWIDE WORKS INFORMATION
   - SITEWIDE TENDER DOCUMENT REGISTER

Rev.	Date	Description	By	Chk'd	App'd
P05	02/08/19	KEY AND NOTES AMENDED, AREAS EXCLUDED FROM WORKS BOUNDARY ADDED	GI	AGV	JF
P04	12/07/19	BULK EARTHWORKS UPDATED. KEY AMENDED. STATUS UPDATED	AGV	JF	TB
P03	18/06/19	EXISTING CONTOURS (2018) AND DEVELOPMENT BOUNDARY ADDED	GI	JF	TB
P02	04/10/18	BASE OF EXCAVATION MODEL UPDATED; EXISTING CONTOURS (2016) ADDED	AGV	JF	TB
P01	04/04/18	INITIAL DRAFT	JH	JF	TB

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

CONTAMINATED MATERIAL, WORKING ADJACENT TO ASBESTOS, OPERATIONAL SITE, BURIED STRUCTURES, NESTING BIRDS, DEEP EXCAVATION, CONTAMINATION OF SSSI, NEARBY RESIDENTIAL PROPERTIES,JAPANESE KNOTWEED, STEEP AREAS, COAL SEAMS 33 KV ELECTRICITY OVERHEAD CABLES & PYLON, UNDERGROUND 33KV ELECTRICITY CABLES, UNDERGROUND SERVICES, LIVE NETWORK RAIL INFRASTRUCTURE, ASH BUND, GCN PRESENCE, MULTIPLE CONTRACTORS

MAINTENANCE/CLEANING

-

DECOMMISSIONING/DEMOLITION

-

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

Drawing Status: FOR TENDER
Suitability: D2

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Client: ST.MODWEN


Project Title: COED DARCY

Drawing Title: PROPOSED BULK EARTHWORKS LEVELS SHEET 1 OF 2

Scale	Designed	Drawn	Checked	Authorised
1:2500	JF	GI	JF	TB
Original Size	Date	Date	Date	Date
A1	04/04/18	04/04/18	04/04/18	04/04/18

Drawing Number: 5041216-ATK-GM-WS-DR-C-6026
Revision: P05

USER: INGRIG01
Date: 02/8/19 13:34:02
Filename: P:\GEMA\ADE\DV7550\04504\1216 Coed Darcy\DWG\ CIVIL\SDR\Whole Site (6000)\5041216-ATK-GM-WS-DR-C-6026 - 6027 BoE vs EGL Incpotyw North Ph3 & South Site.dwg



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

CONTAMINATED MATERIAL, WORKING ADJACENT TO ASBESTOS, OPERATIONAL SITE, BURIED STRUCTURES, NESTING BIRDS, DEEP EXCAVATION, CONTAMINATION OF SSSI, NEARBY RESIDENTIAL PROPERTIES,JAPANESE KNOTWEED, STEEP AREAS, COAL SEAMS 33 KV ELECTRICITY OVERHEAD CABLES & PYLON, UNDERGROUND 33KV ELECTRICITY CABLES, UNDERGROUND SERVICES, LIVE NETWORK RAIL INFRASTRUCTURE, ASH BUND, GCN PRESENCE, LARGE WATERBODY, PROTECTED TREES, REDUNDANT TANKS, THIRD PARTY LAND.

MAINTENANCE/CLEANING

-

DECOMMISSIONING/DEMOLITION

-

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

KEY:

- EXTENT OF WORKS BOUNDARY
- EXTENT OF BULK EARTHWORKS
- AREAS EXCLUDED FROM WORKS BOUNDARY
- 30.00 PROPOSED BULK EARTHWORKS LEVEL MAJOR (2.5m) CONTOUR (mAOD)
- 30.00 PROPOSED BULK EARTHWORKS LEVEL MINOR (0.5m) CONTOUR (mAOD)
- 30.00 EXISTING GROUND LEVEL CONTOUR 2018 (mAOD)

NOTES

1. ALL PROPOSED DIMENSIONS SHOWN ARE FOR INDICATIVE PURPOSES ONLY, AND ARE SUBJECT TO FURTHER DEVELOPMENT.
2. TOPOGRAPHICAL SURVEY DRONE SURVEY UNDERTAKEN DURING AUGUST 2018.
2. PROPOSED BASE OF EXCAVATION LEVELS TAKEN FROM MODELS 5041216-ATK-GM-NA-M3-C-7000 BoE (P01), 5041216-ATK-GM-NS-M3-C-4017 Base of Excavation Level (P06) AND 5041216-ATK-GM-SS-M3-C-5001 BoE Levels (P02).
3. DRAWING TO BE READ IN CONJUNCTION WITH DRAWINGS 5041216-ATK-GM-NS-DR-C-6027 5041216-ATK-GM-NS-DR-C-5013 5041216-ATK-GM-NS-DR-C-4100 5041216-ATK-GM-WS-DR-C-6052 , 6053 AND 6054.
4. FOLLOWING THE COMPLETION OF THE BULK EARTHWORKS
5. FOR FURTHER INFORMATION REFER TO: SITEWIDE WORKS INFORMATION SITEWIDE TENDER DOCUMENT REGISTER
6. CONTRACTOR TO CONFIRM THE VALIDITY OF THE DATA PROVIDED

Rev.	Date	Description	By	Chk'd	App'd
P02	02/08/2019	KEY AND NOTES AMENDED, AREAS EXCLUDED FROM WORKS BOUNDARY ADDED	GI	AGV	JF
P01	12/07/2019	FIRST ISSUE	AGV	JF	TB

Drawing Status: FOR TENDER
Suitability: D2

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: PROPOSED BULK EARTHWORKS LEVELS SHEET 2 OF 2

Scale	Designed	Drawn	Checked	Authorised
1:2500	AGV	AGV	JF	TB
Original Size	**Date**	**Date**	**Date**	**Date**
A1	12/07/19	12/07/19	12/07/19	12/07/19

Drawing Number	Revision
5041216-ATK-GM-WS-DR-C-6027	P02

DO NOT SCALE

NORTHERN SITE

NORTH SITE - PHASE 3

NORTH SITE

EXISTING PERSIMMONS PHASE 1

CONTRACTOR'S YARD

SOUTH SITE

RAILWAY LINE

SSR

NSR

KEY:

- EXTENT OF EARTHWORKS
- CONTRACTOR'S WORKS BOUNDARY
- CONTRACTOR'S WORKS EXCLUSION AREAS
- NORTHERN SITE
- NORTH SITE
- SOUTH SITE

NOTES:

1. ALL PROPOSED DIMENSIONS SHOWN ARE FOR INDICATIVE PORPUSES ONLY, AND ARE SUBJECT TO FURTHER DEVELOPMENT
2. FOR FURTHER DETAILS ON SITE TERMINOLOGY PLEASE REFER TO DRAWING 5041216-ATK-GM-WS-DR-C-6039
3. DRAWING IS TO BE READ IN CONJUNCTION WITH THE SITEWIDE EARTHWORKS TECHNICAL SPECIFICATION REFERENCE PFF

Rev.	Date	Description	By	Chk'd	App'd
P3	8/6/2019	CONTRACTOR'S WORKS EXCLUSION AREAS ADDED AND EXTENT OF EARTHWORKS BOUNDARY UPDATED	GI	AGV	JF
P2	7/19/2019	SITE LOCATION HATCHING ADDED	GI	AGV	JF
P1	10/2/2018	FIRST ISSUE	GI	CS	JF

Drawing Status: FOR TENDER

Suitability: D2

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: WHOLE SITE EARTHWORKS WORKS RESPONSIBILITES

Scale	Designed	Drawn	Checked	Authorised
1:5000	JH	GI	CS	JF
Original Size	Date	Date	Date	Date
A1	18/07/18	02/10/18	02/10/18	02/10/18

Drawing Number: 5041216-ATK-GM-WS-DR-C-6038

Revision: P03

USER: ING5R6301
Date: 06/8/19 10:29:15
Filename: P:\GBBMA\DED\D\75\5045\5041216\Coed Darcy\DWG_CIVIL\SDR\Whole Site (6000)\5041216-ATK-GM-WS-DR-C-6039 Remaining Development Area.dwg

Millimetres 100 10 0

ATTENUATION FEATURES						
	REFERENCE	IL (mAoD)	CL (mAoD)	VOLUME (m3)	IMPERMEABLE AREA - 75% IMP. RATE (m2)	DISCHARGE RATE (l/s)
CATCHMENT 2	SOUTH SITE RESERVOIR (SSR) **	16,50	21,80	IMPOUNDED VOL. = 31.400 FULL VOL. (NO FREEBOARD) = 78.200 ATTENUATION VOLUME = 42.800	35,42	87,00*
CATCHMENT 4	1	25,20	27,00	3.100	3,19	22,50
	2	26,20	28,00	1.900	2,10	19,60
	3	12,20	14,00	8.300	8,75	64,10
	4	18,20	20,00	6.000	6,50	47,60
	5	23,70	25,50	6.000	6,40	46,20
	6	13.20	15,00	4.300	4,50	33,10
	7 (SOUTH BAY)**	7,30	9,30	EXISTING VOL. = 8.020 ADDITIONAL VOL. = 3.700	4,00	29,30
	8	52,20	54,00	6.100	6,60	48,40
	9	43,70	45,50	1.800	2,00	14,30
	ELLEN'S POND***	TBC	TBC	EXISTING VOL. = 690	TBC	TBC
	CRYMLYN BOG LAGOONS **	7,30	9,10	EXISTING VOL. = 20.394	77,55	560 (TBC) *
	WEST BAY **	6,50	9,00	EXISTING VOL. = 2.600	TBC	TBC
CATCHMENT 3	10	44,20	46,00	2.500	2.70	19,80
CATCHMENT 3A	11	26,2	28,00	2.700	2,92	21,45
	TOTAL ADDITIONAL ATTENUATION VOL.			89.200		

*BASED ON DISCHARGE RATE "5.5 L/S/HA OF GROSS AREA" AND CATCHMENT AREA AS SHOWN IN ENVIRONMENTAL STATEMENT FIG 4.3

**EXISTING ATTENUATION FEATURE TO BE UTILISED AS A DRAINAGE ATTENUATION FEATURE.

*** EXITING ATTENUATION FEATURE NOT TO BE UTILISED AS A DRAINAGE ATTENUATION FEATURE

DO NOT SCALE

TAL Y FEDW BROOK
OIL INTERCEPTOR TO BE REMOVED OR BY-PASSED
EXISTING SURFACE WATER STRUCTURE TO BE USED AS OUTFALL CONNECTION
EXISTING NORTH SITE OUTFALL
CRYMLYN BOG
NORTH SITE RESERVOIR
POND 10
POND 11
SOUTH SITE RESERVOIR
BRIDGE HOUSE OUTFALL DISCHARGE LIMIT 583/s
ROAD 60
ROAD 1
ROAD 3
ROAD 50
ROAD 80
ROAD 90
PROPOSED UNDERGROUND ATTENUATION TANKS
OUTFALL TO BE BLOCKED ONCE FLOWS ARE DIVERTED
POTENTIAL RAILHEAD SEPARATOR. SURVEY NEEDED TO PROVE EXISTENCE
POTENTIAL DIRECT OUTFALL TO DITCH, BYPASSING POND 7
CRYMLYN BOG LAGOONS
EXISTING SOUTH STE OUTFALL
POND 7 (SOUTH BAY)
POND 3
WEST BAY
DEMONSTRATION VILLAGE
CRYMLYN BOG
POND 6
POND 4
POND 5
POND 9
POND 8
THE GREENWAY
LLANDARCY BOG
POND 2
FREEMAN'S BUND
ELLEN'S' POND
POND 1
EXISTING DITCH TO BE DIVERTED AROUND POND 1. SUBJECT TO DETAILED DESIGN.

NOTES

1. DISCHARGE RATE CONSIDERED TO BE 5.5. L/S/HA OF GROSS AREA AS AGREED WITH NRW. REFER TO MINUTES 5041216-ENG-MN-0002022 - NRW 2nd Meeting Minutes
2. DRAINAGE LAYOUT ADAPTED TO REFLECT ROBERTS LIMBRICK PROVING LAYOUT
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PLANNING CONDITION 22 REPORT 5041216-ENG-RPT-0001835
4. THIS DRAWING & THE DESIGN DEPICTED ARE COPYRIGHT OF ATKINS AND MAY NOT BE REPRODUCED OR AMENDED EXCEPT BY WRITTEN PERMISSION . NO LIABILITY WILL BE ACCEPTED FOR AMENDMENTS MADE BY OTHER PERSONS.
5. TOPOGRAPHICAL SURVEY SHOWN IS TAKEN FROM GREENHATCH DRAWING 15050_OGL REV 10 DATED 21/12/15.
6. ATTENUATION PONDS HAVE BEEN SIZED USING MICRODRAINAGE - SOURCE CONTROL (MODELLED FOR ALL STORM DURATIONS UP TO AND INCLUDING THE 1in100 + CLIMATE CHANGE STORM EVENT) AND ARE THEREFORE INDICATIVE ONLY. POND VOLUMES ARE SUBJECT TO DETAILED DESIGN AND DETAILED MODELING CALCULATIONS.
7. ATTENUATION PONDS HAVE BEEN SIZED BASED ON THE FOLLOWING ASSUMPTIONS:
   - 1.5m DEPTH
   - 1 IN 100YR STORM EVENT
   - 300mm FREEBOARD ALLOWANCE
   - CLIMATE CHANGE (40%)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

CONTAMINATED MATERIAL, WORKING ADJACENT TO ASBESTOS, OPERATIONAL SITE, BURIED STRUCTURES, NESTING BIRDS, DEEP EXCAVATION, CONTAMINATION OF SSSI, NEARBY RESIDENTIAL PROPERTIES, 11KV BURIED ELECTRICITY CABLE, 33KV BURIED ELECTRICITY CABLE AND 33KV OVERHEAD CABLE, BURIED GAS MAIN, PRESSURE PIPE AND OPEN HOLES.

MAINTENANCE/CLEANING

EARTHWORKS BATTERS, PROXIMITY TO LIVE TRAFFIC

DECOMMISSIONING/DEMOLITION

WORKS NEAR TO AND ON PUBLIC HIGHWAY; ADJACENT TRAFFIC, PEDESTRIANS, UNDERGROUND SERVICES

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

KEY

- LAND DRAINAGE
- CONSTRUCTED SWS NETWORK (PRIVATE NETWORK, OPERATED AND MAINTAINED BY CDL LTD).
- SEWER DESIGN ISSUED TO LOCAL AUTHORITY FOR TECHNICAL APPROVAL
- EXISTING REFINERY SWS NETWORK
- FUTURE CENTRAL SITE GRAVITY SWS NETWORK
- PROPOSED PERMANENT SURFACE WATER DITCH
- EXISTING WATERCOURSE
- EXISTING REFINERY CULVERT
- PROPOSED REED BED (TO BE AGREED WITH DCWW)
- CONCEPT ATTENUATION TANK STORAGE
- EXISTING WATER BODY
- CATHMENT 1
- CATCHMENT 2
- CATCHMENT 3A
- CATCHMENT 3
- SUBCATCHMENT 4-1
- SUBCATCHMENT 4-2
- SUBCATCHMENT 4-3
- SUBCATCHMENT 4-4
- SUBCATCHMENT 4-5
- SUBCATCHMENT 4-6
- SUBCATCHMENT 4-7
- SUBCATCHMENT 4-8
- SUBCATCHMENT 4-9

Rev.	Date	Description	By	Chk'd	App'd
P1	10/29/18	FIRST ISSUE	GI	AGV	JF

Drawing Status: FOR INFORMATION
Suitability: S2

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: WHOLE SITE SURFACE WATER DRAINAGE STRATEGY

Scale	Designed	Drawn	Checked	Authorised
1:5000	GI	GI	AGV	JF
Original Size: A1	Date: 29/10/18	Date: 29/10/18	Date: 29/10/18	Date: 29/10/18

Drawing Number: 5041216-ATK-GM-SS-DR-C-6041
Revision: P 1

USER: GONZ7527 Date: 03/01/19 15:05:36 Filename: P:\GBBMAIE\ZON7\58\04\5041216 Coed Darcy\DWG_CIVIL\SDR\Whole Site (600)\5041216-ATK-GM-WS-DR-C-6041 Whole site Drainage strategy.dwg

DO NOT SCALE

Millimetres 100 10 0

N

TAL Y FEDW BROOK
NORTH SITE RESERVOIR
SOUTH SITE RESERVOIR
CRYMLYN BOG
CRYMLYN BOG
RAILHEAD SEPARATOR
SOUTH BAY
CRYMLYN BOG LAGOON
WEST BAY
DEMONSTRATION VILLAGE
CRYMLYN BOG
FREEMAN'S BUND
SOUTHERN ACCESS STREAM (SAS)
FLETCHER'S FARM STREAM (FFS)
ELLEN'S' POND
DARCY BUSINESS PARK
NATURAL RESOURCE WALES OFFICE
PERSIMMON'S PHASE 1 (300 DWELLINGS)
CONTRACOR'S YARD
LLANDARCY BOG
O1
O2
O3
O4
O5
O6
O7A
O7B
O8
O9

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

CONTAMINATED MATERIAL, WORKING ADJACENT TO ASBESTOS, OPERATIONAL SITE, BURIED STRUCTURES, NESTING BIRDS, DEEP EXCAVATION, CONTAMINATION OF SSSI, NEARBY RESIDENTIAL PROPERTIES, 11KV BURIED ELECTRICITY CABLE, 33KV BURIED ELECTRICITY CABLE AND 33KV OVERHEAD CABLE, BURIED GAS MAIN, PRESSURE PIPE AND OPEN HOLES.

MAINTENANCE/CLEANING

EARTHWORKS BATTERS, PROXIMITY TO LIVE TRAFFIC

DECOMMISSIONING/DEMOLITION

WORKS NEAR TO AND ON PUBLIC HIGHWAY; ADJACENT TRAFFIC, PEDESTRIANS, UNDERGROUND SERVICES

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

NOTES

1. DRAWING TO BE READ IN CONJUNCTION WITH BRIEFING NOTE 5 REF 5041216-ENG-RPT-0001835 AND NRW 'PC22 MEETING' MINUTES REF 5041216-ENG-MN-0002022.

KEY

- EXISTING WATERCOURSES
- EXTENT OF CATCHMENT 1 BOUNDARY (72,86 ha) - FLOWS ATTENUATED AND DISCHARGED TO RIVER NEATH, VIA OUTFALL O1 AND O2
- EXTENT OF CATCHMENT 2 BOUNDARY (60,88 ha) - FLOWS ATTENUATED AND DISCHARGED TO CRYMLYN BOG, VIA OUTFALL O5.
- EXTENT OF CATCHMENT 3 BOUNDARY (6,60 ha) - FLOWS ATTENUATED AND DISCHARGED TO CRYMLYN BOG VIA OUTFALL O3.
- EXTENT OF CATCHMENT 3A BOUNDARY (5,88 ha) - FLOWS ATTENUATED AND DISCHARGED TO CRYMLYN BOG VIA OUTFALL O4.
- EXTENT OF CATCHMENT 4 BOUNDARY (103,40 ha) - FLOWS ATTENUATED AND DISCHARGED TO CRYMLYN BOG VIA OUTFALLS O6, O7A,O7B, O8 AND O9.
- O1 EXISTING HOUSE BRIDGE OUTFALL (CATCHMENT 1 OUTFALL)
- O2 PROPOSED OUTFALL INTO EXISTING DCWW SURFACE WATER SEWER, PENDING CAPACITY ASSESSMENT. (CATCHMENT 1 OUTFALL)
- O3 EXISTING OUTFALL INTO NSR. (CATCHMENT 3 OUTFALL)
- O4 PROPOSED OUTFALL INTO NSR INTERCEPTION DRAIN. (CATCHMENT 3A OUTFALL)
- O5 EXISTING SOUTH SITE RESERVOIR (SSR) OUTFALL. (CATCHMENT 2 OUTFALL)
- O6 PROPOSED OUTFALL (POTENTIAL USE OF EXISTING RAILHEAD SEPARATOR AS OUTFALL STRUCTURE). (CATCHMENT 4 OUTFALL)
- O7A PROPOSED OUTFALL INTO CRYMLYN BOG. EXISTING INTERCEPTOR CHANNEL TO BE REHABILITATED. (CATCHMENT 4 OUTFALL)
- O7B EXISTING OUTFALL INTO CRYMLYN BOG FROM CRYMLYN BOG LAGOON TO BE MAINTAINED (CATCHMENT 4 OUTFALL)
- O8 PROPOSED OUTFALL INTO CRYMLYN BOG. (CATCHMENT 4 OUTFALL)
- O9 EXISTING OUTFALL INTO CRYMLYN BOG. (CATCHMENT 4 OUTFALL)

Rev.	Date	Description	By	Chk'd	App'd
P1	11/20/18	FIRST ISSUE	GI	AGV	JF

Drawing Status: FOR INFORMATION

Suitability: S2

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Client: ST.MODWEN

Project Title: COED DARCY

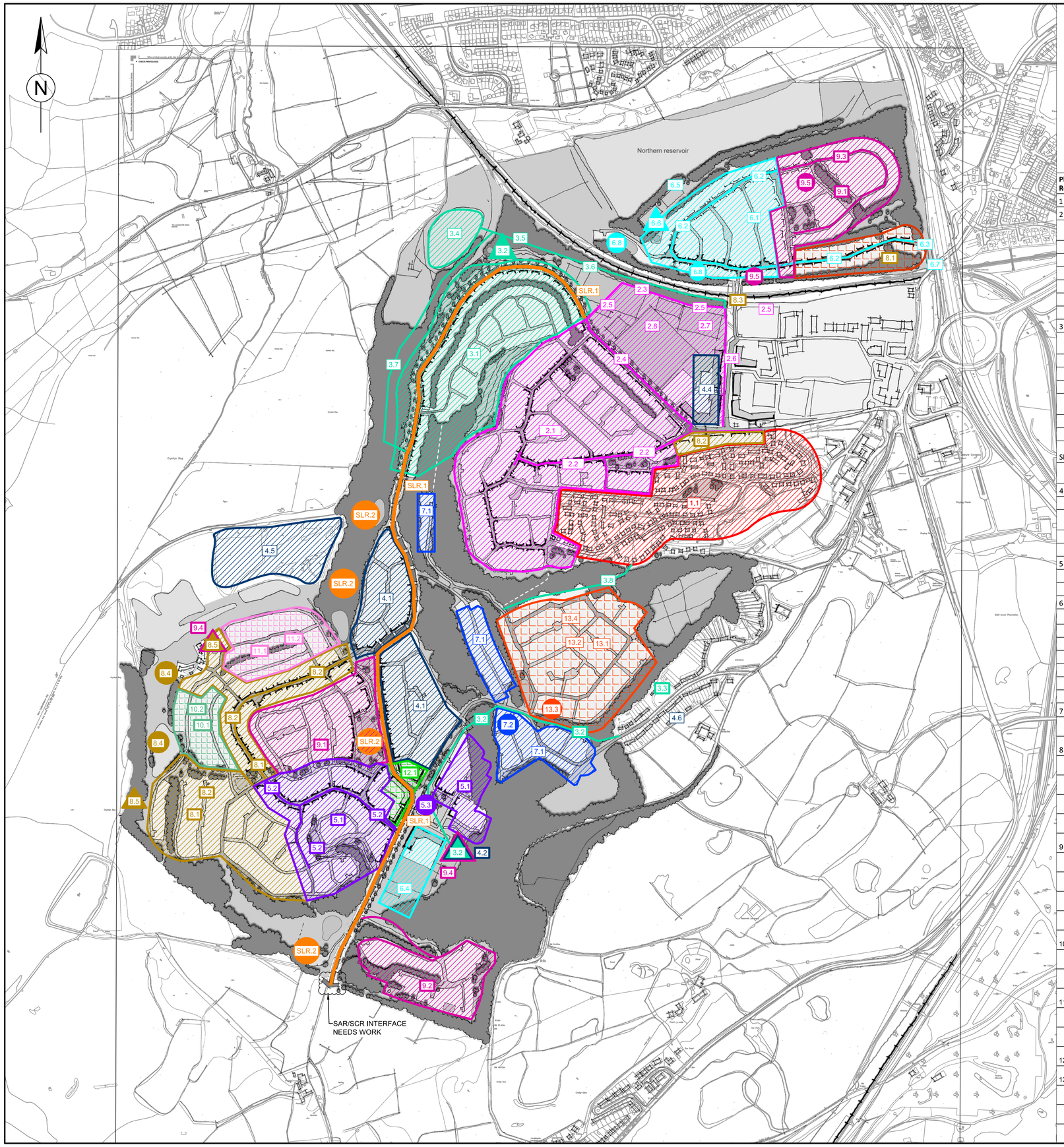
Drawing Title: WHOLE SITE PROPOSED CATCHMENT AREAS AND OUTFALLS

Scale	Designed	Drawn	Checked	Authorised
1:5000	GI	GI	AGV	JF
Original Size	Date	Date	Date	Date
A1	20/11/18	20/11/18	20/11/18	20/11/18

Drawing Number: 5041216-ATK-GM-WS-DR-C-6042

Revision: P 1

USER: GONZ7527 Date: 03/01/19 11:47:10 Filename: P:\GBMAN\EZON7\5\5045941216 Coed Darcy\DWG_CIVILS\DR\Whole Site (6000)\5041216-ATK-GM-WS-DR-C-6042 Proposed Catchment Areas and Outfalls.dwg



DO NOT SCALE

Phase Ref	Infrastructures Ref	Infrastructure Description
1	1.1	Residential Development (complete)
2	2.1	Remediation and Earthworks
	2.2	Completion of Roads 1, 50, 60 junctions and Associated Drainage and Utilities
	2.3	Construction of SW transfer network
	2.4	Construction of Road 1 to Road 60 Junction
	2.5	Construction of Foul Outfall
	2.6	Completion of Road 3 + SW outfall
	2.7	Construction of Primary School
	2.8	Education campus earthworks
3	3.1	Remediation and Earthworks
	3.2	North Site & South Site Pumping Stations and associated Rising Mains
	3.3	Connection to public sewer
	3.4	Rehabilitation of the SSR including construction of controls
	3.5	Removal / make safe existing oil interceptor / SW connect to SSR
	3.6	Northern SW connection to SSR / Construction of Reed Bed (TBC with DCWW)
	3.7	Western SW connection to SSR
	3.8	Upgrade to take farm road for construction access
SLR	SLR.1	Construction of SLR associated corridor earthworks utilities including strategic drainage
	SLR.2	Construction of SW Attenuation ponds + outfalls / South Site open ditch diversion
4	4.1	Remediation and Earthworks
	4.2	Upgrade of South Site Pumping Stations
	4.3	FW Outfall upgrade works
	4.4	(If required within phase 4) construction of Secondary School
	4.5	Crymlyn tip management
5	5.1	Remediation and Earthworks
	5.2	Infrastructure Construction of secondary road
	5.3	Construction of Phase 5 Attenuation Pond & Outfall
6	6.1	Remediation and Earthworks
	6.2	Infrastructure construction of primary and secondary road
	6.3	Junction Improvement Works
	6.4	Construction of Primary School
	6.5	Make safe existing AP's
	6.6	Construction of FPS and associated Rising Main
	6.7	Establish Foul Water discharge point
	6.8	Construction of Phase 6 Attenuation Pond & Outfall
7	7.1	Remediation and Earthworks
	7.2	Construction of Phase 7 Attenuation Pond & Outfall
8	8.1	Remediation and Earthworks
	8.2	Infrastructure construction of secondary road
	8.3	Installation of Bridge
	8.4	Construction of Attenuation Pond & Outfall
	8.5	Construction of FPS and associated Rising Main
9	9.1	Demolition of existing structures
	9.2	Remediation + Earthworks
	9.3	Phase 9 Infrastructure construction of secondary road
	9.4	Upgrade of South Site Pumping Station
	9.5	Construction of Phase 9 Attenuation Pond & Outfall
10	10.1	Demolition of existing structures
	10.2	Remediation + Earthworks
	10.3	Phase 10 Infrastructure
11	11.1	Demolition of existing structures
	11.2	Remediation + Earthworks
	11.3	Phase 11 Infrastructure
12	12.1	Remediation + Earthworks
13	13.1	Remediation + Earthworks
	13.2	Phase 13 infrastructure
	13.3	Construction of SW Attenuation & Outfall
	13.4	Demolition of Existing Structures

NOTES:

1. DRAWING IS TO BE READ IN CONJUNCTION WITH DOCUMENT 5041216-ENG-RPT-0001835 - PC22 BRIEFING NOTE.

KEY:

- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6
- PHASE 7
- PHASE 8
- PHASE 9
- PHASE 10
- PHASE 11
- PHASE 12
- PHASE 13
- X.X INFRASTRUCTURE REFERENCE
- STRATEGIC LINK ROAD (SLR)

Rev.	Date	Description	By	Chk'd	App'd
P01	06/09/19	FIRST ISSUE	CH	AGV	TB

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Client: ST.MODWEN

Project Title: COED DARCY

Drawing Title: PC22 PHASING

Scale	Designed	Drawn	Checked	Authorised
1:5000	AGV	CH	AGV	TB
Original Size: A1	Date: 06/09/19	Date: 06/09/19	Date: 06/09/19	Date: 06/09/19

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Appendix F. Windes Surface Water Hydraulic Calculations

F.1. North Site

F.2. South Site

F.3. Northern Site

F.1. North Site

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface water - SSR

Pipe Sizes NEAP SWS 131014 working Manhole Sizes NEAP SWS 131014 working

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.256	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	300

Designed with Level Soffits

Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	63.883	1.745	36.6	0.183	5.00	0.0	0.600		o	225	Pipe/Conduit	
S2.000	4.996	0.199	25.1	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	46.374	1.221	38.0	0.150	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.002	18.526	0.617	30.0	0.060	0.00	0.0	0.600		o	300	Pipe/Conduit	
S3.000	8.387	0.087	96.4	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S4.000	7.260	0.037	196.2	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	18.095	2.396	7.6	0.010	0.00	0.0	0.600		o	300	Pipe/Conduit	
S5.000	14.443	0.064	225.7	0.079	5.00	0.0	0.600		o	225	Pipe/Conduit	
S6.000	10.384	0.124	83.7	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	38.03	5.49	60.471	0.183	0.0	0.0	0.0	2.17	86.2	18.8
S2.000	39.28	5.04	59.000	0.000	0.0	0.0	0.0	2.02	35.7	0.0
S1.001	37.25	5.79	58.651	0.333	0.0	0.0	0.0	2.56	180.9	33.6
S1.002	36.98	5.90	57.430	0.393	0.0	0.0	0.0	2.88	203.6	39.4
S3.000	39.00	5.14	57.050	0.000	0.0	0.0	0.0	1.02	18.1	0.0
S4.000	38.91	5.17	57.000	0.000	0.0	0.0	0.0	0.71	12.6	0.0
S1.003	36.85	5.95	56.813	0.403	0.0	0.0	0.0	5.76	406.8	40.2
S5.000	38.61	5.28	55.665	0.079	0.0	0.0	0.0	0.87	34.4	8.3
S6.000	38.94	5.16	55.800	0.000	0.0	0.0	0.0	1.10	19.4	0.0

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S5.001	15.149	1.005	15.1	0.013	0.00	0.0	0.600		o	300	Pipe/Conduit	
S7.000	17.127	0.076	225.4	0.012	5.00	0.0	0.600		o	225	Pipe/Conduit	
S7.001	6.291	0.028	224.7	0.016	0.00	0.0	0.600		o	225	Pipe/Conduit	
S5.002	10.610	0.035	303.2	0.013	0.00	0.0	0.600		o	300	Pipe/Conduit	
S5.003	11.521	0.038	303.2	0.012	0.00	0.0	0.600		o	300	Pipe/Conduit	
S8.000	7.179	0.202	35.5	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S5.004	9.216	0.031	297.3	0.008	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.004	19.825	0.066	300.4	0.050	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.005	18.216	1.319	13.8	0.029	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.006	56.577	5.382	10.5	0.124	0.00	0.0	0.600		o	300	Pipe/Conduit	
S9.000	4.359	0.700	6.2	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S1.007	39.750	0.153	259.8	0.076	0.00	0.0	0.600		o	450	Pipe/Conduit	
S1.008	22.362	0.074	302.2	0.024	0.00	0.0	0.600		o	450	Pipe/Conduit	
S10.000	15.668	1.477	10.6	0.519	5.00	0.0	0.600		o	450	Pipe/Conduit	
S1.009	21.454	0.072	298.0	0.032	0.00	0.0	0.600		o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S5.001	38.44	5.34	55.526	0.092	0.0	0.0	0.0	4.07	287.7	9.6
S7.000	38.47	5.33	54.700	0.012	0.0	0.0	0.0	0.87	34.5	1.3
S7.001	38.14	5.45	54.624	0.028	0.0	0.0	0.0	0.87	34.5	2.9
S5.002	37.62	5.65	54.521	0.133	0.0	0.0	0.0	0.90	63.5	13.6
S5.003	37.08	5.86	54.486	0.145	0.0	0.0	0.0	0.90	63.5	14.6
S8.000	39.19	5.07	54.800	0.000	0.0	0.0	0.0	1.69	29.9	0.0
S5.004	36.66	6.03	54.448	0.153	0.0	0.0	0.0	0.91	64.1	15.2
S1.004	35.80	6.40	54.417	0.606	0.0	0.0	0.0	0.90	63.8	58.8
S1.005	35.64	6.47	54.351	0.635	0.0	0.0	0.0	4.25	300.6	61.3
S1.006	35.21	6.66	53.032	0.759	0.0	0.0	0.0	4.88	344.7	72.4
S9.000	39.34	5.02	48.500	0.000	0.0	0.0	0.0	4.06	71.8	0.0
S1.007	34.10	7.19	47.500	0.835	0.0	0.0	0.0	1.26	199.9	77.1
S1.008	33.47	7.51	47.347	0.859	0.0	0.0	0.0	1.16	185.2	77.9
S10.000	39.27	5.04	48.750	0.519	0.0	0.0	0.0	6.27	997.1	55.2
S1.009	32.99	7.76	47.123	1.410	0.0	0.0	0.0	1.41	397.4	126.0

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	7.910	0.649	12.2	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S1.010	40.445	0.135	299.6	0.032	0.00	0.0	0.600		o	600	Pipe/Conduit	
S12.000	10.430	1.484	7.0	0.131	5.00	0.0	0.600		o	225	Pipe/Conduit	
S1.011	29.744	0.099	300.4	0.032	0.00	0.0	0.600		o	675	Pipe/Conduit	
S1.012	19.335	0.064	302.1	0.013	0.00	0.0	0.600		o	675	Pipe/Conduit	
S1.013	12.978	0.043	301.8	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
S13.000	62.874	0.370	169.9	0.053	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.001	22.289	0.131	170.1	0.029	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.002	24.693	0.453	54.5	0.028	0.00	0.0	0.600		o	225	Pipe/Conduit	
S14.000	21.113	0.126	167.6	0.057	5.00	0.0	0.600		o	225	Pipe/Conduit	
S14.001	22.365	0.134	166.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S14.002	8.448	0.051	165.6	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.003	15.472	0.611	25.3	0.013	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.004	15.408	0.609	25.3	0.030	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.005	9.704	1.181	8.2	0.014	0.00	0.0	0.600		o	225	Pipe/Conduit	
S15.000	10.624	0.064	166.0	0.117	5.00	0.0	0.600		o	225	Pipe/Conduit	
S15.001	18.823	1.415	13.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S15.002	22.301	0.405	55.1	0.018	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S11.000	39.26	5.05	48.150	0.000	0.0	0.0	0.0	2.90	51.3	0.0
S1.010	32.12	8.24	47.051	1.442	0.0	0.0	0.0	1.40	396.3	126.0
S12.000	39.29	5.03	48.775	0.131	0.0	0.0	0.0	4.97	197.5	13.9
S1.011	31.56	8.57	46.841	1.605	0.0	0.0	0.0	1.51	539.2	137.2
S1.012	31.21	8.79	46.742	1.618	0.0	0.0	0.0	1.50	537.7	137.2
S1.013	30.98	8.93	46.678	1.618	0.0	0.0	0.0	1.50	538.0	137.2
S13.000	36.62	6.05	77.972	0.053	0.0	0.0	0.0	1.00	39.8	5.3
S13.001	35.75	6.42	77.602	0.082	0.0	0.0	0.0	1.00	39.7	7.9
S13.002	35.23	6.65	77.471	0.110	0.0	0.0	0.0	1.78	70.6	10.5
S14.000	38.41	5.35	77.328	0.057	0.0	0.0	0.0	1.01	40.0	5.9
S14.001	37.44	5.72	77.202	0.057	0.0	0.0	0.0	1.01	40.1	5.9
S14.002	37.09	5.86	77.068	0.057	0.0	0.0	0.0	1.01	40.3	5.9
S13.003	35.02	6.75	77.017	0.180	0.0	0.0	0.0	2.61	103.8	17.1
S13.004	34.80	6.85	76.406	0.210	0.0	0.0	0.0	2.61	103.8	19.8
S13.005	34.73	6.88	75.797	0.224	0.0	0.0	0.0	4.59	182.6	21.1
S15.000	38.89	5.17	76.500	0.117	0.0	0.0	0.0	1.01	40.2	12.3
S15.001	38.65	5.26	76.436	0.117	0.0	0.0	0.0	3.61	143.4	12.3
S15.002	38.08	5.47	75.021	0.135	0.0	0.0	0.0	1.77	70.2	13.9

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.000	11.219	0.429	26.2	0.028	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.006	11.237	0.246	45.7	0.028	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.007	29.683	0.660	45.0	0.045	0.00	0.0	0.600		o	225	Pipe/Conduit	
S17.000	7.448	0.290	25.7	0.034	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.008	38.280	1.113	34.4	0.039	0.00	0.0	0.600		o	300	Pipe/Conduit	
S18.000	70.553	2.352	30.0	0.094	5.00	0.0	0.600		o	225	Pipe/Conduit	
S18.001	6.604	0.051	129.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.009	24.895	0.545	45.7	0.027	0.00	0.0	0.600		o	300	Pipe/Conduit	
S13.010	41.214	0.921	44.7	0.040	0.00	0.0	0.600		o	450	Pipe/Conduit	
S13.011	8.852	0.583	15.2	0.014	0.00	0.0	0.600		o	450	Pipe/Conduit	
S19.000	24.006	0.240	100.0	0.270	5.00	0.0	0.600		o	225	Pipe/Conduit	
S19.001	6.491	0.039	166.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.002	12.714	0.076	167.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.003	17.181	0.103	166.8	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.004	15.313	0.092	166.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.005	10.929	0.065	168.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.006	11.446	0.068	168.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.007	43.161	0.258	167.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.008	28.983	0.173	167.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.009	10.527	0.063	167.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S16.000	39.18	5.07	75.045	0.028	0.0	0.0	0.0	2.57	102.1	3.0
S13.006	34.53	6.98	74.616	0.415	0.0	0.0	0.0	1.94	77.2	38.8
S13.007	34.01	7.23	74.370	0.460	0.0	0.0	0.0	1.96	77.8	42.4
S17.000	39.26	5.05	74.000	0.034	0.0	0.0	0.0	2.59	103.1	3.6
S13.008	33.54	7.47	73.635	0.533	0.0	0.0	0.0	2.69	190.1	48.4
S18.000	38.03	5.49	75.000	0.094	0.0	0.0	0.0	2.40	95.3	9.7
S18.001	37.78	5.59	72.648	0.094	0.0	0.0	0.0	1.15	45.6	9.7
S13.009	33.20	7.65	72.522	0.654	0.0	0.0	0.0	2.33	164.8	58.8
S13.010	32.78	7.87	71.827	0.694	0.0	0.0	0.0	3.05	484.4	61.6
S13.011	32.73	7.90	70.906	0.708	0.0	0.0	0.0	5.24	833.1	62.8
S19.000	38.53	5.31	72.500	0.270	0.0	0.0	0.0	1.31	52.0	28.2
S19.001	38.24	5.41	72.260	0.270	0.0	0.0	0.0	1.01	40.2	28.2
S19.002	37.68	5.62	72.221	0.270	0.0	0.0	0.0	1.01	40.1	28.2
S19.003	36.96	5.91	72.145	0.270	0.0	0.0	0.0	1.01	40.1	28.2
S19.004	36.35	6.16	72.042	0.270	0.0	0.0	0.0	1.01	40.2	28.2
S19.005	35.93	6.34	71.950	0.270	0.0	0.0	0.0	1.01	40.0	28.2
S19.006	35.50	6.53	71.885	0.270	0.0	0.0	0.0	1.00	40.0	28.2
S19.007	33.99	7.24	71.817	0.270	0.0	0.0	0.0	1.01	40.1	28.2
S19.008	33.06	7.72	71.559	0.270	0.0	0.0	0.0	1.01	40.1	28.2
S19.009	32.74	7.90	71.386	0.270	0.0	0.0	0.0	1.01	40.1	28.2

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S19.010	8.320	0.166	50.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S19.011	25.227	0.609	41.4	0.010	0.00	0.0	0.600		o	225	Pipe/Conduit	
S20.000	53.089	0.317	167.5	0.128	5.00	0.0	0.600		o	225	Pipe/Conduit	
S20.001	13.997	1.935	7.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.012	19.374	0.242	80.1	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S13.013	10.067	0.201	50.1	0.032	0.00	0.0	0.600		o	450	Pipe/Conduit	
S21.000	7.314	0.200	36.6	0.026	5.00	0.0	0.600		o	225	Pipe/Conduit	
S21.001	6.392	1.195	5.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.014	40.941	0.308	132.9	0.038	0.00	0.0	0.600		o	450	Pipe/Conduit	
S22.000	32.896	1.003	32.8	0.193	5.00	0.0	0.600		o	225	Pipe/Conduit	
S23.000	6.761	0.703	9.6	0.017	5.00	0.0	0.600		o	225	Pipe/Conduit	
S24.000	7.833	0.703	11.1	0.049	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.015	32.954	0.222	148.4	0.028	0.00	0.0	0.600		o	450	Pipe/Conduit	
S25.000	6.581	0.194	33.9	0.016	5.00	0.0	0.600		o	225	Pipe/Conduit	
S26.000	6.256	0.294	21.3	0.035	5.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S19.010	32.60	7.97	71.323	0.270	0.0	0.0	0.0	1.85	73.6	28.2
S19.011	32.24	8.18	71.157	0.280	0.0	0.0	0.0	2.04	81.0	28.2
S20.000	37.04	5.88	72.800	0.128	0.0	0.0	0.0	1.01	40.1	12.8
S20.001	36.92	5.93	72.483	0.128	0.0	0.0	0.0	4.90	194.7	12.8
S13.012	31.99	8.32	70.323	1.116	0.0	0.0	0.0	2.27	361.6	96.7
S13.013	31.89	8.38	70.081	1.148	0.0	0.0	0.0	2.88	457.8	99.1
S21.000	39.23	5.06	71.500	0.026	0.0	0.0	0.0	2.17	86.3	2.8
S21.001	39.18	5.07	71.300	0.026	0.0	0.0	0.0	5.70	226.5	2.8
S13.014	31.24	8.77	69.880	1.212	0.0	0.0	0.0	1.76	280.2	102.6
S22.000	38.72	5.24	70.800	0.193	0.0	0.0	0.0	2.29	91.1	20.2
S23.000	39.32	5.03	70.500	0.017	0.0	0.0	0.0	4.24	168.8	1.8
S24.000	39.30	5.03	70.500	0.049	0.0	0.0	0.0	3.94	156.8	5.2
S13.015	30.72	9.10	69.572	1.499	0.0	0.0	0.0	1.67	265.0	124.7
S25.000	39.25	5.05	69.769	0.016	0.0	0.0	0.0	2.25	89.6	1.7
S26.000	39.29	5.04	69.869	0.035	0.0	0.0	0.0	2.85	113.3	3.7

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S13.016	26.925	1.205	22.3	0.035	0.00	0.0	0.600		o	450	Pipe/Conduit	
S27.000	22.043	0.600	36.7	0.020	5.00	0.0	0.600		o	225	Pipe/Conduit	
S27.001	17.033	1.205	14.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S28.000	106.759	1.423	75.0	0.600	5.00	0.0	0.600		o	300	Pipe/Conduit	
S28.001	7.141	0.095	75.2	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S28.002	70.101	0.935	75.0	0.800	0.00	0.0	0.600		o	450	Pipe/Conduit	
S28.003	49.822	0.664	75.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S28.004	9.580	0.128	74.8	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S28.005	92.483	1.580	58.5	0.485	0.00	0.0	0.600		o	450	Pipe/Conduit	
S28.006	11.468	0.153	75.0	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S28.007	50.529	0.441	114.6	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S28.008	33.357	0.111	300.5	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S29.000	6.452	0.038	169.8	0.025	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.017	39.220	2.530	15.5	0.046	0.00	0.0	0.600		o	525	Pipe/Conduit	
S13.018	17.842	3.350	5.3	0.023	0.00	0.0	0.600		o	675	Pipe/Conduit	
S13.019	43.522	0.855	50.9	0.023	0.00	0.0	0.600		o	675	Pipe/Conduit	
S30.000	5.438	0.310	17.5	0.005	5.00	0.0	0.600		o	225	Pipe/Conduit	
S13.020	10.135	0.375	27.0	0.033	0.00	0.0	0.600		o	750	Pipe/Conduit	
S31.000	12.599	0.807	15.6	0.005	5.00	0.0	0.040	1 _/		600	1:1 Ditch	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S13.016	30.56	9.20	69.350	1.585	0.0	0.0	0.0	4.32	686.4	131.2
S27.000	38.91	5.17	70.175	0.020	0.0	0.0	0.0	2.17	86.1	2.1
S27.001	38.68	5.25	69.575	0.020	0.0	0.0	0.0	3.50	139.1	2.1
S28.000	36.79	5.98	73.675	0.600	0.0	0.0	0.0	1.82	128.4	59.8
S28.001	36.66	6.03	72.252	0.600	0.0	0.0	0.0	2.35	373.3	59.8
S28.002	35.51	6.53	72.157	1.400	0.0	0.0	0.0	2.35	373.8	134.6
S28.003	34.74	6.88	71.222	1.400	0.0	0.0	0.0	2.35	373.6	134.6
S28.004	34.59	6.95	70.558	1.400	0.0	0.0	0.0	2.35	374.1	134.6
S28.005	33.43	7.53	70.430	1.885	0.0	0.0	0.0	2.66	423.3	170.7
S28.006	33.29	7.60	68.775	1.885	0.0	0.0	0.0	2.59	560.5	170.7
S28.007	32.55	8.00	68.622	1.885	0.0	0.0	0.0	2.09	452.8	170.7
S28.008	31.79	8.44	68.181	1.885	0.0	0.0	0.0	1.29	278.6	170.7
S29.000	39.09	5.11	68.408	0.025	0.0	0.0	0.0	1.00	39.8	2.6
S13.017	30.38	9.31	68.070	3.561	0.0	0.0	0.0	5.71	1235.9	293.0
S13.018	30.35	9.34	65.390	3.584	0.0	0.0	0.0	11.40	4079.9	294.5
S13.019	30.05	9.54	62.040	3.607	0.0	0.0	0.0	3.68	1316.5	294.5
S30.000	39.31	5.03	61.945	0.005	0.0	0.0	0.0	3.14	124.8	0.5
S13.020	30.01	9.57	61.110	3.645	0.0	0.0	0.0	5.40	2383.7	296.2
S31.000	39.04	5.12	69.639	0.005	0.0	0.0	0.0	1.68	269.4	0.5

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S31.001	12.952	0.895	14.5	0.024	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.002	15.375	1.139	13.5	0.023	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.003	8.301	0.669	12.4	0.014	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.004	6.289	0.501	12.6	0.014	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.005	3.604	0.285	12.6	0.028	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.006	13.568	1.004	13.5	0.000	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.007	22.562	1.366	16.5	0.037	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.008	3.360	0.343	9.8	0.000	0.00	0.0		0.040	1 _/	600	1:1 Ditch	
S31.009	4.237	0.170	24.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S13.021	17.639	0.570	30.9	0.011	0.00	0.0	0.600		o	750	Pipe/Conduit	
S13.022	17.665	0.090	196.3	0.021	0.00	0.0	0.600		o	825	Pipe/Conduit	
S32.000	5.781	0.058	99.7	0.048	5.00	0.0	0.600		o	150	Pipe/Conduit	
S32.001	54.737	0.327	167.2	0.065	0.00	0.0	0.600		o	150	Pipe/Conduit	
S33.000	6.250	0.078	80.1	0.048	5.00	0.0	0.600		o	150	Pipe/Conduit	
S34.000	39.608	0.198	200.0	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S35.000	39.614	0.198	200.1	0.000	5.00	0.0	0.600		o	225	Pipe/Conduit	
S34.001	5.360	0.025	214.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S32.002	44.296	0.430	103.0	0.036	0.00	0.0	0.600		o	225	Pipe/Conduit	
S32.003	34.117	0.310	110.1	0.037	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S31.001	38.69	5.25	68.832	0.029	0.0	0.0	0.0	1.75	279.8	3.0
S31.002	38.30	5.39	67.937	0.052	0.0	0.0	0.0	1.81	289.7	5.4
S31.003	38.11	5.46	66.798	0.066	0.0	0.0	0.0	1.89	302.2	6.8
S31.004	37.96	5.52	66.129	0.080	0.0	0.0	0.0	1.88	300.4	8.2
S31.005	37.87	5.55	65.628	0.108	0.0	0.0	0.0	1.87	299.3	11.1
S31.006	37.55	5.68	65.343	0.108	0.0	0.0	0.0	1.81	289.5	11.1
S31.007	36.97	5.91	64.339	0.145	0.0	0.0	0.0	1.64	261.9	14.5
S31.008	36.90	5.93	62.973	0.145	0.0	0.0	0.0	2.13	340.1	14.5
S31.009	36.84	5.96	61.405	0.145	0.0	0.0	0.0	2.63	104.6	14.5
S13.021	29.92	9.63	60.710	3.801	0.0	0.0	0.0	5.04	2227.3	308.0
S13.022	29.72	9.77	60.065	3.822	0.0	0.0	0.0	2.12	1131.0	308.0
S32.000	39.12	5.10	64.758	0.048	0.0	0.0	0.0	1.01	17.8	5.1
S32.001	36.08	6.27	64.700	0.113	0.0	0.0	0.0	0.77	13.7	11.0
S33.000	39.13	5.09	64.293	0.048	0.0	0.0	0.0	1.12	19.9	5.1
S34.000	36.90	5.93	64.438	0.000	0.0	0.0	0.0	0.71	12.5	0.0
S35.000	37.44	5.72	64.438	0.000	0.0	0.0	0.0	0.92	36.6	0.0
S34.001	36.65	6.03	64.165	0.000	0.0	0.0	0.0	0.89	35.3	0.0
S32.002	34.81	6.85	64.140	0.197	0.0	0.0	0.0	1.29	51.2	18.6
S32.003	33.87	7.30	63.710	0.234	0.0	0.0	0.0	1.25	49.5	21.5

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S36.000	6.052	0.224	27.0	0.057	5.00	0.0	0.600		o	225	Pipe/Conduit	
S32.004	19.267	0.204	94.4	0.020	0.00	0.0	0.600		o	225	Pipe/Conduit	
S32.005	39.642	0.498	79.6	0.036	0.00	0.0	0.600		o	225	Pipe/Conduit	
S37.000	7.456	0.392	19.0	0.057	5.00	0.0	0.600		o	150	Pipe/Conduit	
S32.006	23.372	0.270	86.6	0.026	0.00	0.0	0.600		o	225	Pipe/Conduit	
S38.000	5.216	0.373	14.0	0.057	5.00	0.0	0.600		o	150	Pipe/Conduit	
S32.007	16.613	0.462	36.0	0.019	0.00	0.0	0.600		o	225	Pipe/Conduit	
S32.008	29.295	0.638	45.9	0.019	0.00	0.0	0.600		o	225	Pipe/Conduit	
S39.000	4.951	0.495	10.0	0.057	5.00	0.0	0.600		o	150	Pipe/Conduit	
S32.009	22.998	0.727	31.6	0.021	0.00	0.0	0.600		o	300	Pipe/Conduit	
S40.000	4.950	0.091	54.4	0.000	5.00	0.0	0.600	1	_/	600	1:1 Ditch	
S40.001	9.401	0.103	91.3	0.046	0.00	0.0	0.600	1	_/	600	1:1 Ditch	
S40.002	7.859	0.086	91.4	0.000	0.00	0.0	0.600	1	_/	600	1:1 Ditch	
S40.003	10.251	0.066	155.3	0.044	0.00	0.0	0.600	1	_/	600	1:1 Ditch	
S41.000	19.469	0.191	101.9	0.009	5.00	0.0	0.060		o	300	Pipe/Conduit	
S41.001	14.230	0.199	71.5	0.006	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S36.000	39.28	5.04	63.699	0.057	0.0	0.0	0.0	2.53	100.5	6.1
S32.004	33.40	7.54	63.400	0.311	0.0	0.0	0.0	1.35	53.5	28.1
S32.005	32.57	7.99	63.196	0.347	0.0	0.0	0.0	1.47	58.3	30.6
S37.000	39.24	5.05	63.165	0.057	0.0	0.0	0.0	2.32	41.0	6.1
S32.006	32.08	8.27	62.698	0.430	0.0	0.0	0.0	1.41	55.9	37.4
S38.000	39.30	5.03	62.875	0.057	0.0	0.0	0.0	2.71	47.9	6.1
S32.007	31.86	8.40	62.427	0.506	0.0	0.0	0.0	2.19	87.0	43.7
S32.008	31.44	8.65	61.965	0.525	0.0	0.0	0.0	1.94	77.0	44.7
S39.000	39.32	5.03	61.897	0.057	0.0	0.0	0.0	3.20	56.6	6.1
S32.009	31.21	8.79	61.252	0.603	0.0	0.0	0.0	2.81	198.3	51.0
S40.000	39.32	5.03	62.578	0.000	0.0	0.0	0.0	3.13	500.5	0.0
S40.001	39.13	5.09	62.487	0.046	0.0	0.0	0.0	2.41	385.9	4.9
S40.002	38.98	5.15	62.384	0.046	0.0	0.0	0.0	2.41	385.7	4.9
S40.003	38.72	5.24	62.298	0.090	0.0	0.0	0.0	1.85	295.4	9.4
S41.000	38.92	5.17	64.230	0.009	0.0	0.0	0.0	1.95	137.6	0.9
S41.001	38.56	5.29	64.039	0.015	0.0	0.0	0.0	1.86	131.6	1.6

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S41.002	6.000	0.037	162.2	0.003	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.003	3.814	0.063	60.5	0.003	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.004	7.965	0.040	199.1	0.005	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.005	8.896	0.045	197.7	0.006	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.006	15.062	0.146	103.2	0.015	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.007	8.654	0.087	99.5	0.003	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.008	13.330	0.137	97.3	0.002	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.009	7.947	0.097	81.9	0.002	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.010	5.335	0.081	65.9	0.002	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.011	9.369	0.198	47.3	0.002	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.012	9.033	0.243	37.2	0.002	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.013	6.090	0.192	31.7	0.004	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.014	23.121	0.774	29.9	0.004	0.00	0.0	0.600		o	300	Pipe/Conduit	
S42.000	7.243	0.355	20.4	0.013	5.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.001	8.853	0.160	55.3	0.010	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.002	5.359	0.102	52.5	0.050	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.003	5.705	0.091	62.7	0.050	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.004	12.090	0.200	60.4	0.015	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.005	8.418	0.200	42.1	0.011	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.006	5.414	0.050	108.3	0.037	0.00	0.0		0.040	4 \=/	500	1:4 Swale	
S42.007	5.130	0.602	8.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S41.015	8.502	0.070	121.5	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.016	10.428	0.080	130.4	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S41.002	38.34	5.38	63.840	0.018	0.0	0.0	0.0	1.23	87.1	1.9
S41.003	38.26	5.41	63.803	0.021	0.0	0.0	0.0	2.02	143.1	2.1
S41.004	37.94	5.53	63.740	0.025	0.0	0.0	0.0	1.11	78.5	2.6
S41.005	37.59	5.66	63.700	0.032	0.0	0.0	0.0	1.11	78.8	3.2
S41.006	37.18	5.82	63.655	0.046	0.0	0.0	0.0	1.55	109.4	4.7
S41.007	36.95	5.91	63.509	0.050	0.0	0.0	0.0	1.58	111.4	5.0
S41.008	36.61	6.05	63.422	0.051	0.0	0.0	0.0	1.59	112.7	5.1
S41.009	36.43	6.13	63.285	0.053	0.0	0.0	0.0	1.74	122.9	5.2
S41.010	36.32	6.17	63.188	0.055	0.0	0.0	0.0	1.94	137.1	5.4
S41.011	36.16	6.24	63.107	0.057	0.0	0.0	0.0	2.29	162.0	5.6
S41.012	36.02	6.30	62.909	0.059	0.0	0.0	0.0	2.59	182.9	5.7
S41.013	35.94	6.34	62.666	0.062	0.0	0.0	0.0	2.80	198.0	6.1
S41.014	35.63	6.47	62.474	0.066	0.0	0.0	0.0	2.89	204.1	6.4
S42.000	39.09	5.10	63.610	0.013	0.0	0.0	0.0	1.15	190.1	1.4
S42.001	38.50	5.32	63.255	0.023	0.0	0.0	0.0	0.70	115.5	2.4
S42.002	38.17	5.44	63.095	0.073	0.0	0.0	0.0	0.72	118.5	7.5
S42.003	37.78	5.58	62.993	0.123	0.0	0.0	0.0	0.66	108.5	12.6
S42.004	37.02	5.89	62.902	0.138	0.0	0.0	0.0	0.67	110.5	13.8
S42.005	36.59	6.06	62.702	0.149	0.0	0.0	0.0	0.80	132.4	14.8
S42.006	36.16	6.24	62.502	0.186	0.0	0.0	0.0	0.50	82.5	18.2
S42.007	36.12	6.26	62.377	0.186	0.0	0.0	0.0	4.51	179.3	18.2
S41.015	35.41	6.57	61.700	0.252	0.0	0.0	0.0	1.43	100.8	24.2
S41.016	35.13	6.70	61.630	0.252	0.0	0.0	0.0	1.38	97.2	24.2

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S43.000	5.054	0.050	101.1	0.010	5.00	0.0		0.040	1 _/	300	1:1 Ditch	
S43.001	20.282	0.110	184.4	0.027	0.00	0.0		0.040	1 _/	300	1:1 Ditch	
S43.002	26.175	0.100	261.7	0.027	0.00	0.0		0.040	1 _/	300	1:1 Ditch	
S43.003	6.120	0.100	61.2	0.036	0.00	0.0		0.040	1 _/	300	1:1 Ditch	
S43.004	7.550	0.200	37.8	0.007	0.00	0.0	0.600		o	300	Pipe/Conduit	
S43.005	13.580	0.470	28.9	0.015	0.00	0.0	0.600		o	300	Pipe/Conduit	
S43.006	7.874	0.360	21.9	0.009	0.00	0.0	0.600		o	300	Pipe/Conduit	
S43.007	5.587	0.170	32.9	0.008	0.00	0.0	0.600		o	300	Pipe/Conduit	
S43.008	5.294	0.200	26.5	0.008	0.00	0.0	0.600		o	300	Pipe/Conduit	
S43.009	5.040	0.550	9.2	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S41.017	10.927	0.038	287.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S40.004	6.243	0.482	13.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S13.023	23.270	1.025	22.7	0.021	0.00	0.0	0.600		o	825	Pipe/Conduit	
S44.000	4.908	1.300	3.8	0.021	5.00	0.0	0.600		o	150	Pipe/Conduit	
S13.024	27.294	1.950	14.0	0.022	0.00	0.0	0.600		o	825	Pipe/Conduit	
S45.000	4.497	0.950	4.7	0.026	5.00	0.0	0.600		o	150	Pipe/Conduit	
S46.000	8.353	0.250	33.4	0.500	5.00	0.0	0.600		o	300	Pipe/Conduit	
S13.025	4.100	0.513	8.0	0.000	0.00	0.0	0.600		o	825	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S43.000	39.06	5.12	63.960	0.010	0.0	0.0	0.0	0.72	130.1	1.1
S43.001	37.36	5.75	63.910	0.037	0.0	0.0	0.0	0.54	96.3	3.7
S43.002	35.08	6.72	63.800	0.064	0.0	0.0	0.0	0.45	80.9	6.1
S43.003	34.85	6.83	63.700	0.100	0.0	0.0	0.0	0.93	167.2	9.4
S43.004	34.74	6.88	63.600	0.107	0.0	0.0	0.0	2.57	181.4	10.1
S43.005	34.58	6.96	63.400	0.122	0.0	0.0	0.0	2.94	207.5	11.4
S43.006	34.50	6.99	62.930	0.131	0.0	0.0	0.0	3.38	238.7	12.2
S43.007	34.43	7.03	62.570	0.139	0.0	0.0	0.0	2.75	194.5	13.0
S43.008	34.37	7.06	62.400	0.147	0.0	0.0	0.0	3.07	216.9	13.7
S43.009	34.34	7.07	62.200	0.147	0.0	0.0	0.0	5.22	369.2	13.7
S41.017	33.94	7.27	61.550	0.399	0.0	0.0	0.0	0.92	65.2	36.7
S40.004	33.89	7.29	61.512	0.489	0.0	0.0	0.0	4.39	310.4	44.9
S13.023	29.63	9.83	59.975	4.935	0.0	0.0	0.0	6.25	3338.9	396.0
S44.000	39.35	5.02	60.950	0.021	0.0	0.0	0.0	5.22	92.3	2.2
S13.024	29.55	9.89	58.950	4.978	0.0	0.0	0.0	7.96	4254.2	398.4
S45.000	39.35	5.02	58.650	0.026	0.0	0.0	0.0	4.66	82.4	2.8
S46.000	39.25	5.05	57.800	0.500	0.0	0.0	0.0	2.73	192.9	53.1
S13.025	29.54	9.89	57.000	5.504	0.0	0.0	0.0	10.53	5629.3	440.3

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S13.026	22.202	2.789	8.0	0.015	0.00	0.0	0.600		o	825	Pipe/Conduit	
S47.000	4.245	2.276	1.9	0.020	5.00	0.0	0.600		o	150	Pipe/Conduit	
S13.027	20.900	2.613	8.0	0.000	0.00	0.0	0.600		o	825	Pipe/Conduit	
S13.028	28.433	4.565	6.2	0.000	0.00	0.0	0.600		o	825	Pipe/Conduit	
S1.014	7.046	0.025	281.9	0.069	0.00	0.0	0.600		o	1275	Pipe/Conduit	
S48.000	52.392	2.666	19.7	0.081	5.00	0.0	0.600		o	225	Pipe/Conduit	
S49.000	20.944	0.588	35.6	0.472	5.00	0.0	0.600		o	450	Pipe/Conduit	
S49.001	7.624	0.214	35.6	0.241	0.00	0.0	0.600		o	450	Pipe/Conduit	
S49.002	36.094	1.014	35.6	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S49.003	9.960	0.280	35.6	0.575	0.00	0.0	0.600		o	450	Pipe/Conduit	
S49.004	48.223	1.355	35.6	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S50.000	55.692	4.426	12.6	0.881	5.00	0.0	0.600		o	450	Pipe/Conduit	
S49.005	64.059	2.004	32.0	0.458	0.00	0.0	0.600		o	525	Pipe/Conduit	
S48.001	12.061	0.522	23.1	0.465	0.00	0.0	0.600		o	600	Pipe/Conduit	
S48.002	36.392	1.598	22.8	0.078	0.00	0.0	0.600		o	600	Pipe/Conduit	
S48.003	22.643	0.894	25.3	0.116	0.00	0.0	0.600		o	600	Pipe/Conduit	
S48.004	15.953	1.316	12.1	0.051	0.00	0.0	0.600		o	600	Pipe/Conduit	
S48.005	18.320	0.145	126.3	0.156	0.00	0.0	0.600		o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S13.026	29.49	9.93	56.488	5.519	0.0	0.0	0.0	10.56	5643.5	440.8
S47.000	39.37	5.01	56.650	0.020	0.0	0.0	0.0	7.44	131.5	2.1
S13.027	29.45	9.96	53.699	5.539	0.0	0.0	0.0	10.53	5629.6	441.7
S13.028	29.39	10.00	51.086	5.539	0.0	0.0	0.0	11.94	6381.1	441.7
S1.014	29.32	10.05	46.035	7.226	0.0	0.0	0.0	2.31	2946.7	573.8
S48.000	38.56	5.29	70.436	0.081	0.0	0.0	0.0	2.97	117.9	8.4
S49.000	39.10	5.10	73.000	0.472	0.0	0.0	0.0	3.42	543.2	49.9
S49.001	39.00	5.14	72.412	0.712	0.0	0.0	0.0	3.42	543.1	75.2
S49.002	38.50	5.32	72.198	0.712	0.0	0.0	0.0	3.42	543.4	75.2
S49.003	38.37	5.36	71.184	1.287	0.0	0.0	0.0	3.42	543.6	133.8
S49.004	37.80	5.58	70.829	1.287	0.0	0.0	0.0	3.76	814.7	133.8
S50.000	38.93	5.16	74.200	0.881	0.0	0.0	0.0	5.76	915.3	92.9
S49.005	37.11	5.85	69.474	2.627	0.0	0.0	0.0	3.97	859.8	264.0
S48.001	37.02	5.89	67.395	3.172	0.0	0.0	0.0	5.08	1436.5	318.0
S48.002	36.72	6.00	66.873	3.250	0.0	0.0	0.0	5.12	1447.0	323.3
S48.003	36.54	6.08	65.275	3.366	0.0	0.0	0.0	4.85	1371.9	333.0
S48.004	36.45	6.12	64.381	3.417	0.0	0.0	0.0	7.02	1984.6	337.3
S48.005	36.14	6.25	62.990	3.573	0.0	0.0	0.0	2.33	834.0	349.6

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S48.006	38.117	0.530	71.9	0.040	0.00	0.0	0.600		o	675	Pipe/Conduit	
S51.000	6.775	0.271	25.0	0.111	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.007	15.128	0.192	78.8	0.090	0.00	0.0	0.600		o	675	Pipe/Conduit	
S52.000	4.747	0.059	80.5	0.034	5.00	0.0	0.600		o	150	Pipe/Conduit	
S53.000	11.515	0.144	80.0	0.044	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.008	28.223	0.358	78.8	0.016	0.00	0.0	0.600		o	675	Pipe/Conduit	
S54.000	3.832	0.048	79.8	0.037	5.00	0.0	0.600		o	150	Pipe/Conduit	
S55.000	7.640	0.246	31.1	0.109	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.009	28.074	0.356	78.9	0.032	0.00	0.0	0.600		o	675	Pipe/Conduit	
S56.000	4.460	0.056	79.6	0.036	5.00	0.0	0.600		o	150	Pipe/Conduit	
S57.000	10.230	0.445	23.0	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S58.000	12.292	0.123	99.9	0.070	5.00	0.0	0.600		o	225	Pipe/Conduit	
S48.010	25.533	0.324	78.8	0.029	0.00	0.0	0.600		o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S48.006	35.66	6.46	62.845	3.613	0.0	0.0	0.0	3.09	1106.9	349.6
S51.000	39.23	5.06	66.306	0.111	0.0	0.0	0.0	2.02	35.7	11.8
S48.007	35.47	6.54	62.315	3.814	0.0	0.0	0.0	2.95	1057.3	366.4
S52.000	39.19	5.07	65.914	0.034	0.0	0.0	0.0	1.12	19.8	3.6
S53.000	38.91	5.17	65.999	0.044	0.0	0.0	0.0	1.13	19.9	4.6
S48.008	35.12	6.70	62.123	3.909	0.0	0.0	0.0	2.95	1057.0	371.8
S54.000	39.23	5.06	65.553	0.037	0.0	0.0	0.0	1.13	19.9	3.9
S55.000	39.19	5.07	65.751	0.109	0.0	0.0	0.0	1.81	32.0	11.6
S48.009	34.78	6.86	61.765	4.087	0.0	0.0	0.0	2.95	1056.8	384.9
S56.000	39.20	5.07	65.321	0.036	0.0	0.0	0.0	1.13	19.9	3.9
S57.000	39.16	5.08	65.710	0.000	0.0	0.0	0.0	2.11	37.3	0.0
S58.000	38.95	5.16	65.313	0.070	0.0	0.0	0.0	1.31	52.0	7.4
S48.010	34.48	7.00	61.409	4.222	0.0	0.0	0.0	2.95	1057.2	394.2

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S59.000	3.984	0.050	79.7	0.052	5.00	0.0	0.600		o	150	Pipe/Conduit	
S60.000	6.700	0.077	87.0	0.150	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.011	36.578	0.464	78.8	0.030	0.00	0.0	0.600		o	675	Pipe/Conduit	
S61.000	4.358	0.054	80.7	0.018	5.00	0.0	0.600		o	150	Pipe/Conduit	
S62.000	8.261	0.103	80.2	0.204	5.00	0.0	0.600		o	225	Pipe/Conduit	
S48.012	25.974	0.332	78.2	0.042	0.00	0.0	0.600		o	675	Pipe/Conduit	
S63.000	28.457	0.633	45.0	0.292	5.00	0.0	0.600		o	225	Pipe/Conduit	
S63.001	20.717	0.414	50.0	0.071	0.00	0.0	0.600		o	225	Pipe/Conduit	
S63.002	26.580	0.483	55.0	0.067	0.00	0.0	0.600		o	225	Pipe/Conduit	
S63.003	31.703	0.127	250.0	0.034	0.00	0.0	0.600		o	300	Pipe/Conduit	
S63.004	49.026	0.165	296.9	0.058	0.00	0.0	0.600		o	300	Pipe/Conduit	
S63.005	15.285	0.086	177.9	0.079	0.00	0.0	0.600		o	300	Pipe/Conduit	
S64.000	7.715	0.644	12.0	0.103	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.013	30.742	0.448	68.6	0.035	0.00	0.0	0.600		o	675	Pipe/Conduit	
S65.000	12.855	0.250	51.4	0.039	5.00	0.0	0.600		o	150	Pipe/Conduit	
S66.000	7.438	0.354	21.0	0.169	5.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S59.000	39.22	5.06	64.890	0.052	0.0	0.0	0.0	1.13	19.9	5.6
S60.000	39.10	5.10	64.917	0.150	0.0	0.0	0.0	1.08	19.1	15.9
S48.011	34.06	7.21	61.085	4.454	0.0	0.0	0.0	2.95	1057.0	410.8
S61.000	39.21	5.06	63.494	0.018	0.0	0.0	0.0	1.12	19.8	1.9
S62.000	39.12	5.09	63.543	0.204	0.0	0.0	0.0	1.46	58.1	21.6
S48.012	33.77	7.36	60.621	4.718	0.0	0.0	0.0	2.97	1061.0	431.4
S63.000	38.71	5.24	62.613	0.292	0.0	0.0	0.0	1.96	77.8	30.6
S63.001	38.20	5.43	61.980	0.363	0.0	0.0	0.0	1.85	73.7	37.6
S63.002	37.54	5.68	61.566	0.430	0.0	0.0	0.0	1.77	70.3	43.8
S63.003	36.23	6.21	61.008	0.464	0.0	0.0	0.0	0.99	70.0	45.6
S63.004	34.25	7.11	60.881	0.522	0.0	0.0	0.0	0.91	64.1	48.4
S63.005	33.82	7.33	60.716	0.601	0.0	0.0	0.0	1.18	83.1	55.1
S64.000	39.27	5.04	61.458	0.103	0.0	0.0	0.0	2.93	51.7	11.0
S48.013	33.45	7.52	60.289	5.457	0.0	0.0	0.0	3.17	1133.2	494.3
S65.000	38.96	5.15	64.700	0.039	0.0	0.0	0.0	1.41	24.8	4.1
S66.000	39.23	5.06	64.804	0.169	0.0	0.0	0.0	2.21	39.0	18.0

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S67.000	7.567	0.504	15.0	0.077	5.00	0.0	0.600		o	150	Pipe/Conduit	
S65.001	33.131	1.500	22.1	0.039	0.00	0.0	0.600		o	225	Pipe/Conduit	
S68.000	11.349	1.135	10.0	0.077	5.00	0.0	0.600		o	150	Pipe/Conduit	
S69.000	6.130	0.245	25.0	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S65.002	12.501	0.700	17.9	0.086	0.00	0.0	0.600		o	225	Pipe/Conduit	
S70.000	5.671	0.071	79.9	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S71.000	13.349	0.124	107.7	0.143	5.00	0.0	0.600		o	225	Pipe/Conduit	
S65.003	13.260	0.640	20.7	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S72.000	4.872	0.049	99.4	0.000	5.00	0.0	0.600		o	150	Pipe/Conduit	
S65.004	15.168	1.244	12.2	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S73.000	5.089	0.064	80.0	0.069	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.014	23.870	0.900	26.5	0.037	0.00	0.0	0.600		o	675	Pipe/Conduit	
S48.015	23.754	1.300	18.3	0.026	0.00	0.0	0.600		o	675	Pipe/Conduit	
S48.016	21.127	1.400	15.1	0.084	0.00	0.0	0.600		o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S67.000	39.26	5.05	64.954	0.077	0.0	0.0	0.0	2.61	46.2	8.2
S65.001	38.41	5.35	64.375	0.324	0.0	0.0	0.0	2.80	111.2	33.7
S68.000	39.22	5.06	64.085	0.077	0.0	0.0	0.0	3.21	56.6	8.2
S69.000	39.25	5.05	63.195	0.000	0.0	0.0	0.0	2.02	35.7	0.0
S65.002	38.23	5.42	62.875	0.487	0.0	0.0	0.0	3.11	123.7	50.4
S70.000	39.15	5.08	62.321	0.000	0.0	0.0	0.0	1.13	19.9	0.0
S71.000	38.89	5.18	62.299	0.143	0.0	0.0	0.0	1.26	50.1	15.1
S65.003	38.06	5.48	62.100	0.630	0.0	0.0	0.0	3.47	245.2	64.9
S72.000	39.16	5.08	61.659	0.000	0.0	0.0	0.0	1.01	17.8	0.0
S65.004	37.91	5.54	61.460	0.630	0.0	0.0	0.0	4.53	320.0	64.9
S73.000	39.18	5.08	60.430	0.069	0.0	0.0	0.0	1.12	19.9	7.3
S48.014	33.30	7.60	59.841	6.192	0.0	0.0	0.0	5.10	1825.7	558.4
S48.015	33.18	7.66	58.941	6.218	0.0	0.0	0.0	6.15	2200.5	558.7
S48.016	33.08	7.71	57.641	6.302	0.0	0.0	0.0	6.77	2421.9	564.6

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S74.000	6.522	0.082	79.5	0.060	5.00	0.0	0.600		o	300	Pipe/Conduit	
S48.017	34.731	2.350	14.8	0.021	0.00	0.0	0.600		o	675	Pipe/Conduit	
S75.000	7.038	0.088	80.0	0.049	5.00	0.0	0.600		o	300	Pipe/Conduit	
S76.000	8.684	0.511	17.0	0.021	5.00	0.0	0.600		o	150	Pipe/Conduit	
S77.000	9.241	0.039	237.0	0.084	5.00	0.0	0.600		o	300	Pipe/Conduit	
S48.018	17.557	1.200	14.6	0.032	0.00	0.0	0.600		o	675	Pipe/Conduit	
S78.000	5.943	0.660	9.0	0.092	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.019	39.780	2.841	14.0	0.017	0.00	0.0	0.600		o	675	Pipe/Conduit	
S79.000	54.795	0.372	147.3	0.263	5.00	0.0	0.600		o	225	Pipe/Conduit	
S79.001	15.495	0.816	19.0	0.100	0.00	0.0	0.600		o	375	Pipe/Conduit	
S79.002	35.843	1.886	19.0	0.142	0.00	0.0	0.600		o	375	Pipe/Conduit	
S79.003	31.211	1.734	18.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S80.000	67.576	0.488	138.5	0.282	5.00	0.0	0.600		o	225	Pipe/Conduit	
S79.004	76.573	1.454	52.7	0.357	0.00	0.0	0.600		o	375	Pipe/Conduit	
S79.005	16.047	0.458	35.0	0.100	0.00	0.0	0.600		o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S74.000	39.22	5.06	56.698	0.060	0.0	0.0	0.0	1.76	124.7	6.4
S48.017	32.92	7.80	56.241	6.383	0.0	0.0	0.0	6.84	2447.3	569.1
S75.000	39.20	5.07	54.354	0.049	0.0	0.0	0.0	1.76	124.4	5.2
S76.000	39.22	5.06	54.927	0.021	0.0	0.0	0.0	2.46	43.4	2.2
S77.000	38.96	5.15	54.305	0.084	0.0	0.0	0.0	1.02	71.9	8.9
S48.018	32.84	7.84	53.891	6.569	0.0	0.0	0.0	6.87	2459.7	584.4
S78.000	39.31	5.03	53.876	0.092	0.0	0.0	0.0	3.38	59.7	9.8
S48.019	32.67	7.93	52.691	6.679	0.0	0.0	0.0	7.03	2514.4	591.0
S79.000	37.11	5.85	57.020	0.263	0.0	0.0	0.0	1.08	42.7	26.4
S79.001	36.95	5.91	56.498	0.362	0.0	0.0	0.0	4.17	461.1	36.3
S79.002	36.60	6.05	55.682	0.504	0.0	0.0	0.0	4.17	460.9	50.0
S79.003	36.31	6.18	53.796	0.504	0.0	0.0	0.0	4.29	473.6	50.0
S80.000	36.70	6.02	52.700	0.282	0.0	0.0	0.0	1.11	44.1	28.0
S79.004	35.15	6.69	52.062	1.143	0.0	0.0	0.0	2.50	276.3	108.8
S79.005	34.97	6.77	50.608	1.242	0.0	0.0	0.0	3.07	339.1	117.6

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S81.000	12.307	1.367	9.0	0.092	5.00	0.0	0.600		o	150	Pipe/Conduit	
S48.020	34.202	2.625	13.0	0.039	0.00	0.0	0.600		o	750	Pipe/Conduit	
S82.000	8.273	0.103	80.3	0.224	5.00	0.0	0.600		o	225	Pipe/Conduit	
S83.000	8.537	0.107	79.8	0.067	5.00	0.0	0.600		o	225	Pipe/Conduit	
S48.021	41.685	0.405	102.9	0.036	0.00	0.0	0.600		o	900	Pipe/Conduit	
S84.000	15.804	0.198	79.8	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	
S84.001	10.929	0.065	168.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S85.000	8.258	0.103	80.2	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	
S48.022	26.903	0.077	349.4	0.096	0.00	0.0	0.600		o	1200	Pipe/Conduit	
S86.000	8.165	0.102	80.0	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	
S87.000	8.383	0.105	79.8	0.290	5.00	0.0	0.600		o	300	Pipe/Conduit	
S48.023	49.648	0.142	349.6	0.110	0.00	0.0	0.600		o	1200	Pipe/Conduit	
S88.000	9.068	0.113	80.2	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S81.000	39.22	5.06	51.742	0.092	0.0	0.0	0.0	3.38	59.7	9.8
S48.020	32.54	8.01	49.775	8.052	0.0	0.0	0.0	7.78	3435.6	709.6
S82.000	39.12	5.09	47.853	0.224	0.0	0.0	0.0	1.46	58.1	23.8
S83.000	39.12	5.10	47.857	0.067	0.0	0.0	0.0	1.47	58.3	7.1
S48.021	32.14	8.23	47.000	8.379	0.0	0.0	0.0	3.09	1964.9	729.4
S84.000	38.97	5.15	47.498	0.000	0.0	0.0	0.0	1.76	124.5	0.0
S84.001	38.55	5.30	47.300	0.000	0.0	0.0	0.0	1.21	85.5	0.0
S85.000	39.17	5.08	47.298	0.000	0.0	0.0	0.0	1.76	124.2	0.0
S48.022	31.76	8.46	46.295	8.475	0.0	0.0	0.0	2.00	2257.1	729.4
S86.000	39.17	5.08	47.220	0.000	0.0	0.0	0.0	1.76	124.3	0.0
S87.000	39.17	5.08	47.223	0.290	0.0	0.0	0.0	1.76	124.5	30.8
S48.023	31.07	8.87	46.218	8.875	0.0	0.0	0.0	2.00	2256.4	746.9
S88.000	39.15	5.09	47.089	0.000	0.0	0.0	0.0	1.76	124.2	0.0

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S89.000	7.407	0.093	79.6	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	
S48.024	12.135	0.036	337.1	0.167	0.00	0.0	0.600		o	1200	Pipe/Conduit	
S1.015	56.349	0.209	270.0	0.071	0.00	0.0	0.600		o	1350	Pipe/Conduit	
S90.000	7.185	1.437	5.0	0.059	5.00	0.0	0.600		o	225	Pipe/Conduit	
S1.016	49.846	3.486	14.3	0.062	0.00	0.0	0.600		o	1350	Pipe/Conduit	
S91.000	9.569	0.056	170.9	0.084	5.00	0.0	0.600		o	300	Pipe/Conduit	
S1.017	51.433	4.115	12.5	0.070	0.00	0.0	0.600		o	1350	Pipe/Conduit	
S92.000	13.716	0.027	500.0	1.167	5.00	0.0	0.600		o	450	Pipe/Conduit	
S93.000	10.026	0.059	169.9	0.025	5.00	0.0	0.600		o	225	Pipe/Conduit	
S1.018	25.777	1.909	13.5	0.044	0.00	0.0	0.600		o	1350	Pipe/Conduit	
S94.000	9.603	0.056	171.5	0.549	5.00	0.0	0.600		o	300	Pipe/Conduit	
S1.019	63.554	0.578	110.0	0.067	0.00	0.0	0.600		o	1350	Pipe/Conduit	
S95.000	14.655	0.095	154.3	0.000	5.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S89.000	39.19	5.07	47.069	0.000	0.0	0.0	0.0	1.76	124.6	0.0
S48.024	30.92	8.97	46.076	9.042	0.0	0.0	0.0	2.03	2298.2	757.1
S1.015	28.80	10.44	45.895	16.339	0.0	0.0	0.0	2.44	3496.4	1274.4
S90.000	39.34	5.02	49.000	0.059	0.0	0.0	0.0	5.89	234.3	6.3
S1.016	28.70	10.51	45.686	16.460	0.0	0.0	0.0	10.66	15255.3	1279.2
S91.000	39.01	5.13	44.000	0.084	0.0	0.0	0.0	1.20	84.8	8.9
S1.017	28.60	10.59	42.201	16.614	0.0	0.0	0.0	11.40	16318.0	1286.8
S92.000	38.68	5.25	40.000	1.167	0.0	0.0	0.0	0.90	143.5	122.3
S93.000	38.92	5.17	40.000	0.025	0.0	0.0	0.0	1.00	39.8	2.6
S1.018	28.55	10.63	38.086	17.851	0.0	0.0	0.0	10.97	15701.2	1380.1
S94.000	39.01	5.13	38.000	0.549	0.0	0.0	0.0	1.20	84.7	58.0
S1.019	28.20	10.90	36.103	18.467	0.0	0.0	0.0	3.83	5488.3	1410.1
S95.000	38.73	5.23	37.000	0.000	0.0	0.0	0.0	1.05	41.8	0.0

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.020	42.420	0.229	185.0	0.000	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.021	80.199	0.134	600.0	0.000	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.022	59.196	0.118	500.0	0.952	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.023	24.922	0.062	400.0	0.000	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.024	63.744	1.062	60.0	0.881	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.025	39.190	0.653	60.0	0.000	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.026	79.598	1.447	55.0	0.562	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.027	22.498	0.375	60.0	0.167	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.028	29.207	0.489	59.7	0.000	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S96.000	14.219	0.095	150.0	0.026	5.00	0.0	0.600		o	225	Pipe/Conduit	
S96.001	30.193	0.201	150.0	0.034	0.00	0.0	0.600		o	225	Pipe/Conduit	
S97.000	59.574	2.746	21.7	0.044	5.00	0.0	0.600		o	225	Pipe/Conduit	
S96.002	39.508	0.262	150.6	0.045	0.00	0.0	0.600		o	225	Pipe/Conduit	
S96.003	63.682	0.436	145.9	0.098	0.00	0.0	0.600		o	225	Pipe/Conduit	
S98.000	10.594	0.071	150.0	0.213	5.00	0.0	0.600		o	225	Pipe/Conduit	
S96.004	79.064	0.941	84.0	0.107	0.00	0.0	0.600		o	375	Pipe/Conduit	
S99.000	8.161	0.054	150.0	0.273	5.00	0.0	0.600		o	225	Pipe/Conduit	
S96.005	6.653	0.079	84.0	0.105	0.00	0.0	0.600		o	375	Pipe/Conduit	
S96.006	69.343	0.820	84.6	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.020	27.92	11.13	35.375	18.467	0.0	0.0	0.0	3.15	5567.6	1410.1
S1.021	27.02	11.89	35.146	18.467	0.0	0.0	0.0	1.74	3081.5	1410.1
S1.022	26.45	12.41	35.012	19.419	0.0	0.0	0.0	1.91	3377.8	1410.1
S1.023	26.24	12.61	34.894	19.419	0.0	0.0	0.0	2.14	3779.1	1410.1
S1.024	26.05	12.80	34.832	20.299	0.0	0.0	0.0	5.54	9791.9	1431.9
S1.025	25.92	12.91	33.770	20.299	0.0	0.0	0.0	5.54	9793.8	1431.9
S1.026	25.69	13.14	33.116	20.862	0.0	0.0	0.0	5.79	10230.3	1451.7
S1.027	25.63	13.21	31.669	21.029	0.0	0.0	0.0	5.54	9793.8	1459.5
S1.028	25.54	13.30	31.294	21.029	0.0	0.0	0.0	5.55	9816.1	1459.5
S96.000	38.76	5.22	47.325	0.026	0.0	0.0	0.0	1.07	42.4	2.8
S96.001	37.50	5.69	47.230	0.060	0.0	0.0	0.0	1.07	42.4	6.1
S97.000	38.41	5.35	49.775	0.044	0.0	0.0	0.0	2.82	112.2	4.6
S96.002	35.99	6.31	47.029	0.149	0.0	0.0	0.0	1.06	42.3	14.6
S96.003	33.88	7.30	46.767	0.248	0.0	0.0	0.0	1.08	42.9	22.7
S98.000	38.92	5.17	46.401	0.213	0.0	0.0	0.0	1.07	42.4	22.5
S96.004	32.62	7.96	46.180	0.568	0.0	0.0	0.0	1.98	218.5	50.2
S99.000	39.03	5.13	45.443	0.273	0.0	0.0	0.0	1.07	42.4	28.9
S96.005	32.52	8.02	45.239	0.947	0.0	0.0	0.0	1.98	218.5	83.4
S96.006	31.51	8.61	45.159	0.947	0.0	0.0	0.0	1.97	217.7	83.4

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S100.000	10.641	0.071	150.0	0.000	5.00	0.0	0.600		o	225	Pipe/Conduit	
S96.007	11.731	0.139	84.6	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S101.000	39.468	2.230	17.7	0.087	5.00	0.0	0.600		o	225	Pipe/Conduit	
S101.001	43.644	2.625	16.6	0.205	0.00	0.0	0.600		o	225	Pipe/Conduit	
S101.002	37.578	0.452	83.1	0.227	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.003	21.430	0.118	181.6	0.343	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.004	46.752	0.468	100.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.005	74.642	0.482	154.9	0.263	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.006	53.461	1.782	30.0	0.389	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.007	43.454	3.732	11.6	0.158	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.008	53.522	4.532	11.8	0.106	0.00	0.0	0.600		o	450	Pipe/Conduit	
S102.000	84.944	1.899	44.7	0.383	5.00	0.0	0.600		o	375	Pipe/Conduit	
S102.001	57.419	1.596	36.0	0.384	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.009	75.835	6.703	11.3	0.128	0.00	0.0	0.600		o	450	Pipe/Conduit	
S103.000	37.693	1.807	20.9	0.154	5.00	0.0	0.600		o	375	Pipe/Conduit	
S103.001	63.721	2.197	29.0	0.503	0.00	0.0	0.600		o	450	Pipe/Conduit	
S103.002	47.757	1.794	26.6	0.473	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.010	10.770	0.812	13.3	0.206	0.00	0.0	0.600		o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S100.000	38.92	5.17	44.800	0.000	0.0	0.0	0.0	1.07	42.4	0.0
S96.007	31.34	8.70	44.340	0.947	0.0	0.0	0.0	1.97	217.7	83.4
S101.000	38.80	5.21	70.169	0.087	0.0	0.0	0.0	3.13	124.3	9.2
S101.001	38.18	5.44	67.939	0.293	0.0	0.0	0.0	3.23	128.2	30.2
S101.002	37.44	5.72	65.096	0.519	0.0	0.0	0.0	2.23	354.8	52.7
S101.003	36.85	5.95	64.644	0.862	0.0	0.0	0.0	1.51	239.4	86.0
S101.004	35.94	6.34	64.526	0.862	0.0	0.0	0.0	2.03	323.4	86.0
S101.005	34.28	7.10	64.058	1.125	0.0	0.0	0.0	1.63	259.4	104.4
S101.006	33.80	7.34	63.576	1.514	0.0	0.0	0.0	3.72	592.1	138.6
S101.007	33.56	7.46	61.794	1.672	0.0	0.0	0.0	5.98	951.6	151.9
S101.008	33.27	7.61	58.062	1.778	0.0	0.0	0.0	5.94	944.9	160.2
S102.000	37.95	5.52	57.100	0.383	0.0	0.0	0.0	2.72	299.9	39.4
S102.001	37.22	5.80	55.126	0.767	0.0	0.0	0.0	3.40	540.5	77.3
S101.009	32.88	7.82	53.530	2.672	0.0	0.0	0.0	6.07	965.4	238.0
S103.000	38.94	5.16	52.700	0.154	0.0	0.0	0.0	3.98	439.9	16.2
S103.001	38.17	5.44	50.818	0.657	0.0	0.0	0.0	3.79	602.2	67.9
S103.002	37.64	5.64	48.621	1.130	0.0	0.0	0.0	3.95	628.6	115.2
S101.010	32.83	7.85	46.677	4.008	0.0	0.0	0.0	6.71	1897.1	356.4

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S104.000	85.528	5.518	15.5	0.175	5.00	0.0	0.600		o	450	Pipe/Conduit	
S104.001	19.141	1.235	15.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S105.000	48.347	2.653	18.2	0.166	5.00	0.0	0.600		o	225	Pipe/Conduit	
S104.002	28.745	1.855	15.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S104.003	94.971	6.127	15.5	0.295	0.00	0.0	0.600		o	450	Pipe/Conduit	
S104.004	38.329	1.610	23.8	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S104.005	47.243	1.699	27.8	0.082	0.00	0.0	0.600		o	450	Pipe/Conduit	
S101.011	27.605	0.789	35.0	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
S101.012	37.770	1.122	33.7	0.060	0.00	0.0	0.600		o	600	Pipe/Conduit	
S96.008	16.091	0.541	29.8	0.039	0.00	0.0	0.600		o	675	Pipe/Conduit	
S96.009	30.207	1.017	29.7	0.363	0.00	0.0	0.600		o	675	Pipe/Conduit	
S96.010	74.811	5.534	13.5	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
S106.000	29.583	0.335	88.3	0.080	5.00	0.0	0.600		o	225	Pipe/Conduit	
S106.001	51.945	0.588	88.3	0.134	0.00	0.0	0.600		o	225	Pipe/Conduit	
S96.011	25.440	1.817	14.0	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
S96.012	42.631	3.383	12.6	0.000	0.00	0.0	0.600		o	675	Pipe/Conduit	
S1.029	48.550	0.694	70.0	0.054	0.00	0.0	0.600		o	1500	Pipe/Conduit	
S1.030	43.892	1.485	29.6	0.351	0.00	0.0	0.600		o	1200	Pipe/Conduit	
S1.031	32.728	3.692	8.9	0.528	0.00	0.0	0.600		o	1200	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S104.000	38.62	5.27	64.090	0.175	0.0	0.0	0.0	5.18	824.5	18.3
S104.001	38.45	5.34	58.572	0.175	0.0	0.0	0.0	5.18	824.5	18.3
S105.000	38.65	5.26	60.200	0.166	0.0	0.0	0.0	3.08	122.5	17.3
S104.002	38.20	5.43	57.322	0.341	0.0	0.0	0.0	5.18	824.6	35.3
S104.003	37.40	5.73	55.467	0.636	0.0	0.0	0.0	5.18	824.5	64.5
S104.004	37.01	5.89	49.340	0.636	0.0	0.0	0.0	4.18	665.0	64.5
S104.005	36.52	6.09	47.730	0.718	0.0	0.0	0.0	3.87	615.1	71.0
S101.011	32.63	7.96	45.865	4.726	0.0	0.0	0.0	4.13	1166.5	417.7
S101.012	32.36	8.11	45.076	4.786	0.0	0.0	0.0	4.21	1189.5	419.5
S96.008	31.25	8.76	43.902	5.772	0.0	0.0	0.0	4.82	1723.2	488.5
S96.009	31.08	8.86	43.361	6.135	0.0	0.0	0.0	4.82	1725.2	516.5
S96.010	30.81	9.04	42.344	6.135	0.0	0.0	0.0	7.15	2559.1	516.5
S106.000	38.40	5.35	38.275	0.080	0.0	0.0	0.0	1.39	55.4	8.3
S106.001	36.79	5.98	37.940	0.214	0.0	0.0	0.0	1.39	55.3	21.3
S96.011	30.71	9.10	36.810	6.349	0.0	0.0	0.0	7.03	2514.6	528.1
S96.012	30.57	9.20	34.993	6.349	0.0	0.0	0.0	7.41	2650.9	528.1
S1.029	25.39	13.46	30.785	27.432	0.0	0.0	0.0	5.13	9065.5	1886.1
S1.030	25.29	13.56	30.127	27.783	0.0	0.0	0.0	6.89	7796.1	1902.6
S1.031	25.24	13.61	28.642	28.311	0.0	0.0	0.0	12.60	14248.0	1935.6

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.032	27.041	2.522	10.7	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	
S1.033	16.907	0.338	50.0	0.000	0.00	0.0		0.040	|_|	2000	Ditch	
S1.034	41.323	0.040	1033.1	0.000	0.00	0.0		0.040	1.5 _/	12000	1:1.5 Ditch	
S107.000	27.158	0.543	50.0	0.168	5.00	0.0	0.600		o	225	Pipe/Conduit	
S107.001	10.950	0.219	50.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S107.002	24.644	0.493	50.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S108.000	27.023	1.501	18.0	0.220	5.00	0.0	0.600		o	225	Pipe/Conduit	
S108.001	11.727	0.651	18.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S108.002	37.935	2.108	18.0	0.119	0.00	0.0	0.600		o	225	Pipe/Conduit	
S107.003	12.595	0.252	50.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S107.004	52.625	1.053	50.0	0.170	0.00	0.0	0.600		o	375	Pipe/Conduit	
S107.005	7.521	0.150	50.1	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S109.000	41.572	3.199	13.0	0.286	5.00	0.0	0.600		o	225	Pipe/Conduit	
S107.006	14.831	0.297	49.9	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S107.007	36.567	0.731	50.0	0.191	0.00	0.0	0.600		o	375	Pipe/Conduit	
S107.008	19.091	0.382	50.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S110.000	41.948	3.709	11.3	0.259	5.00	0.0	0.600		o	225	Pipe/Conduit	
S107.009	43.286	0.866	50.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.010	18.888	0.378	50.0	0.210	0.00	0.0	0.600		o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.032	25.20	13.65	25.250	28.311	0.0	0.0	0.0	9.60	6105.2	1935.6
S1.033	25.07	13.79	22.728	28.311	0.0	0.0	0.0	2.01	3013.9	1935.6
S1.034	24.28	14.67	21.940	28.311	0.0	0.0	0.0	0.79	13003.0	1935.6
S107.000	38.70	5.24	40.100	0.168	0.0	0.0	0.0	1.85	73.7	17.6
S107.001	38.43	5.34	39.557	0.168	0.0	0.0	0.0	1.85	73.7	17.6
S107.002	37.94	5.53	39.263	0.168	0.0	0.0	0.0	2.23	157.6	17.6
S108.000	38.98	5.15	43.100	0.220	0.0	0.0	0.0	3.10	123.2	23.2
S108.001	38.80	5.21	41.599	0.220	0.0	0.0	0.0	3.10	123.2	23.2
S108.002	38.24	5.41	40.948	0.339	0.0	0.0	0.0	3.10	123.2	35.1
S107.003	37.72	5.61	38.706	0.506	0.0	0.0	0.0	2.57	283.7	51.7
S107.004	36.86	5.95	38.454	0.677	0.0	0.0	0.0	2.57	283.7	67.6
S107.005	36.74	6.00	37.401	0.677	0.0	0.0	0.0	2.56	283.2	67.6
S109.000	38.85	5.19	40.600	0.286	0.0	0.0	0.0	3.65	145.1	30.1
S107.006	36.51	6.10	37.251	0.963	0.0	0.0	0.0	2.57	283.8	95.2
S107.007	35.95	6.33	36.954	1.154	0.0	0.0	0.0	2.57	283.5	112.4
S107.008	35.66	6.46	36.223	1.154	0.0	0.0	0.0	2.57	283.7	112.4
S110.000	38.88	5.18	39.700	0.259	0.0	0.0	0.0	3.91	155.6	27.2
S107.009	35.11	6.71	35.766	1.413	0.0	0.0	0.0	2.88	458.2	134.3
S107.010	34.87	6.82	34.900	1.623	0.0	0.0	0.0	2.88	458.3	153.3

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S107.011	31.071	4.802	6.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.012	27.854	1.463	19.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S111.000	40.020	0.668	59.9	0.129	5.00	0.0	0.600		o	375	Pipe/Conduit	
S111.001	11.556	0.193	59.9	0.071	0.00	0.0	0.600		o	375	Pipe/Conduit	
S111.002	74.164	1.238	59.9	0.207	0.00	0.0	0.600		o	450	Pipe/Conduit	
S111.003	18.776	0.313	60.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S111.004	66.244	1.106	59.9	0.228	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.013	8.077	0.202	40.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.014	63.470	1.103	57.5	0.544	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.015	14.444	0.266	54.3	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S107.016	80.617	1.439	56.0	0.000	0.00	0.0	0.600		o	525	Pipe/Conduit	
S107.017	23.926	0.048	498.5	0.445	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.018	54.114	0.108	501.1	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.019	84.106	0.168	500.6	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.020	43.939	0.088	500.0	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.021	47.561	0.095	500.0	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.022	138.775	0.278	500.0	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.023	103.476	0.207	500.0	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.024	26.040	0.052	500.8	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S112.000	14.303	0.477	30.0	0.282	5.00	0.0	0.600		o	300	Pipe/Conduit	
S112.001	7.750	0.258	30.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S112.002	41.480	1.383	30.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S107.011	34.74	6.88	34.522	1.623	0.0	0.0	0.0	8.03	1277.3	153.3
S107.012	34.53	6.98	29.720	1.623	0.0	0.0	0.0	4.68	743.7	153.3
S111.000	38.59	5.28	31.850	0.129	0.0	0.0	0.0	2.34	259.0	13.5
S111.001	38.37	5.37	31.182	0.200	0.0	0.0	0.0	2.35	259.0	20.8
S111.002	37.14	5.84	30.914	0.407	0.0	0.0	0.0	2.63	418.4	41.0
S111.003	36.84	5.96	29.676	0.407	0.0	0.0	0.0	2.63	418.1	41.0
S111.004	35.85	6.38	29.363	0.635	0.0	0.0	0.0	2.63	418.4	61.7
S107.013	34.44	7.02	28.257	2.258	0.0	0.0	0.0	3.22	512.6	210.6
S107.014	33.65	7.42	28.055	2.802	0.0	0.0	0.0	2.68	426.9	255.4
S107.015	33.49	7.49	26.877	2.802	0.0	0.0	0.0	3.04	659.0	255.4
S107.016	32.66	7.94	26.611	2.802	0.0	0.0	0.0	3.00	648.8	255.4
S107.017	31.82	8.42	24.881	3.247	0.0	0.0	0.0	0.84	3029.1	279.8
S107.018	30.12	9.49	24.833	3.247	0.0	0.0	0.0	0.84	3021.3	279.8
S107.019	27.88	11.16	24.725	3.247	0.0	0.0	0.0	0.84	3022.6	279.8
S107.020	26.86	12.03	24.557	3.247	0.0	0.0	0.0	0.84	3024.5	279.8
S107.021	25.86	12.98	24.469	3.247	0.0	0.0	0.0	0.84	3024.5	279.8
S107.022	23.42	15.73	24.374	3.247	0.0	0.0	0.0	0.84	3024.5	279.8
S107.023	22.02	17.78	24.096	3.247	0.0	0.0	0.0	0.84	3024.5	279.8
S107.024	21.70	18.30	23.889	3.247	0.0	0.0	0.0	0.84	3022.1	279.8
S112.000	39.16	5.08	37.300	0.282	0.0	0.0	0.0	2.88	203.7	29.9
S112.001	39.03	5.13	36.823	0.282	0.0	0.0	0.0	2.88	203.5	29.9
S112.002	38.36	5.37	36.565	0.282	0.0	0.0	0.0	2.88	203.7	29.9

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S113.000	46.664	2.845	16.4	0.251	5.00	0.0	0.600		o	300	Pipe/Conduit	
S113.001	39.320	2.398	16.4	0.136	0.00	0.0	0.600		o	300	Pipe/Conduit	
S113.002	19.402	1.183	16.4	0.163	0.00	0.0	0.600		o	300	Pipe/Conduit	
S113.003	22.566	1.376	16.4	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S114.000	44.522	2.182	20.4	0.159	5.00	0.0	0.600		o	225	Pipe/Conduit	
S114.001	51.573	2.528	20.4	0.311	0.00	0.0	0.600		o	225	Pipe/Conduit	
S114.002	12.748	0.625	20.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S114.003	22.168	1.092	20.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S115.000	51.311	1.710	30.0	0.267	5.00	0.0	0.600		o	300	Pipe/Conduit	
S115.001	45.157	1.505	30.0	0.317	0.00	0.0	0.600		o	300	Pipe/Conduit	
S115.002	25.857	0.862	30.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S115.003	32.832	0.403	81.5	0.196	0.00	0.0	0.600		o	375	Pipe/Conduit	
S115.004	31.883	0.391	81.5	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S115.005	18.691	0.229	81.6	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S113.004	70.484	4.324	16.3	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S112.003	41.480	1.383	30.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S112.004	85.421	2.847	30.0	0.220	0.00	0.0	0.600		o	450	Pipe/Conduit	
S112.005	20.670	0.689	30.0	0.047	0.00	0.0	0.600		o	450	Pipe/Conduit	
S116.000	48.718	1.015	48.0	0.168	5.00	0.0	0.600		o	225	Pipe/Conduit	
S116.001	14.926	0.311	48.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S116.002	27.318	0.569	48.0	0.145	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S113.000	38.83	5.20	47.300	0.251	0.0	0.0	0.0	3.90	275.8	26.4
S113.001	38.36	5.37	44.455	0.387	0.0	0.0	0.0	3.90	275.8	40.2
S113.002	38.14	5.45	42.057	0.550	0.0	0.0	0.0	3.90	275.8	56.8
S113.003	37.88	5.55	40.874	0.550	0.0	0.0	0.0	3.90	275.8	56.8
S114.000	38.67	5.26	46.000	0.159	0.0	0.0	0.0	2.91	115.7	16.6
S114.001	37.87	5.55	43.818	0.470	0.0	0.0	0.0	2.91	115.7	48.2
S114.002	37.68	5.62	41.290	0.470	0.0	0.0	0.0	2.91	115.7	48.2
S114.003	37.36	5.75	40.665	0.470	0.0	0.0	0.0	2.92	116.0	48.2
S115.000	38.56	5.30	44.600	0.267	0.0	0.0	0.0	2.88	203.6	27.8
S115.001	37.85	5.56	42.890	0.584	0.0	0.0	0.0	2.88	203.6	59.8
S115.002	37.47	5.71	41.385	0.584	0.0	0.0	0.0	2.88	203.7	59.8
S115.003	36.78	5.98	40.448	0.779	0.0	0.0	0.0	2.01	221.9	77.6
S115.004	36.15	6.24	40.045	0.779	0.0	0.0	0.0	2.01	221.8	77.6
S115.005	35.79	6.40	39.654	0.779	0.0	0.0	0.0	2.01	221.7	77.6
S113.004	35.21	6.66	39.423	1.800	0.0	0.0	0.0	4.51	497.8	171.6
S112.003	34.81	6.85	35.024	2.082	0.0	0.0	0.0	3.72	592.1	196.3
S112.004	34.02	7.23	33.641	2.302	0.0	0.0	0.0	3.72	592.0	212.1
S112.005	33.83	7.32	30.794	2.349	0.0	0.0	0.0	3.72	592.1	215.3
S116.000	38.20	5.43	32.225	0.168	0.0	0.0	0.0	1.89	75.3	17.3
S116.001	37.85	5.56	31.210	0.168	0.0	0.0	0.0	1.89	75.3	17.3
S116.002	37.23	5.80	30.899	0.313	0.0	0.0	0.0	1.89	75.2	31.5

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Network Design Table for Surface water - SSR

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S112.006	47.097	5.352	8.8	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
S107.025	37.184	0.075	495.8	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.026	110.989	0.232	478.4	0.000	0.00	0.0		0.040	1.5 _/	1200	1:1.5 Ditch	
S107.027	33.466	0.669	50.0	0.000	0.00	0.0		0.040	o	650	Pipe/Conduit	
S1.035	37.496	0.687	54.6	0.000	0.00	0.0	5.000		AR1	-1	Pipe/Conduit	
S1.036	11.650	0.213	54.7	0.000	0.00	0.0		0.040	|_|	4900	Ditch	
S1.037	91.386	0.009	10154.0	0.000	0.00	0.0		0.001	|_|	1000	Ditch	
S1.038	14.764	0.009	1640.4	0.000	0.00	0.0		0.001	|_|	1000	Ditch	
S117.000	43.042	0.406	106.1	0.000	5.00	0.0	0.600		o	1143	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S112.006	33.61	7.44	30.105	2.662	0.0	0.0	0.0	6.88	1094.9	242.3
S107.025	21.26	19.03	23.837	5.909	0.0	0.0	0.0	0.84	3037.3	340.3
S107.026	20.11	21.19	23.762	5.909	0.0	0.0	0.0	0.86	3092.0	340.3
S107.027	19.85	21.72	23.530	5.909	0.0	0.0	0.0	1.05	349.4	340.3
S1.035	19.79	21.84	21.900	34.219	0.0	0.0	0.0	5.01	14044.3	1935.6
S1.036	19.75	21.94	21.213	34.219	0.0	0.0	0.0	1.98	5343.2	1935.6
S1.037	19.60	22.26	18.559	34.219	0.0	0.0	0.0	4.77	4770.9	1935.6
S1.038	19.59	22.28	18.550	34.219	0.0	0.0	0.0	11.87	11869.8	1935.6
S117.000	38.81	5.20	34.740	0.000	0.0	0.0	0.0	3.52	3616.7	0.0

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	61.894	1.423	Open Manhole	1200	S1.000	60.471	225				
S2/1	60.145	1.145	Junction		S2.000	59.000	150				
S2	60.145	1.494	Open Manhole	1200	S1.001	58.651	300	S1.000	58.726	225	
								S2.000	58.801	150	
S3	58.843	1.413	Open Manhole	1200	S1.002	57.430	300	S1.001	57.430	300	
S4/1	58.313	1.263	Junction		S3.000	57.050	150				
S4/2	58.313	1.313	Junction		S4.000	57.000	150				
S4	58.313	1.500	Open Manhole	1200	S1.003	56.813	300	S1.002	56.813	300	
								S3.000	56.963	150	
								S4.000	56.963	150	
S5	57.090	1.425	Open Manhole	1200	S5.000	55.665	225				
S6/1	56.979	1.179	Junction		S6.000	55.800	150				
S6	56.979	1.453	Open Manhole	1200	S5.001	55.526	300	S5.000	55.601	225	
								S6.000	55.676	150	
S7	56.189	1.489	Open Manhole	1200	S7.000	54.700	225				
S8	56.864	2.240	Open Manhole	1200	S7.001	54.624	225	S7.000	54.624	225	
S9	57.078	2.557	Open Manhole	1200	S5.002	54.521	300	S5.001	54.521	300	
								S7.001	54.596	225	
S10	57.273	2.787	Open Manhole	1200	S5.003	54.486	300	S5.002	54.486	300	
S11/1	57.560	2.760	Open Manhole	1200	S8.000	54.800	150				
S11	57.560	3.112	Open Manhole	1200	S5.004	54.448	300	S5.003	54.448	300	
								S8.000	54.598	150	
S12	57.683	3.266	Open Manhole	1200	S1.004	54.417	300	S1.003	54.417	300	
								S5.004	54.417	300	
S13	56.589	2.238	Open Manhole	1200	S1.005	54.351	300	S1.004	54.351	300	
S14	55.192	2.160	Open Manhole	1200	S1.006	53.032	300	S1.005	53.032	300	
S15/1	50.567	2.067	Junction		S9.000	48.500	150				
S15	50.567	3.067	Open Manhole	1500	S1.007	47.500	450	S1.006	47.650	300	
								S9.000	47.800	150	
S16	49.211	1.864	Open Manhole	1500	S1.008	47.347	450	S1.007	47.347	450	
S18/1	50.400	1.650	Junction		S10.000	48.750	450				
S18	49.548	2.425	Open Manhole	1500	S1.009	47.123	600	S1.008	47.273	450	
								S10.000	47.273	450	
S19/1	49.764	1.614	Junction		S11.000	48.150	150				
S19	49.764	2.713	Open Manhole	1500	S1.010	47.051	600	S1.009	47.051	600	
								S11.000	47.501	150	
S21/1	50.200	1.425	Junction		S12.000	48.775	225				
S21	50.184	3.343	Open Manhole	1500	S1.011	46.841	675	S1.010	46.916	600	
								S12.000	47.291	225	
S22	50.473	3.731	Open Manhole	1500	S1.012	46.742	675	S1.011	46.742	675	
S23	50.650	3.972	Open Manhole	1500	S1.013	46.678	675	S1.012	46.678	675	
S24	79.397	1.425	Open Manhole	1200	S13.000	77.972	225				
S25	80.816	3.214	Open Manhole	1200	S13.001	77.602	225	S13.000	77.602	225	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S26	79.429	1.958	Open Manhole	1200	S13.002	77.471	225	S13.001	77.471	225	
S170	79.985	2.657	Open Manhole	1200	S14.000	77.328	225				
S171	79.500	2.298	Open Manhole	1200	S14.001	77.202	225	S14.000	77.202	225	
S172	79.000	1.932	Open Manhole	1200	S14.002	77.068	225	S14.001	77.068	225	
S27	78.443	1.426	Open Manhole	1200	S13.003	77.017	225	S13.002	77.018	225	1
								S14.002	77.017	225	
S28	77.831	1.425	Open Manhole	1200	S13.004	76.406	225	S13.003	76.406	225	
S29	77.222	1.425	Open Manhole	1200	S13.005	75.797	225	S13.004	75.797	225	
S157	78.000	1.500	Open Manhole	1050	S15.000	76.500	225				
S158	77.500	1.064	Open Manhole	1050	S15.001	76.436	225	S15.000	76.436	225	
S159	76.984	1.963	Open Manhole	1200	S15.002	75.021	225	S15.001	75.021	225	
S31/1	77.265	2.220	Junction		S16.000	75.045	225				
S31	76.836	2.220	Open Manhole	1200	S13.006	74.616	225	S13.005	74.616	225	
								S15.002	74.616	225	
								S16.000	74.616	225	
S32	76.376	2.006	Open Manhole	1200	S13.007	74.370	225	S13.006	74.370	225	
S33/1	75.500	1.500	Junction		S17.000	74.000	225				
S33	75.190	1.555	Open Manhole	1200	S13.008	73.635	300	S13.007	73.710	225	
								S17.000	73.710	225	
S143	76.680	1.680	Open Manhole	1050	S18.000	75.000	225				
S144	73.940	1.292	Open Manhole	1050	S18.001	72.648	225	S18.000	72.648	225	
S34	73.992	1.470	Open Manhole	1200	S13.009	72.522	300	S13.008	72.522	300	
								S18.001	72.597	225	
S35	73.529	1.702	Open Manhole	1350	S13.010	71.827	450	S13.009	71.977	300	
S36	73.004	2.098	Open Manhole	1350	S13.011	70.906	450	S13.010	70.906	450	
S145	76.939	4.439	Open Manhole	1200	S19.000	72.500	225				
S146	76.000	3.740	Open Manhole	1200	S19.001	72.260	225	S19.000	72.260	225	
S147	76.000	3.779	Open Manhole	1200	S19.002	72.221	225	S19.001	72.221	225	
S148	76.000	3.855	Open Manhole	1200	S19.003	72.145	225	S19.002	72.145	225	
S149	76.000	3.958	Open Manhole	1200	S19.004	72.042	225	S19.003	72.042	225	
S150	76.000	4.050	Open Manhole	1200	S19.005	71.950	225	S19.004	71.950	225	
S151	76.000	4.115	Open Manhole	1200	S19.006	71.885	225	S19.005	71.885	225	
S152	76.000	4.183	Open Manhole	1200	S19.007	71.817	225	S19.006	71.817	225	
S153	76.000	4.441	Open Manhole	1200	S19.008	71.559	225	S19.007	71.559	225	
S154	76.000	4.614	Open Manhole	1200	S19.009	71.386	225	S19.008	71.386	225	
S155	74.000	2.677	Open Manhole	1200	S19.010	71.323	225	S19.009	71.323	225	
S156	73.400	2.243	Open Manhole	1200	S19.011	71.157	225	S19.010	71.157	225	
S167	74.000	1.200	Open Manhole	1050	S20.000	72.800	225				
S168	74.000	1.517	Open Manhole	1050	S20.001	72.483	225	S20.000	72.483	225	
S38	72.896	2.573	Open Manhole	1350	S13.012	70.323	450	S13.011	70.323	450	
								S19.011	70.548	225	
								S20.001	70.548	225	
S39	72.641	2.560	Open Manhole	1350	S13.013	70.081	450	S13.012	70.081	450	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S165	72.470	0.970	Open Manhole	1050	S21.000	71.500	225				
S166	72.456	1.156	Open Manhole	1050	S21.001	71.300	225	S21.000	71.300	225	
S40	72.511	2.631	Open Manhole	1350	S13.014	69.880	450	S13.013	69.880	450	
								S21.001	70.105	225	
S41	72.300	1.500	Open Manhole	1200	S22.000	70.800	225				
S42/1	71.947	1.447	Junction		S23.000	70.500	225				
S42/2	72.170	1.670	Junction		S24.000	70.500	225				
S42	71.954	2.382	Open Manhole	1350	S13.015	69.572	450	S13.014	69.572	450	
								S22.000	69.797	225	
								S23.000	69.797	225	
								S24.000	69.797	225	
S43/1	71.194	1.425	Junction		S25.000	69.769	225				
S43/2	71.294	1.425	Junction		S26.000	69.869	225				
S43	70.998	1.648	Open Manhole	1350	S13.016	69.350	450	S13.015	69.350	450	
								S25.000	69.575	225	
								S26.000	69.575	225	
S44	71.500	1.325	Open Manhole	1200	S27.000	70.175	225				
S45	71.100	1.525	Open Manhole	1200	S27.001	69.575	225	S27.000	69.575	225	
S47	75.100	1.425	Open Manhole	1350	S28.000	73.675	300				
S67	74.300	2.048	Open Manhole	1350	S28.001	72.252	450	S28.000	72.252	300	
S136	74.100	1.943	Open Manhole	1350	S28.002	72.157	450	S28.001	72.157	450	
S137	73.000	1.778	Open Manhole	1350	S28.003	71.222	450	S28.002	71.222	450	
S138	72.000	1.442	Open Manhole	1350	S28.004	70.558	450	S28.003	70.558	450	
S139	72.000	1.570	Open Manhole	1350	S28.005	70.430	450	S28.004	70.430	450	
S140	70.050	1.275	Open Manhole	1500	S28.006	68.775	525	S28.005	68.850	450	
S141	70.000	1.378	Open Manhole	1500	S28.007	68.622	525	S28.006	68.622	525	
S142	69.400	1.219	Open Manhole	1500	S28.008	68.181	525	S28.007	68.181	525	
S46/1	69.932	1.524	Junction		S29.000	68.408	225				
S46	69.765	1.695	Open Manhole	1500	S13.017	68.070	525	S13.016	68.145	450	
								S27.001	68.370	225	
								S28.008	68.070	525	
								S29.000	68.370	225	
S48	67.201	1.811	Open Manhole	1500	S13.018	65.390	675	S13.017	65.540	525	
S49	65.964	3.924	Open Manhole	1500	S13.019	62.040	675	S13.018	62.040	675	
S50	63.077	1.132	Open Manhole	1050	S30.000	61.945	225				
S51	63.083	1.973	Open Manhole	1800	S13.020	61.110	750	S13.019	61.185	675	
								S30.000	61.635	225	
S52	69.839	0.200	Junction		S31.000	69.639	600				
S53	69.032	0.200	Junction		S31.001	68.832	600	S31.000	68.832	600	
S54	68.137	0.200	Junction		S31.002	67.937	600	S31.001	67.937	600	
S55	66.998	0.200	Junction		S31.003	66.798	600	S31.002	66.798	600	
S56	66.329	0.200	Junction		S31.004	66.129	600	S31.003	66.129	600	
S57	65.828	0.200	Junction		S31.005	65.628	600	S31.004	65.628	600	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S58	65.543	0.200	Junction		S31.006	65.343	600	S31.005	65.343	600	
S59	64.539	0.200	Junction		S31.007	64.339	600	S31.006	64.339	600	
S60	63.173	0.200	Junction		S31.008	62.973	600	S31.007	62.973	600	
S61	62.830	1.425	Junction		S31.009	61.405	225	S31.008	62.630	600	1200
S62	62.632	1.922	Open Manhole	1800	S13.021	60.710	750	S13.020	60.735	750	25
								S31.009	61.235	225	
S63	62.458	2.393	Open Manhole	1800	S13.022	60.065	825	S13.021	60.140	750	
S64B/1	66.120	1.362	Junction		S32.000	64.758	150				
S64B	66.120	1.420	Open Manhole	1050	S32.001	64.700	150	S32.000	64.700	150	
S64A/1	65.710	1.417	Junction		S33.000	64.293	150				
S111	65.710	1.272	Open Manhole	1050	S34.000	64.438	150				
S112	65.280	0.842	Junction		S35.000	64.438	225				
S112	65.710	1.545	Open Manhole	1050	S34.001	64.165	225	S34.000	64.240	150	
								S35.000	64.240	225	75
S64A	65.560	1.420	Open Manhole	1050	S32.002	64.140	225	S32.001	64.373	150	158
								S33.000	64.215	150	
								S34.001	64.140	225	
S64	65.194	1.484	Open Manhole	1200	S32.003	63.710	225	S32.002	63.710	225	
S65/1	64.784	1.085	Junction		S36.000	63.699	225				
S65	64.784	1.384	Open Manhole	1200	S32.004	63.400	225	S32.003	63.400	225	
								S36.000	63.475	225	75
S66	64.577	1.381	Open Manhole	1200	S32.005	63.196	225	S32.004	63.196	225	
S68/1	63.523	0.358	Junction		S37.000	63.165	150				
S68	64.179	1.481	Open Manhole	1200	S32.006	62.698	225	S32.005	62.698	225	
								S37.000	62.773	150	
S69/1	63.808	0.933	Junction		S38.000	62.875	150				
S69	63.826	1.399	Open Manhole	1200	S32.007	62.427	225	S32.006	62.428	225	1
								S38.000	62.502	150	
S70	63.395	1.430	Open Manhole	1200	S32.008	61.965	225	S32.007	61.965	225	
S71/1	63.834	1.937	Junction		S39.000	61.897	150				
S71	62.560	1.308	Open Manhole	1200	S32.009	61.252	300	S32.008	61.327	225	
								S39.000	61.402	150	
S72	62.778	0.200	Junction		S40.000	62.578	600				
S73	62.687	0.200	Junction		S40.001	62.487	600	S40.000	62.487	600	
S74	62.584	0.200	Junction		S40.002	62.384	600	S40.001	62.384	600	
S75	62.498	0.200	Junction		S40.003	62.298	600	S40.002	62.298	600	
S76	65.280	1.050	Open Manhole	1050	S41.000	64.230	300				
S77	65.089	1.050	Open Manhole	1050	S41.001	64.039	300	S41.000	64.039	300	
S78	64.890	1.050	Open Manhole	1050	S41.002	63.840	300	S41.001	63.840	300	
S79	64.945	1.142	Open Manhole	1050	S41.003	63.803	300	S41.002	63.803	300	
S80	64.856	1.116	Open Manhole	1050	S41.004	63.740	300	S41.003	63.740	300	
S81	64.786	1.086	Open Manhole	1050	S41.005	63.700	300	S41.004	63.700	300	
S82	64.706	1.051	Open Manhole	1050	S41.006	63.655	300	S41.005	63.655	300	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S83	64.560	1.051	Open Manhole	1050	S41.007	63.509	300	S41.006	63.509	300	
S84	64.473	1.051	Open Manhole	1050	S41.008	63.422	300	S41.007	63.422	300	
S85	64.336	1.051	Open Manhole	1050	S41.009	63.285	300	S41.008	63.285	300	
S86	64.239	1.051	Open Manhole	1050	S41.010	63.188	300	S41.009	63.188	300	
S87	64.158	1.051	Open Manhole	1050	S41.011	63.107	300	S41.010	63.107	300	
S88	63.960	1.051	Open Manhole	1050	S41.012	62.909	300	S41.011	62.909	300	
S89	63.717	1.051	Open Manhole	1050	S41.013	62.666	300	S41.012	62.666	300	
S90	63.525	1.051	Open Manhole	1050	S41.014	62.474	300	S41.013	62.474	300	
S181	63.860	0.250	Junction		S42.000	63.610	500				
S182	63.750	0.495	Junction		S42.001	63.255	500	S42.000	63.255	500	
S183	63.600	0.505	Junction		S42.002	63.095	500	S42.001	63.095	500	
S184	63.500	0.507	Junction		S42.003	62.993	500	S42.002	62.993	500	
S185	63.400	0.498	Junction		S42.004	62.902	500	S42.003	62.902	500	
S186	63.200	0.498	Junction		S42.005	62.702	500	S42.004	62.702	500	
S187	63.000	0.498	Junction		S42.006	62.502	500	S42.005	62.502	500	
S134	63.000	0.623	Open Manhole	1050	S42.007	62.377	225	S42.006	62.452	500	
S127	62.750	1.050	Open Manhole	1050	S41.015	61.700	300	S41.014	61.700	300	
								S42.007	61.775	225	
S91	62.680	1.050	Open Manhole	1050	S41.016	61.630	300	S41.015	61.630	300	
S128	64.460	0.500	Junction		S43.000	63.960	300				
S129	64.510	0.600	Junction		S43.001	63.910	300	S43.000	63.910	300	
S130	64.400	0.600	Junction		S43.002	63.800	300	S43.001	63.800	300	
S128	64.300	0.600	Junction		S43.003	63.700	300	S43.002	63.700	300	
S129	64.200	0.600	Junction		S43.004	63.600	300	S43.003	63.600	300	
S130	64.000	0.600	Junction		S43.005	63.400	300	S43.004	63.400	300	
S131	63.530	0.600	Junction		S43.006	62.930	300	S43.005	62.930	300	
S132	63.200	0.630	Junction		S43.007	62.570	300	S43.006	62.570	300	
S133	63.000	0.600	Junction		S43.008	62.400	300	S43.007	62.400	300	
S147	62.700	0.500	Open Manhole	1050	S43.009	62.200	300	S43.008	62.200	300	
S92	62.600	1.050	Open Manhole	1050	S41.017	61.550	300	S41.016	61.550	300	
								S43.009	61.650	300	100
S93	62.825	1.313	Open Manhole	1200	S40.004	61.512	300	S40.003	62.232	600	620
								S41.017	61.512	300	
S94	62.324	2.349	Open Manhole	1800	S13.023	59.975	825	S13.022	59.975	825	
								S32.009	60.525	300	25
								S40.004	61.030	300	530
S96/1	61.500	0.550	Junction		S44.000	60.950	150				
S96	61.000	2.050	Open Manhole	1800	S13.024	58.950	825	S13.023	58.950	825	
								S44.000	59.650	150	25
S99/1	59.100	0.450	Junction		S45.000	58.650	150				
S99/2	59.300	1.500	Junction		S46.000	57.800	300				
S99	59.100	2.100	Open Manhole	1800	S13.025	57.000	825	S13.024	57.000	825	
								S45.000	57.700	150	25

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S46.000	57.550	300	25
S100	58.900	2.413	Open Manhole	1800	S13.026	56.488	825	S13.025	56.488	825	
S101	57.100	0.450	Junction		S47.000	56.650	150				
S102	57.500	3.802	Open Manhole	1800	S13.027	53.699	825	S13.026	53.699	825	
								S47.000	54.374	150	
S103	53.000	1.914	Open Manhole	1800	S13.028	51.086	825	S13.027	51.086	825	
S120	50.582	4.547	Open Manhole	1500	S1.014	46.035	1275	S1.013	46.635	675	
								S13.028	46.521	825	36
S250	72.603	2.167	Open Manhole	1200	S48.000	70.436	225				
S186	76.218	3.218	Open Manhole	1350	S49.000	73.000	450				
S187	75.405	2.993	Open Manhole	1350	S49.001	72.412	450	S49.000	72.412	450	
S186	75.090	2.892	Open Manhole	1350	S49.002	72.198	450	S49.001	72.198	450	
S189	73.460	2.276	Open Manhole	1350	S49.003	71.184	450	S49.002	71.184	450	
S190	73.498	2.669	Open Manhole	1500	S49.004	70.829	525	S49.003	70.904	450	
S184	76.323	2.123	Open Manhole	1350	S50.000	74.200	450				
S255	73.707	4.233	Open Manhole	1500	S49.005	69.474	525	S49.004	69.474	525	
								S50.000	69.774	450	225
S256	70.021	2.626	Open Manhole	1500	S48.001	67.395	600	S48.000	67.770	225	
								S49.005	67.470	525	
S191	69.612	2.739	Open Manhole	1500	S48.002	66.873	600	S48.001	66.873	600	
S185	67.979	2.704	Open Manhole	1500	S48.003	65.275	600	S48.002	65.275	600	
S257	67.541	3.160	Open Manhole	1500	S48.004	64.381	600	S48.003	64.381	600	
S258	68.267	5.277	Open Manhole	1500	S48.005	62.990	675	S48.004	63.065	600	
S259	68.089	5.244	Open Manhole	1500	S48.006	62.845	675	S48.005	62.845	675	
S260/1	67.591	1.285	Junction		S51.000	66.306	150				
S260	67.688	5.373	Open Manhole	1500	S48.007	62.315	675	S48.006	62.315	675	
								S51.000	66.035	150	3195
S261/1	67.445	1.531	Junction		S52.000	65.914	150				
S261/2	67.396	1.397	Junction		S53.000	65.999	150				
S261	67.481	5.358	Open Manhole	1500	S48.008	62.123	675	S48.007	62.123	675	
								S52.000	65.855	150	3207
								S53.000	65.855	150	3207
S263/1	67.149	1.596	Junction		S54.000	65.553	150				
S263/2	67.295	1.544	Junction		S55.000	65.751	150				
S263	67.091	5.326	Open Manhole	1500	S48.009	61.765	675	S48.008	61.765	675	
								S54.000	65.505	150	3215
								S55.000	65.505	150	3215
S264/1	66.705	1.384	Junction		S56.000	65.321	150				
S264/2	66.981	1.271	Junction		S57.000	65.710	150				
S264/3	66.909	1.596	Junction		S58.000	65.313	225				
S264	66.705	5.296	Open Manhole	1500	S48.010	61.409	675	S48.009	61.409	675	
								S56.000	65.265	150	3331
								S57.000	65.265	150	3331

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S58.000	65.190	225	3331
S265/1	66.210	1.320	Junction		S59.000	64.890	150				
S265/2	66.300	1.383	Junction		S60.000	64.917	150				
S265	66.159	5.074	Open Manhole	1500	S48.011	61.085	675	S48.010	61.085	675	
								S59.000	64.840	150	3230
								S60.000	64.840	150	3230
S268/1	64.988	1.494	Junction		S61.000	63.494	150				
S268/2	65.104	1.561	Junction		S62.000	63.543	225				
S266	64.893	4.272	Open Manhole	1500	S48.012	60.621	675	S48.011	60.621	675	
								S61.000	63.440	150	2294
								S62.000	63.440	225	2369
S217	64.977	2.364	Open Manhole	1200	S63.000	62.613	225				
S271	64.268	2.288	Open Manhole	1200	S63.001	61.980	225	S63.000	61.980	225	
S272	63.689	2.123	Open Manhole	1200	S63.002	61.566	225	S63.001	61.566	225	
S273	62.351	1.343	Sealed Manhole	1050	S63.003	61.008	300	S63.002	61.083	225	
S222	62.633	1.752	Open Manhole	1050	S63.004	60.881	300	S63.003	60.881	300	
S277	63.317	2.602	Open Manhole	1200	S63.005	60.716	300	S63.004	60.716	300	
S278/1	63.899	2.441	Junction		S64.000	61.458	150				
S278	63.680	3.391	Open Manhole	1500	S48.013	60.289	675	S48.012	60.289	675	
								S63.005	60.630	300	
								S64.000	60.814	150	
S279	67.206	2.506	Open Manhole	1200	S65.000	64.700	150				
S280/1	66.157	1.353	Junction		S66.000	64.804	150				
S280/2	66.297	1.343	Junction		S67.000	64.954	150				
S280	65.796	1.421	Open Manhole	1200	S65.001	64.375	225	S65.000	64.450	150	
								S66.000	64.450	150	
								S67.000	64.450	150	
S281/2	65.098	1.013	Junction		S68.000	64.085	150				
S281/1	64.561	1.366	Junction		S69.000	63.195	150				
S281	64.318	1.443	Open Manhole	1200	S65.002	62.875	225	S65.001	62.875	225	
								S68.000	62.950	150	
								S69.000	62.950	150	
S282/1	63.773	1.452	Junction		S70.000	62.321	150				
S282/2	64.499	2.200	Junction		S71.000	62.299	225				
S282	63.615	1.515	Open Manhole	1200	S65.003	62.100	300	S65.002	62.175	225	
								S70.000	62.250	150	
								S71.000	62.175	225	
S283/1	63.112	1.453	Junction		S72.000	61.659	150				
S283	62.895	1.435	Open Manhole	1200	S65.004	61.460	300	S65.003	61.460	300	
								S72.000	61.610	150	
S237	62.822	2.392	Junction		S73.000	60.430	150				
S284	62.734	2.893	Open Manhole	1500	S48.014	59.841	675	S48.013	59.841	675	
								S65.004	60.216	300	

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								S73.000	60.366	150	
S285	61.721	2.780	Open Manhole	1500	S48.015	58.941	675	S48.014	58.941	675	
S286	60.075	2.434	Open Manhole	1500	S48.016	57.641	675	S48.015	57.641	675	
S287/1	58.728	2.030	Junction		S74.000	56.698	300				
S287	58.593	2.352	Open Manhole	1500	S48.017	56.241	675	S48.016	56.241	675	
								S74.000	56.616	300	
S288/1	56.371	2.017	Junction		S75.000	54.354	300				
S288/3	56.222	1.295	Junction		S76.000	54.927	150				
S288/2(LD)	56.606	2.301	Junction		S77.000	54.305	300				
S288	56.163	2.272	Open Manhole	1500	S48.018	53.891	675	S48.017	53.891	675	
								S75.000	54.266	300	
								S76.000	54.416	150	
								S77.000	54.266	300	
S289/1	55.127	1.251	Junction		S78.000	53.876	150				
S289	54.919	2.228	Open Manhole	1500	S48.019	52.691	675	S48.018	52.691	675	
								S78.000	53.216	150	
S244	58.987	1.967	Open Manhole	1200	S79.000	57.020	225				
S249	59.592	3.094	Open Manhole	1350	S79.001	56.498	375	S79.000	56.648	225	
S250	58.483	2.801	Open Manhole	1350	S79.002	55.682	375	S79.001	55.682	375	
S251	56.886	3.090	Open Manhole	1350	S79.003	53.796	375	S79.002	53.796	375	
S248	54.630	1.930	Open Manhole	1200	S80.000	52.700	225				
S252	55.211	3.149	Open Manhole	1350	S79.004	52.062	375	S79.003	52.062	375	
								S80.000	52.212	225	
S291/2	52.671	2.063	Junction		S79.005	50.608	375	S79.004	50.608	375	
S291/1	53.026	1.284	Junction		S81.000	51.742	150				
S291	52.124	2.349	Open Manhole	1800	S48.020	49.775	750	S48.019	49.850	675	
								S79.005	50.150	375	
								S81.000	50.375	150	
S115/1	50.023	2.170	Junction		S82.000	47.853	225				
S115/2	51.691	3.834	Junction		S83.000	47.857	225				
S115	50.147	3.147	Open Manhole	1800	S48.021	47.000	900	S48.020	47.150	750	
								S82.000	47.750	225	75
								S83.000	47.750	225	75
S116A/1	49.475	1.977	Junction		S84.000	47.498	300				
S116A	49.306	2.006	Open Manhole	1200	S84.001	47.300	300	S84.000	47.300	300	
S116/1	49.451	2.153	Junction		S85.000	47.298	300				
S116	49.389	3.094	Open Manhole	2100	S48.022	46.295	1200	S48.021	46.595	900	
								S84.001	47.235	300	40
								S85.000	47.195	300	
S117/1	50.136	2.916	Junction		S86.000	47.220	300				
S117/2	50.553	3.330	Junction		S87.000	47.223	300				
S117	50.115	3.897	Open Manhole	2100	S48.023	46.218	1200	S48.022	46.218	1200	
								S86.000	47.118	300	

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								S87.000	47.118	300	
S118/1	50.899	3.810	Junction		S88.000	47.089	300				
S118/2	50.830	3.761	Junction		S89.000	47.069	300				
S118	50.750	4.674	Open Manhole	2100	S48.024	46.076	1200	S48.023	46.076	1200	
								S88.000	46.976	300	
								S89.000	46.976	300	
S178	50.750	4.855	Open Manhole	2100	S1.015	45.895	1350	S1.014	46.010	1275	40
								S48.024	46.040	1200	
S123/2	49.500	0.500	Junction		S90.000	49.000	225				
S123	48.339	2.653	Open Manhole	2100	S1.016	45.686	1350	S1.015	45.686	1350	
								S90.000	47.563	225	752
S126/2	44.700	0.700	Junction		S91.000	44.000	300				
S126	44.752	2.551	Open Manhole	2100	S1.017	42.201	1350	S1.016	42.201	1350	
								S91.000	43.944	300	693
S129/1	41.060	1.060	Junction		S92.000	40.000	450				
S129/2	40.300	0.300	Junction		S93.000	40.000	225				
S129	40.628	2.542	Open Manhole	2100	S1.018	38.086	1350	S1.017	38.086	1350	
								S92.000	39.973	450	987
								S93.000	39.941	225	730
S131/1	38.994	0.994	Junction		S94.000	38.000	300				
S131	38.706	2.603	Open Manhole	2100	S1.019	36.103	1350	S1.018	36.177	1350	74
								S94.000	37.944	300	791
S133/1	37.700	0.700	Junction		S95.000	37.000	225				
S133	38.561	3.186	Open Manhole	2100	S1.020	35.375	1500	S1.019	35.525	1350	
								S95.000	36.905	225	255
S134	37.562	2.416	Open Manhole	2100	S1.021	35.146	1500	S1.020	35.146	1500	
S275	38.081	3.069	Open Manhole	2100	S1.022	35.012	1500	S1.021	35.012	1500	
S276	37.970	3.076	Open Manhole	2100	S1.023	34.894	1500	S1.022	34.894	1500	
S277	37.859	3.027	Open Manhole	2100	S1.024	34.832	1500	S1.023	34.832	1500	
S278	38.068	4.298	Open Manhole	2100	S1.025	33.770	1500	S1.024	33.770	1500	
S279	36.729	3.613	Open Manhole	2100	S1.026	33.116	1500	S1.025	33.116	1500	
S280	36.500	4.831	Open Manhole	2100	S1.027	31.669	1500	S1.026	31.669	1500	
S281	36.500	5.206	Open Manhole	2100	S1.028	31.294	1500	S1.027	31.294	1500	
S284	48.750	1.425	Open Manhole	1200	S96.000	47.325	225				
S371	48.660	1.430	Open Manhole	1200	S96.001	47.230	225	S96.000	47.230	225	
S286	51.200	1.425	Open Manhole	1050	S97.000	49.775	225				
S372	48.962	1.933	Open Manhole	1500	S96.002	47.029	225	S96.001	47.029	225	
								S97.000	47.029	225	
S374	49.200	2.433	Open Manhole	1200	S96.003	46.767	225	S96.002	46.767	225	
S288	48.680	2.279	Junction		S98.000	46.401	225				
S375	48.550	2.370	Open Manhole	1500	S96.004	46.180	375	S96.003	46.330	225	
								S98.000	46.330	225	
S291	48.380	2.937	Junction		S99.000	45.443	225				

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S376	48.250	3.011	Open Manhole	1500	S96.005	45.239	375	S96.004	45.239	375	
								S99.000	45.389	225	
S293	48.297	3.137	Open Manhole	1200	S96.006	45.159	375	S96.005	45.159	375	
S294	48.460	3.660	Junction		S100.000	44.800	225				
S294	48.500	4.160	Open Manhole	1350	S96.007	44.340	375	S96.006	44.340	375	
								S100.000	44.729	225	239
S210	72.408	2.239	Open Manhole	1200	S101.000	70.169	225				
S211	72.669	4.730	Open Manhole	1200	S101.001	67.939	225	S101.000	67.939	225	
S212	69.412	4.316	Open Manhole	1350	S101.002	65.096	450	S101.001	65.314	225	
S213	67.542	2.898	Open Manhole	1350	S101.003	64.644	450	S101.002	64.644	450	
S214	67.388	2.862	Open Manhole	1350	S101.004	64.526	450	S101.003	64.526	450	
S215	65.780	1.722	Open Manhole	1350	S101.005	64.058	450	S101.004	64.058	450	
S221	66.256	2.680	Open Manhole	1350	S101.006	63.576	450	S101.005	63.576	450	
S314	64.117	2.323	Open Manhole	1350	S101.007	61.794	450	S101.006	61.794	450	
S320	61.747	3.685	Open Manhole	1350	S101.008	58.062	450	S101.007	58.062	450	
S300	58.812	1.712	Open Manhole	1350	S102.000	57.100	375				
S301	58.498	3.372	Open Manhole	1350	S102.001	55.126	450	S102.000	55.201	375	
S297	58.018	4.488	Open Manhole	1350	S101.009	53.530	450	S101.008	53.530	450	
								S102.001	53.530	450	
S313	54.507	1.807	Open Manhole	1350	S103.000	52.700	375				
S314	54.272	3.454	Open Manhole	1350	S103.001	50.818	450	S103.000	50.893	375	
S314	54.207	5.586	Open Manhole	1350	S103.002	48.621	450	S103.001	48.621	450	
S329	52.362	5.685	Open Manhole	1500	S101.010	46.677	600	S101.009	46.827	450	
								S103.002	46.827	450	
S412	66.023	1.933	Open Manhole	1350	S104.000	64.090	450				
S413	62.616	4.044	Open Manhole	1350	S104.001	58.572	450	S104.000	58.572	450	
S414	61.581	1.381	Open Manhole	1050	S105.000	60.200	225				
S414	60.968	3.646	Open Manhole	1350	S104.002	57.322	450	S104.001	57.337	450	15
								S105.000	57.547	225	
S415	58.619	3.152	Open Manhole	1350	S104.003	55.467	450	S104.002	55.467	450	
S416	51.696	2.356	Open Manhole	1350	S104.004	49.340	450	S104.003	49.340	450	
S320	50.720	2.990	Open Manhole	1350	S104.005	47.730	450	S104.004	47.730	450	
S315	51.650	5.785	Open Manhole	1500	S101.011	45.865	600	S101.010	45.865	600	
								S104.005	46.030	450	15
S345	49.805	4.729	Open Manhole	1500	S101.012	45.076	600	S101.011	45.076	600	
S295	48.350	4.448	Open Manhole	1800	S96.008	43.902	675	S96.007	44.201	375	
								S101.012	43.954	600	
S300	48.053	4.692	Open Manhole	1500	S96.009	43.361	675	S96.008	43.361	675	
S296	47.520	5.176	Open Manhole	1500	S96.010	42.344	675	S96.009	42.344	675	
S326	40.211	1.936	Open Manhole	1200	S106.000	38.275	225				
S318	41.496	3.556	Open Manhole	1200	S106.001	37.940	225	S106.000	37.940	225	
S299	43.242	6.432	Open Manhole	1500	S96.011	36.810	675	S96.010	36.810	675	
								S106.001	37.352	225	92

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S365	37.965	2.972	Open Manhole	1500	S96.012	34.993	675	S96.011	34.993	675	
S282	34.914	4.129	Open Manhole	2100	S1.029	30.785	1500	S1.028	30.805	1500	21
								S96.012	31.610	675	
S283	32.927	2.836	Open Manhole	2100	S1.030	30.127	1200	S1.029	30.091	1500	
S284	31.442	2.800	Open Manhole	2100	S1.031	28.642	1200	S1.030	28.642	1200	
S341	27.750	2.800	Junction		S1.032	25.250	900	S1.031	24.950	1200	
S389	27.106	4.378	Junction		S1.033	22.728	2000	S1.032	22.728	900	
S373	23.140	1.200	Junction		S1.034	21.940	12000	S1.033	22.390	2000	
S337	42.119	2.019	Open Manhole	1200	S107.000	40.100	225				
S379	41.651	2.094	Open Manhole	1200	S107.001	39.557	225	S107.000	39.557	225	
S380	41.826	2.563	Open Manhole	1200	S107.002	39.263	300	S107.001	39.338	225	
S381	45.123	2.023	Open Manhole	1200	S108.000	43.100	225				
S382	44.097	2.498	Open Manhole	1200	S108.001	41.599	225	S108.000	41.599	225	
S383	43.835	2.887	Open Manhole	1200	S108.002	40.948	225	S108.001	40.948	225	
S381	41.708	3.002	Open Manhole	1350	S107.003	38.706	375	S107.002	38.770	300	
								S108.002	38.840	225	
S385	41.086	2.632	Open Manhole	1350	S107.004	38.454	375	S107.003	38.454	375	
S386	40.161	2.760	Open Manhole	1350	S107.005	37.401	375	S107.004	37.401	375	
S387	42.012	1.412	Open Manhole	1050	S109.000	40.600	225				
S387	40.199	2.948	Open Manhole	1350	S107.006	37.251	375	S107.005	37.251	375	
								S109.000	37.401	225	
S389	39.681	2.727	Open Manhole	1350	S107.007	36.954	375	S107.006	36.954	375	
S390	39.419	3.196	Open Manhole	1350	S107.008	36.223	375	S107.007	36.223	375	
S392	40.949	1.249	Open Manhole	1050	S110.000	39.700	225				
S392	39.232	3.466	Open Manhole	1350	S107.009	35.766	450	S107.008	35.841	375	
								S110.000	35.991	225	
S395	38.308	3.408	Open Manhole	1350	S107.010	34.900	450	S107.009	34.900	450	
S396	37.469	2.947	Open Manhole	1350	S107.011	34.522	450	S107.010	34.522	450	
S397	32.490	2.770	Open Manhole	1350	S107.012	29.720	450	S107.011	29.720	450	
S400	33.954	2.104	Open Manhole	1350	S111.000	31.850	375				
S401	33.367	2.185	Open Manhole	1350	S111.001	31.182	375	S111.000	31.182	375	
S402	33.110	2.196	Open Manhole	1350	S111.002	30.914	450	S111.001	30.989	375	
S404	32.109	2.433	Open Manhole	1350	S111.003	29.676	450	S111.002	29.676	450	
S405	32.131	2.768	Open Manhole	1350	S111.004	29.363	450	S111.003	29.363	450	
S398	31.133	2.876	Open Manhole	1350	S107.013	28.257	450	S107.012	28.257	450	
								S111.004	28.257	450	
S408	31.085	3.030	Open Manhole	1350	S107.014	28.055	450	S107.013	28.055	450	
S409	30.703	3.826	Open Manhole	1500	S107.015	26.877	525	S107.014	26.952	450	
S366	30.514	3.903	Open Manhole	1500	S107.016	26.611	525	S107.015	26.611	525	
S335	30.066	5.185	Open Manhole	1200	S107.017	24.881	1200	S107.016	25.172	525	
S367	26.646	1.813	Open Manhole	1200	S107.018	24.833	1200	S107.017	24.833	1200	
S377	26.883	2.158	Junction		S107.019	24.725	1200	S107.018	24.725	1200	
S378	26.714	2.157	Junction		S107.020	24.557	1200	S107.019	24.557	1200	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S379	26.841	2.372	Junction		S107.021	24.469	1200	S107.020	24.469	1200	
S380	26.914	2.540	Junction		S107.022	24.374	1200	S107.021	24.374	1200	
S381	26.974	2.878	Junction		S107.023	24.096	1200	S107.022	24.096	1200	
S382	27.031	3.142	Junction		S107.024	23.889	1200	S107.023	23.889	1200	
S358	39.723	2.423	Open Manhole	1200	S112.000	37.300	300				
S359	39.198	2.375	Open Manhole	1200	S112.001	36.823	300	S112.000	36.823	300	
S360	38.986	2.421	Open Manhole	1200	S112.002	36.565	300	S112.001	36.565	300	
S320	49.746	2.446	Open Manhole	1200	S113.000	47.300	300				
S321	47.472	3.017	Open Manhole	1200	S113.001	44.455	300	S113.000	44.455	300	
S344	45.509	3.452	Open Manhole	1200	S113.002	42.057	300	S113.001	42.057	300	
S345	44.718	3.844	Open Manhole	1200	S113.003	40.874	300	S113.002	40.874	300	
S374	48.661	2.661	Open Manhole	1200	S114.000	46.000	225				
S346	47.007	3.189	Open Manhole	1200	S114.001	43.818	225	S114.000	43.818	225	
S347	45.305	4.015	Open Manhole	1200	S114.002	41.290	225	S114.001	41.290	225	
S348	44.803	4.138	Open Manhole	1200	S114.003	40.665	225	S114.002	40.665	225	
S340	46.572	1.972	Open Manhole	1200	S115.000	44.600	300				
S342	45.141	2.251	Open Manhole	1200	S115.001	42.890	300	S115.000	42.890	300	
S343	43.587	2.202	Open Manhole	1200	S115.002	41.385	300	S115.001	41.385	300	
S344	42.455	2.007	Open Manhole	1350	S115.003	40.448	375	S115.002	40.523	300	
S393	42.933	2.888	Open Manhole	1350	S115.004	40.045	375	S115.003	40.045	375	
S394	43.441	3.787	Open Manhole	1350	S115.005	39.654	375	S115.004	39.654	375	
S346	44.109	4.686	Open Manhole	1350	S113.004	39.423	375	S113.003	39.498	300	
								S114.003	39.573	225	
								S115.005	39.425	375	2
S377	38.036	3.012	Open Manhole	1350	S112.003	35.024	450	S112.002	35.182	300	8
								S113.004	35.099	375	
S361	37.067	3.426	Open Manhole	1350	S112.004	33.641	450	S112.003	33.641	450	
S362	35.753	4.959	Open Manhole	1350	S112.005	30.794	450	S112.004	30.794	450	
S395	34.186	1.961	Open Manhole	1200	S116.000	32.225	225				
S396	34.874	3.664	Open Manhole	1200	S116.001	31.210	225	S116.000	31.210	225	
S364	35.169	4.270	Open Manhole	1200	S116.002	30.899	225	S116.001	30.899	225	
S356	35.569	5.464	Open Manhole	1350	S112.006	30.105	450	S112.005	30.105	450	
								S116.002	30.330	225	
S383	27.178	3.341	Open Manhole	1200	S107.025	23.837	1200	S107.024	23.837	1200	
								S112.006	24.753	450	166
S384	27.210	3.448	Junction		S107.026	23.762	1200	S107.025	23.762	1200	
S385	27.978	4.448	Open Manhole	1200	S107.027	23.530	650	S107.026	23.530	1200	
S342	24.500	2.600	Junction		S1.035	21.900	-1	S1.034	21.900	12000	
								S107.027	22.861	650	
S418	24.000	2.787	Junction		S1.036	21.213	4900	S1.035	21.213	-1	
S418	21.600	3.041	Junction		S1.037	18.559	1000	S1.036	21.000	4900	1991
S417	21.800	3.250	Junction		S1.038	18.550	1000	S1.037	18.550	1000	
S	19.500	0.959	Open Manhole	0		OUTFALL		S1.038	18.541	1000	

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Manhole Schedules for Surface water - SSR

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S394	37.562	2.822	Open Manhole	1800	S117.000	34.740	1143				
S	38.000	3.666	Open Manhole	0		OUTFALL		S117.000	34.334	1143	

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S1	61.894	60.471	1.198	Open Manhole	1200
S2.000	o	150	S2/1	60.145	59.000	0.995	Junction	
S1.001	o	300	S2	60.145	58.651	1.194	Open Manhole	1200
S1.002	o	300	S3	58.843	57.430	1.113	Open Manhole	1200
S3.000	o	150	S4/1	58.313	57.050	1.113	Junction	
S4.000	o	150	S4/2	58.313	57.000	1.163	Junction	
S1.003	o	300	S4	58.313	56.813	1.200	Open Manhole	1200
S5.000	o	225	S5	57.090	55.665	1.200	Open Manhole	1200
S6.000	o	150	S6/1	56.979	55.800	1.029	Junction	
S5.001	o	300	S6	56.979	55.526	1.153	Open Manhole	1200
S7.000	o	225	S7	56.189	54.700	1.264	Open Manhole	1200
S7.001	o	225	S8	56.864	54.624	2.015	Open Manhole	1200
S5.002	o	300	S9	57.078	54.521	2.257	Open Manhole	1200
S5.003	o	300	S10	57.273	54.486	2.487	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	63.883	36.6	S2	60.145	58.726	1.194	Open Manhole	1200
S2.000	4.996	25.1	S2	60.145	58.801	1.194	Open Manhole	1200
S1.001	46.374	38.0	S3	58.843	57.430	1.113	Open Manhole	1200
S1.002	18.526	30.0	S4	58.313	56.813	1.200	Open Manhole	1200
S3.000	8.387	96.4	S4	58.313	56.963	1.200	Open Manhole	1200
S4.000	7.260	196.2	S4	58.313	56.963	1.200	Open Manhole	1200
S1.003	18.095	7.6	S12	57.683	54.417	2.966	Open Manhole	1200
S5.000	14.443	225.7	S6	56.979	55.601	1.153	Open Manhole	1200
S6.000	10.384	83.7	S6	56.979	55.676	1.153	Open Manhole	1200
S5.001	15.149	15.1	S9	57.078	54.521	2.257	Open Manhole	1200
S7.000	17.127	225.4	S8	56.864	54.624	2.015	Open Manhole	1200
S7.001	6.291	224.7	S9	57.078	54.596	2.257	Open Manhole	1200
S5.002	10.610	303.2	S10	57.273	54.486	2.487	Open Manhole	1200
S5.003	11.521	303.2	S11	57.560	54.448	2.812	Open Manhole	1200

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.000	o	150	S11/1	57.560	54.800	2.610	Open Manhole	1200
S5.004	o	300	S11	57.560	54.448	2.812	Open Manhole	1200
S1.004	o	300	S12	57.683	54.417	2.966	Open Manhole	1200
S1.005	o	300	S13	56.589	54.351	1.938	Open Manhole	1200
S1.006	o	300	S14	55.192	53.032	1.860	Open Manhole	1200
S9.000	o	150	S15/1	50.567	48.500	1.917	Junction	
S1.007	o	450	S15	50.567	47.500	2.617	Open Manhole	1500
S1.008	o	450	S16	49.211	47.347	1.414	Open Manhole	1500
S10.000	o	450	S18/1	50.400	48.750	1.200	Junction	
S1.009	o	600	S18	49.548	47.123	1.825	Open Manhole	1500
S11.000	o	150	S19/1	49.764	48.150	1.464	Junction	
S1.010	o	600	S19	49.764	47.051	2.113	Open Manhole	1500
S12.000	o	225	S21/1	50.200	48.775	1.200	Junction	
S1.011	o	675	S21	50.184	46.841	2.668	Open Manhole	1500
S1.012	o	675	S22	50.473	46.742	3.056	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.000	7.179	35.5	S11	57.560	54.598	2.812	Open Manhole	1200
S5.004	9.216	297.3	S12	57.683	54.417	2.966	Open Manhole	1200
S1.004	19.825	300.4	S13	56.589	54.351	1.938	Open Manhole	1200
S1.005	18.216	13.8	S14	55.192	53.032	1.860	Open Manhole	1200
S1.006	56.577	10.5	S15	50.567	47.650	2.617	Open Manhole	1500
S9.000	4.359	6.2	S15	50.567	47.800	2.617	Open Manhole	1500
S1.007	39.750	259.8	S16	49.211	47.347	1.414	Open Manhole	1500
S1.008	22.362	302.2	S18	49.548	47.273	1.825	Open Manhole	1500
S10.000	15.668	10.6	S18	49.548	47.273	1.825	Open Manhole	1500
S1.009	21.454	298.0	S19	49.764	47.051	2.113	Open Manhole	1500
S11.000	7.910	12.2	S19	49.764	47.501	2.113	Open Manhole	1500
S1.010	40.445	299.6	S21	50.184	46.916	2.668	Open Manhole	1500
S12.000	10.430	7.0	S21	50.184	47.291	2.668	Open Manhole	1500
S1.011	29.744	300.4	S22	50.473	46.742	3.056	Open Manhole	1500
S1.012	19.335	302.1	S23	50.650	46.678	3.297	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.013	o	675	S23	50.650	46.678	3.297	Open Manhole	1500
S13.000	o	225	S24	79.397	77.972	1.200	Open Manhole	1200
S13.001	o	225	S25	80.816	77.602	2.989	Open Manhole	1200
S13.002	o	225	S26	79.429	77.471	1.733	Open Manhole	1200
S14.000	o	225	S170	79.985	77.328	2.432	Open Manhole	1200
S14.001	o	225	S171	79.500	77.202	2.073	Open Manhole	1200
S14.002	o	225	S172	79.000	77.068	1.707	Open Manhole	1200
S13.003	o	225	S27	78.443	77.017	1.201	Open Manhole	1200
S13.004	o	225	S28	77.831	76.406	1.200	Open Manhole	1200
S13.005	o	225	S29	77.222	75.797	1.200	Open Manhole	1200
S15.000	o	225	S157	78.000	76.500	1.275	Open Manhole	1050
S15.001	o	225	S158	77.500	76.436	0.839	Open Manhole	1050
S15.002	o	225	S159	76.984	75.021	1.738	Open Manhole	1200
S16.000	o	225	S31/1	77.265	75.045	1.995	Junction	
S13.006	o	225	S31	76.836	74.616	1.995	Open Manhole	1200
S13.007	o	225	S32	76.376	74.370	1.781	Open Manhole	1200
S17.000	o	225	S33/1	75.500	74.000	1.275	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.013	12.978	301.8	S120	50.582	46.635	3.272	Open Manhole	1500
S13.000	62.874	169.9	S25	80.816	77.602	2.989	Open Manhole	1200
S13.001	22.289	170.1	S26	79.429	77.471	1.733	Open Manhole	1200
S13.002	24.693	54.5	S27	78.443	77.018	1.200	Open Manhole	1200
S14.000	21.113	167.6	S171	79.500	77.202	2.073	Open Manhole	1200
S14.001	22.365	166.9	S172	79.000	77.068	1.707	Open Manhole	1200
S14.002	8.448	165.6	S27	78.443	77.017	1.201	Open Manhole	1200
S13.003	15.472	25.3	S28	77.831	76.406	1.200	Open Manhole	1200
S13.004	15.408	25.3	S29	77.222	75.797	1.200	Open Manhole	1200
S13.005	9.704	8.2	S31	76.836	74.616	1.995	Open Manhole	1200
S15.000	10.624	166.0	S158	77.500	76.436	0.839	Open Manhole	1050
S15.001	18.823	13.3	S159	76.984	75.021	1.738	Open Manhole	1200
S15.002	22.301	55.1	S31	76.836	74.616	1.995	Open Manhole	1200
S16.000	11.219	26.2	S31	76.836	74.616	1.995	Open Manhole	1200
S13.006	11.237	45.7	S32	76.376	74.370	1.781	Open Manhole	1200
S13.007	29.683	45.0	S33	75.190	73.710	1.255	Open Manhole	1200
S17.000	7.448	25.7	S33	75.190	73.710	1.255	Open Manhole	1200

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.008	o	300	S33	75.190	73.635	1.255	Open Manhole	1200
S18.000	o	225	S143	76.680	75.000	1.455	Open Manhole	1050
S18.001	o	225	S144	73.940	72.648	1.067	Open Manhole	1050
S13.009	o	300	S34	73.992	72.522	1.170	Open Manhole	1200
S13.010	o	450	S35	73.529	71.827	1.252	Open Manhole	1350
S13.011	o	450	S36	73.004	70.906	1.648	Open Manhole	1350
S19.000	o	225	S145	76.939	72.500	4.214	Open Manhole	1200
S19.001	o	225	S146	76.000	72.260	3.515	Open Manhole	1200
S19.002	o	225	S147	76.000	72.221	3.554	Open Manhole	1200
S19.003	o	225	S148	76.000	72.145	3.630	Open Manhole	1200
S19.004	o	225	S149	76.000	72.042	3.733	Open Manhole	1200
S19.005	o	225	S150	76.000	71.950	3.825	Open Manhole	1200
S19.006	o	225	S151	76.000	71.885	3.890	Open Manhole	1200
S19.007	o	225	S152	76.000	71.817	3.958	Open Manhole	1200
S19.008	o	225	S153	76.000	71.559	4.216	Open Manhole	1200
S19.009	o	225	S154	76.000	71.386	4.389	Open Manhole	1200
S19.010	o	225	S155	74.000	71.323	2.452	Open Manhole	1200
S19.011	o	225	S156	73.400	71.157	2.018	Open Manhole	1200
S20.000	o	225	S167	74.000	72.800	0.975	Open Manhole	1050
S20.001	o	225	S168	74.000	72.483	1.292	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.008	38.280	34.4	S34	73.992	72.522	1.170	Open Manhole	1200
S18.000	70.553	30.0	S144	73.940	72.648	1.067	Open Manhole	1050
S18.001	6.604	129.5	S34	73.992	72.597	1.170	Open Manhole	1200
S13.009	24.895	45.7	S35	73.529	71.977	1.252	Open Manhole	1350
S13.010	41.214	44.7	S36	73.004	70.906	1.648	Open Manhole	1350
S13.011	8.852	15.2	S38	72.896	70.323	2.123	Open Manhole	1350
S19.000	24.006	100.0	S146	76.000	72.260	3.515	Open Manhole	1200
S19.001	6.491	166.4	S147	76.000	72.221	3.554	Open Manhole	1200
S19.002	12.714	167.3	S148	76.000	72.145	3.630	Open Manhole	1200
S19.003	17.181	166.8	S149	76.000	72.042	3.733	Open Manhole	1200
S19.004	15.313	166.4	S150	76.000	71.950	3.825	Open Manhole	1200
S19.005	10.929	168.1	S151	76.000	71.885	3.890	Open Manhole	1200
S19.006	11.446	168.3	S152	76.000	71.817	3.958	Open Manhole	1200
S19.007	43.161	167.3	S153	76.000	71.559	4.216	Open Manhole	1200
S19.008	28.983	167.5	S154	76.000	71.386	4.389	Open Manhole	1200
S19.009	10.527	167.1	S155	74.000	71.323	2.452	Open Manhole	1200
S19.010	8.320	50.1	S156	73.400	71.157	2.018	Open Manhole	1200
S19.011	25.227	41.4	S38	72.896	70.548	2.123	Open Manhole	1350
S20.000	53.089	167.5	S168	74.000	72.483	1.292	Open Manhole	1050
S20.001	13.997	7.2	S38	72.896	70.548	2.123	Open Manhole	1350

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.012	o	450	S38	72.896	70.323	2.123	Open Manhole	1350
S13.013	o	450	S39	72.641	70.081	2.110	Open Manhole	1350
S21.000	o	225	S165	72.470	71.500	0.745	Open Manhole	1050
S21.001	o	225	S166	72.456	71.300	0.931	Open Manhole	1050
S13.014	o	450	S40	72.511	69.880	2.181	Open Manhole	1350
S22.000	o	225	S41	72.300	70.800	1.275	Open Manhole	1200
S23.000	o	225	S42/1	71.947	70.500	1.222	Junction	
S24.000	o	225	S42/2	72.170	70.500	1.445	Junction	
S13.015	o	450	S42	71.954	69.572	1.932	Open Manhole	1350
S25.000	o	225	S43/1	71.194	69.769	1.200	Junction	
S26.000	o	225	S43/2	71.294	69.869	1.200	Junction	
S13.016	o	450	S43	70.998	69.350	1.198	Open Manhole	1350
S27.000	o	225	S44	71.500	70.175	1.100	Open Manhole	1200
S27.001	o	225	S45	71.100	69.575	1.300	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.012	19.374	80.1	S39	72.641	70.081	2.110	Open Manhole	1350
S13.013	10.067	50.1	S40	72.511	69.880	2.181	Open Manhole	1350
S21.000	7.314	36.6	S166	72.456	71.300	0.931	Open Manhole	1050
S21.001	6.392	5.3	S40	72.511	70.105	2.181	Open Manhole	1350
S13.014	40.941	132.9	S42	71.954	69.572	1.932	Open Manhole	1350
S22.000	32.896	32.8	S42	71.954	69.797	1.932	Open Manhole	1350
S23.000	6.761	9.6	S42	71.954	69.797	1.932	Open Manhole	1350
S24.000	7.833	11.1	S42	71.954	69.797	1.932	Open Manhole	1350
S13.015	32.954	148.4	S43	70.998	69.350	1.198	Open Manhole	1350
S25.000	6.581	33.9	S43	70.998	69.575	1.198	Open Manhole	1350
S26.000	6.256	21.3	S43	70.998	69.575	1.198	Open Manhole	1350
S13.016	26.925	22.3	S46	69.765	68.145	1.170	Open Manhole	1500
S27.000	22.043	36.7	S45	71.100	69.575	1.300	Open Manhole	1200
S27.001	17.033	14.1	S46	69.765	68.370	1.170	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S28.000	o	300	S47	75.100	73.675	1.125	Open Manhole	1350
S28.001	o	450	S67	74.300	72.252	1.598	Open Manhole	1350
S28.002	o	450	S136	74.100	72.157	1.493	Open Manhole	1350
S28.003	o	450	S137	73.000	71.222	1.328	Open Manhole	1350
S28.004	o	450	S138	72.000	70.558	0.992	Open Manhole	1350
S28.005	o	450	S139	72.000	70.430	1.120	Open Manhole	1350
S28.006	o	525	S140	70.050	68.775	0.750	Open Manhole	1500
S28.007	o	525	S141	70.000	68.622	0.853	Open Manhole	1500
S28.008	o	525	S142	69.400	68.181	0.694	Open Manhole	1500
S29.000	o	225	S46/1	69.932	68.408	1.299	Junction	
S13.017	o	525	S46	69.765	68.070	1.170	Open Manhole	1500
S13.018	o	675	S48	67.201	65.390	1.136	Open Manhole	1500
S13.019	o	675	S49	65.964	62.040	3.249	Open Manhole	1500
S30.000	o	225	S50	63.077	61.945	0.907	Open Manhole	1050
S13.020	o	750	S51	63.083	61.110	1.223	Open Manhole	1800
S31.000	1 _/	600	S52	69.839	69.639	0.000	Junction	
S31.001	1 _/	600	S53	69.032	68.832	0.000	Junction	
S31.002	1 _/	600	S54	68.137	67.937	0.000	Junction	
S31.003	1 _/	600	S55	66.998	66.798	0.000	Junction	
S31.004	1 _/	600	S56	66.329	66.129	0.000	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S28.000	106.759	75.0	S67	74.300	72.252	1.748	Open Manhole	1350
S28.001	7.141	75.2	S136	74.100	72.157	1.493	Open Manhole	1350
S28.002	70.101	75.0	S137	73.000	71.222	1.328	Open Manhole	1350
S28.003	49.822	75.0	S138	72.000	70.558	0.992	Open Manhole	1350
S28.004	9.580	74.8	S139	72.000	70.430	1.120	Open Manhole	1350
S28.005	92.483	58.5	S140	70.050	68.850	0.750	Open Manhole	1500
S28.006	11.468	75.0	S141	70.000	68.622	0.853	Open Manhole	1500
S28.007	50.529	114.6	S142	69.400	68.181	0.694	Open Manhole	1500
S28.008	33.357	300.5	S46	69.765	68.070	1.170	Open Manhole	1500
S29.000	6.452	169.8	S46	69.765	68.370	1.170	Open Manhole	1500
S13.017	39.220	15.5	S48	67.201	65.540	1.136	Open Manhole	1500
S13.018	17.842	5.3	S49	65.964	62.040	3.249	Open Manhole	1500
S13.019	43.522	50.9	S51	63.083	61.185	1.223	Open Manhole	1800
S30.000	5.438	17.5	S51	63.083	61.635	1.223	Open Manhole	1800
S13.020	10.135	27.0	S62	62.632	60.735	1.147	Open Manhole	1800
S31.000	12.599	15.6	S53	69.032	68.832	0.000	Junction	
S31.001	12.952	14.5	S54	68.137	67.937	0.000	Junction	
S31.002	15.375	13.5	S55	66.998	66.798	0.000	Junction	
S31.003	8.301	12.4	S56	66.329	66.129	0.000	Junction	
S31.004	6.289	12.6	S57	65.828	65.628	0.000	Junction	

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S31.005	1 _/	600	S57	65.828	65.628	0.000	Junction	
S31.006	1 _/	600	S58	65.543	65.343	0.000	Junction	
S31.007	1 _/	600	S59	64.539	64.339	0.000	Junction	
S31.008	1 _/	600	S60	63.173	62.973	0.000	Junction	
S31.009	o	225	S61	62.830	61.405	1.200	Junction	
S13.021	o	750	S62	62.632	60.710	1.172	Open Manhole	1800
S13.022	o	825	S63	62.458	60.065	1.568	Open Manhole	1800
S32.000	o	150	S64B/1	66.120	64.758	1.212	Junction	
S32.001	o	150	S64B	66.120	64.700	1.270	Open Manhole	1050
S33.000	o	150	S64A/1	65.710	64.293	1.267	Junction	
S34.000	o	150	S111	65.710	64.438	1.122	Open Manhole	1050
S35.000	o	225	S112	65.280	64.438	0.617	Junction	
S34.001	o	225	S112	65.710	64.165	1.320	Open Manhole	1050
S32.002	o	225	S64A	65.560	64.140	1.195	Open Manhole	1050
S32.003	o	225	S64	65.194	63.710	1.259	Open Manhole	1200
S36.000	o	225	S65/1	64.784	63.699	0.860	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S31.005	3.604	12.6	S58	65.543	65.343	0.000	Junction	
S31.006	13.568	13.5	S59	64.539	64.339	0.000	Junction	
S31.007	22.562	16.5	S60	63.173	62.973	0.000	Junction	
S31.008	3.360	9.8	S61	62.830	62.630	0.000	Junction	
S31.009	4.237	24.9	S62	62.632	61.235	1.172	Open Manhole	1800
S13.021	17.639	30.9	S63	62.458	60.140	1.568	Open Manhole	1800
S13.022	17.665	196.3	S94	62.324	59.975	1.524	Open Manhole	1800
S32.000	5.781	99.7	S64B	66.120	64.700	1.270	Open Manhole	1050
S32.001	54.737	167.2	S64A	65.560	64.373	1.037	Open Manhole	1050
S33.000	6.250	80.1	S64A	65.560	64.215	1.195	Open Manhole	1050
S34.000	39.608	200.0	S112	65.710	64.240	1.320	Open Manhole	1050
S35.000	39.614	200.1	S112	65.710	64.240	1.245	Open Manhole	1050
S34.001	5.360	214.4	S64A	65.560	64.140	1.195	Open Manhole	1050
S32.002	44.296	103.0	S64	65.194	63.710	1.259	Open Manhole	1200
S32.003	34.117	110.1	S65	64.784	63.400	1.159	Open Manhole	1200
S36.000	6.052	27.0	S65	64.784	63.475	1.084	Open Manhole	1200

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S32.004	o	225	S65	64.784	63.400	1.159	Open Manhole	1200
S32.005	o	225	S66	64.577	63.196	1.156	Open Manhole	1200
S37.000	o	150	S68/1	63.523	63.165	0.208	Junction	
S32.006	o	225	S68	64.179	62.698	1.256	Open Manhole	1200
S38.000	o	150	S69/1	63.808	62.875	0.783	Junction	
S32.007	o	225	S69	63.826	62.427	1.174	Open Manhole	1200
S32.008	o	225	S70	63.395	61.965	1.205	Open Manhole	1200
S39.000	o	150	S71/1	63.834	61.897	1.787	Junction	
S32.009	o	300	S71	62.560	61.252	1.008	Open Manhole	1200
S40.000	1 _/	600	S72	62.778	62.578	0.000	Junction	
S40.001	1 _/	600	S73	62.687	62.487	0.000	Junction	
S40.002	1 _/	600	S74	62.584	62.384	0.000	Junction	
S40.003	1 _/	600	S75	62.498	62.298	0.000	Junction	
S41.000	o	300	S76	65.280	64.230	0.750	Open Manhole	1050
S41.001	o	300	S77	65.089	64.039	0.750	Open Manhole	1050
S41.002	o	300	S78	64.890	63.840	0.750	Open Manhole	1050
S41.003	o	300	S79	64.945	63.803	0.842	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S32.004	19.267	94.4	S66	64.577	63.196	1.156	Open Manhole	1200
S32.005	39.642	79.6	S68	64.179	62.698	1.256	Open Manhole	1200
S37.000	7.456	19.0	S68	64.179	62.773	1.256	Open Manhole	1200
S32.006	23.372	86.6	S69	63.826	62.428	1.173	Open Manhole	1200
S38.000	5.216	14.0	S69	63.826	62.502	1.174	Open Manhole	1200
S32.007	16.613	36.0	S70	63.395	61.965	1.205	Open Manhole	1200
S32.008	29.295	45.9	S71	62.560	61.327	1.008	Open Manhole	1200
S39.000	4.951	10.0	S71	62.560	61.402	1.008	Open Manhole	1200
S32.009	22.998	31.6	S94	62.324	60.525	1.499	Open Manhole	1800
S40.000	4.950	54.4	S73	62.687	62.487	0.000	Junction	
S40.001	9.401	91.3	S74	62.584	62.384	0.000	Junction	
S40.002	7.859	91.4	S75	62.498	62.298	0.000	Junction	
S40.003	10.251	155.3	S93	62.825	62.232	0.393	Open Manhole	1200
S41.000	19.469	101.9	S77	65.089	64.039	0.750	Open Manhole	1050
S41.001	14.230	71.5	S78	64.890	63.840	0.750	Open Manhole	1050
S41.002	6.000	162.2	S79	64.945	63.803	0.842	Open Manhole	1050
S41.003	3.814	60.5	S80	64.856	63.740	0.816	Open Manhole	1050

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S41.004	o	300	S80	64.856	63.740	0.816	Open Manhole	1050
S41.005	o	300	S81	64.786	63.700	0.786	Open Manhole	1050
S41.006	o	300	S82	64.706	63.655	0.751	Open Manhole	1050
S41.007	o	300	S83	64.560	63.509	0.751	Open Manhole	1050
S41.008	o	300	S84	64.473	63.422	0.751	Open Manhole	1050
S41.009	o	300	S85	64.336	63.285	0.751	Open Manhole	1050
S41.010	o	300	S86	64.239	63.188	0.751	Open Manhole	1050
S41.011	o	300	S87	64.158	63.107	0.751	Open Manhole	1050
S41.012	o	300	S88	63.960	62.909	0.751	Open Manhole	1050
S41.013	o	300	S89	63.717	62.666	0.751	Open Manhole	1050
S41.014	o	300	S90	63.525	62.474	0.751	Open Manhole	1050
S42.000	4 \=/	500	S181	63.860	63.610	0.100	Junction	
S42.001	4 \=/	500	S182	63.750	63.255	0.345	Junction	
S42.002	4 \=/	500	S183	63.600	63.095	0.355	Junction	
S42.003	4 \=/	500	S184	63.500	62.993	0.357	Junction	
S42.004	4 \=/	500	S185	63.400	62.902	0.348	Junction	
S42.005	4 \=/	500	S186	63.200	62.702	0.348	Junction	
S42.006	4 \=/	500	S187	63.000	62.502	0.348	Junction	
S42.007	o	225	S134	63.000	62.377	0.398	Open Manhole	1050
S41.015	o	300	S127	62.750	61.700	0.750	Open Manhole	1050
S41.016	o	300	S91	62.680	61.630	0.750	Open Manhole	1050
S43.000	1 _/	300	S128	64.460	63.960	0.200	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S41.004	7.965	199.1	S81	64.786	63.700	0.786	Open Manhole	1050
S41.005	8.896	197.7	S82	64.706	63.655	0.751	Open Manhole	1050
S41.006	15.062	103.2	S83	64.560	63.509	0.751	Open Manhole	1050
S41.007	8.654	99.5	S84	64.473	63.422	0.751	Open Manhole	1050
S41.008	13.330	97.3	S85	64.336	63.285	0.751	Open Manhole	1050
S41.009	7.947	81.9	S86	64.239	63.188	0.751	Open Manhole	1050
S41.010	5.335	65.9	S87	64.158	63.107	0.751	Open Manhole	1050
S41.011	9.369	47.3	S88	63.960	62.909	0.751	Open Manhole	1050
S41.012	9.033	37.2	S89	63.717	62.666	0.751	Open Manhole	1050
S41.013	6.090	31.7	S90	63.525	62.474	0.751	Open Manhole	1050
S41.014	23.121	29.9	S127	62.750	61.700	0.750	Open Manhole	1050
S42.000	7.243	20.4	S182	63.750	63.255	0.345	Junction	
S42.001	8.853	55.3	S183	63.600	63.095	0.355	Junction	
S42.002	5.359	52.5	S184	63.500	62.993	0.357	Junction	
S42.003	5.705	62.7	S185	63.400	62.902	0.348	Junction	
S42.004	12.090	60.4	S186	63.200	62.702	0.348	Junction	
S42.005	8.418	42.1	S187	63.000	62.502	0.348	Junction	
S42.006	5.414	108.3	S134	63.000	62.452	0.398	Open Manhole	1050
S42.007	5.130	8.5	S127	62.750	61.775	0.750	Open Manhole	1050
S41.015	8.502	121.5	S91	62.680	61.630	0.750	Open Manhole	1050
S41.016	10.428	130.4	S92	62.600	61.550	0.750	Open Manhole	1050
S43.000	5.054	101.1	S129	64.510	63.910	0.300	Junction	

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S43.001	1 _/	300	S129	64.510	63.910	0.300	Junction	
S43.002	1 _/	300	S130	64.400	63.800	0.300	Junction	
S43.003	1 _/	300	S128	64.300	63.700	0.300	Junction	
S43.004	o	300	S129	64.200	63.600	0.300	Junction	
S43.005	o	300	S130	64.000	63.400	0.300	Junction	
S43.006	o	300	S131	63.530	62.930	0.300	Junction	
S43.007	o	300	S132	63.200	62.570	0.330	Junction	
S43.008	o	300	S133	63.000	62.400	0.300	Junction	
S43.009	o	300	S147	62.700	62.200	0.200	Open Manhole	1050
S41.017	o	300	S92	62.600	61.550	0.750	Open Manhole	1050
S40.004	o	300	S93	62.825	61.512	1.013	Open Manhole	1200
S13.023	o	825	S94	62.324	59.975	1.524	Open Manhole	1800
S44.000	o	150	S96/1	61.500	60.950	0.400	Junction	
S13.024	o	825	S96	61.000	58.950	1.225	Open Manhole	1800
S45.000	o	150	S99/1	59.100	58.650	0.300	Junction	
S46.000	o	300	S99/2	59.300	57.800	1.200	Junction	
S13.025	o	825	S99	59.100	57.000	1.275	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S43.001	20.282	184.4	S130	64.400	63.800	0.300	Junction	
S43.002	26.175	261.7	S128	64.300	63.700	0.300	Junction	
S43.003	6.120	61.2	S129	64.200	63.600	0.300	Junction	
S43.004	7.550	37.8	S130	64.000	63.400	0.300	Junction	
S43.005	13.580	28.9	S131	63.530	62.930	0.300	Junction	
S43.006	7.874	21.9	S132	63.200	62.570	0.330	Junction	
S43.007	5.587	32.9	S133	63.000	62.400	0.300	Junction	
S43.008	5.294	26.5	S147	62.700	62.200	0.200	Open Manhole	1050
S43.009	5.040	9.2	S92	62.600	61.650	0.650	Open Manhole	1050
S41.017	10.927	287.6	S93	62.825	61.512	1.013	Open Manhole	1200
S40.004	6.243	13.0	S94	62.324	61.030	0.994	Open Manhole	1800
S13.023	23.270	22.7	S96	61.000	58.950	1.225	Open Manhole	1800
S44.000	4.908	3.8	S96	61.000	59.650	1.200	Open Manhole	1800
S13.024	27.294	14.0	S99	59.100	57.000	1.275	Open Manhole	1800
S45.000	4.497	4.7	S99	59.100	57.700	1.250	Open Manhole	1800
S46.000	8.353	33.4	S99	59.100	57.550	1.250	Open Manhole	1800
S13.025	4.100	8.0	S100	58.900	56.488	1.588	Open Manhole	1800

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.026	o	825	S100	58.900	56.488	1.588	Open Manhole	1800
S47.000	o	150	S101	57.100	56.650	0.300	Junction	
S13.027	o	825	S102	57.500	53.699	2.977	Open Manhole	1800
S13.028	o	825	S103	53.000	51.086	1.089	Open Manhole	1800
S1.014	o	1275	S120	50.582	46.035	3.272	Open Manhole	1500
S48.000	o	225	S250	72.603	70.436	1.942	Open Manhole	1200
S49.000	o	450	S186	76.218	73.000	2.768	Open Manhole	1350
S49.001	o	450	S187	75.405	72.412	2.543	Open Manhole	1350
S49.002	o	450	S186	75.090	72.198	2.442	Open Manhole	1350
S49.003	o	450	S189	73.460	71.184	1.826	Open Manhole	1350
S49.004	o	525	S190	73.498	70.829	2.144	Open Manhole	1500
S50.000	o	450	S184	76.323	74.200	1.673	Open Manhole	1350
S49.005	o	525	S255	73.707	69.474	3.708	Open Manhole	1500
S48.001	o	600	S256	70.021	67.395	2.026	Open Manhole	1500
S48.002	o	600	S191	69.612	66.873	2.139	Open Manhole	1500
S48.003	o	600	S185	67.979	65.275	2.104	Open Manhole	1500
S48.004	o	600	S257	67.541	64.381	2.560	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S13.026	22.202	8.0	S102	57.500	53.699	2.977	Open Manhole	1800
S47.000	4.245	1.9	S102	57.500	54.374	2.976	Open Manhole	1800
S13.027	20.900	8.0	S103	53.000	51.086	1.089	Open Manhole	1800
S13.028	28.433	6.2	S120	50.582	46.521	3.236	Open Manhole	1500
S1.014	7.046	281.9	S178	50.750	46.010	3.465	Open Manhole	2100
S48.000	52.392	19.7	S256	70.021	67.770	2.026	Open Manhole	1500
S49.000	20.944	35.6	S187	75.405	72.412	2.543	Open Manhole	1350
S49.001	7.624	35.6	S186	75.090	72.198	2.442	Open Manhole	1350
S49.002	36.094	35.6	S189	73.460	71.184	1.826	Open Manhole	1350
S49.003	9.960	35.6	S190	73.498	70.904	2.144	Open Manhole	1500
S49.004	48.223	35.6	S255	73.707	69.474	3.708	Open Manhole	1500
S50.000	55.692	12.6	S255	73.707	69.774	3.483	Open Manhole	1500
S49.005	64.059	32.0	S256	70.021	67.470	2.026	Open Manhole	1500
S48.001	12.061	23.1	S191	69.612	66.873	2.139	Open Manhole	1500
S48.002	36.392	22.8	S185	67.979	65.275	2.104	Open Manhole	1500
S48.003	22.643	25.3	S257	67.541	64.381	2.560	Open Manhole	1500
S48.004	15.953	12.1	S258	68.267	63.065	4.602	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.005	o	675	S258	68.267	62.990	4.602	Open Manhole	1500
S48.006	o	675	S259	68.089	62.845	4.569	Open Manhole	1500
S51.000	o	150	S260/1	67.591	66.306	1.135	Junction	
S48.007	o	675	S260	67.688	62.315	4.698	Open Manhole	1500
S52.000	o	150	S261/1	67.445	65.914	1.381	Junction	
S53.000	o	150	S261/2	67.396	65.999	1.247	Junction	
S48.008	o	675	S261	67.481	62.123	4.683	Open Manhole	1500
S54.000	o	150	S263/1	67.149	65.553	1.446	Junction	
S55.000	o	150	S263/2	67.295	65.751	1.394	Junction	
S48.009	o	675	S263	67.091	61.765	4.651	Open Manhole	1500
S56.000	o	150	S264/1	66.705	65.321	1.234	Junction	
S57.000	o	150	S264/2	66.981	65.710	1.121	Junction	
S58.000	o	225	S264/3	66.909	65.313	1.371	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.005	18.320	126.3	S259	68.089	62.845	4.569	Open Manhole	1500
S48.006	38.117	71.9	S260	67.688	62.315	4.698	Open Manhole	1500
S51.000	6.775	25.0	S260	67.688	66.035	1.503	Open Manhole	1500
S48.007	15.128	78.8	S261	67.481	62.123	4.683	Open Manhole	1500
S52.000	4.747	80.5	S261	67.481	65.855	1.476	Open Manhole	1500
S53.000	11.515	80.0	S261	67.481	65.855	1.476	Open Manhole	1500
S48.008	28.223	78.8	S263	67.091	61.765	4.651	Open Manhole	1500
S54.000	3.832	79.8	S263	67.091	65.505	1.436	Open Manhole	1500
S55.000	7.640	31.1	S263	67.091	65.505	1.436	Open Manhole	1500
S48.009	28.074	78.9	S264	66.705	61.409	4.621	Open Manhole	1500
S56.000	4.460	79.6	S264	66.705	65.265	1.290	Open Manhole	1500
S57.000	10.230	23.0	S264	66.705	65.265	1.290	Open Manhole	1500
S58.000	12.292	99.9	S264	66.705	65.190	1.290	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.010	o	675	S264	66.705	61.409	4.621	Open Manhole	1500
S59.000	o	150	S265/1	66.210	64.890	1.170	Junction	
S60.000	o	150	S265/2	66.300	64.917	1.233	Junction	
S48.011	o	675	S265	66.159	61.085	4.399	Open Manhole	1500
S61.000	o	150	S268/1	64.988	63.494	1.344	Junction	
S62.000	o	225	S268/2	65.104	63.543	1.336	Junction	
S48.012	o	675	S266	64.893	60.621	3.597	Open Manhole	1500
S63.000	o	225	S217	64.977	62.613	2.139	Open Manhole	1200
S63.001	o	225	S271	64.268	61.980	2.063	Open Manhole	1200
S63.002	o	225	S272	63.689	61.566	1.898	Open Manhole	1200
S63.003	o	300	S273	62.351	61.008	1.043	Sealed Manhole	1050
S63.004	o	300	S222	62.633	60.881	1.452	Open Manhole	1050
S63.005	o	300	S277	63.317	60.716	2.302	Open Manhole	1200
S64.000	o	150	S278/1	63.899	61.458	2.291	Junction	
S48.013	o	675	S278	63.680	60.289	2.716	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.010	25.533	78.8	S265	66.159	61.085	4.399	Open Manhole	1500
S59.000	3.984	79.7	S265	66.159	64.840	1.169	Open Manhole	1500
S60.000	6.700	87.0	S265	66.159	64.840	1.169	Open Manhole	1500
S48.011	36.578	78.8	S266	64.893	60.621	3.597	Open Manhole	1500
S61.000	4.358	80.7	S266	64.893	63.440	1.303	Open Manhole	1500
S62.000	8.261	80.2	S266	64.893	63.440	1.228	Open Manhole	1500
S48.012	25.974	78.2	S278	63.680	60.289	2.716	Open Manhole	1500
S63.000	28.457	45.0	S271	64.268	61.980	2.063	Open Manhole	1200
S63.001	20.717	50.0	S272	63.689	61.566	1.898	Open Manhole	1200
S63.002	26.580	55.0	S273	62.351	61.083	1.043	Sealed Manhole	1050
S63.003	31.703	250.0	S222	62.633	60.881	1.452	Open Manhole	1050
S63.004	49.026	296.9	S277	63.317	60.716	2.302	Open Manhole	1200
S63.005	15.285	177.9	S278	63.680	60.630	2.750	Open Manhole	1500
S64.000	7.715	12.0	S278	63.680	60.814	2.716	Open Manhole	1500
S48.013	30.742	68.6	S284	62.734	59.841	2.218	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S65.000	o	150	S279	67.206	64.700	2.356	Open Manhole	1200
S66.000	o	150	S280/1	66.157	64.804	1.203	Junction	
S67.000	o	150	S280/2	66.297	64.954	1.193	Junction	
S65.001	o	225	S280	65.796	64.375	1.196	Open Manhole	1200
S68.000	o	150	S281/2	65.098	64.085	0.863	Junction	
S69.000	o	150	S281/1	64.561	63.195	1.216	Junction	
S65.002	o	225	S281	64.318	62.875	1.218	Open Manhole	1200
S70.000	o	150	S282/1	63.773	62.321	1.302	Junction	
S71.000	o	225	S282/2	64.499	62.299	1.975	Junction	
S65.003	o	300	S282	63.615	62.100	1.215	Open Manhole	1200
S72.000	o	150	S283/1	63.112	61.659	1.303	Junction	
S65.004	o	300	S283	62.895	61.460	1.135	Open Manhole	1200
S73.000	o	150	S237	62.822	60.430	2.242	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S65.000	12.855	51.4	S280	65.796	64.450	1.196	Open Manhole	1200
S66.000	7.438	21.0	S280	65.796	64.450	1.196	Open Manhole	1200
S67.000	7.567	15.0	S280	65.796	64.450	1.196	Open Manhole	1200
S65.001	33.131	22.1	S281	64.318	62.875	1.218	Open Manhole	1200
S68.000	11.349	10.0	S281	64.318	62.950	1.218	Open Manhole	1200
S69.000	6.130	25.0	S281	64.318	62.950	1.218	Open Manhole	1200
S65.002	12.501	17.9	S282	63.615	62.175	1.215	Open Manhole	1200
S70.000	5.671	79.9	S282	63.615	62.250	1.215	Open Manhole	1200
S71.000	13.349	107.7	S282	63.615	62.175	1.215	Open Manhole	1200
S65.003	13.260	20.7	S283	62.895	61.460	1.135	Open Manhole	1200
S72.000	4.872	99.4	S283	62.895	61.610	1.135	Open Manhole	1200
S65.004	15.168	12.2	S284	62.734	60.216	2.218	Open Manhole	1500
S73.000	5.089	80.0	S284	62.734	60.366	2.218	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.014	o	675	S284	62.734	59.841	2.218	Open Manhole	1500
S48.015	o	675	S285	61.721	58.941	2.105	Open Manhole	1500
S48.016	o	675	S286	60.075	57.641	1.759	Open Manhole	1500
S74.000	o	300	S287/1	58.728	56.698	1.730	Junction	
S48.017	o	675	S287	58.593	56.241	1.677	Open Manhole	1500
S75.000	o	300	S288/1	56.371	54.354	1.717	Junction	
S76.000	o	150	S288/3	56.222	54.927	1.145	Junction	
S77.000	o	300	S288/2(LD)	56.606	54.305	2.001	Junction	
S48.018	o	675	S288	56.163	53.891	1.597	Open Manhole	1500
S78.000	o	150	S289/1	55.127	53.876	1.101	Junction	
S48.019	o	675	S289	54.919	52.691	1.553	Open Manhole	1500
S79.000	o	225	S244	58.987	57.020	1.742	Open Manhole	1200
S79.001	o	375	S249	59.592	56.498	2.719	Open Manhole	1350
S79.002	o	375	S250	58.483	55.682	2.426	Open Manhole	1350
S79.003	o	375	S251	56.886	53.796	2.715	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S48.014	23.870	26.5	S285	61.721	58.941	2.105	Open Manhole	1500
S48.015	23.754	18.3	S286	60.075	57.641	1.759	Open Manhole	1500
S48.016	21.127	15.1	S287	58.593	56.241	1.677	Open Manhole	1500
S74.000	6.522	79.5	S287	58.593	56.616	1.677	Open Manhole	1500
S48.017	34.731	14.8	S288	56.163	53.891	1.597	Open Manhole	1500
S75.000	7.038	80.0	S288	56.163	54.266	1.597	Open Manhole	1500
S76.000	8.684	17.0	S288	56.163	54.416	1.597	Open Manhole	1500
S77.000	9.241	237.0	S288	56.163	54.266	1.597	Open Manhole	1500
S48.018	17.557	14.6	S289	54.919	52.691	1.553	Open Manhole	1500
S78.000	5.943	9.0	S289	54.919	53.216	1.553	Open Manhole	1500
S48.019	39.780	14.0	S291	52.124	49.850	1.599	Open Manhole	1800
S79.000	54.795	147.3	S249	59.592	56.648	2.719	Open Manhole	1350
S79.001	15.495	19.0	S250	58.483	55.682	2.426	Open Manhole	1350
S79.002	35.843	19.0	S251	56.886	53.796	2.715	Open Manhole	1350
S79.003	31.211	18.0	S252	55.211	52.062	2.774	Open Manhole	1350

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S80.000	o	225	S248	54.630	52.700	1.705	Open Manhole	1200
S79.004	o	375	S252	55.211	52.062	2.774	Open Manhole	1350
S79.005	o	375	S291/2	52.671	50.608	1.688	Junction	
S81.000	o	150	S291/1	53.026	51.742	1.134	Junction	
S48.020	o	750	S291	52.124	49.775	1.599	Open Manhole	1800
S82.000	o	225	S115/1	50.023	47.853	1.945	Junction	
S83.000	o	225	S115/2	51.691	47.857	3.609	Junction	
S48.021	o	900	S115	50.147	47.000	2.247	Open Manhole	1800
S84.000	o	300	S116A/1	49.475	47.498	1.677	Junction	
S84.001	o	300	S116A	49.306	47.300	1.706	Open Manhole	1200
S85.000	o	300	S116/1	49.451	47.298	1.853	Junction	
S48.022	o	1200	S116	49.389	46.295	1.894	Open Manhole	2100
S86.000	o	300	S117/1	50.136	47.220	2.616	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S80.000	67.576	138.5	S252	55.211	52.212	2.774	Open Manhole	1350
S79.004	76.573	52.7	S291/2	52.671	50.608	1.688	Junction	
S79.005	16.047	35.0	S291	52.124	50.150	1.599	Open Manhole	1800
S81.000	12.307	9.0	S291	52.124	50.375	1.599	Open Manhole	1800
S48.020	34.202	13.0	S115	50.147	47.150	2.247	Open Manhole	1800
S82.000	8.273	80.3	S115	50.147	47.750	2.172	Open Manhole	1800
S83.000	8.537	79.8	S115	50.147	47.750	2.172	Open Manhole	1800
S48.021	41.685	102.9	S116	49.389	46.595	1.894	Open Manhole	2100
S84.000	15.804	79.8	S116A	49.306	47.300	1.706	Open Manhole	1200
S84.001	10.929	168.1	S116	49.389	47.235	1.854	Open Manhole	2100
S85.000	8.258	80.2	S116	49.389	47.195	1.894	Open Manhole	2100
S48.022	26.903	349.4	S117	50.115	46.218	2.697	Open Manhole	2100
S86.000	8.165	80.0	S117	50.115	47.118	2.697	Open Manhole	2100

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S87.000	o	300	S117/2	50.553	47.223	3.030	Junction	
S48.023	o	1200	S117	50.115	46.218	2.697	Open Manhole	2100
S88.000	o	300	S118/1	50.899	47.089	3.510	Junction	
S89.000	o	300	S118/2	50.830	47.069	3.461	Junction	
S48.024	o	1200	S118	50.750	46.076	3.474	Open Manhole	2100
S1.015	o	1350	S178	50.750	45.895	3.505	Open Manhole	2100
S90.000	o	225	S123/2	49.500	49.000	0.275	Junction	
S1.016	o	1350	S123	48.339	45.686	1.303	Open Manhole	2100
S91.000	o	300	S126/2	44.700	44.000	0.400	Junction	
S1.017	o	1350	S126	44.752	42.201	1.201	Open Manhole	2100
S92.000	o	450	S129/1	41.060	40.000	0.610	Junction	
S93.000	o	225	S129/2	40.300	40.000	0.075	Junction	
S1.018	o	1350	S129	40.628	38.086	1.192	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S87.000	8.383	79.8	S117	50.115	47.118	2.697	Open Manhole	2100
S48.023	49.648	349.6	S118	50.750	46.076	3.474	Open Manhole	2100
S88.000	9.068	80.2	S118	50.750	46.976	3.474	Open Manhole	2100
S89.000	7.407	79.6	S118	50.750	46.976	3.474	Open Manhole	2100
S48.024	12.135	337.1	S178	50.750	46.040	3.510	Open Manhole	2100
S1.015	56.349	270.0	S123	48.339	45.686	1.303	Open Manhole	2100
S90.000	7.185	5.0	S123	48.339	47.563	0.551	Open Manhole	2100
S1.016	49.846	14.3	S126	44.752	42.201	1.201	Open Manhole	2100
S91.000	9.569	170.9	S126	44.752	43.944	0.508	Open Manhole	2100
S1.017	51.433	12.5	S129	40.628	38.086	1.192	Open Manhole	2100
S92.000	13.716	500.0	S129	40.628	39.973	0.205	Open Manhole	2100
S93.000	10.026	169.9	S129	40.628	39.941	0.462	Open Manhole	2100
S1.018	25.777	13.5	S131	38.706	36.177	1.179	Open Manhole	2100

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S94.000	o	300	S131/1	38.994	38.000	0.694	Junction	
S1.019	o	1350	S131	38.706	36.103	1.253	Open Manhole	2100
S95.000	o	225	S133/1	37.700	37.000	0.475	Junction	
S1.020	o	1500	S133	38.561	35.375	1.686	Open Manhole	2100
S1.021	o	1500	S134	37.562	35.146	0.916	Open Manhole	2100
S1.022	o	1500	S275	38.081	35.012	1.569	Open Manhole	2100
S1.023	o	1500	S276	37.970	34.894	1.576	Open Manhole	2100
S1.024	o	1500	S277	37.859	34.832	1.527	Open Manhole	2100
S1.025	o	1500	S278	38.068	33.770	2.798	Open Manhole	2100
S1.026	o	1500	S279	36.729	33.116	2.113	Open Manhole	2100
S1.027	o	1500	S280	36.500	31.669	3.331	Open Manhole	2100
S1.028	o	1500	S281	36.500	31.294	3.706	Open Manhole	2100
S96.000	o	225	S284	48.750	47.325	1.200	Open Manhole	1200
S96.001	o	225	S371	48.660	47.230	1.205	Open Manhole	1200
S97.000	o	225	S286	51.200	49.775	1.200	Open Manhole	1050
S96.002	o	225	S372	48.962	47.029	1.708	Open Manhole	1500
S96.003	o	225	S374	49.200	46.767	2.208	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S94.000	9.603	171.5	S131	38.706	37.944	0.462	Open Manhole	2100
S1.019	63.554	110.0	S133	38.561	35.525	1.686	Open Manhole	2100
S95.000	14.655	154.3	S133	38.561	36.905	1.431	Open Manhole	2100
S1.020	42.420	185.0	S134	37.562	35.146	0.916	Open Manhole	2100
S1.021	80.199	600.0	S275	38.081	35.012	1.569	Open Manhole	2100
S1.022	59.196	500.0	S276	37.970	34.894	1.576	Open Manhole	2100
S1.023	24.922	400.0	S277	37.859	34.832	1.527	Open Manhole	2100
S1.024	63.744	60.0	S278	38.068	33.770	2.798	Open Manhole	2100
S1.025	39.190	60.0	S279	36.729	33.116	2.113	Open Manhole	2100
S1.026	79.598	55.0	S280	36.500	31.669	3.331	Open Manhole	2100
S1.027	22.498	60.0	S281	36.500	31.294	3.706	Open Manhole	2100
S1.028	29.207	59.7	S282	34.914	30.805	2.609	Open Manhole	2100
S96.000	14.219	150.0	S371	48.660	47.230	1.205	Open Manhole	1200
S96.001	30.193	150.0	S372	48.962	47.029	1.708	Open Manhole	1500
S97.000	59.574	21.7	S372	48.962	47.029	1.708	Open Manhole	1500
S96.002	39.508	150.6	S374	49.200	46.767	2.208	Open Manhole	1200
S96.003	63.682	145.9	S375	48.550	46.330	1.995	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S98.000	o	225	S288	48.680	46.401	2.054	Junction	
S96.004	o	375	S375	48.550	46.180	1.995	Open Manhole	1500
S99.000	o	225	S291	48.380	45.443	2.712	Junction	
S96.005	o	375	S376	48.250	45.239	2.636	Open Manhole	1500
S96.006	o	375	S293	48.297	45.159	2.762	Open Manhole	1200
S100.000	o	225	S294	48.460	44.800	3.435	Junction	
S96.007	o	375	S294	48.500	44.340	3.785	Open Manhole	1350
S101.000	o	225	S210	72.408	70.169	2.014	Open Manhole	1200
S101.001	o	225	S211	72.669	67.939	4.505	Open Manhole	1200
S101.002	o	450	S212	69.412	65.096	3.866	Open Manhole	1350
S101.003	o	450	S213	67.542	64.644	2.448	Open Manhole	1350
S101.004	o	450	S214	67.388	64.526	2.412	Open Manhole	1350
S101.005	o	450	S215	65.780	64.058	1.272	Open Manhole	1350
S101.006	o	450	S221	66.256	63.576	2.230	Open Manhole	1350
S101.007	o	450	S314	64.117	61.794	1.873	Open Manhole	1350
S101.008	o	450	S320	61.747	58.062	3.235	Open Manhole	1350
S102.000	o	375	S300	58.812	57.100	1.337	Open Manhole	1350
S102.001	o	450	S301	58.498	55.126	2.922	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S98.000	10.594	150.0	S375	48.550	46.330	1.995	Open Manhole	1500
S96.004	79.064	84.0	S376	48.250	45.239	2.636	Open Manhole	1500
S99.000	8.161	150.0	S376	48.250	45.389	2.636	Open Manhole	1500
S96.005	6.653	84.0	S293	48.297	45.159	2.762	Open Manhole	1200
S96.006	69.343	84.6	S294	48.500	44.340	3.785	Open Manhole	1350
S100.000	10.641	150.0	S294	48.500	44.729	3.546	Open Manhole	1350
S96.007	11.731	84.6	S295	48.350	44.201	3.774	Open Manhole	1800
S101.000	39.468	17.7	S211	72.669	67.939	4.505	Open Manhole	1200
S101.001	43.644	16.6	S212	69.412	65.314	3.873	Open Manhole	1350
S101.002	37.578	83.1	S213	67.542	64.644	2.448	Open Manhole	1350
S101.003	21.430	181.6	S214	67.388	64.526	2.412	Open Manhole	1350
S101.004	46.752	100.0	S215	65.780	64.058	1.272	Open Manhole	1350
S101.005	74.642	154.9	S221	66.256	63.576	2.230	Open Manhole	1350
S101.006	53.461	30.0	S314	64.117	61.794	1.873	Open Manhole	1350
S101.007	43.454	11.6	S320	61.747	58.062	3.235	Open Manhole	1350
S101.008	53.522	11.8	S297	58.018	53.530	4.037	Open Manhole	1350
S102.000	84.944	44.7	S301	58.498	55.201	2.922	Open Manhole	1350
S102.001	57.419	36.0	S297	58.018	53.530	4.038	Open Manhole	1350

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S101.009	o	450	S297	58.018	53.530	4.038	Open Manhole	1350
S103.000	o	375	S313	54.507	52.700	1.432	Open Manhole	1350
S103.001	o	450	S314	54.272	50.818	3.004	Open Manhole	1350
S103.002	o	450	S314	54.207	48.621	5.136	Open Manhole	1350
S101.010	o	600	S329	52.362	46.677	5.085	Open Manhole	1500
S104.000	o	450	S412	66.023	64.090	1.483	Open Manhole	1350
S104.001	o	450	S413	62.616	58.572	3.594	Open Manhole	1350
S105.000	o	225	S414	61.581	60.200	1.156	Open Manhole	1050
S104.002	o	450	S414	60.968	57.322	3.196	Open Manhole	1350
S104.003	o	450	S415	58.619	55.467	2.702	Open Manhole	1350
S104.004	o	450	S416	51.696	49.340	1.906	Open Manhole	1350
S104.005	o	450	S320	50.720	47.730	2.540	Open Manhole	1350
S101.011	o	600	S315	51.650	45.865	5.185	Open Manhole	1500
S101.012	o	600	S345	49.805	45.076	4.129	Open Manhole	1500
S96.008	o	675	S295	48.350	43.902	3.773	Open Manhole	1800
S96.009	o	675	S300	48.053	43.361	4.017	Open Manhole	1500
S96.010	o	675	S296	47.520	42.344	4.501	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S101.009	75.835	11.3	S329	52.362	46.827	5.085	Open Manhole	1500
S103.000	37.693	20.9	S314	54.272	50.893	3.004	Open Manhole	1350
S103.001	63.721	29.0	S314	54.207	48.621	5.136	Open Manhole	1350
S103.002	47.757	26.6	S329	52.362	46.827	5.085	Open Manhole	1500
S101.010	10.770	13.3	S315	51.650	45.865	5.185	Open Manhole	1500
S104.000	85.528	15.5	S413	62.616	58.572	3.594	Open Manhole	1350
S104.001	19.141	15.5	S414	60.968	57.337	3.181	Open Manhole	1350
S105.000	48.347	18.2	S414	60.968	57.547	3.196	Open Manhole	1350
S104.002	28.745	15.5	S415	58.619	55.467	2.702	Open Manhole	1350
S104.003	94.971	15.5	S416	51.696	49.340	1.906	Open Manhole	1350
S104.004	38.329	23.8	S320	50.720	47.730	2.540	Open Manhole	1350
S104.005	47.243	27.8	S315	51.650	46.030	5.170	Open Manhole	1500
S101.011	27.605	35.0	S345	49.805	45.076	4.129	Open Manhole	1500
S101.012	37.770	33.7	S295	48.350	43.954	3.796	Open Manhole	1800
S96.008	16.091	29.8	S300	48.053	43.361	4.017	Open Manhole	1500
S96.009	30.207	29.7	S296	47.520	42.344	4.501	Open Manhole	1500
S96.010	74.811	13.5	S299	43.242	36.810	5.757	Open Manhole	1500

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S106.000	o	225	S326	40.211	38.275	1.711	Open Manhole	1200
S106.001	o	225	S318	41.496	37.940	3.331	Open Manhole	1200
S96.011	o	675	S299	43.242	36.810	5.757	Open Manhole	1500
S96.012	o	675	S365	37.965	34.993	2.297	Open Manhole	1500
S1.029	o	1500	S282	34.914	30.785	2.629	Open Manhole	2100
S1.030	o	1200	S283	32.927	30.127	1.600	Open Manhole	2100
S1.031	o	1200	S284	31.442	28.642	1.600	Open Manhole	2100
S1.032	o	900	S341	27.750	25.250	1.600	Junction	
S1.033	|_|	2000	S389	27.106	22.728	3.628	Junction	
S1.034	1.5 _/	12000	S373	23.140	21.940	0.000	Junction	
S107.000	o	225	S337	42.119	40.100	1.794	Open Manhole	1200
S107.001	o	225	S379	41.651	39.557	1.869	Open Manhole	1200
S107.002	o	300	S380	41.826	39.263	2.263	Open Manhole	1200
S108.000	o	225	S381	45.123	43.100	1.798	Open Manhole	1200
S108.001	o	225	S382	44.097	41.599	2.273	Open Manhole	1200
S108.002	o	225	S383	43.835	40.948	2.662	Open Manhole	1200
S107.003	o	375	S381	41.708	38.706	2.627	Open Manhole	1350
S107.004	o	375	S385	41.086	38.454	2.257	Open Manhole	1350
S107.005	o	375	S386	40.161	37.401	2.385	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S106.000	29.583	88.3	S318	41.496	37.940	3.331	Open Manhole	1200
S106.001	51.945	88.3	S299	43.242	37.352	5.665	Open Manhole	1500
S96.011	25.440	14.0	S365	37.965	34.993	2.297	Open Manhole	1500
S96.012	42.631	12.6	S282	34.914	31.610	2.629	Open Manhole	2100
S1.029	48.550	70.0	S283	32.927	30.091	1.336	Open Manhole	2100
S1.030	43.892	29.6	S284	31.442	28.642	1.600	Open Manhole	2100
S1.031	32.728	8.9	S341	27.750	24.950	1.600	Junction	
S1.032	27.041	10.7	S389	27.106	22.728	3.478	Junction	
S1.033	16.907	50.0	S373	23.140	22.390	0.000	Junction	
S1.034	41.323	1033.1	S342	24.500	21.900	1.400	Junction	
S107.000	27.158	50.0	S379	41.651	39.557	1.869	Open Manhole	1200
S107.001	10.950	50.0	S380	41.826	39.338	2.263	Open Manhole	1200
S107.002	24.644	50.0	S381	41.708	38.770	2.638	Open Manhole	1350
S108.000	27.023	18.0	S382	44.097	41.599	2.273	Open Manhole	1200
S108.001	11.727	18.0	S383	43.835	40.948	2.662	Open Manhole	1200
S108.002	37.935	18.0	S381	41.708	38.840	2.643	Open Manhole	1350
S107.003	12.595	50.0	S385	41.086	38.454	2.257	Open Manhole	1350
S107.004	52.625	50.0	S386	40.161	37.401	2.385	Open Manhole	1350
S107.005	7.521	50.1	S387	40.199	37.251	2.573	Open Manhole	1350

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S109.000	o	225	S387	42.012	40.600	1.187	Open Manhole	1050
S107.006	o	375	S387	40.199	37.251	2.573	Open Manhole	1350
S107.007	o	375	S389	39.681	36.954	2.352	Open Manhole	1350
S107.008	o	375	S390	39.419	36.223	2.821	Open Manhole	1350
S110.000	o	225	S392	40.949	39.700	1.024	Open Manhole	1050
S107.009	o	450	S392	39.232	35.766	3.016	Open Manhole	1350
S107.010	o	450	S395	38.308	34.900	2.958	Open Manhole	1350
S107.011	o	450	S396	37.469	34.522	2.497	Open Manhole	1350
S107.012	o	450	S397	32.490	29.720	2.320	Open Manhole	1350
S111.000	o	375	S400	33.954	31.850	1.729	Open Manhole	1350
S111.001	o	375	S401	33.367	31.182	1.810	Open Manhole	1350
S111.002	o	450	S402	33.110	30.914	1.746	Open Manhole	1350
S111.003	o	450	S404	32.109	29.676	1.983	Open Manhole	1350
S111.004	o	450	S405	32.131	29.363	2.318	Open Manhole	1350
S107.013	o	450	S398	31.133	28.257	2.426	Open Manhole	1350
S107.014	o	450	S408	31.085	28.055	2.580	Open Manhole	1350
S107.015	o	525	S409	30.703	26.877	3.301	Open Manhole	1500
S107.016	o	525	S366	30.514	26.611	3.378	Open Manhole	1500
S107.017	1.5 _/	1200	S335	30.066	24.881	3.985	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S109.000	41.572	13.0	S387	40.199	37.401	2.573	Open Manhole	1350
S107.006	14.831	49.9	S389	39.681	36.954	2.352	Open Manhole	1350
S107.007	36.567	50.0	S390	39.419	36.223	2.821	Open Manhole	1350
S107.008	19.091	50.0	S392	39.232	35.841	3.016	Open Manhole	1350
S110.000	41.948	11.3	S392	39.232	35.991	3.016	Open Manhole	1350
S107.009	43.286	50.0	S395	38.308	34.900	2.958	Open Manhole	1350
S107.010	18.888	50.0	S396	37.469	34.522	2.497	Open Manhole	1350
S107.011	31.071	6.5	S397	32.490	29.720	2.320	Open Manhole	1350
S107.012	27.854	19.0	S398	31.133	28.257	2.426	Open Manhole	1350
S111.000	40.020	59.9	S401	33.367	31.182	1.810	Open Manhole	1350
S111.001	11.556	59.9	S402	33.110	30.989	1.746	Open Manhole	1350
S111.002	74.164	59.9	S404	32.109	29.676	1.983	Open Manhole	1350
S111.003	18.776	60.0	S405	32.131	29.363	2.318	Open Manhole	1350
S111.004	66.244	59.9	S398	31.133	28.257	2.426	Open Manhole	1350
S107.013	8.077	40.0	S408	31.085	28.055	2.580	Open Manhole	1350
S107.014	63.470	57.5	S409	30.703	26.952	3.301	Open Manhole	1500
S107.015	14.444	54.3	S366	30.514	26.611	3.378	Open Manhole	1500
S107.016	80.617	56.0	S335	30.066	25.172	4.369	Open Manhole	1200
S107.017	23.926	498.5	S367	26.646	24.833	0.613	Open Manhole	1200

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S107.018	1.5 _/	1200	S367	26.646	24.833	0.613	Open Manhole	1200
S107.019	1.5 _/	1200	S377	26.883	24.725	0.958	Junction	
S107.020	1.5 _/	1200	S378	26.714	24.557	0.957	Junction	
S107.021	1.5 _/	1200	S379	26.841	24.469	1.172	Junction	
S107.022	1.5 _/	1200	S380	26.914	24.374	1.340	Junction	
S107.023	1.5 _/	1200	S381	26.974	24.096	1.678	Junction	
S107.024	1.5 _/	1200	S382	27.031	23.889	1.942	Junction	
S112.000	o	300	S358	39.723	37.300	2.123	Open Manhole	1200
S112.001	o	300	S359	39.198	36.823	2.075	Open Manhole	1200
S112.002	o	300	S360	38.986	36.565	2.121	Open Manhole	1200
S113.000	o	300	S320	49.746	47.300	2.146	Open Manhole	1200
S113.001	o	300	S321	47.472	44.455	2.717	Open Manhole	1200
S113.002	o	300	S344	45.509	42.057	3.152	Open Manhole	1200
S113.003	o	300	S345	44.718	40.874	3.544	Open Manhole	1200
S114.000	o	225	S374	48.661	46.000	2.436	Open Manhole	1200
S114.001	o	225	S346	47.007	43.818	2.964	Open Manhole	1200
S114.002	o	225	S347	45.305	41.290	3.790	Open Manhole	1200
S114.003	o	225	S348	44.803	40.665	3.913	Open Manhole	1200
S115.000	o	300	S340	46.572	44.600	1.672	Open Manhole	1200
S115.001	o	300	S342	45.141	42.890	1.951	Open Manhole	1200
S115.002	o	300	S343	43.587	41.385	1.902	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S107.018	54.114	501.1	S377	26.883	24.725	0.958	Junction	
S107.019	84.106	500.6	S378	26.714	24.557	0.957	Junction	
S107.020	43.939	500.0	S379	26.841	24.469	1.172	Junction	
S107.021	47.561	500.0	S380	26.914	24.374	1.340	Junction	
S107.022	138.775	500.0	S381	26.974	24.096	1.678	Junction	
S107.023	103.476	500.0	S382	27.031	23.889	1.942	Junction	
S107.024	26.040	500.8	S383	27.178	23.837	2.141	Open Manhole	1200
S112.000	14.303	30.0	S359	39.198	36.823	2.075	Open Manhole	1200
S112.001	7.750	30.0	S360	38.986	36.565	2.121	Open Manhole	1200
S112.002	41.480	30.0	S377	38.036	35.182	2.554	Open Manhole	1350
S113.000	46.664	16.4	S321	47.472	44.455	2.717	Open Manhole	1200
S113.001	39.320	16.4	S344	45.509	42.057	3.152	Open Manhole	1200
S113.002	19.402	16.4	S345	44.718	40.874	3.544	Open Manhole	1200
S113.003	22.566	16.4	S346	44.109	39.498	4.311	Open Manhole	1350
S114.000	44.522	20.4	S346	47.007	43.818	2.964	Open Manhole	1200
S114.001	51.573	20.4	S347	45.305	41.290	3.790	Open Manhole	1200
S114.002	12.748	20.4	S348	44.803	40.665	3.913	Open Manhole	1200
S114.003	22.168	20.3	S346	44.109	39.573	4.311	Open Manhole	1350
S115.000	51.311	30.0	S342	45.141	42.890	1.951	Open Manhole	1200
S115.001	45.157	30.0	S343	43.587	41.385	1.902	Open Manhole	1200
S115.002	25.857	30.0	S344	42.455	40.523	1.632	Open Manhole	1350

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S115.003	o	375	S344	42.455	40.448	1.632	Open Manhole	1350
S115.004	o	375	S393	42.933	40.045	2.513	Open Manhole	1350
S115.005	o	375	S394	43.441	39.654	3.412	Open Manhole	1350
S113.004	o	375	S346	44.109	39.423	4.311	Open Manhole	1350
S112.003	o	450	S377	38.036	35.024	2.562	Open Manhole	1350
S112.004	o	450	S361	37.067	33.641	2.976	Open Manhole	1350
S112.005	o	450	S362	35.753	30.794	4.509	Open Manhole	1350
S116.000	o	225	S395	34.186	32.225	1.736	Open Manhole	1200
S116.001	o	225	S396	34.874	31.210	3.439	Open Manhole	1200
S116.002	o	225	S364	35.169	30.899	4.045	Open Manhole	1200
S112.006	o	450	S356	35.569	30.105	5.014	Open Manhole	1350
S107.025	1.5 _/	1200	S383	27.178	23.837	2.141	Open Manhole	1200
S107.026	1.5 _/	1200	S384	27.210	23.762	2.248	Junction	
S107.027	o	650	S385	27.978	23.530	3.798	Open Manhole	1200
S1.035	AR1	-1	S342	24.500	21.900	0.700	Junction	
S1.036	|_|	4900	S418	24.000	21.213	2.237	Junction	
S1.037	|_|	1000	S418	21.600	18.559	2.041	Junction	
S1.038	|_|	1000	S417	21.800	18.550	2.250	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S115.003	32.832	81.5	S393	42.933	40.045	2.513	Open Manhole	1350
S115.004	31.883	81.5	S394	43.441	39.654	3.412	Open Manhole	1350
S115.005	18.691	81.6	S346	44.109	39.425	4.309	Open Manhole	1350
S113.004	70.484	16.3	S377	38.036	35.099	2.562	Open Manhole	1350
S112.003	41.480	30.0	S361	37.067	33.641	2.976	Open Manhole	1350
S112.004	85.421	30.0	S362	35.753	30.794	4.509	Open Manhole	1350
S112.005	20.670	30.0	S356	35.569	30.105	5.014	Open Manhole	1350
S116.000	48.718	48.0	S396	34.874	31.210	3.439	Open Manhole	1200
S116.001	14.926	48.0	S364	35.169	30.899	4.045	Open Manhole	1200
S116.002	27.318	48.0	S356	35.569	30.330	5.014	Open Manhole	1350
S112.006	47.097	8.8	S383	27.178	24.753	1.975	Open Manhole	1200
S107.025	37.184	495.8	S384	27.210	23.762	2.248	Junction	
S107.026	110.989	478.4	S385	27.978	23.530	3.248	Open Manhole	1200
S107.027	33.466	50.0	S342	24.500	22.861	0.989	Junction	
S1.035	37.496	54.6	S418	24.000	21.213	0.887	Junction	
S1.036	11.650	54.7	S418	21.600	21.000	0.050	Junction	
S1.037	91.386	10154.0	S417	21.800	18.550	2.250	Junction	
S1.038	14.764	1640.4	S	19.500	18.541	-0.041	Open Manhole	0

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PIPELINE SCHEDULES for Surface water - SSR

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S117.000	o	1143	S394	37.562	34.740	1.679	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S117.000	43.042	106.1	S	38.000	34.334	2.523	Open Manhole	0

Free Flowing Outfall Details for Surface water - SSR

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.038	S	19.500	18.541	0.000	0	0

Free Flowing Outfall Details for Surface water - SSR

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S117.000	S	38.000	34.334	0.000	0	0

Simulation Criteria for Surface water - SSR

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	15
Ratio R	0.256		

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Online Controls for Surface water - SSR

Hydro-Brake® Optimum Manhole: S417, DS/PN: S1.038, Volume (m³): 277.9

Unit Reference	MD-SHE-0345-8700-3000-8700
Design Head (m)	3.000
Design Flow (l/s)	87.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	345
Invert Level (m)	18.550
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.000	86.7	Kick-Flo®	1.905	69.6
Flush-Flo™	0.884	86.6	Mean Flow over Head Range	-	75.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	10.0	0.800	86.5	2.000	71.3	4.000	99.7	7.000	131.0
0.200	34.9	1.000	86.4	2.200	74.6	4.500	105.6	7.500	135.5
0.300	63.8	1.200	85.3	2.400	77.8	5.000	111.2	8.000	139.8
0.400	78.2	1.400	83.3	2.600	80.9	5.500	116.4	8.500	144.0
0.500	82.0	1.600	80.1	3.000	86.7	6.000	121.5	9.000	148.1
0.600	84.4	1.800	74.3	3.500	93.5	6.500	126.3	9.500	152.0

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Storage Structures for Surface water - SSR

Tank or Pond Manhole: S417, DS/PN: S1.038

Invert Level (m) 18.550

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15300.0	0.500	15300.0	1.000	15300.0	1.500	15300.0	2.800	15300.0
0.100	15300.0	0.600	15300.0	1.100	15300.0	1.600	15300.0	3.250	15300.0
0.200	15300.0	0.700	15300.0	1.200	15300.0	1.700	15300.0		
0.300	15300.0	0.800	15300.0	1.300	15300.0	1.800	15300.0		
0.400	15300.0	0.900	15300.0	1.400	15300.0	1.900	15300.0		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.200
Region	England and Wales	Ratio R	0.253
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	1	+0%	100/15 Winter				60.546	-0.150
S2.000	S2/1	360 Winter	1	+0%					59.000	-0.150
S1.001	S2	15 Winter	1	+0%					58.742	-0.209
S1.002	S3	15 Winter	1	+0%	100/15 Summer				57.526	-0.204
S3.000	S4/1	360 Winter	1	+0%					57.050	-0.150
S4.000	S4/2	360 Winter	1	+0%					57.000	-0.150
S1.003	S4	15 Winter	1	+0%					56.880	-0.233
S5.000	S5	15 Winter	1	+0%	100/15 Summer				55.747	-0.143
S6.000	S6/1	360 Winter	1	+0%					55.800	-0.150
S5.001	S6	15 Winter	1	+0%	100/15 Summer				55.565	-0.261
S7.000	S7	15 Winter	1	+0%	30/15 Summer	100/15 Winter			54.731	-0.194
S7.001	S8	15 Winter	1	+0%	30/15 Summer				54.699	-0.150
S5.002	S9	15 Winter	1	+0%	30/15 Summer				54.695	-0.126
S5.003	S10	15 Winter	1	+0%	30/15 Summer				54.687	-0.099
S8.000	S11/1	360 Winter	1	+0%	30/15 Summer				54.800	-0.150
S5.004	S11	15 Winter	1	+0%	30/15 Summer				54.677	-0.071
S1.004	S12	15 Winter	1	+0%	30/15 Summer				54.669	-0.048
S1.005	S13	15 Winter	1	+0%	100/15 Winter				54.447	-0.204
S1.006	S14	15 Winter	1	+0%	100/15 Summer				53.125	-0.207
S9.000	S15/1	360 Winter	1	+0%					48.500	-0.150
S1.007	S15	15 Winter	1	+0%	30/15 Summer				47.703	-0.247
S1.008	S16	15 Winter	1	+0%	30/15 Summer				47.569	-0.228
S10.000	S18/1	15 Winter	1	+0%					48.837	-0.363
S1.009	S18	15 Winter	1	+0%	30/15 Summer				47.387	-0.336
S11.000	S19/1	360 Winter	1	+0%					48.150	-0.150
S1.010	S19	15 Winter	1	+0%	30/15 Summer				47.299	-0.352
S12.000	S21/1	15 Winter	1	+0%					48.818	-0.182
S1.011	S21	15 Winter	1	+0%	30/15 Summer				47.105	-0.411
S1.012	S22	15 Winter	1	+0%	30/15 Summer				47.019	-0.398

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.23		19.6	OK	
S2.000	S2/1	0.000	0.00		0.0	OK*	
S1.001	S2	0.000	0.20		33.5	OK	
S1.002	S3	0.000	0.22		39.1	OK	
S3.000	S4/1	0.000	0.00		0.0	OK*	
S4.000	S4/2	0.000	0.00		0.0	OK*	
S1.003	S4	0.000	0.11		40.0	OK	
S5.000	S5	0.000	0.28		8.5	OK	
S6.000	S6/1	0.000	0.00		0.0	OK*	
S5.001	S6	0.000	0.04		9.7	OK	
S7.000	S7	0.000	0.04		1.3	OK	1
S7.001	S8	0.000	0.10		2.8	OK	
S5.002	S9	0.000	0.25		12.4	OK	
S5.003	S10	0.000	0.28		14.1	OK	
S8.000	S11/1	0.000	0.00		0.0	OK	
S5.004	S11	0.000	0.32		15.9	OK	
S1.004	S12	0.000	1.00		55.4	OK	
S1.005	S13	0.000	0.22		57.7	OK	
S1.006	S14	0.000	0.21		67.9	OK	
S9.000	S15/1	0.000	0.00		0.0	OK*	
S1.007	S15	0.000	0.41		73.1	OK	
S1.008	S16	0.000	0.49		74.3	OK	
S10.000	S18/1	0.000	0.08		56.4	OK*	
S1.009	S18	0.000	0.39		119.8	OK	
S11.000	S19/1	0.000	0.00		0.0	OK*	
S1.010	S19	0.000	0.36		120.8	OK	
S12.000	S21/1	0.000	0.08		14.2	OK*	
S1.011	S21	0.000	0.31		130.4	OK	
S1.012	S22	0.000	0.33		129.8	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.013	S23	15 Winter	1	+0%	30/15 Summer				46.962	-0.391
S13.000	S24	15 Winter	1	+0%					78.030	-0.167
S13.001	S25	15 Winter	1	+0%					77.674	-0.153
S13.002	S26	15 Winter	1	+0%	100/15 Winter				77.531	-0.165
S14.000	S170	15 Winter	1	+0%	100/15 Summer				77.390	-0.163
S14.001	S171	15 Winter	1	+0%	100/15 Summer				77.264	-0.163
S14.002	S172	15 Winter	1	+0%	100/15 Summer				77.134	-0.159
S13.003	S27	15 Winter	1	+0%	100/15 Summer				77.084	-0.158
S13.004	S28	15 Winter	1	+0%	30/15 Summer				76.478	-0.153
S13.005	S29	15 Winter	1	+0%	30/15 Summer				75.853	-0.169
S15.000	S157	15 Winter	1	+0%	30/15 Summer				76.596	-0.129
S15.001	S158	15 Winter	1	+0%	30/15 Winter				76.483	-0.178
S15.002	S159	15 Winter	1	+0%	30/15 Summer	100/15 Summer			75.094	-0.152
S16.000	S31/1	15 Winter	1	+0%					75.072	-0.198
S13.006	S31	15 Winter	1	+0%	30/15 Summer	100/15 Summer			74.745	-0.096
S13.007	S32	15 Winter	1	+0%	30/15 Summer				74.498	-0.097
S17.000	S33/1	15 Winter	1	+0%					74.032	-0.193
S13.008	S33	15 Winter	1	+0%	100/15 Summer				73.746	-0.189
S18.000	S143	15 Winter	1	+0%					75.050	-0.175
S18.001	S144	15 Winter	1	+0%	30/15 Summer				72.736	-0.137
S13.009	S34	15 Winter	1	+0%	30/15 Summer				72.660	-0.162
S13.010	S35	15 Winter	1	+0%					71.945	-0.332
S13.011	S36	15 Winter	1	+0%	30/15 Winter				71.026	-0.331
S19.000	S145	15 Winter	1	+0%	30/15 Summer				72.629	-0.096
S19.001	S146	15 Winter	1	+0%	30/15 Summer				72.439	-0.046
S19.002	S147	15 Winter	1	+0%	30/15 Summer				72.380	-0.066
S19.003	S148	15 Winter	1	+0%	30/15 Summer				72.300	-0.070
S19.004	S149	15 Winter	1	+0%	30/15 Summer				72.197	-0.070
S19.005	S150	15 Winter	1	+0%	30/15 Summer				72.111	-0.064
S19.006	S151	15 Winter	1	+0%	30/15 Summer				72.045	-0.065
S19.007	S152	15 Winter	1	+0%	30/15 Summer				71.963	-0.079
S19.008	S153	15 Winter	1	+0%	30/15 Summer				71.705	-0.079
S19.009	S154	15 Winter	1	+0%	30/15 Summer				71.541	-0.070
S19.010	S155	15 Winter	1	+0%	100/15 Summer				71.433	-0.115
S19.011	S156	15 Winter	1	+0%	100/15 Summer				71.252	-0.130
S20.000	S167	15 Winter	1	+0%	30/15 Summer				72.894	-0.131
S20.001	S168	15 Winter	1	+0%					72.525	-0.183
S13.012	S38	15 Winter	1	+0%	30/15 Summer				70.508	-0.265
S13.013	S39	15 Winter	1	+0%	30/15 Summer				70.279	-0.252
S21.000	S165	15 Winter	1	+0%					71.531	-0.194
S21.001	S166	15 Winter	1	+0%					71.320	-0.205
S13.014	S40	15 Winter	1	+0%	30/15 Summer				70.084	-0.246
S22.000	S41	15 Winter	1	+0%	100/15 Summer				70.876	-0.149
S23.000	S42/1	15 Winter	1	+0%					70.517	-0.208
S24.000	S42/2	15 Winter	1	+0%					70.531	-0.194
S13.015	S42	15 Winter	1	+0%	30/15 Summer				69.812	-0.210
S25.000	S43/1	15 Winter	1	+0%					69.794	-0.200
S26.000	S43/2	15 Winter	1	+0%					69.901	-0.193
S13.016	S43	15 Winter	1	+0%					69.496	-0.304
S27.000	S44	15 Winter	1	+0%					70.200	-0.200
S27.001	S45	15 Winter	1	+0%					69.594	-0.206
S28.000	S47	15 Winter	1	+0%	30/15 Summer	30/15 Summer			73.830	-0.145
S28.001	S67	15 Winter	1	+0%	30/15 Summer				72.438	-0.264
S28.002	S136	15 Winter	1	+0%	30/15 Summer	100/15 Winter			72.348	-0.259
S28.003	S137	15 Winter	1	+0%	30/15 Summer				71.414	-0.258

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.013	S23	0.000	0.37		129.5	OK	
S13.000	S24	0.000	0.14		5.5	OK	
S13.001	S25	0.000	0.22		8.0	OK	
S13.002	S26	0.000	0.16		10.4	OK	
S14.000	S170	0.000	0.17		6.1	OK	
S14.001	S171	0.000	0.17		6.1	OK	
S14.002	S172	0.000	0.19		6.0	OK	
S13.003	S27	0.000	0.19		17.6	OK	
S13.004	S28	0.000	0.22		20.2	OK	
S13.005	S29	0.000	0.14		21.4	OK	
S15.000	S157	0.000	0.38		12.7	OK	
S15.001	S158	0.000	0.10		12.6	OK	
S15.002	S159	0.000	0.22		14.2	OK	4
S16.000	S31/1	0.000	0.03		3.0	OK*	
S13.006	S31	0.000	0.62		40.4	OK	4
S13.007	S32	0.000	0.61		44.1	OK	
S17.000	S33/1	0.000	0.05		3.7	OK*	
S13.008	S33	0.000	0.29		50.7	OK	
S18.000	S143	0.000	0.11		10.0	OK	
S18.001	S144	0.000	0.32		10.1	OK	
S13.009	S34	0.000	0.43		62.9	OK	
S13.010	S35	0.000	0.15		66.6	OK	
S13.011	S36	0.000	0.16		68.1	OK	
S19.000	S145	0.000	0.61		29.0	OK	
S19.001	S146	0.000	0.97		29.1	OK	
S19.002	S147	0.000	0.85		29.2	OK	
S19.003	S148	0.000	0.80		28.8	OK	
S19.004	S149	0.000	0.81		28.8	OK	
S19.005	S150	0.000	0.84		28.5	OK	
S19.006	S151	0.000	0.85		28.8	OK	
S19.007	S152	0.000	0.73		28.1	OK	
S19.008	S153	0.000	0.74		27.5	OK	
S19.009	S154	0.000	0.82		27.5	OK	
S19.010	S155	0.000	0.48		27.3	OK	
S19.011	S156	0.000	0.37		27.7	OK	
S20.000	S167	0.000	0.35		13.4	OK	
S20.001	S168	0.000	0.08		13.4	OK	
S13.012	S38	0.000	0.35		97.6	OK	
S13.013	S39	0.000	0.40		100.5	OK	
S21.000	S165	0.000	0.04		2.8	OK	
S21.001	S166	0.000	0.02		2.8	OK	
S13.014	S40	0.000	0.42		105.4	OK	
S22.000	S41	0.000	0.25		21.0	OK	
S23.000	S42/1	0.000	0.02		1.8	OK*	
S24.000	S42/2	0.000	0.05		5.3	OK*	
S13.015	S42	0.000	0.55		126.7	OK	
S25.000	S43/1	0.000	0.03		1.7	OK*	
S26.000	S43/2	0.000	0.05		3.8	OK*	
S13.016	S43	0.000	0.23		133.1	OK	
S27.000	S44	0.000	0.03		2.2	OK	
S27.001	S45	0.000	0.02		2.1	OK	
S28.000	S47	0.000	0.50		62.4	OK	10
S28.001	S67	0.000	0.36		62.2	OK	
S28.002	S136	0.000	0.37		130.2	OK	3

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.003	S137	0.000	0.38		129.1	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S28.004	S138	15 Winter	1	+0%	30/15 Summer	100/15 Summer			70.822
S28.005	S139	15 Winter	1	+0%	30/15 Summer				70.633
S28.006	S140	15 Winter	1	+0%	30/15 Summer				69.054
S28.007	S141	15 Winter	1	+0%	30/15 Summer				68.855
S28.008	S142	15 Winter	1	+0%	30/15 Summer				68.503
S29.000	S46/1	15 Winter	1	+0%					68.454
S13.017	S46	15 Winter	1	+0%					68.258
S13.018	S48	15 Winter	1	+0%					65.550
S13.019	S49	15 Winter	1	+0%					62.277
S30.000	S50	15 Winter	1	+0%					61.952
S13.020	S51	15 Winter	1	+0%					61.398
S31.000	S52	15 Winter	1	+0%					69.644
S31.001	S53	15 Winter	1	+0%					68.845
S31.002	S54	15 Winter	1	+0%					67.955
S31.003	S55	15 Winter	1	+0%					66.818
S31.004	S56	15 Winter	1	+0%					66.151
S31.005	S57	15 Winter	1	+0%					65.655
S31.006	S58	15 Winter	1	+0%					65.370
S31.007	S59	15 Winter	1	+0%					64.373
S31.008	S60	15 Winter	1	+0%					63.002
S31.009	S61	15 Winter	1	+0%	100/15 Summer				61.478
S13.021	S62	15 Winter	1	+0%					60.971
S13.022	S63	15 Winter	1	+0%	30/15 Summer				60.437
S32.000	S64B/1	15 Winter	1	+0%					64.822
S32.001	S64B	15 Winter	1	+0%	30/15 Summer	30/15 Summer			64.806
S33.000	S64A/1	15 Winter	1	+0%					64.349
S34.000	S111	360 Winter	1	+0%	30/15 Summer				64.438
S35.000	S112	360 Winter	1	+0%					64.438
S34.001	S112	15 Winter	1	+0%	30/15 Summer				64.238
S32.002	S64A	15 Winter	1	+0%	30/15 Summer				64.238
S32.003	S64	15 Winter	1	+0%	30/15 Summer				63.819
S36.000	S65/1	15 Winter	1	+0%					63.745
S32.004	S65	15 Winter	1	+0%	30/15 Summer	100/15 Summer			63.526
S32.005	S66	15 Winter	1	+0%	30/15 Summer	100/15 Summer			63.318
S37.000	S68/1	15 Winter	1	+0%					63.205
S32.006	S68	15 Winter	1	+0%	30/15 Summer	100/15 Summer			62.844
S38.000	S69/1	15 Winter	1	+0%					62.915
S32.007	S69	15 Winter	1	+0%	30/15 Summer				62.551
S32.008	S70	15 Winter	1	+0%	30/15 Summer				62.097
S39.000	S71/1	15 Winter	1	+0%					61.934
S32.009	S71	15 Winter	1	+0%					61.365
S40.000	S72	360 Winter	1	+0%					62.578
S40.001	S73	15 Winter	1	+0%					62.501
S40.002	S74	15 Winter	1	+0%					62.398
S40.003	S75	15 Winter	1	+0%					62.322
S41.000	S76	15 Winter	1	+0%					64.243
S41.001	S77	15 Winter	1	+0%					64.059
S41.002	S78	15 Winter	1	+0%					63.874
S41.003	S79	15 Winter	1	+0%					63.838
S41.004	S80	15 Winter	1	+0%					63.779
S41.005	S81	15 Winter	1	+0%					63.743
S41.006	S82	15 Winter	1	+0%					63.697
S41.007	S83	15 Winter	1	+0%					63.557
S41.008	S84	15 Winter	1	+0%					63.465
S41.009	S85	15 Winter	1	+0%					63.333

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.004	S138	-0.186	0.000	0.64		129.1	OK	6
S28.005	S139	-0.247	0.000	0.41		165.7	OK	
S28.006	S140	-0.246	0.000	0.55		165.9	OK	
S28.007	S141	-0.292	0.000	0.41		164.2	OK	
S28.008	S142	-0.203	0.000	0.69		162.5	OK	
S29.000	S46/1	-0.179	0.000	0.09		2.7	OK*	
S13.017	S46	-0.337	0.000	0.28		297.1	OK	
S13.018	S48	-0.515	0.000	0.13		298.5	OK	
S13.019	S49	-0.438	0.000	0.27		299.7	OK	
S30.000	S50	-0.218	0.000	0.01		0.5	OK	
S13.020	S51	-0.462	0.000	0.31		301.2	OK	
S31.000	S52	-0.195	0.000	0.00		0.5	FLOOD RISK*	
S31.001	S53	-0.187	0.000	0.01		2.7	FLOOD RISK*	
S31.002	S54	-0.182	0.000	0.02		4.8	FLOOD RISK*	
S31.003	S55	-0.180	0.000	0.02		6.1	FLOOD RISK*	
S31.004	S56	-0.178	0.000	0.02		7.4	FLOOD RISK*	
S31.005	S57	-0.173	0.000	0.03		10.0	FLOOD RISK*	
S31.006	S58	-0.173	0.000	0.03		10.0	FLOOD RISK*	
S31.007	S59	-0.166	0.000	0.05		13.4	FLOOD RISK*	
S31.008	S60	-0.171	0.000	0.04		13.4	FLOOD RISK*	
S31.009	S61	-0.152	0.000	0.23		13.3	OK*	
S13.021	S62	-0.489	0.000	0.26		311.7	OK	
S13.022	S63	-0.453	0.000	0.42		313.1	OK	
S32.000	S64B/1	-0.086	0.000	0.34		5.2	OK*	
S32.001	S64B	-0.044	0.000	0.83		11.1	OK	10
S33.000	S64A/1	-0.094	0.000	0.30		5.2	OK*	
S34.000	S111	-0.150	0.000	0.00		0.0	OK	
S35.000	S112	-0.225	0.000	0.00		0.0	OK*	
S34.001	S112	-0.152	0.000	0.01		0.2	OK	
S32.002	S64A	-0.127	0.000	0.39		18.9	OK	
S32.003	S64	-0.116	0.000	0.47		21.9	OK	
S36.000	S65/1	-0.179	0.000	0.09		6.2	OK*	
S32.004	S65	-0.099	0.000	0.60		28.8	OK	6
S32.005	S66	-0.103	0.000	0.57		31.3	OK	6
S37.000	S68/1	-0.110	0.000	0.16		6.2	OK*	
S32.006	S68	-0.079	0.000	0.75		38.4	OK	5
S38.000	S69/1	-0.110	0.000	0.16		6.2	OK*	
S32.007	S69	-0.101	0.000	0.58		45.0	OK	
S32.008	S70	-0.093	0.000	0.65		46.5	OK	
S39.000	S71/1	-0.113	0.000	0.14		6.2	OK*	
S32.009	S71	-0.187	0.000	0.30		53.2	OK	
S40.000	S72	-0.200	0.000	0.00		0.0	OK	
S40.001	S73	-0.186	0.000	0.02		4.2	FLOOD RISK*	
S40.002	S74	-0.186	0.000	0.02		4.2	FLOOD RISK*	
S40.003	S75	-0.176	0.000	0.04		8.3	FLOOD RISK*	
S41.000	S76	-0.287	0.000	0.01		1.0	OK	
S41.001	S77	-0.280	0.000	0.01		1.6	OK	
S41.002	S78	-0.266	0.000	0.03		1.8	OK	
S41.003	S79	-0.265	0.000	0.03		2.0	OK	
S41.004	S80	-0.261	0.000	0.04		2.4	OK	
S41.005	S81	-0.257	0.000	0.05		3.0	OK	
S41.006	S82	-0.258	0.000	0.05		4.2	OK	
S41.007	S83	-0.252	0.000	0.06		4.5	OK	
S41.008	S84	-0.257	0.000	0.05		4.7	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.009	S85	-0.252	0.000	0.06		4.8	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S41.010	S86	15 Winter	1	+0%					63.240	-0.248
S41.011	S87	15 Winter	1	+0%					63.148	-0.259
S41.012	S88	15 Winter	1	+0%					62.949	-0.260
S41.013	S89	15 Winter	1	+0%					62.709	-0.257
S41.014	S90	15 Winter	1	+0%					62.509	-0.265
S42.000	S181	15 Winter	1	+0%					63.620	-0.240
S42.001	S182	15 Winter	1	+0%					63.274	-0.476
S42.002	S183	15 Winter	1	+0%					63.129	-0.471
S42.003	S184	15 Winter	1	+0%					63.041	-0.459
S42.004	S185	15 Winter	1	+0%					62.952	-0.448
S42.005	S186	15 Winter	1	+0%					62.749	-0.451
S42.006	S187	15 Winter	1	+0%					62.568	-0.432
S42.007	S134	15 Winter	1	+0%	100/15 Summer				62.436	-0.166
S41.015	S127	15 Winter	1	+0%	30/15 Summer				61.820	-0.180
S41.016	S91	15 Winter	1	+0%	30/15 Summer				61.757	-0.173
S43.000	S128	15 Winter	1	+0%					63.980	-0.480
S43.001	S129	15 Winter	1	+0%					63.959	-0.551
S43.002	S130	15 Winter	1	+0%					63.871	-0.529
S43.003	S128	15 Winter	1	+0%					63.761	-0.539
S43.004	S129	15 Winter	1	+0%					63.660	-0.240
S43.005	S130	15 Winter	1	+0%					63.449	-0.251
S43.006	S131	15 Winter	1	+0%					62.986	-0.244
S43.007	S132	15 Winter	1	+0%					62.639	-0.231
S43.008	S133	15 Winter	1	+0%					62.468	-0.232
S43.009	S147	15 Winter	1	+0%					62.252	-0.248
S41.017	S92	15 Winter	1	+0%	30/15 Summer				61.732	-0.118
S40.004	S93	15 Winter	1	+0%	100/15 Summer				61.612	-0.200
S13.023	S94	15 Winter	1	+0%					60.229	-0.571
S44.000	S96/1	15 Winter	1	+0%					60.967	-0.133
S13.024	S96	15 Winter	1	+0%					59.164	-0.611
S45.000	S99/1	15 Winter	1	+0%					58.671	-0.129
S46.000	S99/2	15 Winter	1	+0%					57.939	-0.161
S13.025	S99	15 Winter	1	+0%	100/15 Winter				57.317	-0.508
S13.026	S100	15 Winter	1	+0%					56.688	-0.625
S47.000	S101	15 Winter	1	+0%					56.665	-0.135
S13.027	S102	15 Winter	1	+0%					53.902	-0.621
S13.028	S103	15 Winter	1	+0%					51.264	-0.647
S1.014	S120	15 Winter	1	+0%	30/15 Summer				46.663	-0.647
S48.000	S250	15 Winter	1	+0%					70.478	-0.183
S49.000	S186	15 Winter	1	+0%	100/15 Summer				73.103	-0.347
S49.001	S187	15 Winter	1	+0%	30/15 Winter				72.575	-0.287
S49.002	S186	15 Winter	1	+0%	100/15 Summer				72.316	-0.332
S49.003	S189	15 Winter	1	+0%	30/15 Summer	100/15 Summer			71.384	-0.250
S49.004	S190	15 Winter	1	+0%	30/15 Summer				70.973	-0.381
S50.000	S184	15 Winter	1	+0%					74.301	-0.349
S49.005	S255	15 Winter	1	+0%	30/15 Summer				69.681	-0.318
S48.001	S256	15 Winter	1	+0%	30/15 Summer	100/15 Summer			67.669	-0.326
S48.002	S191	15 Winter	1	+0%	30/15 Summer				67.080	-0.393
S48.003	S185	15 Winter	1	+0%	30/15 Summer	30/15 Summer			65.517	-0.358
S48.004	S257	15 Winter	1	+0%	30/15 Summer	100/15 Summer			64.599	-0.382
S48.005	S258	15 Winter	1	+0%	30/15 Summer				63.413	-0.252
S48.006	S259	15 Winter	1	+0%	30/15 Summer				63.133	-0.387
S51.000	S260/1	15 Winter	1	+0%					66.369	-0.087
S48.007	S260	15 Winter	1	+0%	30/15 Summer				62.715	-0.275
S52.000	S261/1	15 Winter	1	+0%					65.964	-0.100

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.010	S86	0.000	0.07		4.9	OK	
S41.011	S87	0.000	0.05		5.1	OK	
S41.012	S88	0.000	0.04		5.3	OK	
S41.013	S89	0.000	0.05		5.6	OK	
S41.014	S90	0.000	0.03		5.8	OK	
S42.000	S181	0.000	0.00		1.4	FLOOD RISK*	
S42.001	S182	0.000	0.00		2.3	OK	
S42.002	S183	0.000	0.00		6.9	OK	
S42.003	S184	0.000	0.01		11.5	OK	
S42.004	S185	0.000	0.01		12.9	OK	
S42.005	S186	0.000	0.01		13.9	OK	
S42.006	S187	0.000	0.01		17.3	OK	
S42.007	S134	0.000	0.16		17.2	OK	
S41.015	S127	0.000	0.34		22.4	OK	
S41.016	S91	0.000	0.31		22.1	OK	
S43.000	S128	0.000	0.00		1.1	OK	
S43.001	S129	0.000	0.01		3.6	OK	
S43.002	S130	0.000	0.02		5.9	OK	
S43.003	S128	0.000	0.01		9.0	OK	
S43.004	S129	0.000	0.09		9.7	OK*	
S43.005	S130	0.000	0.06		10.9	OK*	
S43.006	S131	0.000	0.08		11.7	OK*	
S43.007	S132	0.000	0.12		12.4	OK*	
S43.008	S133	0.000	0.12		13.0	OK*	
S43.009	S147	0.000	0.07		12.9	OK	
S41.017	S92	0.000	0.68		35.2	OK	
S40.004	S93	0.000	0.24		42.4	OK	
S13.023	S94	0.000	0.21		399.2	OK	
S44.000	S96/1	0.000	0.03		2.3	OK*	
S13.024	S96	0.000	0.15		400.2	OK	
S45.000	S99/1	0.000	0.05		2.8	OK*	
S46.000	S99/2	0.000	0.43		54.3	OK*	
S13.025	S99	0.000	0.31		425.1	OK	
S13.026	S100	0.000	0.13		425.0	OK	
S47.000	S101	0.000	0.02		2.2	OK*	
S13.027	S102	0.000	0.14		424.7	OK	
S13.028	S103	0.000	0.11		425.8	OK	
S1.014	S120	0.000	0.48		558.8	OK	
S48.000	S250	0.000	0.08		8.7	OK	
S49.000	S186	0.000	0.12		51.3	OK	
S49.001	S187	0.000	0.28		72.9	OK	
S49.002	S186	0.000	0.15		72.7	OK	
S49.003	S189	0.000	0.41		122.4	OK	4
S49.004	S190	0.000	0.17		122.4	OK	
S50.000	S184	0.000	0.11		95.9	OK	
S49.005	S255	0.000	0.33		256.7	OK	
S48.001	S256	0.000	0.42		307.7	OK	5
S48.002	S191	0.000	0.26		314.7	OK	
S48.003	S185	0.000	0.34		324.4	OK	10
S48.004	S257	0.000	0.28		327.4	OK	4
S48.005	S258	0.000	0.70		340.1	OK	
S48.006	S259	0.000	0.38		345.7	OK	
S51.000	S260/1	0.000	0.37		12.1	OK*	
S48.007	S260	0.000	0.66		364.5	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S52.000	S261/1	0.000	0.24		3.7	OK*	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S53.000	S261/2	15 Winter	1	+0%					66.049
S48.008	S261	15 Winter	1	+0%	30/15 Summer				62.456
S54.000	S263/1	15 Winter	1	+0%					65.608
S55.000	S263/2	15 Winter	1	+0%					65.815
S48.009	S263	15 Winter	1	+0%	30/15 Summer				62.108
S56.000	S264/1	15 Winter	1	+0%					65.374
S57.000	S264/2	360 Winter	1	+0%					65.710
S58.000	S264/3	15 Winter	1	+0%					65.372
S48.010	S264	15 Winter	1	+0%	30/15 Summer				61.769
S59.000	S265/1	15 Winter	1	+0%					64.957
S60.000	S265/2	15 Winter	1	+0%					65.032
S48.011	S265	15 Winter	1	+0%	30/15 Summer				61.417
S61.000	S268/1	15 Winter	1	+0%					63.531
S62.000	S268/2	15 Winter	1	+0%					63.655
S48.012	S266	15 Winter	1	+0%	30/15 Summer				60.998
S63.000	S217	15 Winter	1	+0%	30/15 Summer	30/15 Summer			62.718
S63.001	S271	15 Winter	1	+0%	30/15 Summer	30/15 Summer			62.103
S63.002	S272	15 Winter	1	+0%	30/15 Summer	30/15 Summer			61.705
S63.003	S273	15 Winter	1	+0%	30/15 Summer				61.203
S63.004	S222	15 Winter	1	+0%	30/15 Summer	30/15 Summer			61.096
S63.005	S277	15 Winter	1	+0%	30/15 Summer				60.920
S64.000	S278/1	15 Winter	1	+0%					61.506
S48.013	S278	15 Winter	1	+0%	30/15 Summer				60.663
S65.000	S279	15 Winter	1	+0%	30/15 Summer				64.744
S66.000	S280/1	15 Winter	1	+0%					64.879
S67.000	S280/2	15 Winter	1	+0%					64.998
S65.001	S280	15 Winter	1	+0%	30/15 Summer	100/15 Summer			64.465
S68.000	S281/2	15 Winter	1	+0%					64.123
S69.000	S281/1	360 Winter	1	+0%					63.195
S65.002	S281	15 Winter	1	+0%	30/15 Summer	100/15 Summer			62.986
S70.000	S282/1	360 Winter	1	+0%					62.321
S71.000	S282/2	15 Winter	1	+0%					62.386
S65.003	S282	15 Winter	1	+0%	100/15 Summer				62.220
S72.000	S283/1	360 Winter	1	+0%					61.659
S65.004	S283	15 Winter	1	+0%	100/15 Summer				61.561
S73.000	S237	15 Winter	1	+0%					60.503
S48.014	S284	15 Winter	1	+0%	30/15 Summer				60.164
S48.015	S285	15 Winter	1	+0%	30/15 Winter				59.231
S48.016	S286	15 Winter	1	+0%	100/15 Summer				57.928
S74.000	S287/1	15 Winter	1	+0%					56.759
S48.017	S287	15 Winter	1	+0%					56.491
S75.000	S288/1	15 Winter	1	+0%					54.407
S76.000	S288/3	15 Winter	1	+0%					54.949
S77.000	S288/2(LD)	15 Winter	1	+0%					54.382
S48.018	S288	15 Winter	1	+0%	30/15 Summer				54.197
S78.000	S289/1	15 Winter	1	+0%					53.921
S48.019	S289	15 Winter	1	+0%					52.935
S79.000	S244	15 Winter	1	+0%	30/15 Summer	100/15 Summer			57.159
S79.001	S249	15 Winter	1	+0%					56.579
S79.002	S250	15 Winter	1	+0%					55.769
S79.003	S251	15 Winter	1	+0%	30/15 Winter				53.882
S80.000	S248	15 Winter	1	+0%	30/15 Summer	30/15 Summer			52.843
S79.004	S252	15 Winter	1	+0%	30/15 Summer				52.234
S79.005	S291/2	15 Winter	1	+0%					50.786
S81.000	S291/1	15 Winter	1	+0%					51.783

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S53.000	S261/2	-0.100	0.000	0.24		4.8	OK*	
S48.008	S261	-0.342	0.000	0.49		372.0	OK	
S54.000	S263/1	-0.095	0.000	0.29		4.0	OK*	
S55.000	S263/2	-0.086	0.000	0.38		11.8	OK*	
S48.009	S263	-0.332	0.000	0.51		384.8	OK	
S56.000	S264/1	-0.097	0.000	0.27		3.9	OK*	
S57.000	S264/2	-0.150	0.000	0.00		0.0	OK*	
S58.000	S264/3	-0.166	0.000	0.15		7.6	OK*	
S48.010	S264	-0.315	0.000	0.55		396.9	OK	
S59.000	S265/1	-0.083	0.000	0.40		5.7	OK*	
S60.000	S265/2	-0.035	0.000	0.93		16.2	OK*	
S48.011	S265	-0.343	0.000	0.48		416.5	OK	
S61.000	S268/1	-0.113	0.000	0.13		2.0	OK*	
S62.000	S268/2	-0.113	0.000	0.49		22.1	OK*	
S48.012	S266	-0.298	0.000	0.60		437.1	OK	
S63.000	S217	-0.120	0.000	0.44		31.7	OK	10
S63.001	S271	-0.102	0.000	0.57		37.9	OK	11
S63.002	S272	-0.086	0.000	0.68		44.2	OK	11
S63.003	S273	-0.105	0.000	0.73		46.9	OK	
S63.004	S222	-0.085	0.000	0.82		49.3	OK	10
S63.005	S277	-0.096	0.000	0.80		55.7	OK	
S64.000	S278/1	-0.102	0.000	0.22		11.2	OK*	
S48.013	S278	-0.301	0.000	0.59		502.1	OK	
S65.000	S279	-0.106	0.000	0.19		4.2	OK	
S66.000	S280/1	-0.075	0.000	0.49		18.4	OK*	
S67.000	S280/2	-0.106	0.000	0.19		8.4	OK*	
S65.001	S280	-0.135	0.000	0.33		34.2	OK	4
S68.000	S281/2	-0.112	0.000	0.15		8.4	OK*	
S69.000	S281/1	-0.150	0.000	0.00		0.0	OK*	
S65.002	S281	-0.114	0.000	0.47		50.2	OK	4
S70.000	S282/1	-0.150	0.000	0.00		0.0	OK*	
S71.000	S282/2	-0.138	0.000	0.31		15.5	OK*	
S65.003	S282	-0.180	0.000	0.33		65.9	OK	
S72.000	S283/1	-0.150	0.000	0.00		0.0	OK*	
S65.004	S283	-0.199	0.000	0.25		66.3	OK	
S73.000	S237	-0.077	0.000	0.47		7.4	OK*	
S48.014	S284	-0.352	0.000	0.47		560.6	OK	
S48.015	S285	-0.385	0.000	0.39		561.2	OK	
S48.016	S286	-0.388	0.000	0.38		565.0	OK	
S74.000	S287/1	-0.239	0.000	0.09		6.5	OK*	
S48.017	S287	-0.425	0.000	0.29		567.7	OK	
S75.000	S288/1	-0.247	0.000	0.07		5.3	OK*	
S76.000	S288/3	-0.128	0.000	0.05		2.3	OK*	
S77.000	S288/2(LD)	-0.223	0.000	0.15		9.1	OK*	
S48.018	S288	-0.369	0.000	0.42		580.3	OK	
S78.000	S289/1	-0.105	0.000	0.20		10.0	OK*	
S48.019	S289	-0.431	0.000	0.28		588.3	OK	
S79.000	S244	-0.086	0.000	0.70		28.8	OK	4
S79.001	S249	-0.294	0.000	0.11		37.7	OK	
S79.002	S250	-0.288	0.000	0.12		50.3	OK	
S79.003	S251	-0.289	0.000	0.12		50.2	OK	
S80.000	S248	-0.082	0.000	0.72		30.8	OK	10
S79.004	S252	-0.203	0.000	0.42		111.0	OK	
S79.005	S291/2	-0.197	0.000	0.45		119.6	OK*	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S81.000	S291/1	-0.109	0.000	0.17		10.0	OK*	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S48.020	S291	15 Winter	1	+0%	100/15 Summer				50.042
S82.000	S115/1	15 Winter	1	+0%					47.971
S83.000	S115/2	15 Winter	1	+0%					47.917
S48.021	S115	15 Winter	1	+0%	30/15 Summer				47.452
S84.000	S116A/1	360 Winter	1	+0%					47.498
S84.001	S116A	360 Winter	1	+0%	30/15 Summer				47.300
S85.000	S116/1	360 Winter	1	+0%					47.298
S48.022	S116	15 Winter	1	+0%	30/15 Summer				46.940
S86.000	S117/1	360 Winter	1	+0%					47.220
S87.000	S117/2	15 Winter	1	+0%					47.353
S48.023	S117	15 Winter	1	+0%	30/15 Summer				46.875
S88.000	S118/1	360 Winter	1	+0%					47.089
S89.000	S118/2	360 Winter	1	+0%					47.069
S48.024	S118	15 Winter	1	+0%	30/15 Summer				46.794
S1.015	S178	15 Winter	1	+0%	30/15 Summer				46.560
S90.000	S123/2	15 Winter	1	+0%					49.028
S1.016	S123	15 Winter	1	+0%					46.015
S91.000	S126/2	15 Winter	1	+0%					44.077
S1.017	S126	15 Winter	1	+0%					42.516
S92.000	S129/1	15 Winter	1	+0%					40.450
S93.000	S129/2	15 Winter	1	+0%					40.042
S1.018	S129	15 Winter	1	+0%	100/15 Winter				38.480
S94.000	S131/1	15 Winter	1	+0%					38.237
S1.019	S131	30 Winter	1	+0%	30/15 Summer	100/15 Winter			36.650
S95.000	S133/1	360 Winter	1	+0%					37.000
S1.020	S133	30 Winter	1	+0%	30/15 Summer				36.088
S1.021	S134	30 Winter	1	+0%	30/15 Summer	100/15 Winter			35.994
S1.022	S275	30 Winter	1	+0%	30/15 Summer				35.855
S1.023	S276	30 Winter	1	+0%	30/15 Summer				35.715
S1.024	S277	30 Winter	1	+0%	100/60 Winter				35.289
S1.025	S278	30 Winter	1	+0%	100/30 Summer				34.285
S1.026	S279	30 Winter	1	+0%	100/30 Summer				33.537
S1.027	S280	30 Winter	1	+0%	30/30 Winter				32.277
S1.028	S281	30 Winter	1	+0%	100/15 Winter				31.857
S96.000	S284	15 Winter	1	+0%	30/15 Summer				47.367
S96.001	S371	15 Winter	1	+0%	30/15 Summer	100/15 Summer			47.289
S97.000	S286	15 Winter	1	+0%					49.805
S96.002	S372	15 Winter	1	+0%	30/15 Summer	100/15 Summer			47.123
S96.003	S374	15 Winter	1	+0%	30/15 Summer				46.888
S98.000	S288	15 Winter	1	+0%					46.530
S96.004	S375	15 Winter	1	+0%	30/15 Summer	100/15 Summer			46.310
S99.000	S291	15 Winter	1	+0%					45.611
S96.005	S376	15 Winter	1	+0%	30/15 Summer	100/15 Summer			45.498
S96.006	S293	15 Winter	1	+0%	30/15 Summer				45.332
S100.000	S294	360 Winter	1	+0%					44.800
S96.007	S294	15 Winter	1	+0%	30/15 Summer				44.551
S101.000	S210	15 Winter	1	+0%					70.212
S101.001	S211	15 Winter	1	+0%	100/15 Summer				68.013
S101.002	S212	15 Winter	1	+0%	30/15 Summer				65.215
S101.003	S213	15 Winter	1	+0%	30/15 Summer				64.847
S101.004	S214	15 Winter	1	+0%	30/15 Summer				64.686
S101.005	S215	15 Winter	1	+0%	30/15 Summer	100/15 Summer			64.264
S101.006	S221	15 Winter	1	+0%	100/15 Summer				63.728
S101.007	S314	15 Winter	1	+0%	100/15 Winter				61.920
S101.008	S320	15 Winter	1	+0%	100/15 Summer				58.191

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S48.020	S291	-0.483	0.000	0.27		697.4	OK	
S82.000	S115/1	-0.107	0.000	0.54		24.3	OK*	
S83.000	S115/2	-0.165	0.000	0.16		7.3	OK*	
S48.021	S115	-0.448	0.000	0.50		716.9	OK	
S84.000	S116A/1	-0.300	0.000	0.00		0.0	OK*	
S84.001	S116A	-0.300	0.000	0.00		0.0	OK	
S85.000	S116/1	-0.300	0.000	0.00		0.0	OK*	
S48.022	S116	-0.555	0.000	0.48		715.9	OK	
S86.000	S117/1	-0.300	0.000	0.00		0.0	OK*	
S87.000	S117/2	-0.170	0.000	0.39		31.5	OK*	
S48.023	S117	-0.543	0.000	0.42		720.2	OK	
S88.000	S118/1	-0.300	0.000	0.00		0.0	OK*	
S89.000	S118/2	-0.300	0.000	0.00		0.0	OK*	
S48.024	S118	-0.482	0.000	0.66		720.5	OK	
S1.015	S178	-0.685	0.000	0.48		1274.6	OK	
S90.000	S123/2	-0.197	0.000	0.04		6.4	OK*	
S1.016	S123	-1.022	0.000	0.14		1280.8	OK	
S91.000	S126/2	-0.223	0.000	0.15		9.1	OK*	
S1.017	S126	-1.035	0.000	0.12		1284.7	OK	
S92.000	S129/1	0.000	0.000	1.11		123.0	OK*	
S93.000	S129/2	-0.183	0.000	0.08		2.7	FLOOD RISK*	
S1.018	S129	-0.956	0.000	0.19		1316.3	OK	
S94.000	S131/1	-0.063	0.000	0.97		59.3	OK*	
S1.019	S131	-0.803	0.000	0.35		1334.1	OK	5
S95.000	S133/1	-0.225	0.000	0.00		0.0	OK*	
S1.020	S133	-0.788	0.000	0.38		1316.0	OK	
S1.021	S134	-0.652	0.000	0.53		1286.2	OK	5
S1.022	S275	-0.658	0.000	0.51		1293.3	OK	
S1.023	S276	-0.679	0.000	0.58		1286.9	OK	
S1.024	S277	-1.043	0.000	0.20		1309.9	OK	
S1.025	S278	-0.984	0.000	0.26		1309.8	OK	
S1.026	S279	-1.080	0.000	0.18		1320.1	OK	
S1.027	S280	-0.892	0.000	0.35		1324.5	OK	
S1.028	S281	-0.937	0.000	0.30		1325.7	OK	
S96.000	S284	-0.183	0.000	0.08		2.9	OK	
S96.001	S371	-0.167	0.000	0.15		5.9	OK	6
S97.000	S286	-0.195	0.000	0.04		4.8	OK	
S96.002	S372	-0.130	0.000	0.36		14.4	OK	4
S96.003	S374	-0.104	0.000	0.56		23.2	OK	
S98.000	S288	-0.096	0.000	0.62		23.2	OK*	
S96.004	S375	-0.245	0.000	0.25		52.5	OK	4
S99.000	S291	-0.057	0.000	0.90		29.6	OK*	
S96.005	S376	-0.116	0.000	0.80		88.7	OK	4
S96.006	S293	-0.202	0.000	0.43		88.6	OK	
S100.000	S294	-0.225	0.000	0.00		0.0	OK*	
S96.007	S294	-0.163	0.000	0.60		87.8	OK	
S101.000	S210	-0.182	0.000	0.08		9.5	OK	
S101.001	S211	-0.151	0.000	0.23		28.4	OK	
S101.002	S212	-0.331	0.000	0.16		48.9	OK	
S101.003	S213	-0.247	0.000	0.42		80.5	OK	
S101.004	S214	-0.290	0.000	0.27		79.7	OK	
S101.005	S215	-0.245	0.000	0.41		100.7	OK	2
S101.006	S221	-0.298	0.000	0.25		132.8	OK	
S101.007	S314	-0.325	0.000	0.17		145.9	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S101.008	S320	-0.322	0.000	0.18		154.7	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S102.000	S300	15 Winter	1	+0%	100/15 Summer	100/15 Winter			57.195	-0.280
S102.001	S301	15 Winter	1	+0%	30/15 Winter	100/15 Winter			55.244	-0.332
S101.009	S297	15 Winter	1	+0%	30/15 Summer	100/15 Winter			53.687	-0.293
S103.000	S313	15 Winter	1	+0%	100/15 Summer				52.749	-0.326
S103.001	S314	15 Winter	1	+0%	30/15 Winter				50.915	-0.353
S103.002	S314	15 Winter	1	+0%	30/15 Summer				48.749	-0.322
S101.010	S329	15 Winter	1	+0%	30/15 Summer	100/15 Winter			46.939	-0.338
S104.000	S412	15 Winter	1	+0%					64.137	-0.403
S104.001	S413	15 Winter	1	+0%					58.623	-0.399
S105.000	S414	15 Winter	1	+0%					60.259	-0.166
S104.002	S414	15 Winter	1	+0%					57.388	-0.384
S104.003	S415	15 Winter	1	+0%					55.553	-0.364
S104.004	S416	15 Winter	1	+0%	30/15 Winter				49.439	-0.351
S104.005	S320	15 Winter	1	+0%	30/15 Summer	100/15 Summer			47.836	-0.343
S101.011	S315	15 Winter	1	+0%	30/15 Summer				46.159	-0.306
S101.012	S345	15 Winter	1	+0%	30/15 Summer				45.351	-0.325
S96.008	S295	15 Winter	1	+0%	30/15 Summer				44.263	-0.314
S96.009	S300	15 Winter	1	+0%	30/15 Summer				43.670	-0.366
S96.010	S296	15 Winter	1	+0%					42.567	-0.452
S106.000	S326	15 Winter	1	+0%	30/15 Summer				38.337	-0.163
S106.001	S318	15 Winter	1	+0%	30/15 Summer				38.038	-0.127
S96.011	S299	15 Winter	1	+0%	100/15 Summer				37.079	-0.406
S96.012	S365	15 Winter	1	+0%					35.224	-0.444
S1.029	S282	30 Winter	1	+0%	30/30 Winter				31.334	-0.950
S1.030	S283	30 Winter	1	+0%	30/30 Winter	100/30 Winter			30.586	-0.741
S1.031	S284	30 Winter	1	+0%	30/30 Winter				29.005	-0.837
S1.032	S341	30 Winter	1	+0%					25.661	-0.489
S1.033	S389	30 Winter	1	+0%					23.195	-3.911
S1.034	S373	30 Winter	1	+0%					22.339	-0.801
S107.000	S337	15 Winter	1	+0%	30/15 Winter				40.179	-0.146
S107.001	S379	15 Winter	1	+0%	30/15 Summer				39.640	-0.142
S107.002	S380	15 Winter	1	+0%	30/15 Summer				39.335	-0.228
S108.000	S381	15 Winter	1	+0%	100/15 Summer				43.170	-0.155
S108.001	S382	15 Winter	1	+0%	30/15 Winter				41.672	-0.152
S108.002	S383	15 Winter	1	+0%	30/15 Summer				41.032	-0.141
S107.003	S381	15 Winter	1	+0%	30/15 Summer				38.839	-0.242
S107.004	S385	15 Winter	1	+0%	30/15 Summer				38.584	-0.245
S107.005	S386	15 Winter	1	+0%	30/15 Summer	100/15 Winter			37.577	-0.199
S109.000	S387	15 Winter	1	+0%	100/15 Summer	100/15 Winter			40.672	-0.153
S107.006	S387	15 Winter	1	+0%	30/15 Summer				37.430	-0.196
S107.007	S389	15 Winter	1	+0%	30/15 Summer				37.131	-0.198
S107.008	S390	15 Winter	1	+0%	30/15 Summer				36.408	-0.190
S110.000	S392	15 Winter	1	+0%					39.766	-0.159
S107.009	S392	15 Winter	1	+0%	30/15 Summer				35.948	-0.268
S107.010	S395	15 Winter	1	+0%	30/15 Summer				35.115	-0.235
S107.011	S396	15 Winter	1	+0%					34.636	-0.336
S107.012	S397	15 Winter	1	+0%	30/15 Summer				29.873	-0.297
S111.000	S400	15 Winter	1	+0%	100/15 Summer				31.909	-0.316
S111.001	S401	15 Winter	1	+0%	30/15 Summer				31.268	-0.289
S111.002	S402	15 Winter	1	+0%	30/15 Summer				31.010	-0.354
S111.003	S404	15 Winter	1	+0%	30/15 Summer				29.781	-0.345
S111.004	S405	15 Winter	1	+0%	30/15 Summer				29.480	-0.333
S107.013	S398	15 Winter	1	+0%	30/15 Summer	30/15 Summer			28.581	-0.126
S107.014	S408	15 Winter	1	+0%	30/15 Summer				28.325	-0.180
S107.015	S409	15 Winter	1	+0%	30/15 Summer				27.193	-0.209

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S102.000	S300	0.000	0.14		40.9	OK	2
S102.001	S301	0.000	0.15		76.1	OK	1
S101.009	S297	0.000	0.26		237.5	OK	3
S103.000	S313	0.000	0.04		16.7	OK	
S103.001	S314	0.000	0.11		59.0	OK	
S103.002	S314	0.000	0.18		101.8	OK	
S101.010	S329	0.000	0.39		353.8	OK	1
S104.000	S412	0.000	0.02		18.9	OK	
S104.001	S413	0.000	0.03		18.7	OK	
S105.000	S414	0.000	0.15		17.9	OK	
S104.002	S414	0.000	0.05		36.5	OK	
S104.003	S415	0.000	0.08		63.8	OK	
S104.004	S416	0.000	0.11		64.0	OK	
S104.005	S320	0.000	0.13		71.5	OK	4
S101.011	S315	0.000	0.48		424.5	OK	
S101.012	S345	0.000	0.43		431.2	OK	
S96.008	S295	0.000	0.56		522.4	OK	
S96.009	S300	0.000	0.43		551.4	OK	
S96.010	S296	0.000	0.24		549.6	OK	
S106.000	S326	0.000	0.16		8.5	OK	
S106.001	S318	0.000	0.40		21.0	OK	
S96.011	S299	0.000	0.33		567.1	OK	
S96.012	S365	0.000	0.25		567.6	OK	
S1.029	S282	0.000	0.29		1516.3	OK	
S1.030	S283	0.000	0.31		1525.3	OK	3
S1.031	S284	0.000	0.20		1538.6	OK	
S1.032	S341	0.000	0.43		1539.1	OK*	
S1.033	S389	0.000	0.06		1539.3	OK	
S1.034	S373	0.000	0.13		1535.6	OK	
S107.000	S337	0.000	0.27		18.2	OK	
S107.001	S379	0.000	0.29		18.0	OK	
S107.002	S380	0.000	0.13		18.0	OK	
S108.000	S381	0.000	0.21		23.9	OK	
S108.001	S382	0.000	0.23		23.7	OK	
S108.002	S383	0.000	0.30		34.4	OK	
S107.003	S381	0.000	0.27		52.9	OK	
S107.004	S385	0.000	0.26		68.5	OK	
S107.005	S386	0.000	0.45		68.3	OK	1
S109.000	S387	0.000	0.23		31.1	OK	1
S107.006	S387	0.000	0.46		98.1	OK	
S107.007	S389	0.000	0.45		115.2	OK	
S107.008	S390	0.000	0.49		114.6	OK	
S110.000	S392	0.000	0.19		28.1	OK	
S107.009	S392	0.000	0.34		141.1	OK	
S107.010	S395	0.000	0.46		158.8	OK	
S107.011	S396	0.000	0.14		158.7	OK	
S107.012	S397	0.000	0.25		159.6	OK	
S111.000	S400	0.000	0.06		13.9	OK	
S111.001	S401	0.000	0.12		20.3	OK	
S111.002	S402	0.000	0.10		39.3	OK	
S111.003	S404	0.000	0.12		39.3	OK	
S111.004	S405	0.000	0.15		59.3	OK	
S107.013	S398	0.000	0.86		219.1	OK	11
S107.014	S408	0.000	0.66		262.6	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.015	S409	0.000	0.66		262.9	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S107.016	S366	15 Winter	1	+0%	30/15 Winter				26.854
S107.017	S335	15 Winter	1	+0%					25.281
S107.018	S367	15 Winter	1	+0%					25.217
S107.019	S377	15 Winter	1	+0%					25.074
S107.020	S378	15 Winter	1	+0%					24.909
S107.021	S379	15 Winter	1	+0%					24.808
S107.022	S380	15 Winter	1	+0%					24.688
S107.023	S381	30 Winter	1	+0%					24.417
S107.024	S382	60 Winter	1	+0%					24.251
S112.000	S358	15 Winter	1	+0%	100/15 Summer				37.386
S112.001	S359	15 Winter	1	+0%	100/15 Summer				36.923
S112.002	S360	15 Winter	1	+0%	100/15 Summer				36.646
S113.000	S320	15 Winter	1	+0%					47.365
S113.001	S321	15 Winter	1	+0%	100/15 Winter				44.534
S113.002	S344	15 Winter	1	+0%	100/15 Summer				42.154
S113.003	S345	15 Winter	1	+0%	30/15 Summer				40.971
S114.000	S374	15 Winter	1	+0%	30/15 Summer				46.059
S114.001	S346	15 Winter	1	+0%	30/15 Summer	30/15 Winter			43.919
S114.002	S347	15 Winter	1	+0%	30/15 Summer				41.398
S114.003	S348	15 Winter	1	+0%	30/15 Summer				40.769
S115.000	S340	15 Winter	1	+0%	100/15 Summer				44.678
S115.001	S342	15 Winter	1	+0%	30/15 Summer	100/15 Summer			43.004
S115.002	S343	15 Winter	1	+0%	30/15 Summer	100/15 Summer			41.502
S115.003	S344	15 Winter	1	+0%	30/15 Summer	100/15 Summer			40.610
S115.004	S393	15 Winter	1	+0%	30/15 Summer				40.206
S115.005	S394	15 Winter	1	+0%	30/15 Summer				39.821
S113.004	S346	15 Winter	1	+0%	30/15 Summer				39.581
S112.003	S377	15 Winter	1	+0%	30/15 Summer				35.218
S112.004	S361	15 Winter	1	+0%	30/15 Summer				33.839
S112.005	S362	15 Winter	1	+0%	30/15 Summer				31.017
S116.000	S395	15 Winter	1	+0%	30/15 Summer				32.302
S116.001	S396	15 Winter	1	+0%	30/15 Summer				31.290
S116.002	S364	15 Winter	1	+0%	30/15 Summer				31.005
S112.006	S356	15 Winter	1	+0%					30.261
S107.025	S383	60 Winter	1	+0%					24.218
S107.026	S384	60 Winter	1	+0%					24.126
S107.027	S385	60 Winter	1	+0%	30/15 Summer				23.964
S1.035	S342	30 Winter	1	+0%					22.264
S1.036	S418	30 Winter	1	+0%					21.486
S1.037	S418	5760 Winter	1	+0%					19.369
S1.038	S417	5760 Winter	1	+0%					19.354
S117.000	S394	360 Winter	1	+0%					34.740

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.016	S366	-0.282	0.000	0.44		262.6	OK	
S107.017	S335	-4.785	0.000	0.01		293.2	OK	
S107.018	S367	-1.429	0.000	0.04		278.5	OK	
S107.019	S377	-1.809	0.000	0.02		260.3	OK	
S107.020	S378	-1.805	0.000	0.02		237.5	OK	
S107.021	S379	-2.033	0.000	0.02		230.8	OK	
S107.022	S380	-2.226	0.000	0.01		222.3	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.023	S381	-2.557	0.000	0.01		212.5	OK	
S107.024	S382	-2.781	0.000	0.01		190.8	OK	
S112.000	S358	-0.214	0.000	0.18		30.7	OK	
S112.001	S359	-0.200	0.000	0.24		30.3	OK	
S112.002	S360	-0.219	0.000	0.16		30.3	OK	
S113.000	S320	-0.235	0.000	0.11		27.3	OK	
S113.001	S321	-0.221	0.000	0.15		39.6	OK	
S113.002	S344	-0.203	0.000	0.23		54.3	OK	
S113.003	S345	-0.203	0.000	0.22		54.5	OK	
S114.000	S374	-0.166	0.000	0.16		17.3	OK	
S114.001	S346	-0.124	0.000	0.41		45.4	OK	6
S114.002	S347	-0.117	0.000	0.46		45.7	OK	
S114.003	S348	-0.121	0.000	0.43		45.9	OK	
S115.000	S340	-0.222	0.000	0.15		28.7	OK	
S115.001	S342	-0.186	0.000	0.30		57.6	OK	4
S115.002	S343	-0.183	0.000	0.32		57.7	OK	2
S115.003	S344	-0.213	0.000	0.38		75.9	OK	5
S115.004	S393	-0.214	0.000	0.38		75.6	OK	
S115.005	S394	-0.208	0.000	0.41		75.0	OK	
S113.004	S346	-0.217	0.000	0.37		175.1	OK	
S112.003	S377	-0.256	0.000	0.39		204.8	OK	
S112.004	S361	-0.252	0.000	0.40		221.9	OK	
S112.005	S362	-0.227	0.000	0.49		227.0	OK	
S116.000	S395	-0.148	0.000	0.25		17.8	OK	
S116.001	S396	-0.145	0.000	0.27		18.0	OK	
S116.002	S364	-0.119	0.000	0.45		31.3	OK	
S112.006	S356	-0.294	0.000	0.26		257.0	OK	
S107.025	S383	-2.961	0.000	0.01		270.7	OK	
S107.026	S384	-3.084	0.000	0.01		269.5	OK	
S107.027	S385	-0.216	0.000	0.78		266.7	OK	
S1.035	S342	-1.536	0.000	0.22		1773.2	OK*	
S1.036	S418	-2.514	0.000	0.04		1773.9	OK	
S1.037	S418	-2.231	0.000	0.03		160.2	OK	
S1.038	S417	-2.446	0.000	0.01		81.3	OK	
S117.000	S394	-1.143	0.000	0.00		0.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.200
Region	England and Wales	Ratio R	0.253
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	30	+40%	100/15 Winter				60.627	-0.069
S2.000	S2/1	360 Winter	30	+40%					59.000	-0.150
S1.001	S2	15 Winter	30	+40%					58.846	-0.105
S1.002	S3	15 Winter	30	+40%	100/15 Summer				57.644	-0.086
S3.000	S4/1	360 Winter	30	+40%					57.050	-0.150
S4.000	S4/2	360 Winter	30	+40%					57.000	-0.150
S1.003	S4	15 Winter	30	+40%					56.952	-0.161
S5.000	S5	15 Winter	30	+40%	100/15 Summer				55.843	-0.047
S6.000	S6/1	360 Winter	30	+40%					55.800	-0.150
S5.001	S6	15 Winter	30	+40%	100/15 Summer				55.749	-0.077
S7.000	S7	15 Winter	30	+40%	30/15 Summer	100/15 Winter			55.737	0.812
S7.001	S8	15 Winter	30	+40%	30/15 Summer				55.730	0.881
S5.002	S9	15 Winter	30	+40%	30/15 Summer				55.721	0.900
S5.003	S10	15 Winter	30	+40%	30/15 Summer				55.644	0.858
S8.000	S11/1	15 Winter	30	+40%	30/15 Summer				55.571	0.621
S5.004	S11	15 Winter	30	+40%	30/15 Summer				55.566	0.818
S1.004	S12	15 Winter	30	+40%	30/15 Summer				55.488	0.771
S1.005	S13	15 Winter	30	+40%	100/15 Winter				54.556	-0.095
S1.006	S14	15 Winter	30	+40%	100/15 Summer				53.230	-0.102
S9.000	S15/1	15 Winter	30	+40%					48.650	0.000
S1.007	S15	15 Winter	30	+40%	30/15 Summer				48.679	0.729
S1.008	S16	15 Winter	30	+40%	30/15 Summer				48.386	0.589
S10.000	S18/1	15 Winter	30	+40%					48.913	-0.287
S1.009	S18	15 Winter	30	+40%	30/15 Summer				48.178	0.455
S11.000	S19/1	360 Winter	30	+40%					48.150	-0.150
S1.010	S19	15 Winter	30	+40%	30/15 Summer				48.011	0.360
S12.000	S21/1	15 Winter	30	+40%					48.857	-0.143
S1.011	S21	15 Winter	30	+40%	30/15 Summer				47.804	0.288
S1.012	S22	30 Winter	30	+40%	30/15 Summer				47.697	0.280

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.79		66.3	OK	
S2.000	S2/1	0.000	0.00		0.0	OK*	
S1.001	S2	0.000	0.73		123.4	OK	
S1.002	S3	0.000	0.83		145.8	OK	
S3.000	S4/1	0.000	0.00		0.0	OK*	
S4.000	S4/2	0.000	0.00		0.0	OK*	
S1.003	S4	0.000	0.43		148.7	OK	
S5.000	S5	0.000	0.96		28.9	OK	
S6.000	S6/1	0.000	0.00		0.0	OK*	
S5.001	S6	0.000	0.14		33.1	OK	
S7.000	S7	0.000	0.21		6.4	SURCHARGED	1
S7.001	S8	0.000	0.48		12.8	SURCHARGED	
S5.002	S9	0.000	1.01		50.2	SURCHARGED	
S5.003	S10	0.000	1.11		56.4	SURCHARGED	
S8.000	S11/1	0.000	0.19		4.9	SURCHARGED	
S5.004	S11	0.000	1.28		62.9	SURCHARGED	
S1.004	S12	0.000	3.54		196.4	SURCHARGED	
S1.005	S13	0.000	0.79		205.4	OK	
S1.006	S14	0.000	0.74		242.9	OK	
S9.000	S15/1	0.000	0.03		1.6	SURCHARGED*	
S1.007	S15	0.000	1.43		254.9	SURCHARGED	
S1.008	S16	0.000	1.68		256.5	SURCHARGED	
S10.000	S18/1	0.000	0.28		192.9	OK*	
S1.009	S18	0.000	1.39		421.2	SURCHARGED	
S11.000	S19/1	0.000	0.00		0.0	OK*	
S1.010	S19	0.000	1.24		418.3	SURCHARGED	
S12.000	S21/1	0.000	0.28		48.7	OK*	
S1.011	S21	0.000	1.07		455.3	SURCHARGED	
S1.012	S22	0.000	1.10		429.5	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.013	S23	30 Winter	30	+40%	30/15 Summer				47.622	0.269
S13.000	S24	15 Winter	30	+40%					78.087	-0.110
S13.001	S25	15 Winter	30	+40%					77.756	-0.071
S13.002	S26	15 Winter	30	+40%	100/15 Winter				77.597	-0.099
S14.000	S170	15 Winter	30	+40%	100/15 Summer				77.452	-0.101
S14.001	S171	15 Winter	30	+40%	100/15 Summer				77.324	-0.103
S14.002	S172	15 Winter	30	+40%	100/15 Summer				77.231	-0.062
S13.003	S27	15 Winter	30	+40%	100/15 Summer				77.209	-0.033
S13.004	S28	15 Winter	30	+40%	30/15 Summer				77.003	0.372
S13.005	S29	15 Winter	30	+40%	30/15 Summer				76.745	0.723
S15.000	S157	15 Winter	30	+40%	30/15 Summer				76.819	0.094
S15.001	S158	15 Winter	30	+40%	30/15 Winter				76.739	0.078
S15.002	S159	15 Winter	30	+40%	30/15 Summer	100/15 Summer			76.651	1.405
S16.000	S31/1	60 Winter	30	+40%					75.270	0.000
S13.006	S31	15 Winter	30	+40%	30/15 Summer	100/15 Summer			76.539	1.698
S13.007	S32	15 Winter	30	+40%	30/15 Summer				75.809	1.214
S17.000	S33/1	15 Winter	30	+40%					74.062	-0.163
S13.008	S33	15 Winter	30	+40%	100/15 Summer				73.845	-0.090
S18.000	S143	15 Winter	30	+40%					75.096	-0.129
S18.001	S144	15 Winter	30	+40%	30/15 Summer				73.168	0.295
S13.009	S34	15 Winter	30	+40%	30/15 Summer				73.097	0.275
S13.010	S35	15 Winter	30	+40%					72.038	-0.240
S13.011	S36	15 Winter	30	+40%	30/15 Winter				71.363	0.006
S19.000	S145	15 Winter	30	+40%	30/15 Summer				74.890	2.165
S19.001	S146	15 Winter	30	+40%	30/15 Summer				74.247	1.762
S19.002	S147	15 Winter	30	+40%	30/15 Summer				74.005	1.559
S19.003	S148	15 Winter	30	+40%	30/15 Summer				73.738	1.368
S19.004	S149	15 Winter	30	+40%	30/15 Summer				73.428	1.161
S19.005	S150	15 Winter	30	+40%	30/15 Summer				73.153	0.978
S19.006	S151	15 Winter	30	+40%	30/15 Summer				72.970	0.860
S19.007	S152	15 Winter	30	+40%	30/15 Summer				72.769	0.727
S19.008	S153	15 Winter	30	+40%	30/15 Summer				72.157	0.373
S19.009	S154	15 Winter	30	+40%	30/15 Summer				71.729	0.118
S19.010	S155	15 Winter	30	+40%	100/15 Summer				71.543	-0.005
S19.011	S156	30 Winter	30	+40%	100/15 Summer				71.363	-0.019
S20.000	S167	15 Winter	30	+40%	30/15 Summer				73.183	0.158
S20.001	S168	15 Winter	30	+40%					72.562	-0.146
S13.012	S38	15 Winter	30	+40%	30/15 Summer				71.127	0.354
S13.013	S39	15 Winter	30	+40%	30/15 Summer				70.927	0.396
S21.000	S165	15 Winter	30	+40%					71.559	-0.166
S21.001	S166	15 Winter	30	+40%					71.337	-0.188
S13.014	S40	15 Winter	30	+40%	30/15 Summer				70.707	0.377
S22.000	S41	15 Winter	30	+40%	100/15 Summer				70.959	-0.066
S23.000	S42/1	15 Winter	30	+40%					70.533	-0.192
S24.000	S42/2	15 Winter	30	+40%					70.559	-0.166
S13.015	S42	15 Winter	30	+40%	30/15 Summer				70.315	0.293
S25.000	S43/1	15 Winter	30	+40%					69.816	-0.178
S26.000	S43/2	15 Winter	30	+40%					69.931	-0.163
S13.016	S43	15 Winter	30	+40%					69.615	-0.185
S27.000	S44	15 Winter	30	+40%					70.221	-0.179
S27.001	S45	15 Winter	30	+40%					69.611	-0.189
S28.000	S47	15 Winter	30	+40%	30/15 Summer	30/15 Summer			75.112	1.137
S28.001	S67	15 Winter	30	+40%	30/15 Summer				73.450	0.748
S28.002	S136	15 Winter	30	+40%	30/15 Summer	100/15 Winter			73.364	0.757
S28.003	S137	15 Winter	30	+40%	30/15 Summer				72.475	0.803

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.013	S23	0.000	1.23		429.0	SURCHARGED	
S13.000	S24	0.000	0.49		18.7	OK	
S13.001	S25	0.000	0.79		28.7	OK	
S13.002	S26	0.000	0.59		38.5	OK	
S14.000	S170	0.000	0.57		20.8	OK	
S14.001	S171	0.000	0.57		20.8	OK	
S14.002	S172	0.000	0.64		20.3	OK	
S13.003	S27	0.000	0.68		62.5	OK	
S13.004	S28	0.000	0.73		67.1	SURCHARGED	
S13.005	S29	0.000	0.43		65.2	SURCHARGED	
S15.000	S157	0.000	1.28		43.3	SURCHARGED	
S15.001	S158	0.000	0.33		42.9	SURCHARGED	
S15.002	S159	0.000	0.61		39.1	SURCHARGED	4
S16.000	S31/1	0.000	0.07		6.7	SURCHARGED*	
S13.006	S31	0.000	1.72		112.7	FLOOD RISK	4
S13.007	S32	0.000	1.68		121.7	SURCHARGED	
S17.000	S33/1	0.000	0.17		12.6	OK*	
S13.008	S33	0.000	0.81		141.8	OK	
S18.000	S143	0.000	0.37		34.0	OK	
S18.001	S144	0.000	0.97		31.0	SURCHARGED	
S13.009	S34	0.000	1.23		181.0	SURCHARGED	
S13.010	S35	0.000	0.44		191.0	OK	
S13.011	S36	0.000	0.43		186.6	SURCHARGED	
S19.000	S145	0.000	1.86		88.8	SURCHARGED	
S19.001	S146	0.000	2.75		82.1	SURCHARGED	
S19.002	S147	0.000	2.22		76.6	SURCHARGED	
S19.003	S148	0.000	1.99		71.3	SURCHARGED	
S19.004	S149	0.000	1.92		68.0	SURCHARGED	
S19.005	S150	0.000	1.91		64.4	SURCHARGED	
S19.006	S151	0.000	1.83		62.0	SURCHARGED	
S19.007	S152	0.000	1.55		59.1	SURCHARGED	
S19.008	S153	0.000	1.56		58.4	SURCHARGED	
S19.009	S154	0.000	1.74		58.5	SURCHARGED	
S19.010	S155	0.000	1.00		57.4	OK	
S19.011	S156	0.000	0.79		59.4	OK	
S20.000	S167	0.000	1.18		45.4	SURCHARGED	
S20.001	S168	0.000	0.27		45.1	OK	
S13.012	S38	0.000	0.95		263.8	SURCHARGED	
S13.013	S39	0.000	1.06		268.7	SURCHARGED	
S21.000	S165	0.000	0.15		9.6	OK	
S21.001	S166	0.000	0.06		9.5	OK	
S13.014	S40	0.000	1.12		279.5	SURCHARGED	
S22.000	S41	0.000	0.84		71.6	OK	
S23.000	S42/1	0.000	0.05		6.3	OK*	
S24.000	S42/2	0.000	0.15		18.2	OK*	
S13.015	S42	0.000	1.53		352.3	SURCHARGED	
S25.000	S43/1	0.000	0.10		5.9	OK*	
S26.000	S43/2	0.000	0.17		13.0	OK*	
S13.016	S43	0.000	0.64		373.8	OK	
S27.000	S44	0.000	0.09		7.4	OK	
S27.001	S45	0.000	0.06		7.3	OK	
S28.000	S47	11.639	1.23		153.2	FLOOD	10
S28.001	S67	0.000	1.01		175.9	SURCHARGED	
S28.002	S136	0.000	1.02		354.0	SURCHARGED	3

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.003	S137	0.000	1.02		345.8	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S28.004	S138	15 Winter	30	+40%	30/15 Summer	100/15 Summer			71.849
S28.005	S139	15 Winter	30	+40%	30/15 Summer				71.516
S28.006	S140	30 Winter	30	+40%	30/15 Summer				69.705
S28.007	S141	30 Winter	30	+40%	30/15 Summer				69.404
S28.008	S142	30 Winter	30	+40%	30/15 Summer				68.923
S29.000	S46/1	15 Winter	30	+40%					68.494
S13.017	S46	15 Winter	30	+40%					68.410
S13.018	S48	15 Winter	30	+40%					65.664
S13.019	S49	15 Winter	30	+40%					62.469
S30.000	S50	15 Winter	30	+40%					61.968
S13.020	S51	15 Winter	30	+40%					61.643
S31.000	S52	15 Winter	30	+40%					69.649
S31.001	S53	15 Winter	30	+40%					68.862
S31.002	S54	15 Winter	30	+40%					67.979
S31.003	S55	15 Winter	30	+40%					66.845
S31.004	S56	15 Winter	30	+40%					66.182
S31.005	S57	15 Winter	30	+40%					65.692
S31.006	S58	15 Winter	30	+40%					65.408
S31.007	S59	15 Winter	30	+40%					64.421
S31.008	S60	15 Winter	30	+40%					63.043
S31.009	S61	15 Winter	30	+40%	100/15 Summer				61.584
S13.021	S62	15 Winter	30	+40%					61.260
S13.022	S63	15 Winter	30	+40%	30/15 Summer				60.964
S32.000	S64B/1	60 Winter	30	+40%					64.908
S32.001	S64B	15 Winter	30	+40%	30/15 Summer	30/15 Summer			66.121
S33.000	S64A/1	60 Winter	30	+40%					64.443
S34.000	S111	30 Winter	30	+40%	30/15 Summer				65.184
S35.000	S112	30 Winter	30	+40%					64.663
S34.001	S112	30 Winter	30	+40%	30/15 Summer				65.189
S32.002	S64A	30 Winter	30	+40%	30/15 Summer				65.193
S32.003	S64	30 Winter	30	+40%	30/15 Summer				64.971
S36.000	S65/1	60 Winter	30	+40%					63.924
S32.004	S65	30 Winter	30	+40%	30/15 Summer	100/15 Summer			64.749
S32.005	S66	30 Winter	30	+40%	30/15 Summer	100/15 Summer			64.502
S37.000	S68/1	60 Winter	30	+40%					63.315
S32.006	S68	15 Winter	30	+40%	30/15 Summer	100/15 Summer			63.994
S38.000	S69/1	60 Winter	30	+40%					63.025
S32.007	S69	15 Winter	30	+40%	30/15 Summer				63.416
S32.008	S70	15 Winter	30	+40%	30/15 Summer				62.732
S39.000	S71/1	15 Winter	30	+40%					61.971
S32.009	S71	15 Winter	30	+40%					61.437
S40.000	S72	360 Winter	30	+40%					62.578
S40.001	S73	15 Winter	30	+40%					62.519
S40.002	S74	15 Summer	30	+40%					62.416
S40.003	S75	15 Summer	30	+40%					62.355
S41.000	S76	15 Winter	30	+40%					64.264
S41.001	S77	15 Winter	30	+40%					64.084
S41.002	S78	15 Winter	30	+40%					63.907
S41.003	S79	15 Winter	30	+40%					63.874
S41.004	S80	15 Winter	30	+40%					63.821
S41.005	S81	15 Winter	30	+40%					63.791
S41.006	S82	15 Winter	30	+40%					63.745
S41.007	S83	15 Winter	30	+40%					63.612
S41.008	S84	15 Winter	30	+40%					63.515
S41.009	S85	15 Winter	30	+40%					63.388

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.004	S138	0.841	0.000	1.75		353.8	FLOOD RISK	6
S28.005	S139	0.636	0.000	1.07		429.9	SURCHARGED	
S28.006	S140	0.405	0.000	1.41		423.2	SURCHARGED	
S28.007	S141	0.257	0.000	1.05		422.5	SURCHARGED	
S28.008	S142	0.217	0.000	1.78		422.0	SURCHARGED	
S29.000	S46/1	-0.139	0.000	0.31		9.2	OK*	
S13.017	S46	-0.185	0.000	0.75		800.9	OK	
S13.018	S48	-0.401	0.000	0.35		803.4	OK	
S13.019	S49	-0.246	0.000	0.73		805.2	OK	
S30.000	S50	-0.202	0.000	0.02		1.9	OK	
S13.020	S51	-0.217	0.000	0.85		811.8	OK	
S31.000	S52	-0.190	0.000	0.01		1.9	FLOOD RISK*	
S31.001	S53	-0.170	0.000	0.04		11.4	FLOOD RISK*	
S31.002	S54	-0.158	0.000	0.07		20.5	FLOOD RISK*	
S31.003	S55	-0.153	0.000	0.09		26.0	FLOOD RISK*	
S31.004	S56	-0.147	0.000	0.11		31.6	FLOOD RISK*	
S31.005	S57	-0.136	0.000	0.14		42.6	FLOOD RISK*	
S31.006	S58	-0.135	0.000	0.15		42.4	FLOOD RISK*	
S31.007	S59	-0.118	0.000	0.22		56.7	FLOOD RISK*	
S31.008	S60	-0.130	0.000	0.17		56.2	FLOOD RISK*	
S31.009	S61	-0.046	0.000	0.97		56.1	OK*	
S13.021	S62	-0.200	0.000	0.72		846.0	OK	
S13.022	S63	0.074	0.000	1.14		852.3	SURCHARGED	
S32.000	S64B/1	0.000	0.000	0.67		10.1	SURCHARGED*	
S32.001	S64B	1.271	1.455	2.08		27.7	FLOOD	10
S33.000	S64A/1	0.000	0.000	0.58		10.2	SURCHARGED*	
S34.000	S111	0.596	0.000	0.15		1.8	SURCHARGED	
S35.000	S112	0.000	0.000	0.06		2.1	SURCHARGED*	
S34.001	S112	0.799	0.000	0.66		17.2	SURCHARGED	
S32.002	S64A	0.828	0.000	0.81		39.7	SURCHARGED	
S32.003	S64	1.036	0.000	0.96		44.7	FLOOD RISK	
S36.000	S65/1	0.000	0.000	0.17		11.3	SURCHARGED*	
S32.004	S65	1.124	0.000	1.13		54.7	FLOOD RISK	6
S32.005	S66	1.081	0.000	1.09		60.4	FLOOD RISK	6
S37.000	S68/1	0.000	0.000	0.30		11.8	FLOOD RISK*	
S32.006	S68	1.071	0.000	1.47		75.3	FLOOD RISK	5
S38.000	S69/1	0.000	0.000	0.33		12.6	SURCHARGED*	
S32.007	S69	0.764	0.000	1.21		93.6	SURCHARGED	
S32.008	S70	0.542	0.000	1.36		97.5	SURCHARGED	
S39.000	S71/1	-0.076	0.000	0.48		21.2	OK*	
S32.009	S71	-0.115	0.000	0.68		119.2	OK	
S40.000	S72	-0.200	0.000	0.00		0.0	OK	
S40.001	S73	-0.168	0.000	0.10		18.3	FLOOD RISK*	
S40.002	S74	-0.168	0.000	0.10		18.3	FLOOD RISK*	
S40.003	S75	-0.143	0.000	0.19		35.8	FLOOD RISK*	
S41.000	S76	-0.266	0.000	0.03		3.3	OK	
S41.001	S77	-0.255	0.000	0.05		5.8	OK	
S41.002	S78	-0.233	0.000	0.11		6.8	OK	
S41.003	S79	-0.229	0.000	0.12		7.8	OK	
S41.004	S80	-0.219	0.000	0.16		9.5	OK	
S41.005	S81	-0.209	0.000	0.20		11.8	OK	
S41.006	S82	-0.210	0.000	0.19		17.3	OK	
S41.007	S83	-0.197	0.000	0.25		18.6	OK	
S41.008	S84	-0.207	0.000	0.21		19.3	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.009	S85	-0.197	0.000	0.26		20.1	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S41.010	S86	15 Winter	30	+40%					63.297	-0.191
S41.011	S87	15 Winter	30	+40%					63.196	-0.211
S41.012	S88	15 Winter	30	+40%					62.994	-0.215
S41.013	S89	15 Winter	30	+40%					62.759	-0.207
S41.014	S90	15 Winter	30	+40%					62.547	-0.227
S42.000	S181	15 Winter	30	+40%					63.631	-0.229
S42.001	S182	15 Winter	30	+40%					63.295	-0.455
S42.002	S183	15 Winter	30	+40%					63.166	-0.434
S42.003	S184	15 Winter	30	+40%					63.094	-0.406
S42.004	S185	15 Winter	30	+40%					63.007	-0.393
S42.005	S186	15 Winter	30	+40%					62.803	-0.397
S42.006	S187	15 Winter	30	+40%					62.643	-0.357
S42.007	S134	15 Winter	30	+40%	100/15 Summer				62.601	-0.001
S41.015	S127	15 Winter	30	+40%	30/15 Summer				62.378	0.378
S41.016	S91	15 Winter	30	+40%	30/15 Summer				62.247	0.317
S43.000	S128	15 Winter	30	+40%					64.024	-0.436
S43.001	S129	15 Winter	30	+40%					64.020	-0.490
S43.002	S130	15 Winter	30	+40%					63.959	-0.441
S43.003	S128	15 Winter	30	+40%					63.833	-0.467
S43.004	S129	15 Winter	30	+40%					63.721	-0.179
S43.005	S130	15 Winter	30	+40%					63.502	-0.198
S43.006	S131	15 Winter	30	+40%					63.044	-0.186
S43.007	S132	15 Winter	30	+40%					62.716	-0.154
S43.008	S133	15 Winter	30	+40%					62.543	-0.157
S43.009	S147	15 Winter	30	+40%					62.307	-0.193
S41.017	S92	15 Winter	30	+40%	30/15 Summer				62.117	0.267
S40.004	S93	15 Winter	30	+40%	100/15 Summer				61.748	-0.064
S13.023	S94	15 Winter	30	+40%					60.429	-0.371
S44.000	S96/1	15 Winter	30	+40%					60.983	-0.117
S13.024	S96	15 Winter	30	+40%					59.326	-0.449
S45.000	S99/1	15 Winter	30	+40%					58.690	-0.110
S46.000	S99/2	30 Winter	30	+40%					58.100	0.000
S13.025	S99	30 Winter	30	+40%	100/15 Winter				57.620	-0.205
S13.026	S100	30 Winter	30	+40%					56.845	-0.467
S47.000	S101	15 Winter	30	+40%					56.678	-0.122
S13.027	S102	30 Winter	30	+40%					54.063	-0.461
S13.028	S103	30 Winter	30	+40%					51.399	-0.512
S1.014	S120	30 Winter	30	+40%	30/15 Summer				47.560	0.250
S48.000	S250	15 Winter	30	+40%					70.515	-0.146
S49.000	S186	15 Winter	30	+40%	100/15 Summer				73.200	-0.250
S49.001	S187	15 Winter	30	+40%	30/15 Winter				72.868	0.006
S49.002	S186	15 Winter	30	+40%	100/15 Summer				72.462	-0.186
S49.003	S189	15 Winter	30	+40%	30/15 Summer	100/15 Summer			72.307	0.673
S49.004	S190	15 Winter	30	+40%	30/15 Summer				71.887	0.533
S50.000	S184	15 Winter	30	+40%					74.396	-0.254
S49.005	S255	15 Winter	30	+40%	30/15 Summer				71.533	1.534
S48.001	S256	15 Winter	30	+40%	30/15 Summer	100/15 Summer			69.702	1.707
S48.002	S191	15 Winter	30	+40%	30/15 Summer				68.904	1.431
S48.003	S185	15 Winter	30	+40%	30/15 Summer	30/15 Summer			67.994	2.119
S48.004	S257	15 Winter	30	+40%	30/15 Summer	100/15 Summer			67.400	2.419
S48.005	S258	15 Winter	30	+40%	30/15 Summer				66.800	3.135
S48.006	S259	15 Winter	30	+40%	30/15 Summer				66.386	2.866
S51.000	S260/1	15 Winter	30	+40%					66.456	0.000
S48.007	S260	15 Winter	30	+40%	30/15 Summer				65.953	2.963
S52.000	S261/1	15 Winter	30	+40%					66.020	-0.044

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.010	S86	0.000	0.29		20.5	OK	
S41.011	S87	0.000	0.19		21.2	OK	
S41.012	S88	0.000	0.17		21.5	OK	
S41.013	S89	0.000	0.21		22.7	OK	
S41.014	S90	0.000	0.13		23.8	OK	
S42.000	S181	0.000	0.01		4.8	FLOOD RISK*	
S42.001	S182	0.000	0.01		8.7	OK	
S42.002	S183	0.000	0.02		28.5	OK	
S42.003	S184	0.000	0.03		48.3	OK	
S42.004	S185	0.000	0.03		54.2	OK	
S42.005	S186	0.000	0.03		58.2	OK	
S42.006	S187	0.000	0.06		71.9	OK	
S42.007	S134	0.000	0.62		68.2	OK	
S41.015	S127	0.000	1.36		90.3	SURCHARGED	
S41.016	S91	0.000	1.27		90.3	SURCHARGED	
S43.000	S128	0.000	0.01		3.7	OK	
S43.001	S129	0.000	0.03		14.0	OK	
S43.002	S130	0.000	0.07		23.5	OK	
S43.003	S128	0.000	0.05		36.0	OK	
S43.004	S129	0.000	0.34		38.2	OK*	
S43.005	S130	0.000	0.25		43.2	OK*	
S43.006	S131	0.000	0.31		46.0	OK*	
S43.007	S132	0.000	0.47		48.3	OK*	
S43.008	S133	0.000	0.45		50.6	OK*	
S43.009	S147	0.000	0.27		50.8	OK	
S41.017	S92	0.000	2.72		141.2	SURCHARGED	
S40.004	S93	0.000	0.97		168.4	OK	
S13.023	S94	0.000	0.58		1108.0	OK	
S44.000	S96/1	0.000	0.11		7.8	OK*	
S13.024	S96	0.000	0.42		1120.2	OK	
S45.000	S99/1	0.000	0.16		9.6	OK*	
S46.000	S99/2	0.000	1.24		155.8	SURCHARGED*	
S13.025	S99	0.000	0.92		1241.0	OK	
S13.026	S100	0.000	0.39		1242.8	OK	
S47.000	S101	0.000	0.08		7.4	OK*	
S13.027	S102	0.000	0.41		1244.1	OK	
S13.028	S103	0.000	0.31		1238.6	OK	
S1.014	S120	0.000	1.45		1675.2	SURCHARGED	
S48.000	S250	0.000	0.26		29.7	OK	
S49.000	S186	0.000	0.41		175.2	OK	
S49.001	S187	0.000	1.01		263.7	SURCHARGED	
S49.002	S186	0.000	0.55		264.6	OK	
S49.003	S189	0.000	1.45		432.4	SURCHARGED	4
S49.004	S190	0.000	0.57		414.2	SURCHARGED	
S50.000	S184	0.000	0.39		327.5	OK	
S49.005	S255	0.000	1.04		818.0	SURCHARGED	
S48.001	S256	0.000	1.34		971.5	SURCHARGED	5
S48.002	S191	0.000	0.78		953.0	SURCHARGED	
S48.003	S185	15.729	0.94		891.7	FLOOD	10
S48.004	S257	0.000	0.78		892.0	FLOOD RISK	4
S48.005	S258	0.000	1.89		914.1	SURCHARGED	
S48.006	S259	0.000	1.02		932.1	SURCHARGED	
S51.000	S260/1	0.000	1.25		40.6	SURCHARGED*	
S48.007	S260	0.000	1.71		950.5	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S52.000	S261/1	0.000	0.83		12.7	OK*	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S53.000	S261/2	15 Winter	30	+40%					66.104
S48.008	S261	15 Winter	30	+40%	30/15 Summer				65.451
S54.000	S263/1	15 Winter	30	+40%					65.677
S55.000	S263/2	15 Winter	30	+40%					65.901
S48.009	S263	15 Winter	30	+40%	30/15 Summer				64.911
S56.000	S264/1	15 Winter	30	+40%					65.434
S57.000	S264/2	360 Winter	30	+40%					65.710
S58.000	S264/3	15 Winter	30	+40%					65.430
S48.010	S264	15 Winter	30	+40%	30/15 Summer				64.303
S59.000	S265/1	15 Winter	30	+40%					65.040
S60.000	S265/2	60 Winter	30	+40%					65.067
S48.011	S265	15 Winter	30	+40%	30/15 Summer				63.649
S61.000	S268/1	15 Winter	30	+40%					63.566
S62.000	S268/2	30 Winter	30	+40%					63.768
S48.012	S266	15 Winter	30	+40%	30/15 Summer				62.918
S63.000	S217	15 Winter	30	+40%	30/15 Summer	30/15 Summer			64.980
S63.001	S271	15 Winter	30	+40%	30/15 Summer	30/15 Summer			64.272
S63.002	S272	30 Winter	30	+40%	30/15 Summer	30/15 Summer			63.692
S63.003	S273	30 Winter	30	+40%	30/15 Summer				62.351
S63.004	S222	15 Winter	30	+40%	30/15 Summer	30/15 Summer			62.635
S63.005	S277	15 Winter	30	+40%	30/15 Summer				62.309
S64.000	S278/1	30 Winter	30	+40%					61.608
S48.013	S278	15 Winter	30	+40%	30/15 Summer				62.105
S65.000	S279	15 Winter	30	+40%	30/15 Summer				65.353
S66.000	S280/1	60 Winter	30	+40%					64.954
S67.000	S280/2	15 Winter	30	+40%					65.104
S65.001	S280	15 Winter	30	+40%	30/15 Summer	100/15 Summer			65.291
S68.000	S281/2	15 Winter	30	+40%					64.161
S69.000	S281/1	30 Winter	30	+40%					63.345
S65.002	S281	15 Winter	30	+40%	30/15 Summer	100/15 Summer			63.868
S70.000	S282/1	15 Winter	30	+40%					62.357
S71.000	S282/2	15 Winter	30	+40%					62.524
S65.003	S282	15 Winter	30	+40%	100/15 Summer				62.394
S72.000	S283/1	15 Winter	30	+40%					61.682
S65.004	S283	15 Winter	30	+40%	100/15 Summer				61.723
S73.000	S237	60 Winter	30	+40%					60.580
S48.014	S284	15 Winter	30	+40%	30/15 Summer				61.084
S48.015	S285	15 Winter	30	+40%	30/15 Winter				59.688
S48.016	S286	15 Winter	30	+40%	100/15 Summer				58.277
S74.000	S287/1	15 Winter	30	+40%					56.813
S48.017	S287	15 Winter	30	+40%					56.691
S75.000	S288/1	15 Winter	30	+40%					54.654
S76.000	S288/3	15 Winter	30	+40%					54.970
S77.000	S288/2(LD)	30 Winter	30	+40%					54.605
S48.018	S288	15 Winter	30	+40%	30/15 Summer				54.846
S78.000	S289/1	15 Winter	30	+40%					53.967
S48.019	S289	15 Winter	30	+40%					53.131
S79.000	S244	15 Winter	30	+40%	30/15 Summer	100/15 Summer			58.753
S79.001	S249	15 Winter	30	+40%					56.653
S79.002	S250	15 Winter	30	+40%					55.855
S79.003	S251	15 Winter	30	+40%	30/15 Winter				54.234
S80.000	S248	15 Winter	30	+40%	30/15 Summer	30/15 Summer			54.637
S79.004	S252	15 Winter	30	+40%	30/15 Summer				53.900
S79.005	S291/2	60 Winter	30	+40%					50.983
S81.000	S291/1	15 Winter	30	+40%					51.824

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S53.000	S261/2	-0.045	0.000	0.82		16.3	OK*	
S48.008	S261	2.653	0.000	1.27		960.6	SURCHARGED	
S54.000	S263/1	-0.026	0.000	0.98		13.5	OK*	
S55.000	S263/2	0.000	0.000	1.28		39.9	SURCHARGED*	
S48.009	S263	2.471	0.000	1.29		977.5	SURCHARGED	
S56.000	S264/1	-0.037	0.000	0.91		13.4	OK*	
S57.000	S264/2	-0.150	0.000	0.00		0.0	OK*	
S58.000	S264/3	-0.108	0.000	0.53		26.0	OK*	
S48.010	S264	2.219	0.000	1.40		1012.4	SURCHARGED	
S59.000	S265/1	0.000	0.000	1.38		19.3	SURCHARGED*	
S60.000	S265/2	0.000	0.000	1.90		33.1	SURCHARGED*	
S48.011	S265	1.889	0.000	1.25		1076.0	SURCHARGED	
S61.000	S268/1	-0.078	0.000	0.46		6.7	OK*	
S62.000	S268/2	0.000	0.000	1.41		63.5	SURCHARGED*	
S48.012	S266	1.622	0.000	1.56		1139.5	SURCHARGED	
S63.000	S217	2.142	3.338	1.07		77.4	FLOOD	10
S63.001	S271	2.067	3.717	1.29		86.5	FLOOD	11
S63.002	S272	1.901	2.928	1.52		99.1	FLOOD	11
S63.003	S273	1.043	0.000	1.62		103.8	FLOOD RISK*	
S63.004	S222	1.454	2.409	1.89		114.1	FLOOD	10
S63.005	S277	1.293	0.000	1.79		125.0	SURCHARGED	
S64.000	S278/1	0.000	0.000	0.63		31.7	SURCHARGED*	
S48.013	S278	1.141	0.000	1.51		1279.5	SURCHARGED	
S65.000	S279	0.503	0.000	0.62		14.0	SURCHARGED	
S66.000	S280/1	0.000	0.000	1.00		37.3	SURCHARGED*	
S67.000	S280/2	0.000	0.000	0.59		26.3	SURCHARGED*	
S65.001	S280	0.691	0.000	0.98		101.9	SURCHARGED	4
S68.000	S281/2	-0.074	0.000	0.50		28.6	OK*	
S69.000	S281/1	0.000	0.000	0.14		4.4	SURCHARGED*	
S65.002	S281	0.768	0.000	1.43		152.5	SURCHARGED	4
S70.000	S282/1	-0.114	0.000	0.04		0.6	OK*	
S71.000	S282/2	0.000	0.000	1.07		53.0	SURCHARGED*	
S65.003	S282	-0.006	0.000	1.00		200.4	OK	
S72.000	S283/1	-0.127	0.000	0.03		0.4	OK*	
S65.004	S283	-0.037	0.000	0.75		200.1	OK	
S73.000	S237	0.000	0.000	0.96		15.2	SURCHARGED*	
S48.014	S284	0.568	0.000	1.24		1496.1	SURCHARGED	
S48.015	S285	0.072	0.000	1.03		1495.9	SURCHARGED	
S48.016	S286	-0.039	0.000	1.00		1500.5	OK	
S74.000	S287/1	-0.185	0.000	0.31		22.2	OK*	
S48.017	S287	-0.225	0.000	0.78		1513.5	OK	
S75.000	S288/1	0.000	0.000	0.25		18.3	SURCHARGED*	
S76.000	S288/3	-0.107	0.000	0.18		7.8	OK*	
S77.000	S288/2(LD)	0.000	0.000	0.43		26.1	SURCHARGED*	
S48.018	S288	0.280	0.000	1.12		1550.5	SURCHARGED	
S78.000	S289/1	-0.059	0.000	0.67		34.2	OK*	
S48.019	S289	-0.235	0.000	0.75		1569.3	OK	
S79.000	S244	1.508	0.000	2.25		92.6	FLOOD RISK	4
S79.001	S249	-0.220	0.000	0.35		123.5	OK	
S79.002	S250	-0.202	0.000	0.42		172.4	OK	
S79.003	S251	0.063	0.000	0.41		173.7	SURCHARGED	
S80.000	S248	1.712	6.978	1.94		83.0	FLOOD	10
S79.004	S252	1.463	0.000	1.29		338.9	SURCHARGED	
S79.005	S291/2	0.000	0.000	1.02		270.0	SURCHARGED*	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S81.000	S291/1	-0.068	0.000	0.57		34.2	OK*	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S48.020	S291	30 Winter	30	+40%	100/15 Summer				50.414
S82.000	S115/1	60 Winter	30	+40%					48.078
S83.000	S115/2	60 Winter	30	+40%					48.082
S48.021	S115	30 Winter	30	+40%	30/15 Summer				48.960
S84.000	S116A/1	30 Winter	30	+40%					47.798
S84.001	S116A	30 Winter	30	+40%	30/15 Summer				48.211
S85.000	S116/1	30 Winter	30	+40%					47.598
S48.022	S116	30 Winter	30	+40%	30/15 Summer				48.213
S86.000	S117/1	15 Winter	30	+40%					47.520
S87.000	S117/2	120 Winter	30	+40%					47.523
S48.023	S117	30 Winter	30	+40%	30/15 Summer				48.027
S88.000	S118/1	15 Winter	30	+40%					47.389
S89.000	S118/2	30 Winter	30	+40%					47.369
S48.024	S118	30 Winter	30	+40%	30/15 Summer				47.769
S1.015	S178	30 Winter	30	+40%	30/15 Summer				47.507
S90.000	S123/2	15 Winter	30	+40%					49.054
S1.016	S123	30 Winter	30	+40%					46.274
S91.000	S126/2	15 Winter	30	+40%					44.152
S1.017	S126	30 Winter	30	+40%					42.764
S92.000	S129/1	120 Winter	30	+40%					40.450
S93.000	S129/2	15 Winter	30	+40%					40.080
S1.018	S129	30 Winter	30	+40%	100/15 Winter				39.044
S94.000	S131/1	60 Winter	30	+40%					38.300
S1.019	S131	30 Winter	30	+40%	30/15 Summer	100/15 Winter			38.463
S95.000	S133/1	30 Winter	30	+40%					37.225
S1.020	S133	30 Winter	30	+40%	30/15 Summer				37.875
S1.021	S134	30 Winter	30	+40%	30/15 Summer	100/15 Winter			37.481
S1.022	S275	30 Winter	30	+40%	30/15 Summer				37.085
S1.023	S276	30 Winter	30	+40%	30/15 Summer				36.671
S1.024	S277	30 Winter	30	+40%	100/60 Winter				35.705
S1.025	S278	30 Winter	30	+40%	100/30 Summer				34.800
S1.026	S279	30 Winter	30	+40%	100/30 Summer				33.914
S1.027	S280	30 Winter	30	+40%	30/30 Winter				33.217
S1.028	S281	30 Winter	30	+40%	100/15 Winter				32.743
S96.000	S284	15 Winter	30	+40%	30/15 Summer				48.492
S96.001	S371	15 Winter	30	+40%	30/15 Summer	100/15 Summer			48.487
S97.000	S286	15 Winter	30	+40%					49.834
S96.002	S372	15 Winter	30	+40%	30/15 Summer	100/15 Summer			48.466
S96.003	S374	15 Winter	30	+40%	30/15 Summer				48.379
S98.000	S288	60 Winter	30	+40%					46.626
S96.004	S375	15 Winter	30	+40%	30/15 Summer	100/15 Summer			47.917
S99.000	S291	60 Winter	30	+40%					45.668
S96.005	S376	15 Winter	30	+40%	30/15 Summer	100/15 Summer			47.571
S96.006	S293	15 Winter	30	+40%	30/15 Summer				47.245
S100.000	S294	60 Winter	30	+40%					45.025
S96.007	S294	15 Winter	30	+40%	30/15 Summer				46.307
S101.000	S210	15 Winter	30	+40%					70.249
S101.001	S211	15 Winter	30	+40%	100/15 Summer				68.163
S101.002	S212	15 Winter	30	+40%	30/15 Summer				66.167
S101.003	S213	15 Winter	30	+40%	30/15 Summer				65.971
S101.004	S214	15 Winter	30	+40%	30/15 Summer				65.702
S101.005	S215	15 Winter	30	+40%	30/15 Summer	100/15 Summer			65.222
S101.006	S221	15 Winter	30	+40%	100/15 Summer				63.914
S101.007	S314	15 Winter	30	+40%	100/15 Winter				62.056
S101.008	S320	15 Winter	30	+40%	100/15 Summer				58.331

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S48.020	S291	-0.111	0.000	0.75		1912.1	OK	
S82.000	S115/1	0.000	0.000	1.10		49.6	SURCHARGED*	
S83.000	S115/2	0.000	0.000	0.32		14.7	SURCHARGED*	
S48.021	S115	1.060	0.000	1.36		1953.4	SURCHARGED	
S84.000	S116A/1	0.000	0.000	0.03		3.4	SURCHARGED*	
S84.001	S116A	0.611	0.000	0.15		9.3	SURCHARGED	
S85.000	S116/1	0.000	0.000	0.05		3.6	SURCHARGED*	
S48.022	S116	0.718	0.000	1.33		1963.5	SURCHARGED	
S86.000	S117/1	0.000	0.000	0.05		3.7	SURCHARGED*	
S87.000	S117/2	0.000	0.000	0.53		42.9	SURCHARGED*	
S48.023	S117	0.609	0.000	1.18		2027.1	SURCHARGED	
S88.000	S118/1	0.000	0.000	0.04		3.3	SURCHARGED*	
S89.000	S118/2	0.000	0.000	0.03		2.2	SURCHARGED*	
S48.024	S118	0.493	0.000	1.89		2051.7	SURCHARGED	
S1.015	S178	0.262	0.000	1.40		3700.7	SURCHARGED	
S90.000	S123/2	-0.171	0.000	0.13		21.9	OK*	
S1.016	S123	-0.763	0.000	0.39		3726.7	OK	
S91.000	S126/2	-0.148	0.000	0.51		31.1	OK*	
S1.017	S126	-0.787	0.000	0.36		3752.0	OK	
S92.000	S129/1	0.000	0.000	1.56		173.3	SURCHARGED*	
S93.000	S129/2	-0.145	0.000	0.27		9.2	FLOOD RISK*	
S1.018	S129	-0.392	0.000	0.56		3942.1	OK	
S94.000	S131/1	0.000	0.000	1.97		121.0	SURCHARGED*	
S1.019	S131	1.010	0.000	1.03		3954.7	FLOOD RISK	5
S95.000	S133/1	0.000	0.000	0.10		4.2	SURCHARGED*	
S1.020	S133	1.000	0.000	1.15		3944.6	SURCHARGED	
S1.021	S134	0.835	0.000	1.60		3919.1	FLOOD RISK	5
S1.022	S275	0.573	0.000	1.59		4019.3	SURCHARGED	
S1.023	S276	0.277	0.000	1.81		4021.0	SURCHARGED	
S1.024	S277	-0.627	0.000	0.64		4116.4	OK	
S1.025	S278	-0.470	0.000	0.81		4113.9	OK	
S1.026	S279	-0.702	0.000	0.55		4161.3	OK	
S1.027	S280	0.048	0.000	1.09		4160.9	SURCHARGED	
S1.028	S281	-0.052	0.000	0.95		4170.8	OK	
S96.000	S284	0.942	0.000	0.25		9.4	FLOOD RISK	
S96.001	S371	1.032	0.000	0.48		18.8	FLOOD RISK	6
S97.000	S286	-0.166	0.000	0.15		16.2	OK	
S96.002	S372	1.212	0.000	1.02		40.8	SURCHARGED	4
S96.003	S374	1.387	0.000	1.32		54.7	SURCHARGED	
S98.000	S288	0.000	0.000	1.26		47.2	SURCHARGED*	
S96.004	S375	1.361	0.000	0.65		135.4	SURCHARGED	4
S99.000	S291	0.000	0.000	1.78		58.6	SURCHARGED*	
S96.005	S376	1.957	0.000	2.00		220.5	SURCHARGED	4
S96.006	S293	1.711	0.000	1.06		217.9	SURCHARGED	
S100.000	S294	0.000	0.000	0.04		1.4	SURCHARGED*	
S96.007	S294	1.592	0.000	1.73		251.8	SURCHARGED	
S101.000	S210	-0.145	0.000	0.28		32.5	OK	
S101.001	S211	-0.001	0.000	0.92		112.4	OK	
S101.002	S212	0.621	0.000	0.59		185.1	SURCHARGED	
S101.003	S213	0.877	0.000	1.55		299.9	SURCHARGED	
S101.004	S214	0.726	0.000	1.01		293.4	SURCHARGED	
S101.005	S215	0.714	0.000	1.52		368.6	SURCHARGED	2
S101.006	S221	-0.112	0.000	0.88		475.1	OK	
S101.007	S314	-0.189	0.000	0.61		522.3	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S101.008	S320	-0.181	0.000	0.64		554.3	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S102.000	S300	15 Winter	30	+40%	100/15 Summer	100/15 Winter			57.288
S102.001	S301	15 Winter	30	+40%	30/15 Winter	100/15 Winter			55.843
S101.009	S297	15 Winter	30	+40%	30/15 Summer	100/15 Winter			55.491
S103.000	S313	15 Winter	30	+40%	100/15 Summer				52.795
S103.001	S314	15 Winter	30	+40%	30/15 Winter				51.488
S103.002	S314	15 Winter	30	+40%	30/15 Summer				51.202
S101.010	S329	15 Winter	30	+40%	30/15 Summer	100/15 Winter			50.717
S104.000	S412	15 Winter	30	+40%					64.177
S104.001	S413	15 Winter	30	+40%					58.669
S105.000	S414	15 Winter	30	+40%					60.317
S104.002	S414	15 Winter	30	+40%					57.451
S104.003	S415	15 Winter	30	+40%					55.639
S104.004	S416	15 Winter	30	+40%	30/15 Winter				50.212
S104.005	S320	15 Winter	30	+40%	30/15 Summer	100/15 Summer			49.872
S101.011	S315	15 Winter	30	+40%	30/15 Summer				49.527
S101.012	S345	15 Winter	30	+40%	30/15 Summer				47.883
S96.008	S295	15 Winter	30	+40%	30/15 Summer				46.008
S96.009	S300	15 Winter	30	+40%	30/15 Summer				44.583
S96.010	S296	15 Winter	30	+40%					42.758
S106.000	S326	15 Winter	30	+40%	30/15 Summer				38.839
S106.001	S318	15 Winter	30	+40%	30/15 Summer				38.752
S96.011	S299	15 Winter	30	+40%	100/15 Summer				37.338
S96.012	S365	15 Winter	30	+40%					35.427
S1.029	S282	30 Winter	30	+40%	30/30 Winter				32.295
S1.030	S283	30 Winter	30	+40%	30/30 Winter	100/30 Winter			31.712
S1.031	S284	30 Winter	30	+40%	30/30 Winter				30.199
S1.032	S341	120 Winter	30	+40%					26.150
S1.033	S389	30 Winter	30	+40%					23.814
S1.034	S373	30 Winter	30	+40%					22.722
S107.000	S337	15 Winter	30	+40%	30/15 Winter				40.412
S107.001	S379	15 Winter	30	+40%	30/15 Summer				40.154
S107.002	S380	15 Winter	30	+40%	30/15 Summer				39.990
S108.000	S381	15 Winter	30	+40%	100/15 Summer				43.242
S108.001	S382	15 Winter	30	+40%	30/15 Winter				41.978
S108.002	S383	15 Winter	30	+40%	30/15 Summer				41.669
S107.003	S381	15 Winter	30	+40%	30/15 Summer				39.842
S107.004	S385	15 Winter	30	+40%	30/15 Summer				39.694
S107.005	S386	15 Winter	30	+40%	30/15 Summer	100/15 Winter			39.148
S109.000	S387	15 Winter	30	+40%	100/15 Summer	100/15 Winter			40.750
S107.006	S387	15 Winter	30	+40%	30/15 Summer				38.926
S107.007	S389	15 Winter	30	+40%	30/15 Summer				38.427
S107.008	S390	15 Winter	30	+40%	30/15 Summer				37.187
S110.000	S392	15 Winter	30	+40%					39.833
S107.009	S392	15 Winter	30	+40%	30/15 Summer				36.453
S107.010	S395	15 Winter	30	+40%	30/15 Summer				35.619
S107.011	S396	15 Winter	30	+40%					34.723
S107.012	S397	15 Winter	30	+40%	30/15 Summer				31.916
S111.000	S400	15 Winter	30	+40%	100/15 Summer				32.060
S111.001	S401	30 Winter	30	+40%	30/15 Summer				32.024
S111.002	S402	15 Winter	30	+40%	30/15 Summer				31.869
S111.003	S404	15 Winter	30	+40%	30/15 Summer				31.618
S111.004	S405	30 Winter	30	+40%	30/15 Summer				31.407
S107.013	S398	15 Winter	30	+40%	30/15 Summer	30/15 Summer			31.156
S107.014	S408	15 Winter	30	+40%	30/15 Summer				30.485
S107.015	S409	30 Winter	30	+40%	30/15 Summer				27.787

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S102.000	S300	-0.187	0.000	0.48		138.7	OK	2
S102.001	S301	0.267	0.000	0.58		286.2	SURCHARGED	1
S101.009	S297	1.511	0.000	0.84		763.1	SURCHARGED	3
S103.000	S313	-0.280	0.000	0.14		57.1	OK	
S103.001	S314	0.220	0.000	0.38		213.5	SURCHARGED	
S103.002	S314	2.131	0.000	0.60		340.3	SURCHARGED	
S101.010	S329	3.440	0.000	1.21		1096.1	SURCHARGED	1
S104.000	S412	-0.363	0.000	0.08		64.6	OK	
S104.001	S413	-0.353	0.000	0.10		63.9	OK	
S105.000	S414	-0.108	0.000	0.52		61.1	OK	
S104.002	S414	-0.321	0.000	0.18		124.5	OK	
S104.003	S415	-0.278	0.000	0.30		237.9	OK	
S104.004	S416	0.422	0.000	0.40		235.8	SURCHARGED	
S104.005	S320	1.693	0.000	0.42		230.6	SURCHARGED	4
S101.011	S315	3.062	0.000	1.44		1282.0	SURCHARGED	
S101.012	S345	2.207	0.000	1.29		1295.9	SURCHARGED	
S96.008	S295	1.431	0.000	1.63		1519.8	SURCHARGED	
S96.009	S300	0.547	0.000	1.24		1583.9	SURCHARGED	
S96.010	S296	-0.261	0.000	0.69		1585.2	OK	
S106.000	S326	0.339	0.000	0.57		29.5	SURCHARGED	
S106.001	S318	0.587	0.000	1.39		73.9	SURCHARGED	
S96.011	S299	-0.147	0.000	0.97		1652.7	OK	
S96.012	S365	-0.241	0.000	0.74		1653.3	OK	
S1.029	S282	0.011	0.000	0.98		5115.2	SURCHARGED	
S1.030	S283	0.385	0.000	1.01		4949.7	SURCHARGED	3
S1.031	S284	0.357	0.000	0.64		4965.4	SURCHARGED	
S1.032	S341	0.000	0.000	1.06		3791.6	SURCHARGED*	
S1.033	S389	-3.292	0.000	0.20		4963.8	OK	
S1.034	S373	-0.418	0.000	0.41		4951.2	OK	
S107.000	S337	0.087	0.000	0.91		62.2	SURCHARGED	
S107.001	S379	0.372	0.000	0.98		60.9	SURCHARGED	
S107.002	S380	0.427	0.000	0.45		63.6	SURCHARGED	
S108.000	S381	-0.083	0.000	0.72		81.7	OK	
S108.001	S382	0.154	0.000	0.75		78.5	SURCHARGED	
S108.002	S383	0.496	0.000	1.01		117.5	SURCHARGED	
S107.003	S381	0.761	0.000	0.80		158.0	SURCHARGED	
S107.004	S385	0.865	0.000	0.77		202.6	SURCHARGED	
S107.005	S386	1.372	0.000	1.39		210.8	SURCHARGED	1
S109.000	S387	-0.075	0.000	0.77		106.3	OK	1
S107.006	S387	1.300	0.000	1.30		277.6	SURCHARGED	
S107.007	S389	1.098	0.000	1.28		327.9	SURCHARGED	
S107.008	S390	0.589	0.000	1.40		329.4	SURCHARGED	
S110.000	S392	-0.092	0.000	0.65		96.0	OK	
S107.009	S392	0.237	0.000	0.98		402.8	SURCHARGED	
S107.010	S395	0.269	0.000	1.32		456.9	SURCHARGED	
S107.011	S396	-0.249	0.000	0.41		456.6	OK	
S107.012	S397	1.746	0.000	0.72		456.6	SURCHARGED	
S111.000	S400	-0.165	0.000	0.20		47.4	OK	
S111.001	S401	0.467	0.000	0.36		61.4	SURCHARGED	
S111.002	S402	0.505	0.000	0.38		150.0	SURCHARGED	
S111.003	S404	1.492	0.000	0.51		161.6	SURCHARGED	
S111.004	S405	1.594	0.000	0.57		222.4	SURCHARGED	
S107.013	S398	2.449	23.216	2.15		545.5	FLOOD	11
S107.014	S408	1.980	0.000	1.56		618.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.015	S409	0.385	0.000	1.55		614.4	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S107.016	S366	30 Winter	30	+40%	30/15 Winter				27.153
S107.017	S335	30 Winter	30	+40%					25.512
S107.018	S367	30 Winter	30	+40%					25.451
S107.019	S377	30 Winter	30	+40%					25.316
S107.020	S378	30 Winter	30	+40%					25.161
S107.021	S379	30 Winter	30	+40%					25.059
S107.022	S380	60 Winter	30	+40%					24.965
S107.023	S381	60 Winter	30	+40%					24.892
S107.024	S382	60 Winter	30	+40%					24.878
S112.000	S358	15 Winter	30	+40%	100/15 Summer				37.472
S112.001	S359	15 Winter	30	+40%	100/15 Summer				37.033
S112.002	S360	15 Winter	30	+40%	100/15 Summer				36.826
S113.000	S320	15 Winter	30	+40%					47.425
S113.001	S321	15 Winter	30	+40%	100/15 Winter				44.619
S113.002	S344	15 Winter	30	+40%	100/15 Summer				42.277
S113.003	S345	15 Winter	30	+40%	30/15 Summer				41.576
S114.000	S374	15 Winter	30	+40%	30/15 Summer				47.479
S114.001	S346	15 Winter	30	+40%	30/15 Summer	30/15 Winter			47.007
S114.002	S347	15 Winter	30	+40%	30/15 Summer				43.508
S114.003	S348	15 Winter	30	+40%	30/15 Summer				42.537
S115.000	S340	15 Winter	30	+40%	100/15 Summer				44.754
S115.001	S342	15 Winter	30	+40%	30/15 Summer	100/15 Summer			44.136
S115.002	S343	15 Winter	30	+40%	30/15 Summer	100/15 Summer			42.952
S115.003	S344	15 Winter	30	+40%	30/15 Summer	100/15 Summer			42.280
S115.004	S393	15 Winter	30	+40%	30/15 Summer				41.819
S115.005	S394	15 Winter	30	+40%	30/15 Summer				41.371
S113.004	S346	15 Winter	30	+40%	30/15 Summer				41.068
S112.003	S377	15 Winter	30	+40%	30/15 Summer				36.602
S112.004	S361	15 Winter	30	+40%	30/15 Summer				35.054
S112.005	S362	15 Winter	30	+40%	30/15 Summer				31.716
S116.000	S395	15 Winter	30	+40%	30/15 Summer				32.695
S116.001	S396	15 Winter	30	+40%	30/15 Summer				32.033
S116.002	S364	15 Winter	30	+40%	30/15 Summer				31.821
S112.006	S356	15 Winter	30	+40%					30.388
S107.025	S383	60 Winter	30	+40%					24.873
S107.026	S384	60 Winter	30	+40%					24.867
S107.027	S385	60 Winter	30	+40%	30/15 Summer				24.854
S1.035	S342	30 Winter	30	+40%					22.640
S1.036	S418	30 Winter	30	+40%					21.767
S1.037	S418	5760 Winter	30	+40%					20.799
S1.038	S417	5760 Winter	30	+40%					20.762
S117.000	S394	360 Winter	30	+40%					34.740

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.016	S366	0.017	0.000	1.01		611.0	SURCHARGED	
S107.017	S335	-4.554	0.000	0.01		711.7	OK	
S107.018	S367	-1.195	0.000	0.10		694.9	OK	
S107.019	S377	-1.567	0.000	0.06		669.4	OK	
S107.020	S378	-1.553	0.000	0.06		643.5	OK	
S107.021	S379	-1.782	0.000	0.05		635.5	OK	
S107.022	S380	-1.949	0.000	0.03		570.8	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.023	S381	-2.083	0.000	0.02		494.7	OK	
S107.024	S382	-2.153	0.000	0.02		436.1	OK	
S112.000	S358	-0.128	0.000	0.62		104.8	OK	
S112.001	S359	-0.090	0.000	0.81		103.6	OK	
S112.002	S360	-0.039	0.000	0.54		102.5	OK	
S113.000	S320	-0.175	0.000	0.36		93.2	OK	
S113.001	S321	-0.136	0.000	0.57		146.5	OK	
S113.002	S344	-0.080	0.000	0.88		210.2	OK	
S113.003	S345	0.402	0.000	0.85		206.1	SURCHARGED	
S114.000	S374	1.254	0.000	0.48		53.3	SURCHARGED	
S114.001	S346	2.964	0.150	1.27		141.6	FLOOD	6
S114.002	S347	1.993	0.000	1.25		124.5	SURCHARGED	
S114.003	S348	1.647	0.000	1.27		134.8	SURCHARGED	
S115.000	S340	-0.146	0.000	0.51		97.9	OK	
S115.001	S342	0.946	0.000	1.03		196.1	SURCHARGED	4
S115.002	S343	1.267	0.000	0.98		178.7	SURCHARGED	2
S115.003	S344	1.457	0.000	1.19		236.1	FLOOD RISK	5
S115.004	S393	1.399	0.000	1.06		208.7	SURCHARGED	
S115.005	S394	1.342	0.000	1.23		226.1	SURCHARGED	
S113.004	S346	1.270	0.000	1.01		477.4	SURCHARGED	
S112.003	S377	1.128	0.000	1.06		560.6	SURCHARGED	
S112.004	S361	0.963	0.000	1.08		602.7	SURCHARGED	
S112.005	S362	0.472	0.000	1.31		611.9	SURCHARGED	
S116.000	S395	0.245	0.000	0.80		57.3	SURCHARGED	
S116.001	S396	0.598	0.000	0.94		62.3	SURCHARGED	
S116.002	S364	0.697	0.000	1.47		102.7	SURCHARGED	
S112.006	S356	-0.167	0.000	0.72		708.9	OK	
S107.025	S383	-2.306	0.000	0.03		698.8	OK	
S107.026	S384	-2.344	0.000	0.02		646.1	OK	
S107.027	S385	0.673	0.000	1.43		490.3	SURCHARGED	
S1.035	S342	-1.160	0.000	0.66		5397.5	OK*	
S1.036	S418	-2.233	0.000	0.11		5396.7	OK	
S1.037	S418	-0.801	0.000	0.06		376.5	OK	
S1.038	S417	-1.038	0.000	0.01		86.6	OK	
S117.000	S394	-1.143	0.000	0.00		0.0	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.200
Region	England and Wales	Ratio R	0.253
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	100	+40%	100/15 Winter				60.783	0.087
S2.000	S2/1	360 Winter	100	+40%					59.000	-0.150
S1.001	S2	15 Winter	100	+40%					58.887	-0.064
S1.002	S3	15 Winter	100	+40%	100/15 Summer				57.815	0.085
S3.000	S4/1	360 Winter	100	+40%					57.050	-0.150
S4.000	S4/2	360 Winter	100	+40%					57.000	-0.150
S1.003	S4	15 Winter	100	+40%					56.972	-0.141
S5.000	S5	15 Winter	100	+40%	100/15 Summer				56.286	0.396
S6.000	S6/1	30 Winter	100	+40%					55.950	0.000
S5.001	S6	15 Winter	100	+40%	100/15 Summer				56.209	0.383
S7.000	S7	15 Winter	100	+40%	30/15 Summer	100/15 Winter			56.189	1.264
S7.001	S8	15 Winter	100	+40%	30/15 Summer				56.183	1.334
S5.002	S9	15 Winter	100	+40%	30/15 Summer				56.173	1.352
S5.003	S10	15 Winter	100	+40%	30/15 Summer				56.092	1.306
S8.000	S11/1	15 Winter	100	+40%	30/15 Summer				56.022	1.072
S5.004	S11	15 Winter	100	+40%	30/15 Summer				56.010	1.262
S1.004	S12	15 Winter	100	+40%	30/15 Summer				55.934	1.217
S1.005	S13	15 Winter	100	+40%	100/15 Winter				54.763	0.112
S1.006	S14	15 Winter	100	+40%	100/15 Summer				53.579	0.247
S9.000	S15/1	30 Winter	100	+40%					48.650	0.000
S1.007	S15	15 Winter	100	+40%	30/15 Summer				49.584	1.634
S1.008	S16	15 Winter	100	+40%	30/15 Summer				49.145	1.348
S10.000	S18/1	15 Winter	100	+40%					48.972	-0.228
S1.009	S18	15 Winter	100	+40%	30/15 Summer				48.850	1.127
S11.000	S19/1	30 Winter	100	+40%					48.300	0.000
S1.010	S19	30 Winter	100	+40%	30/15 Summer				48.611	0.960
S12.000	S21/1	15 Winter	100	+40%					48.869	-0.131
S1.011	S21	30 Winter	100	+40%	30/15 Summer				48.330	0.814
S1.012	S22	30 Winter	100	+40%	30/15 Summer				48.153	0.736

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	1.02		84.9	SURCHARGED	
S2.000	S2/1	0.000	0.00		0.0	OK*	
S1.001	S2	0.000	0.93		157.4	OK	
S1.002	S3	0.000	1.06		185.9	SURCHARGED	
S3.000	S4/1	0.000	0.00		0.0	OK*	
S4.000	S4/2	0.000	0.00		0.0	OK*	
S1.003	S4	0.000	0.55		190.7	OK	
S5.000	S5	0.000	1.16		34.8	SURCHARGED	
S6.000	S6/1	0.000	0.09		1.7	SURCHARGED*	
S5.001	S6	0.000	0.19		44.8	SURCHARGED	
S7.000	S7	0.177	0.30		9.1	FLOOD	1
S7.001	S8	0.000	0.68		17.9	SURCHARGED	
S5.002	S9	0.000	1.39		69.6	SURCHARGED	
S5.003	S10	0.000	1.49		75.5	SURCHARGED	
S8.000	S11/1	0.000	0.23		6.0	SURCHARGED	
S5.004	S11	0.000	1.73		85.4	SURCHARGED	
S1.004	S12	0.000	4.33		240.3	SURCHARGED	
S1.005	S13	0.000	0.95		245.9	SURCHARGED	
S1.006	S14	0.000	0.88		288.1	SURCHARGED	
S9.000	S15/1	0.000	0.12		6.2	SURCHARGED*	
S1.007	S15	0.000	1.69		300.2	SURCHARGED	
S1.008	S16	0.000	2.02		308.1	FLOOD RISK	
S10.000	S18/1	0.000	0.36		248.0	OK*	
S1.009	S18	0.000	1.68		509.7	SURCHARGED	
S11.000	S19/1	0.000	0.07		3.4	SURCHARGED*	
S1.010	S19	0.000	1.45		489.1	SURCHARGED	
S12.000	S21/1	0.000	0.36		62.6	OK*	
S1.011	S21	0.000	1.26		539.1	SURCHARGED	
S1.012	S22	0.000	1.40		543.2	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.013	S23	30 Winter	100	+40%	30/15 Summer				47.974	0.621
S13.000	S24	15 Winter	100	+40%					78.106	-0.091
S13.001	S25	15 Winter	100	+40%					77.818	-0.009
S13.002	S26	15 Winter	100	+40%	100/15 Winter				77.743	0.047
S14.000	S170	15 Winter	100	+40%	100/15 Summer				77.766	0.213
S14.001	S171	15 Winter	100	+40%	100/15 Summer				77.707	0.280
S14.002	S172	15 Winter	100	+40%	100/15 Summer				77.652	0.359
S13.003	S27	15 Winter	100	+40%	100/15 Summer				77.609	0.367
S13.004	S28	15 Winter	100	+40%	30/15 Summer				77.380	0.749
S13.005	S29	15 Winter	100	+40%	30/15 Summer				77.076	1.054
S15.000	S157	15 Winter	100	+40%	30/15 Summer				77.394	0.669
S15.001	S158	15 Winter	100	+40%	30/15 Winter				77.235	0.574
S15.002	S159	15 Winter	100	+40%	30/15 Summer	100/15 Summer			76.986	1.740
S16.000	S31/1	120 Winter	100	+40%					75.270	0.000
S13.006	S31	15 Winter	100	+40%	30/15 Summer	100/15 Summer			76.838	1.997
S13.007	S32	15 Winter	100	+40%	30/15 Summer				76.183	1.588
S17.000	S33/1	15 Winter	100	+40%					74.179	-0.046
S13.008	S33	15 Winter	100	+40%	100/15 Summer				74.167	0.232
S18.000	S143	15 Winter	100	+40%					75.111	-0.114
S18.001	S144	15 Winter	100	+40%	30/15 Summer				73.397	0.524
S13.009	S34	15 Winter	100	+40%	30/15 Summer				73.311	0.489
S13.010	S35	15 Winter	100	+40%					72.055	-0.223
S13.011	S36	30 Winter	100	+40%	30/15 Winter				71.814	0.458
S19.000	S145	15 Winter	100	+40%	30/15 Summer				76.337	3.612
S19.001	S146	15 Winter	100	+40%	30/15 Summer				75.335	2.850
S19.002	S147	30 Winter	100	+40%	30/15 Summer				75.042	2.596
S19.003	S148	30 Winter	100	+40%	30/15 Summer				74.731	2.361
S19.004	S149	30 Winter	100	+40%	30/15 Summer				74.377	2.110
S19.005	S150	30 Winter	100	+40%	30/15 Summer				74.051	1.876
S19.006	S151	30 Winter	100	+40%	30/15 Summer				73.816	1.706
S19.007	S152	30 Winter	100	+40%	30/15 Summer				73.564	1.522
S19.008	S153	30 Winter	100	+40%	30/15 Summer				72.797	1.013
S19.009	S154	30 Winter	100	+40%	30/15 Summer				72.273	0.662
S19.010	S155	30 Winter	100	+40%	100/15 Summer				72.059	0.511
S19.011	S156	30 Winter	100	+40%	100/15 Summer				71.889	0.507
S20.000	S167	15 Winter	100	+40%	30/15 Summer				73.490	0.465
S20.001	S168	15 Winter	100	+40%					72.574	-0.134
S13.012	S38	30 Winter	100	+40%	30/15 Summer				71.557	0.784
S13.013	S39	30 Winter	100	+40%	30/15 Summer				71.272	0.741
S21.000	S165	15 Winter	100	+40%					71.568	-0.157
S21.001	S166	15 Winter	100	+40%					71.343	-0.182
S13.014	S40	15 Winter	100	+40%	30/15 Summer				70.989	0.659
S22.000	S41	15 Winter	100	+40%	100/15 Summer				71.516	0.491
S23.000	S42/1	15 Winter	100	+40%					70.539	-0.186
S24.000	S42/2	15 Winter	100	+40%					70.568	-0.157
S13.015	S42	15 Winter	100	+40%	30/15 Summer				70.503	0.481
S25.000	S43/1	15 Winter	100	+40%					69.821	-0.173
S26.000	S43/2	15 Winter	100	+40%					69.940	-0.154
S13.016	S43	15 Winter	100	+40%					69.647	-0.153
S27.000	S44	15 Winter	100	+40%					70.227	-0.173
S27.001	S45	15 Winter	100	+40%					69.616	-0.184
S28.000	S47	30 Winter	100	+40%	30/15 Summer	30/15 Summer			75.140	1.165
S28.001	S67	15 Winter	100	+40%	30/15 Summer				74.204	1.502
S28.002	S136	15 Winter	100	+40%	30/15 Summer	100/15 Winter			74.102	1.495
S28.003	S137	30 Winter	100	+40%	30/15 Summer				72.910	1.238

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.013	S23	0.000	1.55		542.8	SURCHARGED	
S13.000	S24	0.000	0.62		24.0	OK	
S13.001	S25	0.000	1.00		36.2	OK	
S13.002	S26	0.000	0.73		47.2	SURCHARGED	
S14.000	S170	0.000	0.73		26.7	SURCHARGED	
S14.001	S171	0.000	0.67		24.6	SURCHARGED	
S14.002	S172	0.000	0.80		25.3	SURCHARGED	
S13.003	S27	0.000	0.67		61.6	SURCHARGED	
S13.004	S28	0.000	0.76		69.6	SURCHARGED	
S13.005	S29	0.000	0.44		66.9	FLOOD RISK	
S15.000	S157	0.000	1.50		50.8	SURCHARGED	
S15.001	S158	0.000	0.39		50.3	FLOOD RISK	
S15.002	S159	2.143	0.63		40.4	FLOOD	4
S16.000	S31/1	0.000	0.06		5.5	SURCHARGED*	
S13.006	S31	1.997	1.88		122.6	FLOOD	4
S13.007	S32	0.000	1.76		127.7	FLOOD RISK	
S17.000	S33/1	0.000	0.21		16.2	OK*	
S13.008	S33	0.000	0.87		153.4	SURCHARGED	
S18.000	S143	0.000	0.47		43.8	OK	
S18.001	S144	0.000	1.31		41.6	SURCHARGED	
S13.009	S34	0.000	1.38		203.4	SURCHARGED	
S13.010	S35	0.000	0.50		216.5	OK	
S13.011	S36	0.000	0.48		206.4	SURCHARGED	
S19.000	S145	0.000	2.34		111.7	SURCHARGED	
S19.001	S146	0.000	3.39		101.3	SURCHARGED	
S19.002	S147	0.000	2.49		85.9	SURCHARGED	
S19.003	S148	0.000	2.25		80.6	SURCHARGED	
S19.004	S149	0.000	2.11		74.9	SURCHARGED	
S19.005	S150	0.000	2.06		69.6	SURCHARGED	
S19.006	S151	0.000	1.96		66.7	SURCHARGED	
S19.007	S152	0.000	1.72		65.6	SURCHARGED	
S19.008	S153	0.000	1.78		66.6	SURCHARGED	
S19.009	S154	0.000	2.03		68.4	SURCHARGED	
S19.010	S155	0.000	1.22		70.1	SURCHARGED	
S19.011	S156	0.000	1.00		75.1	SURCHARGED	
S20.000	S167	0.000	1.50		57.8	SURCHARGED	
S20.001	S168	0.000	0.34		57.5	OK	
S13.012	S38	0.000	1.08		300.7	SURCHARGED	
S13.013	S39	0.000	1.22		308.2	SURCHARGED	
S21.000	S165	0.000	0.20		12.4	OK	
S21.001	S166	0.000	0.08		12.3	OK	
S13.014	S40	0.000	1.28		319.7	SURCHARGED	
S22.000	S41	0.000	1.02		86.9	SURCHARGED	
S23.000	S42/1	0.000	0.07		8.1	OK*	
S24.000	S42/2	0.000	0.20		23.4	OK*	
S13.015	S42	0.000	1.79		412.1	SURCHARGED	
S25.000	S43/1	0.000	0.12		7.6	OK*	
S26.000	S43/2	0.000	0.22		16.7	OK*	
S13.016	S43	0.000	0.76		442.7	OK	
S27.000	S44	0.000	0.12		9.5	OK	
S27.001	S45	0.000	0.08		9.4	OK	
S28.000	S47	40.203	1.27		159.1	FLOOD	10
S28.001	S67	0.000	1.01		175.2	FLOOD RISK	
S28.002	S136	1.530	1.13		393.8	FLOOD	3

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.003	S137	0.000	1.16		392.7	FLOOD RISK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S28.004	S138	30 Winter	100	+40%	30/15 Summer	100/15 Summer			72.026
S28.005	S139	15 Winter	100	+40%	30/15 Summer				71.861
S28.006	S140	30 Winter	100	+40%	30/15 Summer				69.828
S28.007	S141	30 Winter	100	+40%	30/15 Summer				69.492
S28.008	S142	30 Winter	100	+40%	30/15 Summer				68.961
S29.000	S46/1	15 Winter	100	+40%					68.507
S13.017	S46	15 Winter	100	+40%					68.443
S13.018	S48	30 Winter	100	+40%					65.684
S13.019	S49	30 Winter	100	+40%					62.511
S30.000	S50	15 Winter	100	+40%					61.971
S13.020	S51	30 Winter	100	+40%					61.774
S31.000	S52	15 Winter	100	+40%					69.651
S31.001	S53	15 Winter	100	+40%					68.867
S31.002	S54	15 Winter	100	+40%					67.986
S31.003	S55	15 Winter	100	+40%					66.853
S31.004	S56	15 Winter	100	+40%					66.191
S31.005	S57	15 Winter	100	+40%					65.702
S31.006	S58	15 Winter	100	+40%					65.419
S31.007	S59	15 Winter	100	+40%					64.435
S31.008	S60	15 Winter	100	+40%					63.055
S31.009	S61	15 Winter	100	+40%	100/15 Summer				61.725
S13.021	S62	30 Winter	100	+40%					61.420
S13.022	S63	30 Winter	100	+40%	30/15 Summer				61.029
S32.000	S64B/1	180 Winter	100	+40%					64.908
S32.001	S64B	30 Winter	100	+40%	30/15 Summer	30/15 Summer			66.127
S33.000	S64A/1	120 Winter	100	+40%					64.443
S34.000	S111	30 Winter	100	+40%	30/15 Summer				65.502
S35.000	S112	60 Winter	100	+40%					64.663
S34.001	S112	30 Winter	100	+40%	30/15 Summer				65.512
S32.002	S64A	30 Winter	100	+40%	30/15 Summer				65.518
S32.003	S64	30 Winter	100	+40%	30/15 Summer				65.191
S36.000	S65/1	120 Winter	100	+40%					63.924
S32.004	S65	30 Winter	100	+40%	30/15 Summer	100/15 Summer			64.793
S32.005	S66	30 Winter	100	+40%	30/15 Summer	100/15 Summer			64.581
S37.000	S68/1	120 Winter	100	+40%					63.315
S32.006	S68	15 Winter	100	+40%	30/15 Summer	100/15 Summer			64.181
S38.000	S69/1	120 Winter	100	+40%					63.025
S32.007	S69	15 Winter	100	+40%	30/15 Summer				63.730
S32.008	S70	15 Winter	100	+40%	30/15 Summer				62.970
S39.000	S71/1	15 Winter	100	+40%					61.983
S32.009	S71	15 Winter	100	+40%					61.457
S40.000	S72	360 Winter	100	+40%					62.578
S40.001	S73	15 Winter	100	+40%					62.524
S40.002	S74	15 Summer	100	+40%					62.421
S40.003	S75	15 Summer	100	+40%					62.365
S41.000	S76	15 Winter	100	+40%					64.268
S41.001	S77	15 Winter	100	+40%					64.090
S41.002	S78	15 Winter	100	+40%					63.916
S41.003	S79	15 Winter	100	+40%					63.884
S41.004	S80	15 Winter	100	+40%					63.833
S41.005	S81	15 Winter	100	+40%					63.804
S41.006	S82	15 Winter	100	+40%					63.757
S41.007	S83	15 Winter	100	+40%					63.628
S41.008	S84	15 Winter	100	+40%					63.527
S41.009	S85	15 Winter	100	+40%					63.403

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S28.004	S138	1.018	26.346	1.93		388.3	FLOOD	6
S28.005	S139	0.981	0.000	1.15		461.6	FLOOD RISK	
S28.006	S140	0.528	0.000	1.48		445.0	FLOOD RISK	
S28.007	S141	0.345	0.000	1.10		444.7	SURCHARGED	
S28.008	S142	0.255	0.000	1.88		443.9	SURCHARGED	
S29.000	S46/1	-0.126	0.000	0.40		11.9	OK*	
S13.017	S46	-0.152	0.000	0.85		906.2	OK	
S13.018	S48	-0.381	0.000	0.39		914.0	OK	
S13.019	S49	-0.204	0.000	0.83		920.7	OK	
S30.000	S50	-0.199	0.000	0.03		2.4	OK	
S13.020	S51	-0.086	0.000	0.97		929.1	OK	
S31.000	S52	-0.188	0.000	0.01		2.4	FLOOD RISK*	
S31.001	S53	-0.165	0.000	0.05		14.6	FLOOD RISK*	
S31.002	S54	-0.151	0.000	0.09		26.3	FLOOD RISK*	
S31.003	S55	-0.145	0.000	0.11		33.5	FLOOD RISK*	
S31.004	S56	-0.138	0.000	0.14		40.6	FLOOD RISK*	
S31.005	S57	-0.126	0.000	0.18		54.7	FLOOD RISK*	
S31.006	S58	-0.124	0.000	0.19		54.5	FLOOD RISK*	
S31.007	S59	-0.104	0.000	0.28		72.9	FLOOD RISK*	
S31.008	S60	-0.118	0.000	0.22		72.3	FLOOD RISK*	
S31.009	S61	0.095	0.000	1.25		72.6	SURCHARGED*	
S13.021	S62	-0.040	0.000	0.83		976.5	OK	
S13.022	S63	0.139	0.000	1.31		982.2	SURCHARGED	
S32.000	S64B/1	0.000	0.000	0.48		7.2	SURCHARGED*	
S32.001	S64B	1.277	7.069	2.03		27.2	FLOOD	10
S33.000	S64A/1	0.000	0.000	0.52		9.1	SURCHARGED*	
S34.000	S111	0.914	0.000	0.21		2.5	FLOOD RISK	
S35.000	S112	0.000	0.000	0.06		2.2	SURCHARGED*	
S34.001	S112	1.122	0.000	0.84		22.1	FLOOD RISK	
S32.002	S64A	1.153	0.000	0.86		42.2	FLOOD RISK	
S32.003	S64	1.256	0.000	1.12		52.3	FLOOD RISK	
S36.000	S65/1	0.000	0.000	0.15		10.2	SURCHARGED*	
S32.004	S65	1.168	8.841	1.41		68.2	FLOOD	6
S32.005	S66	1.160	3.627	1.28		71.0	FLOOD	6
S37.000	S68/1	0.000	0.000	0.26		10.1	FLOOD RISK*	
S32.006	S68	1.258	1.870	1.61		82.3	FLOOD	5
S38.000	S69/1	0.000	0.000	0.29		10.9	SURCHARGED*	
S32.007	S69	1.078	0.000	1.28		99.1	FLOOD RISK	
S32.008	S70	0.780	0.000	1.48		106.4	SURCHARGED	
S39.000	S71/1	-0.064	0.000	0.62		27.2	OK*	
S32.009	S71	-0.095	0.000	0.79		138.6	OK	
S40.000	S72	-0.200	0.000	0.00		0.0	OK	
S40.001	S73	-0.163	0.000	0.12		23.5	FLOOD RISK*	
S40.002	S74	-0.163	0.000	0.13		23.5	FLOOD RISK*	
S40.003	S75	-0.133	0.000	0.24		46.0	FLOOD RISK*	
S41.000	S76	-0.262	0.000	0.04		4.3	OK	
S41.001	S77	-0.249	0.000	0.07		7.4	OK	
S41.002	S78	-0.224	0.000	0.14		8.8	OK	
S41.003	S79	-0.219	0.000	0.16		10.0	OK	
S41.004	S80	-0.207	0.000	0.21		12.2	OK	
S41.005	S81	-0.196	0.000	0.25		15.2	OK	
S41.006	S82	-0.198	0.000	0.24		22.3	OK	
S41.007	S83	-0.181	0.000	0.32		24.0	OK	
S41.008	S84	-0.195	0.000	0.27		24.8	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.009	S85	-0.182	0.000	0.33		25.8	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S41.010	S86	15 Winter	100	+40%					63.314	-0.174
S41.011	S87	15 Winter	100	+40%					63.208	-0.199
S41.012	S88	15 Winter	100	+40%					63.006	-0.203
S41.013	S89	15 Winter	100	+40%					62.772	-0.194
S41.014	S90	15 Winter	100	+40%					62.604	-0.170
S42.000	S181	15 Winter	100	+40%					63.635	-0.225
S42.001	S182	15 Winter	100	+40%					63.301	-0.449
S42.002	S183	15 Winter	100	+40%					63.177	-0.423
S42.003	S184	15 Winter	100	+40%					63.106	-0.394
S42.004	S185	15 Winter	100	+40%					63.020	-0.380
S42.005	S186	15 Winter	100	+40%					62.815	-0.385
S42.006	S187	15 Winter	100	+40%					62.795	-0.205
S42.007	S134	15 Winter	100	+40%	100/15 Summer				62.788	0.186
S41.015	S127	15 Winter	100	+40%	30/15 Summer				62.573	0.573
S41.016	S91	15 Winter	100	+40%	30/15 Summer				62.427	0.497
S43.000	S128	15 Winter	100	+40%					64.043	-0.417
S43.001	S129	15 Winter	100	+40%					64.040	-0.470
S43.002	S130	15 Winter	100	+40%					63.983	-0.417
S43.003	S128	15 Winter	100	+40%					63.853	-0.447
S43.004	S129	15 Winter	100	+40%					63.739	-0.161
S43.005	S130	15 Winter	100	+40%					63.518	-0.182
S43.006	S131	15 Winter	100	+40%					63.061	-0.169
S43.007	S132	15 Winter	100	+40%					62.740	-0.130
S43.008	S133	15 Winter	100	+40%					62.567	-0.133
S43.009	S147	15 Winter	100	+40%					62.431	-0.069
S41.017	S92	15 Winter	100	+40%	30/15 Summer				62.290	0.440
S40.004	S93	15 Winter	100	+40%	100/15 Summer				61.909	0.097
S13.023	S94	30 Winter	100	+40%					60.472	-0.328
S44.000	S96/1	15 Winter	100	+40%					60.987	-0.113
S13.024	S96	30 Winter	100	+40%					59.359	-0.416
S45.000	S99/1	15 Winter	100	+40%					58.696	-0.104
S46.000	S99/2	60 Winter	100	+40%					58.100	0.000
S13.025	S99	15 Winter	100	+40%	100/15 Winter				57.894	0.069
S13.026	S100	15 Winter	100	+40%					56.886	-0.427
S47.000	S101	15 Winter	100	+40%					56.682	-0.118
S13.027	S102	30 Winter	100	+40%					54.105	-0.419
S13.028	S103	30 Summer	100	+40%					51.432	-0.479
S1.014	S120	30 Winter	100	+40%	30/15 Summer				47.793	0.483
S48.000	S250	15 Winter	100	+40%					70.527	-0.134
S49.000	S186	15 Winter	100	+40%	100/15 Summer				74.552	1.102
S49.001	S187	15 Winter	100	+40%	30/15 Winter				74.282	1.420
S49.002	S186	15 Winter	100	+40%	100/15 Summer				73.953	1.305
S49.003	S189	15 Winter	100	+40%	30/15 Summer	100/15 Summer			73.483	1.849
S49.004	S190	15 Winter	100	+40%	30/15 Summer				73.272	1.918
S50.000	S184	15 Winter	100	+40%					74.427	-0.223
S49.005	S255	15 Winter	100	+40%	30/15 Summer				73.106	3.107
S48.001	S256	15 Winter	100	+40%	30/15 Summer	100/15 Summer			70.045	2.050
S48.002	S191	15 Winter	100	+40%	30/15 Summer				69.128	1.655
S48.003	S185	30 Winter	100	+40%	30/15 Summer	30/15 Summer			68.092	2.217
S48.004	S257	15 Winter	100	+40%	30/15 Summer	100/15 Summer			67.546	2.565
S48.005	S258	30 Summer	100	+40%	30/15 Summer				67.149	3.484
S48.006	S259	15 Winter	100	+40%	30/15 Summer				66.835	3.315
S51.000	S260/1	30 Winter	100	+40%					66.456	0.000
S48.007	S260	15 Winter	100	+40%	30/15 Summer				66.527	3.537
S52.000	S261/1	15 Winter	100	+40%					66.064	0.000

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S41.010	S86	0.000	0.37		26.2	OK	
S41.011	S87	0.000	0.24		27.0	OK	
S41.012	S88	0.000	0.22		27.7	OK	
S41.013	S89	0.000	0.27		29.2	OK	
S41.014	S90	0.000	0.17		30.2	OK	
S42.000	S181	0.000	0.01		6.2	FLOOD RISK*	
S42.001	S182	0.000	0.01		11.2	OK	
S42.002	S183	0.000	0.02		36.7	OK	
S42.003	S184	0.000	0.04		62.2	OK	
S42.004	S185	0.000	0.04		69.7	OK	
S42.005	S186	0.000	0.04		74.5	OK	
S42.006	S187	0.000	0.07		84.8	FLOOD RISK*	
S42.007	S134	0.000	0.65		71.1	FLOOD RISK	
S41.015	S127	0.000	1.49		98.4	FLOOD RISK	
S41.016	S91	0.000	1.41		99.8	FLOOD RISK	
S43.000	S128	0.000	0.01		4.7	OK	
S43.001	S129	0.000	0.04		17.8	OK	
S43.002	S130	0.000	0.09		30.1	OK	
S43.003	S128	0.000	0.06		46.2	OK	
S43.004	S129	0.000	0.44		49.2	OK*	
S43.005	S130	0.000	0.32		55.6	OK*	
S43.006	S131	0.000	0.39		59.3	OK*	
S43.007	S132	0.000	0.60		62.5	OK*	
S43.008	S133	0.000	0.58		65.5	OK*	
S43.009	S147	0.000	0.34		63.5	FLOOD RISK	
S41.017	S92	0.000	3.09		160.1	SURCHARGED	
S40.004	S93	0.000	1.10		191.2	SURCHARGED	
S13.023	S94	0.000	0.67		1290.8	OK	
S44.000	S96/1	0.000	0.14		10.0	OK*	
S13.024	S96	0.000	0.49		1303.1	OK	
S45.000	S99/1	0.000	0.20		12.4	OK*	
S46.000	S99/2	0.000	1.16		144.8	SURCHARGED*	
S13.025	S99	0.000	1.09		1477.1	SURCHARGED	
S13.026	S100	0.000	0.47		1482.0	OK	
S47.000	S101	0.000	0.10		9.6	OK*	
S13.027	S102	0.000	0.49		1489.3	OK	
S13.028	S103	0.000	0.37		1481.2	OK	
S1.014	S120	0.000	1.78		2051.0	SURCHARGED	
S48.000	S250	0.000	0.34		38.2	OK	
S49.000	S186	0.000	0.48		208.2	SURCHARGED	
S49.001	S187	0.000	1.18		308.5	SURCHARGED	
S49.002	S186	0.000	0.63		302.1	SURCHARGED	
S49.003	S189	23.796	1.68		500.1	FLOOD	4
S49.004	S190	0.000	0.72		523.5	FLOOD RISK	
S50.000	S184	0.000	0.50		421.1	OK	
S49.005	S255	0.000	1.20		943.6	SURCHARGED	
S48.001	S256	24.621	1.39		1005.8	FLOOD	5
S48.002	S191	0.000	0.82		999.8	SURCHARGED	
S48.003	S185	114.748	0.96		909.1	FLOOD	10
S48.004	S257	5.225	0.81		935.4	FLOOD	4
S48.005	S258	0.000	1.93		933.0	SURCHARGED	
S48.006	S259	0.000	1.05		957.9	SURCHARGED	
S51.000	S260/1	0.000	1.33		43.3	SURCHARGED*	
S48.007	S260	0.000	1.74		967.2	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S52.000	S261/1	0.000	1.06		16.2	SURCHARGED*	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S53.000	S261/2	15 Winter	100	+40%					66.149
S48.008	S261	15 Winter	100	+40%	30/15 Summer				66.119
S54.000	S263/1	15 Winter	100	+40%					65.703
S55.000	S263/2	60 Winter	100	+40%					65.901
S48.009	S263	15 Winter	100	+40%	30/15 Summer				65.670
S56.000	S264/1	15 Winter	100	+40%					65.471
S57.000	S264/2	360 Winter	100	+40%					65.710
S58.000	S264/3	15 Winter	100	+40%					65.450
S48.010	S264	15 Winter	100	+40%	30/15 Summer				65.100
S59.000	S265/1	60 Winter	100	+40%					65.040
S60.000	S265/2	180 Winter	100	+40%					65.067
S48.011	S265	15 Winter	100	+40%	30/15 Summer				64.426
S61.000	S268/1	15 Winter	100	+40%					63.593
S62.000	S268/2	60 Winter	100	+40%					63.768
S48.012	S266	15 Winter	100	+40%	30/15 Summer				63.595
S63.000	S217	15 Winter	100	+40%	30/15 Summer	30/15 Summer			64.989
S63.001	S271	30 Winter	100	+40%	30/15 Summer	30/15 Summer			64.278
S63.002	S272	30 Winter	100	+40%	30/15 Summer	30/15 Summer			63.697
S63.003	S273	60 Winter	100	+40%	30/15 Summer				62.351
S63.004	S222	30 Winter	100	+40%	30/15 Summer	30/15 Summer			62.655
S63.005	S277	15 Winter	100	+40%	30/15 Summer				62.688
S64.000	S278/1	60 Winter	100	+40%					61.608
S48.013	S278	30 Summer	100	+40%	30/15 Summer				62.634
S65.000	S279	15 Winter	100	+40%	30/15 Summer				65.963
S66.000	S280/1	60 Winter	100	+40%					64.954
S67.000	S280/2	30 Winter	100	+40%					65.104
S65.001	S280	15 Winter	100	+40%	30/15 Summer	100/15 Summer			65.800
S68.000	S281/2	15 Winter	100	+40%					64.235
S69.000	S281/1	60 Winter	100	+40%					63.345
S65.002	S281	15 Winter	100	+40%	30/15 Summer	100/15 Summer			64.319
S70.000	S282/1	30 Winter	100	+40%					62.471
S71.000	S282/2	30 Winter	100	+40%					62.524
S65.003	S282	15 Winter	100	+40%	100/15 Summer				62.898
S72.000	S283/1	30 Winter	100	+40%					61.809
S65.004	S283	15 Winter	100	+40%	100/15 Summer				62.255
S73.000	S237	60 Winter	100	+40%					60.580
S48.014	S284	15 Winter	100	+40%	30/15 Summer				61.556
S48.015	S285	15 Winter	100	+40%	30/15 Winter				60.043
S48.016	S286	15 Winter	100	+40%	100/15 Summer				58.485
S74.000	S287/1	15 Winter	100	+40%					56.830
S48.017	S287	30 Winter	100	+40%					56.718
S75.000	S288/1	60 Winter	100	+40%					54.654
S76.000	S288/3	15 Winter	100	+40%					55.077
S77.000	S288/2(LD)	60 Winter	100	+40%					54.605
S48.018	S288	30 Winter	100	+40%	30/15 Summer				55.088
S78.000	S289/1	15 Winter	100	+40%					53.984
S48.019	S289	30 Winter	100	+40%					53.256
S79.000	S244	15 Winter	100	+40%	30/15 Summer	100/15 Summer			58.991
S79.001	S249	15 Summer	100	+40%					56.668
S79.002	S250	15 Summer	100	+40%					55.877
S79.003	S251	15 Winter	100	+40%	30/15 Winter				55.260
S80.000	S248	15 Winter	100	+40%	30/15 Summer	30/15 Summer			54.657
S79.004	S252	15 Winter	100	+40%	30/15 Summer				54.839
S79.005	S291/2	60 Winter	100	+40%					50.983
S81.000	S291/1	15 Winter	100	+40%					51.839

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S53.000	S261/2	0.000	0.000	1.03		20.5	SURCHARGED*	
S48.008	S261	3.321	0.000	1.28		973.4	SURCHARGED	
S54.000	S263/1	0.000	0.000	1.27		17.4	SURCHARGED*	
S55.000	S263/2	0.000	0.000	1.01		31.5	SURCHARGED*	
S48.009	S263	3.230	0.000	1.30		987.5	SURCHARGED	
S56.000	S264/1	0.000	0.000	1.17		17.3	SURCHARGED*	
S57.000	S264/2	-0.150	0.000	0.00		0.0	OK*	
S58.000	S264/3	-0.088	0.000	0.68		33.4	OK*	
S48.010	S264	3.016	0.000	1.42		1024.1	SURCHARGED	
S59.000	S265/1	0.000	0.000	1.09		15.2	SURCHARGED*	
S60.000	S265/2	0.000	0.000	1.31		22.7	SURCHARGED*	
S48.011	S265	2.666	0.000	1.31		1130.9	SURCHARGED	
S61.000	S268/1	-0.051	0.000	0.59		8.6	OK*	
S62.000	S268/2	0.000	0.000	1.31		59.1	SURCHARGED*	
S48.012	S266	2.299	0.000	1.70		1239.6	SURCHARGED	
S63.000	S217	2.151	11.941	1.08		78.0	FLOOD	10
S63.001	S271	2.073	10.151	1.27		84.8	FLOOD	11
S63.002	S272	1.906	8.132	1.57		102.2	FLOOD	11
S63.003	S273	1.043	0.000	1.64		104.5	FLOOD RISK*	
S63.004	S222	1.474	22.055	2.50		150.7	FLOOD	10
S63.005	S277	1.672	0.000	2.20		153.4	SURCHARGED	
S64.000	S278/1	0.000	0.000	0.55		27.7	SURCHARGED*	
S48.013	S278	1.670	0.000	1.59		1346.2	SURCHARGED	
S65.000	S279	1.113	0.000	0.94		21.4	SURCHARGED	
S66.000	S280/1	0.000	0.000	1.29		47.9	SURCHARGED*	
S67.000	S280/2	0.000	0.000	0.63		27.8	SURCHARGED*	
S65.001	S280	1.200	4.436	1.07		112.0	FLOOD	4
S68.000	S281/2	0.000	0.000	0.57		32.4	SURCHARGED*	
S69.000	S281/1	0.000	0.000	0.07		2.3	SURCHARGED*	
S65.002	S281	1.219	1.081	1.53		163.2	FLOOD	4
S70.000	S282/1	0.000	0.000	0.17		2.8	SURCHARGED*	
S71.000	S282/2	0.000	0.000	1.13		56.2	SURCHARGED*	
S65.003	S282	0.498	0.000	1.09		217.7	SURCHARGED	
S72.000	S283/1	0.000	0.000	0.18		2.6	SURCHARGED*	
S65.004	S283	0.495	0.000	0.80		216.0	SURCHARGED	
S73.000	S237	0.000	0.000	1.14		18.1	SURCHARGED*	
S48.014	S284	1.040	0.000	1.31		1580.7	SURCHARGED	
S48.015	S285	0.427	0.000	1.09		1573.4	SURCHARGED	
S48.016	S286	0.169	0.000	1.07		1598.1	SURCHARGED	
S74.000	S287/1	-0.168	0.000	0.40		28.6	OK*	
S48.017	S287	-0.198	0.000	0.83		1612.4	OK	
S75.000	S288/1	0.000	0.000	0.18		13.4	SURCHARGED*	
S76.000	S288/3	0.000	0.000	0.23		10.0	SURCHARGED*	
S77.000	S288/2(LD)	0.000	0.000	0.37		22.9	SURCHARGED*	
S48.018	S288	0.522	0.000	1.21		1675.4	SURCHARGED	
S78.000	S289/1	-0.042	0.000	0.86		43.9	OK*	
S48.019	S289	-0.110	0.000	0.81		1701.2	OK	
S79.000	S244	1.746	3.606	2.39		98.4	FLOOD	4
S79.001	S249	-0.205	0.000	0.40		142.3	OK	
S79.002	S250	-0.180	0.000	0.51		211.5	OK	
S79.003	S251	1.089	0.000	0.52		216.8	SURCHARGED	
S80.000	S248	1.732	26.983	2.13		91.0	FLOOD	10
S79.004	S252	2.402	0.000	1.45		381.1	SURCHARGED	
S79.005	S291/2	0.000	0.000	1.28		338.0	SURCHARGED*	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S81.000	S291/1	-0.053	0.000	0.74		43.9	OK*	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S48.020	S291	30 Winter	100	+40%	100/15 Summer				51.380
S82.000	S115/1	120 Winter	100	+40%					48.078
S83.000	S115/2	120 Winter	100	+40%					48.082
S48.021	S115	30 Winter	100	+40%	30/15 Summer				49.609
S84.000	S116A/1	60 Winter	100	+40%					47.798
S84.001	S116A	30 Winter	100	+40%	30/15 Summer				48.681
S85.000	S116/1	120 Winter	100	+40%					47.598
S48.022	S116	30 Winter	100	+40%	30/15 Summer				48.682
S86.000	S117/1	120 Winter	100	+40%					47.520
S87.000	S117/2	180 Winter	100	+40%					47.523
S48.023	S117	30 Winter	100	+40%	30/15 Summer				48.383
S88.000	S118/1	120 Winter	100	+40%					47.389
S89.000	S118/2	120 Winter	100	+40%					47.369
S48.024	S118	30 Winter	100	+40%	30/15 Summer				48.053
S1.015	S178	30 Winter	100	+40%	30/15 Summer				47.715
S90.000	S123/2	15 Winter	100	+40%					49.062
S1.016	S123	30 Winter	100	+40%					46.331
S91.000	S126/2	15 Winter	100	+40%					44.178
S1.017	S126	30 Winter	100	+40%					42.818
S92.000	S129/1	180 Winter	100	+40%					40.450
S93.000	S129/2	15 Winter	100	+40%					40.092
S1.018	S129	30 Winter	100	+40%	100/15 Winter				39.643
S94.000	S131/1	180 Winter	100	+40%					38.300
S1.019	S131	30 Winter	100	+40%	30/15 Summer	100/15 Winter			38.841
S95.000	S133/1	15 Winter	100	+40%					37.225
S1.020	S133	30 Winter	100	+40%	30/15 Summer				38.116
S1.021	S134	30 Winter	100	+40%	30/15 Summer	100/15 Winter			37.657
S1.022	S275	60 Winter	100	+40%	30/15 Summer				37.246
S1.023	S276	60 Winter	100	+40%	30/15 Summer				36.808
S1.024	S277	60 Winter	100	+40%	100/60 Winter				36.359
S1.025	S278	60 Winter	100	+40%	100/30 Summer				35.877
S1.026	S279	60 Winter	100	+40%	100/30 Summer				35.399
S1.027	S280	60 Winter	100	+40%	30/30 Winter				34.898
S1.028	S281	60 Winter	100	+40%	100/15 Winter				34.407
S96.000	S284	15 Winter	100	+40%	30/15 Summer				48.747
S96.001	S371	30 Winter	100	+40%	30/15 Summer	100/15 Summer			48.676
S97.000	S286	15 Winter	100	+40%					49.843
S96.002	S372	15 Winter	100	+40%	30/15 Summer	100/15 Summer			48.963
S96.003	S374	30 Summer	100	+40%	30/15 Summer				49.069
S98.000	S288	120 Winter	100	+40%					46.626
S96.004	S375	15 Winter	100	+40%	30/15 Summer	100/15 Summer			48.557
S99.000	S291	180 Winter	100	+40%					45.668
S96.005	S376	15 Winter	100	+40%	30/15 Summer	100/15 Summer			48.256
S96.006	S293	15 Winter	100	+40%	30/15 Summer				47.954
S100.000	S294	15 Winter	100	+40%					45.025
S96.007	S294	15 Winter	100	+40%	30/15 Summer				47.009
S101.000	S210	15 Winter	100	+40%					70.262
S101.001	S211	15 Winter	100	+40%	100/15 Summer				69.992
S101.002	S212	15 Winter	100	+40%	30/15 Summer				67.203
S101.003	S213	15 Winter	100	+40%	30/15 Summer				66.979
S101.004	S214	15 Winter	100	+40%	30/15 Summer				66.532
S101.005	S215	15 Winter	100	+40%	30/15 Summer	100/15 Summer			65.782
S101.006	S221	15 Winter	100	+40%	100/15 Summer				64.190
S101.007	S314	15 Winter	100	+40%	100/15 Winter				62.321
S101.008	S320	15 Winter	100	+40%	100/15 Summer				60.434

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S48.020	S291	0.855	0.000	0.82		2080.7	SURCHARGED	
S82.000	S115/1	0.000	0.000	0.95		42.9	SURCHARGED*	
S83.000	S115/2	0.000	0.000	0.28		12.8	SURCHARGED*	
S48.021	S115	1.709	0.000	1.51		2170.0	SURCHARGED	
S84.000	S116A/1	0.000	0.000	0.03		3.2	SURCHARGED*	
S84.001	S116A	1.081	0.000	0.16		10.4	SURCHARGED	
S85.000	S116/1	0.000	0.000	0.01		0.8	SURCHARGED*	
S48.022	S116	1.187	0.000	1.48		2191.9	SURCHARGED	
S86.000	S117/1	0.000	0.000	0.01		0.6	SURCHARGED*	
S87.000	S117/2	0.000	0.000	0.53		43.4	SURCHARGED*	
S48.023	S117	0.965	0.000	1.33		2285.6	SURCHARGED	
S88.000	S118/1	0.000	0.000	0.01		0.4	SURCHARGED*	
S89.000	S118/2	0.000	0.000	0.01		0.4	SURCHARGED*	
S48.024	S118	0.777	0.000	2.13		2321.4	SURCHARGED	
S1.015	S178	0.470	0.000	1.65		4362.3	SURCHARGED	
S90.000	S123/2	-0.163	0.000	0.17		28.2	OK*	
S1.016	S123	-0.705	0.000	0.46		4386.1	OK	
S91.000	S126/2	-0.122	0.000	0.65		40.0	OK*	
S1.017	S126	-0.733	0.000	0.43		4416.8	OK	
S92.000	S129/1	0.000	0.000	1.59		177.0	SURCHARGED*	
S93.000	S129/2	-0.133	0.000	0.35		11.9	FLOOD RISK*	
S1.018	S129	0.207	0.000	0.68		4735.9	SURCHARGED	
S94.000	S131/1	0.000	0.000	1.36		83.2	SURCHARGED*	
S1.019	S131	1.388	135.529	1.13		4354.5	FLOOD	5
S95.000	S133/1	0.000	0.000	0.15		6.4	SURCHARGED*	
S1.020	S133	1.241	0.000	1.27		4339.6	SURCHARGED	
S1.021	S134	1.012	95.527	1.72		4216.3	FLOOD	5
S1.022	S275	0.734	0.000	1.69		4251.4	SURCHARGED	
S1.023	S276	0.414	0.000	1.91		4252.2	SURCHARGED	
S1.024	S277	0.027	0.000	0.69		4427.8	SURCHARGED	
S1.025	S278	0.608	0.000	0.86		4337.1	SURCHARGED	
S1.026	S279	0.782	0.000	0.58		4398.0	SURCHARGED	
S1.027	S280	1.729	0.000	1.15		4418.6	SURCHARGED	
S1.028	S281	1.613	0.000	1.01		4418.5	SURCHARGED	
S96.000	S284	1.197	0.000	0.37		13.7	FLOOD RISK	
S96.001	S371	1.220	15.787	1.36		53.9	FLOOD	6
S97.000	S286	-0.157	0.000	0.19		20.9	OK	
S96.002	S372	1.709	0.962	1.55		62.0	FLOOD	4
S96.003	S374	2.077	0.000	1.59		66.0	FLOOD RISK	
S98.000	S288	0.000	0.000	1.11		41.7	SURCHARGED*	
S96.004	S375	2.002	7.079	0.67		139.5	FLOOD	4
S99.000	S291	0.000	0.000	1.26		41.4	SURCHARGED*	
S96.005	S376	2.642	5.735	2.23		245.3	FLOOD	4
S96.006	S293	2.420	0.000	1.16		238.7	SURCHARGED	
S100.000	S294	0.000	0.000	0.19		7.0	SURCHARGED*	
S96.007	S294	2.294	0.000	1.66		242.3	SURCHARGED	
S101.000	S210	-0.132	0.000	0.35		41.8	OK	
S101.001	S211	1.828	0.000	1.02		124.2	SURCHARGED	
S101.002	S212	1.657	0.000	0.70		220.2	SURCHARGED	
S101.003	S213	1.885	0.000	1.91		370.0	SURCHARGED	
S101.004	S214	1.556	0.000	1.24		362.4	SURCHARGED	
S101.005	S215	1.273	1.959	1.82		442.6	FLOOD	2
S101.006	S221	0.164	0.000	1.04		562.9	SURCHARGED	
S101.007	S314	0.076	0.000	0.72		616.7	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S101.008	S320	1.922	0.000	0.73		627.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S102.000	S300	15 Winter	100	+40%	100/15 Summer	100/15 Winter			58.813
S102.001	S301	15 Winter	100	+40%	30/15 Winter	100/15 Winter			58.498
S101.009	S297	15 Winter	100	+40%	30/15 Summer	100/15 Winter			58.026
S103.000	S313	15 Winter	100	+40%	100/15 Summer				53.798
S103.001	S314	15 Winter	100	+40%	30/15 Winter				53.747
S103.002	S314	15 Winter	100	+40%	30/15 Summer				53.354
S101.010	S329	15 Winter	100	+40%	30/15 Summer	100/15 Winter			52.362
S104.000	S412	15 Winter	100	+40%					64.188
S104.001	S413	15 Winter	100	+40%					58.681
S105.000	S414	15 Winter	100	+40%					60.337
S104.002	S414	15 Winter	100	+40%					57.469
S104.003	S415	15 Winter	100	+40%					55.665
S104.004	S416	15 Summer	100	+40%	30/15 Winter				51.208
S104.005	S320	15 Winter	100	+40%	30/15 Summer	100/15 Summer			50.749
S101.011	S315	15 Winter	100	+40%	30/15 Summer				50.718
S101.012	S345	15 Winter	100	+40%	30/15 Summer				48.856
S96.008	S295	15 Winter	100	+40%	30/15 Summer				46.680
S96.009	S300	15 Winter	100	+40%	30/15 Summer				45.001
S96.010	S296	15 Winter	100	+40%					42.791
S106.000	S326	15 Winter	100	+40%	30/15 Summer				39.569
S106.001	S318	15 Winter	100	+40%	30/15 Summer				39.428
S96.011	S299	15 Winter	100	+40%	100/15 Summer				37.781
S96.012	S365	30 Winter	100	+40%					35.588
S1.029	S282	60 Winter	100	+40%	30/30 Winter				33.917
S1.030	S283	60 Winter	100	+40%	30/30 Winter	100/30 Winter			33.118
S1.031	S284	60 Winter	100	+40%	30/30 Winter				31.359
S1.032	S341	180 Winter	100	+40%					26.150
S1.033	S389	60 Winter	100	+40%					23.881
S1.034	S373	60 Winter	100	+40%					22.767
S107.000	S337	15 Winter	100	+40%	30/15 Winter				41.909
S107.001	S379	15 Winter	100	+40%	30/15 Summer				41.480
S107.002	S380	15 Winter	100	+40%	30/15 Summer				41.290
S108.000	S381	15 Winter	100	+40%	100/15 Summer				44.336
S108.001	S382	15 Winter	100	+40%	30/15 Winter				43.581
S108.002	S383	15 Winter	100	+40%	30/15 Summer				43.212
S107.003	S381	15 Winter	100	+40%	30/15 Summer				41.096
S107.004	S385	15 Winter	100	+40%	30/15 Summer				40.901
S107.005	S386	15 Winter	100	+40%	30/15 Summer	100/15 Winter			40.163
S109.000	S387	15 Winter	100	+40%	100/15 Summer	100/15 Winter			42.013
S107.006	S387	15 Winter	100	+40%	30/15 Summer				39.969
S107.007	S389	15 Winter	100	+40%	30/15 Summer				39.421
S107.008	S390	15 Winter	100	+40%	30/15 Summer				37.932
S110.000	S392	15 Winter	100	+40%					39.859
S107.009	S392	15 Winter	100	+40%	30/15 Summer				37.053
S107.010	S395	15 Winter	100	+40%	30/15 Summer				35.919
S107.011	S396	15 Winter	100	+40%					34.747
S107.012	S397	15 Winter	100	+40%	30/15 Summer				32.257
S111.000	S400	15 Winter	100	+40%	100/15 Summer				32.736
S111.001	S401	15 Summer	100	+40%	30/15 Summer				32.494
S111.002	S402	15 Winter	100	+40%	30/15 Summer				32.157
S111.003	S404	15 Winter	100	+40%	30/15 Summer				31.898
S111.004	S405	15 Winter	100	+40%	30/15 Summer				31.694
S107.013	S398	30 Winter	100	+40%	30/15 Summer	30/15 Summer			31.238
S107.014	S408	15 Winter	100	+40%	30/15 Summer				30.627
S107.015	S409	30 Winter	100	+40%	30/15 Summer				27.861

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S102.000	S300	1.338	1.502	0.61		174.2	FLOOD	2
S102.001	S301	2.922	0.155	0.66		328.9	FLOOD	1
S101.009	S297	4.046	8.386	0.97		877.5	FLOOD	3
S103.000	S313	0.723	0.000	0.18		73.4	SURCHARGED	
S103.001	S314	2.479	0.000	0.44		246.8	SURCHARGED	
S103.002	S314	4.283	0.000	0.69		391.9	SURCHARGED	
S101.010	S329	5.085	0.311	1.43		1286.8	FLOOD	1
S104.000	S412	-0.352	0.000	0.11		83.1	OK	
S104.001	S413	-0.341	0.000	0.13		82.3	OK	
S105.000	S414	-0.088	0.000	0.67		78.5	OK	
S104.002	S414	-0.303	0.000	0.23		160.1	OK	
S104.003	S415	-0.252	0.000	0.39		306.0	OK	
S104.004	S416	1.418	0.000	0.44		258.7	SURCHARGED	
S104.005	S320	2.569	29.013	0.53		297.1	FLOOD	4
S101.011	S315	4.253	0.000	1.56		1383.9	SURCHARGED	
S101.012	S345	3.180	0.000	1.40		1402.6	SURCHARGED	
S96.008	S295	2.103	0.000	1.77		1646.3	SURCHARGED	
S96.009	S300	0.965	0.000	1.38		1765.1	SURCHARGED	
S96.010	S296	-0.228	0.000	0.77		1765.5	OK	
S106.000	S326	1.069	0.000	0.70		36.1	SURCHARGED	
S106.001	S318	1.263	0.000	1.75		92.7	SURCHARGED	
S96.011	S299	0.296	0.000	1.08		1845.8	SURCHARGED	
S96.012	S365	-0.080	0.000	0.82		1837.1	OK	
S1.029	S282	1.633	0.000	1.11		5799.2	SURCHARGED	
S1.030	S283	1.791	190.649	1.09		5324.1	FLOOD	3
S1.031	S284	1.517	0.000	0.70		5370.3	FLOOD RISK	
S1.032	S341	0.000	0.000	1.14		4075.2	SURCHARGED*	
S1.033	S389	-3.225	0.000	0.21		5370.6	OK	
S1.034	S373	-0.373	0.000	0.45		5370.1	OK	
S107.000	S337	1.584	0.000	1.01		68.7	FLOOD RISK	
S107.001	S379	1.698	0.000	1.03		63.9	FLOOD RISK	
S107.002	S380	1.727	0.000	0.46		64.2	SURCHARGED	
S108.000	S381	1.011	0.000	0.84		96.2	SURCHARGED	
S108.001	S382	1.757	0.000	0.79		82.4	SURCHARGED	
S108.002	S383	2.039	0.000	1.05		122.5	SURCHARGED	
S107.003	S381	2.015	0.000	0.93		182.8	SURCHARGED	
S107.004	S385	2.072	0.000	0.82		216.6	FLOOD RISK	
S107.005	S386	2.387	1.743	1.58		239.0	FLOOD	1
S109.000	S387	1.188	0.637	0.85		116.7	FLOOD	1
S107.006	S387	2.343	0.000	1.55		330.6	FLOOD RISK	
S107.007	S389	2.092	0.000	1.43		365.2	FLOOD RISK	
S107.008	S390	1.334	0.000	1.56		369.0	SURCHARGED	
S110.000	S392	-0.066	0.000	0.83		123.5	OK	
S107.009	S392	0.837	0.000	1.14		466.2	SURCHARGED	
S107.010	S395	0.569	0.000	1.57		545.0	SURCHARGED	
S107.011	S396	-0.225	0.000	0.50		546.0	OK	
S107.012	S397	2.087	0.000	0.86		544.6	FLOOD RISK	
S111.000	S400	0.511	0.000	0.27		63.4	SURCHARGED	
S111.001	S401	0.937	0.000	0.49		85.1	SURCHARGED	
S111.002	S402	0.793	0.000	0.43		168.3	SURCHARGED	
S111.003	S404	1.772	0.000	0.54		171.0	FLOOD RISK	
S111.004	S405	1.881	0.000	0.64		249.5	SURCHARGED	
S107.013	S398	2.531	104.891	2.15		545.4	FLOOD	11
S107.014	S408	2.122	0.000	1.60		630.3	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.015	S409	0.459	0.000	1.57		621.9	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S107.016	S366	30 Winter	100	+40%	30/15 Winter				27.204
S107.017	S335	30 Winter	100	+40%					25.541
S107.018	S367	30 Winter	100	+40%					25.481
S107.019	S377	60 Winter	100	+40%					25.354
S107.020	S378	60 Winter	100	+40%					25.235
S107.021	S379	60 Winter	100	+40%					25.177
S107.022	S380	60 Winter	100	+40%					25.135
S107.023	S381	60 Winter	100	+40%					25.122
S107.024	S382	60 Winter	100	+40%					25.108
S112.000	S358	15 Winter	100	+40%	100/15 Summer				38.227
S112.001	S359	15 Winter	100	+40%	100/15 Summer				37.979
S112.002	S360	15 Winter	100	+40%	100/15 Summer				37.798
S113.000	S320	15 Winter	100	+40%					47.444
S113.001	S321	15 Winter	100	+40%	100/15 Winter				44.913
S113.002	S344	15 Winter	100	+40%	100/15 Summer				44.023
S113.003	S345	15 Winter	100	+40%	30/15 Summer				43.014
S114.000	S374	15 Winter	100	+40%	30/15 Summer				48.119
S114.001	S346	15 Winter	100	+40%	30/15 Summer	30/15 Winter			47.021
S114.002	S347	15 Winter	100	+40%	30/15 Summer				44.133
S114.003	S348	15 Winter	100	+40%	30/15 Summer				43.246
S115.000	S340	15 Winter	100	+40%	100/15 Summer				45.853
S115.001	S342	15 Winter	100	+40%	30/15 Summer	100/15 Summer			45.147
S115.002	S343	15 Winter	100	+40%	30/15 Summer	100/15 Summer			43.587
S115.003	S344	15 Winter	100	+40%	30/15 Summer	100/15 Summer			42.479
S115.004	S393	15 Winter	100	+40%	30/15 Summer				42.255
S115.005	S394	15 Winter	100	+40%	30/15 Summer				42.041
S113.004	S346	15 Winter	100	+40%	30/15 Summer				41.889
S112.003	S377	15 Winter	100	+40%	30/15 Summer				37.405
S112.004	S361	15 Winter	100	+40%	30/15 Summer				35.752
S112.005	S362	15 Winter	100	+40%	30/15 Summer				31.907
S116.000	S395	15 Winter	100	+40%	30/15 Summer				33.802
S116.001	S396	15 Winter	100	+40%	30/15 Summer				32.800
S116.002	S364	15 Winter	100	+40%	30/15 Summer				32.475
S112.006	S356	15 Winter	100	+40%					30.408
S107.025	S383	60 Winter	100	+40%					25.103
S107.026	S384	60 Winter	100	+40%					25.097
S107.027	S385	60 Winter	100	+40%	30/15 Summer				25.083
S1.035	S342	60 Winter	100	+40%					22.686
S1.036	S418	60 Winter	100	+40%					21.799
S1.037	S418	5760 Winter	100	+40%					21.353
S1.038	S417	5760 Winter	100	+40%					21.276
S117.000	S394	360 Winter	100	+40%					34.740

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.016	S366	0.068	0.000	1.03		621.7	SURCHARGED	
S107.017	S335	-4.525	0.000	0.02		780.5	OK	
S107.018	S367	-1.165	0.000	0.11		760.9	OK	
S107.019	S377	-1.529	0.000	0.06		707.2	OK	
S107.020	S378	-1.479	0.000	0.06		678.7	OK	
S107.021	S379	-1.664	0.000	0.05		658.0	OK	
S107.022	S380	-1.779	0.000	0.04		619.7	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface water - SSR

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S107.023	S381	-1.853	0.000	0.02		530.3	OK	
S107.024	S382	-1.923	0.000	0.02		474.3	OK	
S112.000	S358	0.627	0.000	0.78		132.7	SURCHARGED	
S112.001	S359	0.856	0.000	0.95		120.9	SURCHARGED	
S112.002	S360	0.933	0.000	0.60		113.2	SURCHARGED	
S113.000	S320	-0.156	0.000	0.46		119.9	OK	
S113.001	S321	0.158	0.000	0.73		188.0	SURCHARGED	
S113.002	S344	1.666	0.000	1.00		239.4	SURCHARGED	
S113.003	S345	1.840	0.000	0.91		221.5	SURCHARGED	
S114.000	S374	1.894	0.000	0.69		75.9	SURCHARGED	
S114.001	S346	2.978	14.325	1.30		144.5	FLOOD	6
S114.002	S347	2.618	0.000	1.37		136.4	SURCHARGED	
S114.003	S348	2.356	0.000	1.37		144.6	SURCHARGED	
S115.000	S340	0.953	0.000	0.62		119.0	SURCHARGED	
S115.001	S342	1.957	6.016	1.15		218.3	FLOOD	4
S115.002	S343	1.902	0.174	1.11		202.9	FLOOD	2
S115.003	S344	1.656	24.315	1.27		251.0	FLOOD	5
S115.004	S393	1.835	0.000	1.25		247.1	SURCHARGED	
S115.005	S394	2.012	0.000	1.42		261.5	SURCHARGED	
S113.004	S346	2.091	0.000	1.03		485.6	SURCHARGED	
S112.003	S377	1.931	0.000	1.11		587.2	SURCHARGED	
S112.004	S361	1.661	0.000	1.15		644.3	SURCHARGED	
S112.005	S362	0.663	0.000	1.41		657.9	SURCHARGED	
S116.000	S395	1.352	0.000	0.97		70.2	SURCHARGED	
S116.001	S396	1.365	0.000	1.15		75.8	SURCHARGED	
S116.002	S364	1.351	0.000	1.79		124.8	SURCHARGED	
S112.006	S356	-0.147	0.000	0.79		778.6	OK	
S107.025	S383	-2.076	0.000	0.03		823.8	OK	
S107.026	S384	-2.114	0.000	0.02		748.1	OK	
S107.027	S385	0.902	0.000	1.55		529.7	SURCHARGED	
S1.035	S342	-1.114	0.000	0.71		5884.4	OK*	
S1.036	S418	-2.201	0.000	0.12		5884.2	OK	
S1.037	S418	-0.247	0.000	0.07		445.9	FLOOD RISK*	
S1.038	S417	-0.524	0.000	0.01		86.6	OK	
S117.000	S394	-1.143	0.000	0.00		0.0	OK	

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F.2. South Site

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.701	0.501	22.5	611.5	O K
30 min Summer	98.875	0.675	22.5	860.7	O K
60 min Summer	99.061	0.861	22.5	1152.3	O K
120 min Summer	99.250	1.050	22.5	1471.9	O K
180 min Summer	99.347	1.147	22.5	1646.8	O K
240 min Summer	99.403	1.203	22.5	1752.3	O K
360 min Summer	99.475	1.275	22.5	1890.2	O K
480 min Summer	99.514	1.314	22.5	1965.4	O K
600 min Summer	99.533	1.333	22.5	2004.1	O K
720 min Summer	99.541	1.341	22.5	2019.4	O K
960 min Summer	99.544	1.344	22.5	2025.1	O K
1440 min Summer	99.530	1.330	22.5	1997.6	O K
2160 min Summer	99.490	1.290	22.5	1918.5	O K
2880 min Summer	99.440	1.240	22.5	1822.2	O K
4320 min Summer	99.335	1.135	22.5	1625.2	O K
5760 min Summer	99.217	1.017	22.5	1415.1	O K
7200 min Summer	99.074	0.874	22.5	1172.1	O K
8640 min Summer	98.949	0.749	22.5	973.8	O K
10080 min Summer	98.840	0.640	22.5	809.3	O K
15 min Winter	98.756	0.556	22.5	687.1	O K
30 min Winter	98.945	0.745	22.5	968.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	612.9	26
30 min Summer	74.920	0.0	871.1	41
60 min Summer	50.812	0.0	1204.7	70
120 min Summer	33.237	0.0	1577.3	130
180 min Summer	25.439	0.0	1811.0	188
240 min Summer	20.836	0.0	1977.6	248
360 min Summer	15.743	0.0	2240.3	364
480 min Summer	12.875	0.0	2441.1	484
600 min Summer	11.001	0.0	2605.0	602
720 min Summer	9.667	0.0	2743.6	708
960 min Summer	7.872	0.0	2968.0	818
1440 min Summer	5.875	0.0	3242.0	1076
2160 min Summer	4.369	0.0	3754.1	1484
2880 min Summer	3.534	0.0	4047.2	1908
4320 min Summer	2.625	0.0	4503.5	2732
5760 min Summer	2.128	0.0	4883.8	3576
7200 min Summer	1.809	0.0	5189.4	4264
8640 min Summer	1.586	0.0	5456.2	5008
10080 min Summer	1.420	0.0	5692.8	5656
15 min Winter	105.919	0.0	687.8	26
30 min Winter	74.920	0.0	976.3	40

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.149	0.949	22.5	1298.2	O K
120 min Winter	99.354	1.154	22.5	1660.5	O K
180 min Winter	99.461	1.261	22.5	1861.8	O K
240 min Winter	99.524	1.324	22.5	1986.4	O K
360 min Winter	99.607	1.407	22.5	2154.0	O K
480 min Winter	99.655	1.455	22.5	2251.5	O K
600 min Winter	99.682	1.482	22.5	2308.4	O K
720 min Winter	99.696	1.496	22.5	2339.1	O K
960 min Winter	99.702	1.502	22.5	2351.6	Flood Risk
1440 min Winter	99.680	1.480	22.5	2305.7	O K
2160 min Winter	99.624	1.424	22.5	2187.6	O K
2880 min Winter	99.549	1.349	22.5	2035.6	O K
4320 min Winter	99.385	1.185	22.5	1718.2	O K
5760 min Winter	99.189	0.989	22.5	1365.4	O K
7200 min Winter	98.957	0.757	22.5	985.4	O K
8640 min Winter	98.770	0.570	22.5	707.6	O K
10080 min Winter	98.624	0.424	22.5	506.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	1349.9	70
120 min Winter	33.237	0.0	1766.8	126
180 min Winter	25.439	0.0	2028.3	184
240 min Winter	20.836	0.0	2214.5	242
360 min Winter	15.743	0.0	2507.5	358
480 min Winter	12.875	0.0	2730.8	472
600 min Winter	11.001	0.0	2911.8	584
720 min Winter	9.667	0.0	3063.0	694
960 min Winter	7.872	0.0	3295.5	906
1440 min Winter	5.875	0.0	3372.2	1134
2160 min Winter	4.369	0.0	4204.7	1604
2880 min Winter	3.534	0.0	4532.7	2072
4320 min Winter	2.625	0.0	5040.9	2980
5760 min Winter	2.128	0.0	5470.3	3864
7200 min Winter	1.809	0.0	5812.8	4472
8640 min Winter	1.586	0.0	6112.1	5112
10080 min Winter	1.420	0.0	6378.5	5752

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.190

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.000	4	8	1.000	8	12	1.190

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1066.1	1.800	2378.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0202-2250-1500-2250
Design Head (m)	1.500
Design Flow (l/s)	22.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	202
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	22.5
Flush-Flo™	0.455	22.5
Kick-Flo®	0.994	18.5
Mean Flow over Head Range	-	19.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.0	1.200	20.2	3.000	31.3	7.000	47.2
0.200	19.2	1.400	21.8	3.500	33.8	7.500	48.8
0.300	21.8	1.600	23.2	4.000	36.0	8.000	50.3
0.400	22.4	1.800	24.5	4.500	38.1	8.500	51.8
0.500	22.4	2.000	25.8	5.000	40.1	9.000	53.3
0.600	22.2	2.200	27.0	5.500	42.0	9.500	54.7
0.800	21.3	2.400	28.2	6.000	43.8		
1.000	18.5	2.600	29.3	6.500	45.5		

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Woodcote Grove
Ashley Road
Epsom Surrey KT18 5BW

Date 12/08/2019 16:23 | Designed by GONZ7537
File POND 2 VOLUME - SOURCE ... | Checked by
Innovyze | Source Control 2018.1.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.707	0.507	19.6	396.8	O K
30 min Summer	98.883	0.683	19.6	556.1	O K
60 min Summer	99.071	0.871	19.6	739.6	O K
120 min Summer	99.257	1.057	19.6	935.4	O K
180 min Summer	99.348	1.148	19.6	1035.8	O K
240 min Summer	99.397	1.197	19.6	1091.1	O K
360 min Summer	99.451	1.251	19.6	1154.3	O K
480 min Summer	99.471	1.271	19.6	1177.6	O K
600 min Summer	99.477	1.277	19.6	1184.1	O K
720 min Summer	99.478	1.278	19.6	1185.0	O K
960 min Summer	99.469	1.269	19.6	1175.3	O K
1440 min Summer	99.435	1.235	19.6	1135.3	O K
2160 min Summer	99.365	1.165	19.6	1054.9	O K
2880 min Summer	99.285	1.085	19.6	965.1	O K
4320 min Summer	99.089	0.889	19.6	758.4	O K
5760 min Summer	98.906	0.706	19.6	578.2	O K
7200 min Summer	98.755	0.555	19.6	439.6	O K
8640 min Summer	98.638	0.438	19.6	337.6	O K
10080 min Summer	98.551	0.351	19.4	265.1	O K
15 min Winter	98.763	0.563	19.6	446.1	O K
30 min Winter	98.956	0.756	19.6	625.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	404.6	22
30 min Summer	74.920	0.0	574.6	37
60 min Summer	50.812	0.0	788.2	66
120 min Summer	33.237	0.0	1032.0	126
180 min Summer	25.439	0.0	1185.1	184
240 min Summer	20.836	0.0	1294.4	244
360 min Summer	15.743	0.0	1467.1	362
480 min Summer	12.875	0.0	1599.7	480
600 min Summer	11.001	0.0	1708.5	530
720 min Summer	9.667	0.0	1801.3	596
960 min Summer	7.872	0.0	1954.8	724
1440 min Summer	5.875	0.0	2184.8	998
2160 min Summer	4.369	0.0	2450.6	1412
2880 min Summer	3.534	0.0	2642.6	1840
4320 min Summer	2.625	0.0	2942.6	2600
5760 min Summer	2.128	0.0	3185.3	3336
7200 min Summer	1.809	0.0	3384.7	4032
8640 min Summer	1.586	0.0	3559.2	4672
10080 min Summer	1.420	0.0	3714.6	5344
15 min Winter	105.919	0.0	453.8	22
30 min Winter	74.920	0.0	644.1	36

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.164	0.964	19.6	835.0	O K
120 min Winter	99.367	1.167	19.6	1057.5	O K
180 min Winter	99.469	1.269	19.6	1174.8	O K
240 min Winter	99.526	1.326	19.6	1242.2	O K
360 min Winter	99.593	1.393	19.6	1324.0	O K
480 min Winter	99.623	1.423	19.6	1361.6	O K
600 min Winter	99.634	1.434	19.6	1374.5	O K
720 min Winter	99.632	1.432	19.6	1372.5	O K
960 min Winter	99.618	1.418	19.6	1355.3	O K
1440 min Winter	99.569	1.369	19.6	1294.9	O K
2160 min Winter	99.462	1.262	19.6	1166.9	O K
2880 min Winter	99.337	1.137	19.6	1023.8	O K
4320 min Winter	99.018	0.818	19.6	686.5	O K
5760 min Winter	98.742	0.542	19.6	427.4	O K
7200 min Winter	98.553	0.353	19.4	266.4	O K
8640 min Winter	98.445	0.245	18.4	180.3	O K
10080 min Winter	98.398	0.198	17.3	144.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	883.2	66
120 min Winter	33.237	0.0	1156.1	124
180 min Winter	25.439	0.0	1327.6	180
240 min Winter	20.836	0.0	1450.0	238
360 min Winter	15.743	0.0	1643.3	352
480 min Winter	12.875	0.0	1791.7	464
600 min Winter	11.001	0.0	1913.4	572
720 min Winter	9.667	0.0	2017.1	672
960 min Winter	7.872	0.0	2188.6	762
1440 min Winter	5.875	0.0	2443.9	1072
2160 min Winter	4.369	0.0	2744.9	1536
2880 min Winter	3.534	0.0	2959.9	1992
4320 min Winter	2.625	0.0	3296.7	2768
5760 min Winter	2.128	0.0	3567.7	3408
7200 min Winter	1.809	0.0	3791.2	4032
8640 min Winter	1.586	0.0	3986.8	4592
10080 min Winter	1.420	0.0	4161.6	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.080

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.000	4	8	1.080

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	695.9	1.800	1415.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0190-1960-1500-1960
Design Head (m)	1.500
Design Flow (l/s)	19.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	190
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	19.6
Flush-Flo™	0.451	19.6
Kick-Flo®	0.982	16.0
Mean Flow over Head Range	-	16.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	17.6	3.000	27.3	7.000	41.1
0.200	17.5	1.400	19.0	3.500	29.4	7.500	42.5
0.300	19.1	1.600	20.2	4.000	31.3	8.000	43.8
0.400	19.6	1.800	21.4	4.500	33.2	8.500	45.1
0.500	19.6	2.000	22.5	5.000	34.9	9.000	46.4
0.600	19.3	2.200	23.5	5.500	36.5	9.500	47.6
0.800	18.5	2.400	24.5	6.000	38.1		
1.000	16.2	2.600	25.5	6.500	39.6		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.670	0.470	63.9	1675.2	O K
30 min Summer	98.840	0.640	64.1	2356.6	O K
60 min Summer	99.028	0.828	64.1	3158.5	O K
120 min Summer	99.221	1.021	64.1	4036.6	O K
180 min Summer	99.325	1.125	64.1	4534.0	O K
240 min Summer	99.387	1.187	64.1	4837.1	O K
360 min Summer	99.466	1.266	64.1	5233.4	O K
480 min Summer	99.509	1.309	64.1	5453.3	O K
600 min Summer	99.532	1.332	64.1	5570.7	O K
720 min Summer	99.542	1.342	64.1	5623.9	O K
960 min Summer	99.551	1.351	64.1	5668.4	O K
1440 min Summer	99.543	1.343	64.1	5627.5	O K
2160 min Summer	99.503	1.303	64.1	5422.0	O K
2880 min Summer	99.449	1.249	64.1	5146.2	O K
4320 min Summer	99.331	1.131	64.1	4562.5	O K
5760 min Summer	99.191	0.991	64.1	3892.7	O K
7200 min Summer	99.060	0.860	64.1	3300.3	O K
8640 min Summer	98.944	0.744	64.1	2795.1	O K
10080 min Summer	98.843	0.643	64.1	2368.4	O K
15 min Winter	98.722	0.522	64.1	1881.1	O K
30 min Winter	98.910	0.710	64.1	2650.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	1602.6	30
30 min Summer	74.920	0.0	2299.7	44
60 min Summer	50.812	0.0	3259.1	74
120 min Summer	33.237	0.0	4275.3	132
180 min Summer	25.439	0.0	4911.0	192
240 min Summer	20.836	0.0	5363.3	250
360 min Summer	15.743	0.0	6074.9	366
480 min Summer	12.875	0.0	6617.0	484
600 min Summer	11.001	0.0	7057.6	602
720 min Summer	9.667	0.0	7428.4	694
960 min Summer	7.872	0.0	8024.1	806
1440 min Summer	5.875	0.0	8783.4	1062
2160 min Summer	4.369	0.0	10258.9	1476
2880 min Summer	3.534	0.0	11055.8	1888
4320 min Summer	2.625	0.0	12286.2	2728
5760 min Summer	2.128	0.0	13378.7	3472
7200 min Summer	1.809	0.0	14212.1	4248
8640 min Summer	1.586	0.0	14934.9	4936
10080 min Summer	1.420	0.0	15563.2	5648
15 min Winter	105.919	0.0	1805.3	30
30 min Winter	74.920	0.0	2582.9	44

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.117	0.917	64.1	3556.5	O K
120 min Winter	99.331	1.131	64.1	4560.2	O K
180 min Winter	99.444	1.244	64.1	5122.0	O K
240 min Winter	99.513	1.313	64.1	5470.8	O K
360 min Winter	99.603	1.403	64.1	5942.0	O K
480 min Winter	99.655	1.455	64.1	6218.0	O K
600 min Winter	99.685	1.485	64.1	6381.1	O K
720 min Winter	99.701	1.501	64.1	6471.1	Flood Risk
960 min Winter	99.709	1.509	64.3	6515.2	Flood Risk
1440 min Winter	99.693	1.493	64.1	6425.9	O K
2160 min Winter	99.634	1.434	64.1	6108.2	O K
2880 min Winter	99.553	1.353	64.1	5678.1	O K
4320 min Winter	99.370	1.170	64.1	4751.8	O K
5760 min Winter	99.140	0.940	64.1	3662.0	O K
7200 min Winter	98.936	0.736	64.1	2757.2	O K
8640 min Winter	98.766	0.566	64.1	2053.7	O K
10080 min Winter	98.639	0.439	63.7	1557.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	3655.4	72
120 min Winter	33.237	0.0	4791.4	130
180 min Winter	25.439	0.0	5501.7	188
240 min Winter	20.836	0.0	6006.7	244
360 min Winter	15.743	0.0	6799.5	360
480 min Winter	12.875	0.0	7401.0	474
600 min Winter	11.001	0.0	7886.4	586
720 min Winter	9.667	0.0	8290.7	696
960 min Winter	7.872	0.0	8919.1	904
1440 min Winter	5.875	0.0	9464.8	1126
2160 min Winter	4.369	0.0	11491.5	1592
2880 min Winter	3.534	0.0	12382.4	2056
4320 min Winter	2.625	0.0	13750.8	2948
5760 min Winter	2.128	0.0	14987.6	3704
7200 min Winter	1.809	0.0	15922.5	4408
8640 min Winter	1.586	0.0	16734.8	5032
10080 min Winter	1.420	0.0	17446.9	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 8.750

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.000	4	8	2.000	8	12	2.000	12	16	2.750

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	3254.8	1.800	5967.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0321-6410-1500-6410
Design Head (m)	1.500
Design Flow (l/s)	64.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	321
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	64.1
Flush-Flo™	0.536	64.1
Kick-Flo®	1.092	55.0
Mean Flow over Head Range	-	53.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.6	1.200	57.6	3.000	89.7	7.000	135.5
0.200	32.9	1.400	62.0	3.500	96.7	7.500	140.2
0.300	57.8	1.600	66.1	4.000	103.2	8.000	144.7
0.400	63.1	1.800	70.0	4.500	109.2	8.500	149.0
0.500	64.0	2.000	73.7	5.000	115.0	9.000	153.3
0.600	64.0	2.200	77.1	5.500	120.5	9.500	157.4
0.800	62.4	2.400	80.5	6.000	125.7		
1.000	58.7	2.600	83.7	6.500	130.7		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.634	0.434	47.2	1248.5	O K
30 min Summer	98.799	0.599	47.4	1754.4	O K
60 min Summer	98.987	0.787	47.4	2349.2	O K
120 min Summer	99.184	0.984	47.4	2998.8	O K
180 min Summer	99.293	1.093	47.4	3368.7	O K
240 min Summer	99.358	1.158	47.4	3593.8	O K
360 min Summer	99.442	1.242	47.4	3888.2	O K
480 min Summer	99.488	1.288	47.4	4051.3	O K
600 min Summer	99.512	1.312	47.4	4138.4	O K
720 min Summer	99.523	1.323	47.4	4177.9	O K
960 min Summer	99.532	1.332	47.4	4210.6	O K
1440 min Summer	99.524	1.324	47.4	4180.7	O K
2160 min Summer	99.482	1.282	47.4	4029.9	O K
2880 min Summer	99.424	1.224	47.4	3826.8	O K
4320 min Summer	99.300	1.100	47.4	3395.1	O K
5760 min Summer	99.152	0.952	47.4	2893.1	O K
7200 min Summer	99.019	0.819	47.4	2454.9	O K
8640 min Summer	98.903	0.703	47.4	2080.9	O K
10080 min Summer	98.803	0.603	47.4	1765.0	O K
15 min Winter	98.685	0.485	47.4	1401.7	O K
30 min Winter	98.869	0.669	47.4	1972.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	1188.0	26
30 min Summer	74.920	0.0	1705.0	41
60 min Summer	50.812	0.0	2416.6	70
120 min Summer	33.237	0.0	3170.3	128
180 min Summer	25.439	0.0	3641.7	188
240 min Summer	20.836	0.0	3977.1	248
360 min Summer	15.743	0.0	4504.7	364
480 min Summer	12.875	0.0	4906.7	482
600 min Summer	11.001	0.0	5233.3	602
720 min Summer	9.667	0.0	5508.2	694
960 min Summer	7.872	0.0	5949.6	806
1440 min Summer	5.875	0.0	6508.7	1062
2160 min Summer	4.369	0.0	7608.3	1476
2880 min Summer	3.534	0.0	8199.2	1900
4320 min Summer	2.625	0.0	9111.5	2728
5760 min Summer	2.128	0.0	9922.8	3512
7200 min Summer	1.809	0.0	10540.8	4248
8640 min Summer	1.586	0.0	11076.9	4936
10080 min Summer	1.420	0.0	11542.7	5648
15 min Winter	105.919	0.0	1338.3	26
30 min Winter	74.920	0.0	1915.2	40

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.077	0.877	47.4	2643.3	O K
120 min Winter	99.298	1.098	47.4	3387.3	O K
180 min Winter	99.418	1.218	47.4	3804.6	O K
240 min Winter	99.491	1.291	47.4	4063.4	O K
360 min Winter	99.588	1.388	47.4	4412.3	O K
480 min Winter	99.644	1.444	47.4	4616.7	O K
600 min Winter	99.677	1.477	47.4	4737.7	O K
720 min Winter	99.695	1.495	47.5	4804.6	O K
960 min Winter	99.704	1.504	47.6	4837.8	Flood Risk
1440 min Winter	99.686	1.486	47.4	4772.6	O K
2160 min Winter	99.623	1.423	47.4	4540.1	O K
2880 min Winter	99.536	1.336	47.4	4224.6	O K
4320 min Winter	99.343	1.143	47.4	3541.7	O K
5760 min Winter	99.102	0.902	47.4	2726.6	O K
7200 min Winter	98.896	0.696	47.4	2057.7	O K
8640 min Winter	98.729	0.529	47.4	1536.0	O K
10080 min Winter	98.607	0.407	47.0	1166.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	2710.6	70
120 min Winter	33.237	0.0	3553.0	126
180 min Winter	25.439	0.0	4079.7	184
240 min Winter	20.836	0.0	4454.2	242
360 min Winter	15.743	0.0	5042.0	358
480 min Winter	12.875	0.0	5487.9	472
600 min Winter	11.001	0.0	5847.9	584
720 min Winter	9.667	0.0	6147.4	694
960 min Winter	7.872	0.0	6612.5	902
1440 min Winter	5.875	0.0	7002.2	1124
2160 min Winter	4.369	0.0	8522.5	1588
2880 min Winter	3.534	0.0	9183.1	2052
4320 min Winter	2.625	0.0	10197.2	2948
5760 min Winter	2.128	0.0	11116.2	3744
7200 min Winter	1.809	0.0	11809.4	4400
8640 min Winter	1.586	0.0	12411.9	5096
10080 min Winter	1.420	0.0	12939.9	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.490

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	2.000	4	8	2.000	8	12	2.490

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2745.5	1.800	3921.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0282-4760-1500-4760
Design Head (m)	1.500
Design Flow (l/s)	47.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	282
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	47.6
Flush-Flo™	0.501	47.4
Kick-Flo®	1.061	40.3
Mean Flow over Head Range	-	40.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.8	1.200	42.7	3.000	66.5	7.000	100.4
0.200	29.1	1.400	46.0	3.500	71.6	7.500	103.8
0.300	45.3	1.600	49.1	4.000	76.4	8.000	107.1
0.400	47.0	1.800	51.9	4.500	80.9	8.500	110.3
0.500	47.4	2.000	54.6	5.000	85.2	9.000	113.5
0.600	47.1	2.200	57.2	5.500	89.2	9.500	116.5
0.800	45.8	2.400	59.7	6.000	93.1		
1.000	42.4	2.600	62.0	6.500	96.8		

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Woodcote Grove
Ashley Road
Epsom Surrey KT18 5BW

Date 12/08/2019 16:27 | Designed by GONZ7537
File POND 5 VOLUME - SOURCE ... | Checked by
Innovyze | Source Control 2018.1.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.647	0.447	46.1	1232.8	O K
30 min Summer	98.814	0.614	46.2	1732.9	O K
60 min Summer	99.001	0.801	46.2	2320.8	O K
120 min Summer	99.196	0.996	46.2	2963.5	O K
180 min Summer	99.304	1.104	46.2	3329.4	O K
240 min Summer	99.367	1.167	46.2	3551.5	O K
360 min Summer	99.449	1.249	46.2	3843.0	O K
480 min Summer	99.494	1.294	46.2	4005.5	O K
600 min Summer	99.519	1.319	46.2	4093.2	O K
720 min Summer	99.529	1.329	46.2	4133.0	O K
960 min Summer	99.538	1.338	46.2	4163.8	O K
1440 min Summer	99.530	1.330	46.2	4133.4	O K
2160 min Summer	99.489	1.289	46.2	3985.5	O K
2880 min Summer	99.434	1.234	46.2	3788.2	O K
4320 min Summer	99.315	1.115	46.2	3370.4	O K
5760 min Summer	99.173	0.973	46.2	2884.1	O K
7200 min Summer	99.040	0.840	46.2	2447.1	O K
8640 min Summer	98.923	0.723	46.2	2073.2	O K
10080 min Summer	98.822	0.622	46.2	1757.3	O K
15 min Winter	98.698	0.498	46.2	1384.2	O K
30 min Winter	98.883	0.683	46.2	1948.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	1180.6	26
30 min Summer	74.920	0.0	1691.9	41
60 min Summer	50.812	0.0	2391.1	70
120 min Summer	33.237	0.0	3135.9	128
180 min Summer	25.439	0.0	3601.8	188
240 min Summer	20.836	0.0	3933.3	248
360 min Summer	15.743	0.0	4454.8	364
480 min Summer	12.875	0.0	4852.1	482
600 min Summer	11.001	0.0	5174.8	602
720 min Summer	9.667	0.0	5446.3	702
960 min Summer	7.872	0.0	5881.3	812
1440 min Summer	5.875	0.0	6418.7	1068
2160 min Summer	4.369	0.0	7518.0	1476
2880 min Summer	3.534	0.0	8102.0	1904
4320 min Summer	2.625	0.0	9003.7	2732
5760 min Summer	2.128	0.0	9802.3	3520
7200 min Summer	1.809	0.0	10413.2	4248
8640 min Summer	1.586	0.0	10943.5	4936
10080 min Summer	1.420	0.0	11405.4	5648
15 min Winter	105.919	0.0	1329.2	26
30 min Winter	74.920	0.0	1899.6	40

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.091	0.891	46.2	2611.4	O K
120 min Winter	99.309	1.109	46.2	3347.2	O K
180 min Winter	99.426	1.226	46.2	3759.7	O K
240 min Winter	99.497	1.297	46.2	4016.0	O K
360 min Winter	99.592	1.392	46.2	4362.4	O K
480 min Winter	99.646	1.446	46.2	4566.4	O K
600 min Winter	99.679	1.479	46.2	4687.9	O K
720 min Winter	99.697	1.497	46.2	4755.9	O K
960 min Winter	99.706	1.506	46.3	4792.2	Flood Risk
1440 min Winter	99.689	1.489	46.2	4726.2	O K
2160 min Winter	99.629	1.429	46.2	4500.7	O K
2880 min Winter	99.546	1.346	46.2	4193.1	O K
4320 min Winter	99.361	1.161	46.2	3530.3	O K
5760 min Winter	99.129	0.929	46.2	2737.8	O K
7200 min Winter	98.921	0.721	46.2	2065.6	O K
8640 min Winter	98.750	0.550	46.2	1539.2	O K
10080 min Winter	98.621	0.421	46.0	1159.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	2681.6	70
120 min Winter	33.237	0.0	3514.1	126
180 min Winter	25.439	0.0	4034.7	184
240 min Winter	20.836	0.0	4404.8	242
360 min Winter	15.743	0.0	4985.6	358
480 min Winter	12.875	0.0	5426.0	472
600 min Winter	11.001	0.0	5781.1	584
720 min Winter	9.667	0.0	6076.1	694
960 min Winter	7.872	0.0	6529.7	904
1440 min Winter	5.875	0.0	6839.8	1128
2160 min Winter	4.369	0.0	8421.0	1600
2880 min Winter	3.534	0.0	9074.0	2056
4320 min Winter	2.625	0.0	10075.6	2948
5760 min Winter	2.128	0.0	10980.9	3752
7200 min Winter	1.809	0.0	11666.1	4464
8640 min Winter	1.586	0.0	12262.0	5104
10080 min Winter	1.420	0.0	12785.3	5664

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.410

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	2.000	4	8	2.000	8	12	2.410

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2593.7	1.800	4072.9

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0279-4620-1500-4620
Design Head (m)	1.500
Design Flow (l/s)	46.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	279
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	46.2
Flush-Flo™	0.496	46.2
Kick-Flo®	1.060	39.1
Mean Flow over Head Range	-	39.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.7	1.200	41.5	3.000	64.5	7.000	97.4
0.200	28.7	1.400	44.7	3.500	69.5	7.500	100.8
0.300	44.3	1.600	47.6	4.000	74.2	8.000	104.0
0.400	45.8	1.800	50.4	4.500	78.6	8.500	107.1
0.500	46.2	2.000	53.0	5.000	82.7	9.000	110.1
0.600	45.9	2.200	55.5	5.500	86.6	9.500	113.1
0.800	44.5	2.400	57.9	6.000	90.4		
1.000	41.2	2.600	60.2	6.500	94.0		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.667	0.467	33.1	860.7	O K
30 min Summer	98.837	0.637	33.1	1212.1	O K
60 min Summer	99.024	0.824	33.1	1624.6	O K
120 min Summer	99.216	1.016	33.1	2075.8	O K
180 min Summer	99.318	1.118	33.1	2327.1	O K
240 min Summer	99.378	1.178	33.1	2477.9	O K
360 min Summer	99.453	1.253	33.1	2674.0	O K
480 min Summer	99.494	1.294	33.1	2780.5	O K
600 min Summer	99.514	1.314	33.1	2835.1	O K
720 min Summer	99.522	1.322	33.1	2857.0	O K
960 min Summer	99.527	1.327	33.1	2869.7	O K
1440 min Summer	99.514	1.314	33.1	2834.5	O K
2160 min Summer	99.471	1.271	33.1	2719.6	O K
2880 min Summer	99.416	1.216	33.1	2575.6	O K
4320 min Summer	99.298	1.098	33.1	2277.1	O K
5760 min Summer	99.155	0.955	33.1	1927.8	O K
7200 min Summer	99.018	0.818	33.1	1609.7	O K
8640 min Summer	98.898	0.698	33.1	1343.1	O K
10080 min Summer	98.793	0.593	33.1	1119.2	O K
15 min Winter	98.720	0.520	33.1	967.1	O K
30 min Winter	98.908	0.708	33.1	1363.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	851.5	30
30 min Summer	74.920	0.0	1214.6	44
60 min Summer	50.812	0.0	1694.7	74
120 min Summer	33.237	0.0	2220.5	132
180 min Summer	25.439	0.0	2550.0	192
240 min Summer	20.836	0.0	2784.8	250
360 min Summer	15.743	0.0	3154.7	366
480 min Summer	12.875	0.0	3437.2	484
600 min Summer	11.001	0.0	3667.6	602
720 min Summer	9.667	0.0	3862.4	696
960 min Summer	7.872	0.0	4177.8	808
1440 min Summer	5.875	0.0	4590.6	1066
2160 min Summer	4.369	0.0	5300.6	1480
2880 min Summer	3.534	0.0	5713.8	1904
4320 min Summer	2.625	0.0	6355.9	2732
5760 min Summer	2.128	0.0	6901.4	3520
7200 min Summer	1.809	0.0	7332.5	4248
8640 min Summer	1.586	0.0	7708.0	4936
10080 min Summer	1.420	0.0	8038.4	5648
15 min Winter	105.919	0.0	957.0	30
30 min Winter	74.920	0.0	1362.4	44

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.113	0.913	33.1	1830.0	O K
120 min Winter	99.325	1.125	33.1	2344.7	O K
180 min Winter	99.437	1.237	33.1	2630.0	O K
240 min Winter	99.503	1.303	33.1	2806.2	O K
360 min Winter	99.591	1.391	33.1	3042.8	O K
480 min Winter	99.641	1.441	33.1	3179.4	O K
600 min Winter	99.669	1.469	33.1	3258.3	O K
720 min Winter	99.684	1.484	33.1	3300.0	O K
960 min Winter	99.689	1.489	33.1	3314.4	O K
1440 min Winter	99.667	1.467	33.1	3253.8	O K
2160 min Winter	99.604	1.404	33.1	3079.2	O K
2880 min Winter	99.521	1.321	33.1	2853.8	O K
4320 min Winter	99.338	1.138	33.1	2376.6	O K
5760 min Winter	99.101	0.901	33.1	1802.2	O K
7200 min Winter	98.888	0.688	33.1	1321.3	O K
8640 min Winter	98.713	0.513	33.1	952.6	O K
10080 min Winter	98.585	0.385	32.9	697.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	1899.7	72
120 min Winter	33.237	0.0	2487.8	130
180 min Winter	25.439	0.0	2856.3	188
240 min Winter	20.836	0.0	3118.6	246
360 min Winter	15.743	0.0	3531.2	360
480 min Winter	12.875	0.0	3845.4	474
600 min Winter	11.001	0.0	4100.1	586
720 min Winter	9.667	0.0	4313.5	696
960 min Winter	7.872	0.0	4648.6	904
1440 min Winter	5.875	0.0	4915.0	1128
2160 min Winter	4.369	0.0	5937.1	1596
2880 min Winter	3.534	0.0	6399.4	2056
4320 min Winter	2.625	0.0	7114.9	2952
5760 min Winter	2.128	0.0	7730.7	3752
7200 min Winter	1.809	0.0	8214.0	4408
8640 min Winter	1.586	0.0	8635.5	5032
10080 min Winter	1.420	0.0	9008.5	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.510

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.000	4	8	1.000	8	12	1.000	12	16	1.510

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1680.1	1.800	3097.6

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0241-3310-1500-3310
Design Head (m)	1.500
Design Flow (l/s)	33.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	241
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	33.1
Flush-Flo™	0.468	33.1
Kick-Flo®	1.027	27.6
Mean Flow over Head Range	-	28.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.9	1.200	29.7	3.000	46.2	7.000	69.6
0.200	24.4	1.400	32.0	3.500	49.7	7.500	72.0
0.300	32.0	1.600	34.1	4.000	53.1	8.000	74.3
0.400	32.9	1.800	36.1	4.500	56.2	8.500	76.5
0.500	33.1	2.000	38.0	5.000	59.1	9.000	78.7
0.600	32.8	2.200	39.8	5.500	61.9	9.500	80.8
0.800	31.6	2.400	41.5	6.000	64.6		
1.000	28.5	2.600	43.1	6.500	67.2		

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Woodcote Grove
Ashley Road
Epsom Surrey KT18 5BW

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Innovyze | Source Control 2018.1.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.643	0.443	29.2	762.9	O K
30 min Summer	98.811	0.611	29.3	1075.1	O K
60 min Summer	99.000	0.800	29.3	1441.1	O K
120 min Summer	99.198	0.998	29.3	1842.7	O K
180 min Summer	99.304	1.104	29.3	2066.8	O K
240 min Summer	99.367	1.167	29.3	2201.4	O K
360 min Summer	99.447	1.247	29.3	2376.7	O K
480 min Summer	99.490	1.290	29.3	2472.1	O K
600 min Summer	99.512	1.312	29.3	2521.4	O K
720 min Summer	99.521	1.321	29.3	2541.6	O K
960 min Summer	99.527	1.327	29.3	2554.2	O K
1440 min Summer	99.514	1.314	29.3	2525.2	O K
2160 min Summer	99.469	1.269	29.3	2425.3	O K
2880 min Summer	99.412	1.212	29.3	2299.2	O K
4320 min Summer	99.290	1.090	29.3	2037.2	O K
5760 min Summer	99.142	0.942	29.3	1728.8	O K
7200 min Summer	99.002	0.802	29.3	1445.1	O K
8640 min Summer	98.881	0.681	29.3	1208.6	O K
10080 min Summer	98.777	0.577	29.3	1010.2	O K
15 min Winter	98.695	0.495	29.3	857.3	O K
30 min Winter	98.882	0.682	29.3	1209.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	752.6	29
30 min Summer	74.920	0.0	1074.2	44
60 min Summer	50.812	0.0	1501.5	72
120 min Summer	33.237	0.0	1967.6	132
180 min Summer	25.439	0.0	2259.6	190
240 min Summer	20.836	0.0	2467.6	248
360 min Summer	15.743	0.0	2795.3	366
480 min Summer	12.875	0.0	3045.5	484
600 min Summer	11.001	0.0	3249.4	602
720 min Summer	9.667	0.0	3421.6	696
960 min Summer	7.872	0.0	3700.1	808
1440 min Summer	5.875	0.0	4060.4	1066
2160 min Summer	4.369	0.0	4699.8	1480
2880 min Summer	3.534	0.0	5065.9	1904
4320 min Summer	2.625	0.0	5634.3	2732
5760 min Summer	2.128	0.0	6120.4	3520
7200 min Summer	1.809	0.0	6502.6	4248
8640 min Summer	1.586	0.0	6835.3	4936
10080 min Summer	1.420	0.0	7127.6	5648
15 min Winter	105.919	0.0	846.0	29
30 min Winter	74.920	0.0	1205.1	44

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.091	0.891	29.3	1623.7	O K
120 min Winter	99.311	1.111	29.3	2081.1	O K
180 min Winter	99.428	1.228	29.3	2334.9	O K
240 min Winter	99.499	1.299	29.3	2492.0	O K
360 min Winter	99.593	1.393	29.3	2702.7	O K
480 min Winter	99.646	1.446	29.3	2824.6	O K
600 min Winter	99.676	1.476	29.3	2895.3	O K
720 min Winter	99.693	1.493	29.3	2932.9	O K
960 min Winter	99.699	1.499	29.3	2946.9	O K
1440 min Winter	99.677	1.477	29.3	2896.0	O K
2160 min Winter	99.611	1.411	29.3	2744.3	O K
2880 min Winter	99.524	1.324	29.3	2546.9	O K
4320 min Winter	99.333	1.133	29.3	2128.6	O K
5760 min Winter	99.089	0.889	29.3	1620.5	O K
7200 min Winter	98.873	0.673	29.3	1192.3	O K
8640 min Winter	98.699	0.499	29.3	865.6	O K
10080 min Winter	98.574	0.374	29.0	638.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	1683.2	72
120 min Winter	33.237	0.0	2204.5	130
180 min Winter	25.439	0.0	2531.0	186
240 min Winter	20.836	0.0	2763.4	244
360 min Winter	15.743	0.0	3128.8	360
480 min Winter	12.875	0.0	3406.9	474
600 min Winter	11.001	0.0	3632.2	586
720 min Winter	9.667	0.0	3820.7	694
960 min Winter	7.872	0.0	4115.7	904
1440 min Winter	5.875	0.0	4341.2	1126
2160 min Winter	4.369	0.0	5264.2	1596
2880 min Winter	3.534	0.0	5673.8	2056
4320 min Winter	2.625	0.0	6306.8	2952
5760 min Winter	2.128	0.0	6855.9	3752
7200 min Winter	1.809	0.0	7284.4	4408
8640 min Winter	1.586	0.0	7657.9	5096
10080 min Winter	1.420	0.0	7988.1	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.000

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.000	4	8	1.000	8	12	1.000	12	16	1.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1624.0	1.800	2487.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0228-2930-1500-2930
Design Head (m)	1.500
Design Flow (l/s)	29.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	228
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	29.3
Flush-Flo™	0.459	29.3
Kick-Flo®	1.010	24.3
Mean Flow over Head Range	-	25.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	1.200	26.3	3.000	40.9	7.000	61.6
0.200	22.7	1.400	28.3	3.500	44.0	7.500	63.7
0.300	28.4	1.600	30.2	4.000	47.0	8.000	65.7
0.400	29.2	1.800	32.0	4.500	49.7	8.500	67.7
0.500	29.2	2.000	33.6	5.000	52.3	9.000	69.6
0.600	28.9	2.200	35.2	5.500	54.8	9.500	71.5
0.800	27.8	2.400	36.7	6.000	57.2		
1.000	24.6	2.600	38.2	6.500	59.4		

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Woodcote Grove
Ashley Road
Epsom Surrey KT18 5BW

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.629	0.429	47.9	1268.2	O K
30 min Summer	98.793	0.593	48.1	1781.8	O K
60 min Summer	98.980	0.780	48.1	2385.9	O K
120 min Summer	99.176	0.976	48.1	3045.4	O K
180 min Summer	99.286	1.086	48.1	3421.4	O K
240 min Summer	99.351	1.151	48.1	3651.0	O K
360 min Summer	99.436	1.236	48.1	3951.1	O K
480 min Summer	99.482	1.282	48.1	4117.5	O K
600 min Summer	99.507	1.307	48.1	4206.8	O K
720 min Summer	99.518	1.318	48.1	4247.6	O K
960 min Summer	99.527	1.327	48.1	4281.9	O K
1440 min Summer	99.519	1.319	48.1	4253.3	O K
2160 min Summer	99.477	1.277	48.1	4101.4	O K
2880 min Summer	99.420	1.220	48.1	3895.5	O K
4320 min Summer	99.295	1.095	48.1	3455.9	O K
5760 min Summer	99.147	0.947	48.1	2945.8	O K
7200 min Summer	99.015	0.815	48.1	2502.0	O K
8640 min Summer	98.899	0.699	48.1	2123.1	O K
10080 min Summer	98.800	0.600	48.1	1802.9	O K
15 min Winter	98.679	0.479	48.1	1423.7	O K
30 min Winter	98.862	0.662	48.1	2003.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	1202.4	26
30 min Summer	74.920	0.0	1726.9	41
60 min Summer	50.812	0.0	2451.5	70
120 min Summer	33.237	0.0	3216.5	130
180 min Summer	25.439	0.0	3694.9	188
240 min Summer	20.836	0.0	4035.2	248
360 min Summer	15.743	0.0	4570.6	364
480 min Summer	12.875	0.0	4978.3	482
600 min Summer	11.001	0.0	5309.5	602
720 min Summer	9.667	0.0	5588.1	694
960 min Summer	7.872	0.0	6035.2	806
1440 min Summer	5.875	0.0	6600.6	1062
2160 min Summer	4.369	0.0	7723.5	1476
2880 min Summer	3.534	0.0	8323.1	1900
4320 min Summer	2.625	0.0	9248.3	2728
5760 min Summer	2.128	0.0	10074.8	3472
7200 min Summer	1.809	0.0	10702.1	4248
8640 min Summer	1.586	0.0	11245.9	4936
10080 min Summer	1.420	0.0	11717.9	5648
15 min Winter	105.919	0.0	1355.0	26
30 min Winter	74.920	0.0	1940.1	40

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.070	0.870	48.1	2684.4	O K
120 min Winter	99.291	1.091	48.1	3440.0	O K
180 min Winter	99.411	1.211	48.1	3864.4	O K
240 min Winter	99.485	1.285	48.1	4127.6	O K
360 min Winter	99.582	1.382	48.1	4482.7	O K
480 min Winter	99.639	1.439	48.1	4690.9	O K
600 min Winter	99.672	1.472	48.1	4814.4	O K
720 min Winter	99.690	1.490	48.2	4882.8	O K
960 min Winter	99.700	1.500	48.4	4917.4	O K
1440 min Winter	99.682	1.482	48.1	4852.9	O K
2160 min Winter	99.619	1.419	48.1	4618.5	O K
2880 min Winter	99.532	1.332	48.1	4298.6	O K
4320 min Winter	99.338	1.138	48.1	3604.4	O K
5760 min Winter	99.097	0.897	48.1	2776.0	O K
7200 min Winter	98.892	0.692	48.1	2098.7	O K
8640 min Winter	98.726	0.526	48.1	1570.5	O K
10080 min Winter	98.606	0.406	47.8	1196.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	2749.9	70
120 min Winter	33.237	0.0	3604.9	128
180 min Winter	25.439	0.0	4139.5	184
240 min Winter	20.836	0.0	4519.4	242
360 min Winter	15.743	0.0	5115.7	358
480 min Winter	12.875	0.0	5568.0	472
600 min Winter	11.001	0.0	5932.8	584
720 min Winter	9.667	0.0	6236.5	694
960 min Winter	7.872	0.0	6707.5	902
1440 min Winter	5.875	0.0	7105.7	1124
2160 min Winter	4.369	0.0	8651.6	1588
2880 min Winter	3.534	0.0	9321.9	2052
4320 min Winter	2.625	0.0	10350.2	2948
5760 min Winter	2.128	0.0	11286.5	3704
7200 min Winter	1.809	0.0	11990.2	4400
8640 min Winter	1.586	0.0	12601.6	5096
10080 min Winter	1.420	0.0	13136.8	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.590

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	2.000	4	8	2.000	8	12	2.590

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2833.5	1.800	3944.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0284-4840-1500-4840
Design Head (m)	1.500
Design Flow (l/s)	48.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	284
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	48.4
Flush-Flo™	0.502	48.1
Kick-Flo®	1.060	40.9
Mean Flow over Head Range	-	40.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.9	1.200	43.5	3.000	67.6	7.000	102.1
0.200	29.3	1.400	46.8	3.500	72.9	7.500	105.6
0.300	46.1	1.600	49.9	4.000	77.8	8.000	109.0
0.400	47.7	1.800	52.8	4.500	82.3	8.500	112.3
0.500	48.1	2.000	55.6	5.000	86.7	9.000	115.4
0.600	47.9	2.200	58.2	5.500	90.8	9.500	118.5
0.800	46.5	2.400	60.7	6.000	94.7		
1.000	43.1	2.600	63.1	6.500	98.5		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.681	0.481	14.3	370.5	O K
30 min Summer	98.856	0.656	14.3	522.8	O K
60 min Summer	99.048	0.848	14.3	700.8	O K
120 min Summer	99.243	1.043	14.3	895.1	O K
180 min Summer	99.344	1.144	14.3	1000.1	O K
240 min Summer	99.403	1.203	14.3	1062.8	O K
360 min Summer	99.477	1.277	14.3	1143.5	O K
480 min Summer	99.515	1.315	14.3	1186.0	O K
600 min Summer	99.533	1.333	14.3	1206.4	O K
720 min Summer	99.539	1.339	14.3	1213.2	O K
960 min Summer	99.540	1.340	14.3	1214.5	O K
1440 min Summer	99.522	1.322	14.3	1194.2	O K
2160 min Summer	99.476	1.276	14.3	1142.9	O K
2880 min Summer	99.420	1.220	14.3	1081.9	O K
4320 min Summer	99.304	1.104	14.3	958.1	O K
5760 min Summer	99.174	0.974	14.3	825.2	O K
7200 min Summer	99.015	0.815	14.3	669.8	O K
8640 min Summer	98.883	0.683	14.3	547.5	O K
10080 min Summer	98.772	0.572	14.3	448.8	O K
15 min Winter	98.735	0.535	14.3	416.7	O K
30 min Winter	98.928	0.728	14.3	588.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	377.3	29
30 min Summer	74.920	0.0	535.8	44
60 min Summer	50.812	0.0	737.9	72
120 min Summer	33.237	0.0	965.9	132
180 min Summer	25.439	0.0	1109.1	190
240 min Summer	20.836	0.0	1211.2	248
360 min Summer	15.743	0.0	1372.3	366
480 min Summer	12.875	0.0	1495.7	484
600 min Summer	11.001	0.0	1596.6	602
720 min Summer	9.667	0.0	1682.3	692
960 min Summer	7.872	0.0	1822.3	806
1440 min Summer	5.875	0.0	2011.4	1064
2160 min Summer	4.369	0.0	2296.2	1476
2880 min Summer	3.534	0.0	2475.7	1900
4320 min Summer	2.625	0.0	2756.0	2732
5760 min Summer	2.128	0.0	2985.9	3568
7200 min Summer	1.809	0.0	3172.8	4256
8640 min Summer	1.586	0.0	3336.2	4936
10080 min Summer	1.420	0.0	3481.5	5648
15 min Winter	105.919	0.0	423.3	29
30 min Winter	74.920	0.0	600.4	43

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	99.140	0.940	14.3	790.7	O K
120 min Winter	99.354	1.154	14.3	1010.3	O K
180 min Winter	99.466	1.266	14.3	1131.6	O K
240 min Winter	99.533	1.333	14.3	1206.1	O K
360 min Winter	99.619	1.419	14.3	1304.9	O K
480 min Winter	99.667	1.467	14.3	1361.0	O K
600 min Winter	99.694	1.494	14.3	1392.4	O K
720 min Winter	99.707	1.507	14.3	1407.9	Flood Risk
960 min Winter	99.709	1.509	14.3	1409.9	Flood Risk
1440 min Winter	99.682	1.482	14.3	1378.6	O K
2160 min Winter	99.615	1.415	14.3	1300.4	O K
2880 min Winter	99.531	1.331	14.3	1203.9	O K
4320 min Winter	99.348	1.148	14.3	1004.1	O K
5760 min Winter	99.121	0.921	14.3	772.0	O K
7200 min Winter	98.875	0.675	14.3	539.8	O K
8640 min Winter	98.690	0.490	14.3	378.1	O K
10080 min Winter	98.557	0.357	14.2	268.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	826.7	72
120 min Winter	33.237	0.0	1082.0	130
180 min Winter	25.439	0.0	1242.2	186
240 min Winter	20.836	0.0	1356.4	244
360 min Winter	15.743	0.0	1536.4	358
480 min Winter	12.875	0.0	1673.9	472
600 min Winter	11.001	0.0	1786.0	584
720 min Winter	9.667	0.0	1880.5	694
960 min Winter	7.872	0.0	2031.0	902
1440 min Winter	5.875	0.0	2138.5	1126
2160 min Winter	4.369	0.0	2571.8	1592
2880 min Winter	3.534	0.0	2772.7	2056
4320 min Winter	2.625	0.0	3085.7	2948
5760 min Winter	2.128	0.0	3344.5	3808
7200 min Winter	1.809	0.0	3553.9	4408
8640 min Winter	1.586	0.0	3737.1	5032
10080 min Winter	1.420	0.0	3900.6	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.950

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.500	4	8	0.500	8	12	0.500	12	16	0.450

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.8	1.800	1299.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0164-1430-1500-1430
Design Head (m)	1.500
Design Flow (l/s)	14.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	164
Invert Level (m)	98.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	14.3
Flush-Flo™	0.439	14.3
Kick-Flo®	0.950	11.5
Mean Flow over Head Range	-	12.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.9	1.200	12.9	3.000	19.9	7.000	29.9
0.200	12.9	1.400	13.8	3.500	21.4	7.500	30.9
0.300	13.9	1.600	14.7	4.000	22.8	8.000	31.9
0.400	14.3	1.800	15.6	4.500	24.1	8.500	32.8
0.500	14.2	2.000	16.4	5.000	25.4	9.000	33.7
0.600	14.1	2.200	17.1	5.500	26.6	9.500	34.6
0.800	13.2	2.400	17.9	6.000	27.7		
1.000	11.8	2.600	18.6	6.500	28.8		

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F.3. Northern Site

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	26.629	0.429	19.8	529.7	O K
30 min Summer	26.789	0.589	19.8	738.0	O K
60 min Summer	26.970	0.770	19.8	978.5	O K
120 min Summer	27.160	0.960	19.8	1239.6	O K
180 min Summer	27.264	1.064	19.8	1385.7	O K
240 min Summer	27.324	1.124	19.8	1471.5	O K
360 min Summer	27.400	1.200	19.8	1581.8	O K
480 min Summer	27.440	1.240	19.8	1639.8	O K
600 min Summer	27.460	1.260	19.8	1667.8	O K
720 min Summer	27.466	1.266	19.8	1677.4	O K
960 min Summer	27.468	1.268	19.8	1680.2	O K
1440 min Summer	27.449	1.249	19.8	1653.1	O K
2160 min Summer	27.399	1.199	19.8	1579.4	O K
2880 min Summer	27.337	1.137	19.8	1490.1	O K
4320 min Summer	27.201	1.001	19.8	1297.2	O K
5760 min Summer	27.040	0.840	19.8	1074.5	O K
7200 min Summer	26.904	0.704	19.8	890.0	O K
8640 min Summer	26.787	0.587	19.8	735.3	O K
10080 min Summer	26.691	0.491	19.8	610.4	O K
15 min Winter	26.679	0.479	19.8	594.3	O K
30 min Winter	26.858	0.658	19.8	829.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.252	0.0	518.0	19
30 min Summer	75.382	0.0	733.6	33
60 min Summer	50.812	0.0	1015.4	64
120 min Summer	33.048	0.0	1322.8	122
180 min Summer	25.230	0.0	1515.1	182
240 min Summer	20.620	0.0	1650.9	242
360 min Summer	15.538	0.0	1865.3	362
480 min Summer	12.682	0.0	2028.7	480
600 min Summer	10.821	0.0	2161.7	600
720 min Summer	9.498	0.0	2274.3	688
960 min Summer	7.721	0.0	2456.9	802
1440 min Summer	5.749	0.0	2700.7	1056
2160 min Summer	4.267	0.0	3099.6	1472
2880 min Summer	3.447	0.0	3336.8	1900
4320 min Summer	2.551	0.0	3699.6	2724
5760 min Summer	2.063	0.0	4006.6	3464
7200 min Summer	1.751	0.0	4248.7	4184
8640 min Summer	1.532	0.0	4458.4	4920
10080 min Summer	1.369	0.0	4641.9	5552
15 min Winter	107.252	0.0	581.9	19
30 min Winter	75.382	0.0	822.7	33

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	27.060	0.860	19.8	1101.4	O K
120 min Winter	27.274	1.074	19.8	1399.8	O K
180 min Winter	27.389	1.189	19.8	1564.9	O K
240 min Winter	27.457	1.257	19.8	1664.7	O K
360 min Winter	27.548	1.348	19.8	1797.9	O K
480 min Winter	27.599	1.399	19.8	1873.3	O K
600 min Winter	27.627	1.427	19.8	1915.5	O K
720 min Winter	27.641	1.441	19.8	1936.5	O K
960 min Winter	27.643	1.443	19.8	1939.2	O K
1440 min Winter	27.614	1.414	19.8	1896.3	O K
2160 min Winter	27.540	1.340	19.8	1786.2	O K
2880 min Winter	27.446	1.246	19.8	1648.2	O K
4320 min Winter	27.236	1.036	19.8	1346.3	O K
5760 min Winter	26.975	0.775	19.8	986.3	O K
7200 min Winter	26.771	0.571	19.8	713.7	O K
8640 min Winter	26.617	0.417	19.8	514.1	O K
10080 min Winter	26.511	0.311	19.4	380.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	1138.2	62
120 min Winter	33.048	0.0	1481.9	122
180 min Winter	25.230	0.0	1697.0	180
240 min Winter	20.620	0.0	1848.8	238
360 min Winter	15.538	0.0	2088.0	354
480 min Winter	12.682	0.0	2269.8	468
600 min Winter	10.821	0.0	2417.1	580
720 min Winter	9.498	0.0	2540.7	688
960 min Winter	7.721	0.0	2736.2	896
1440 min Winter	5.749	0.0	2913.6	1124
2160 min Winter	4.267	0.0	3471.9	1596
2880 min Winter	3.447	0.0	3737.2	2048
4320 min Winter	2.551	0.0	4142.0	2944
5760 min Winter	2.063	0.0	4488.0	3688
7200 min Winter	1.751	0.0	4759.4	4392
8640 min Winter	1.532	0.0	4994.8	5008
10080 min Winter	1.369	0.0	5202.0	5552

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.270	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.700

Time (mins) From:	To:	Area (ha)
0	4	2.700

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Model Details

Storage is Online Cover Level (m) 28.000

Tank or Pond Structure

Invert Level (m) 26.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1191.2	1.800	1586.5

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0191-1980-1500-1980
Design Head (m)	1.500
Design Flow (l/s)	19.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	191
Invert Level (m)	26.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	19.8
Flush-Flo™	0.447	19.8
Kick-Flo®	0.978	16.2
Mean Flow over Head Range	-	17.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	17.8	3.000	27.6	7.000	41.5
0.200	17.5	1.400	19.2	3.500	29.7	7.500	42.9
0.300	19.3	1.600	20.4	4.000	31.7	8.000	44.2
0.400	19.8	1.800	21.6	4.500	33.5	8.500	45.6
0.500	19.7	2.000	22.7	5.000	35.2	9.000	46.8
0.600	19.5	2.200	23.8	5.500	36.9	9.500	48.1
0.800	18.6	2.400	24.8	6.000	38.5		
1.000	16.3	2.600	25.7	6.500	40.0		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	26.619	0.419	21.4	561.0	O K
30 min Summer	26.781	0.581	21.5	788.9	O K
60 min Summer	26.966	0.766	21.5	1055.8	O K
120 min Summer	27.163	0.963	21.5	1347.6	O K
180 min Summer	27.271	1.071	21.5	1511.7	O K
240 min Summer	27.335	1.135	21.5	1609.8	O K
360 min Summer	27.417	1.217	21.5	1737.4	O K
480 min Summer	27.461	1.261	21.5	1806.7	O K
600 min Summer	27.483	1.283	21.5	1842.3	O K
720 min Summer	27.492	1.292	21.5	1856.6	O K
960 min Summer	27.497	1.297	21.5	1864.8	O K
1440 min Summer	27.483	1.283	21.5	1842.4	O K
2160 min Summer	27.437	1.237	21.5	1768.7	O K
2880 min Summer	27.377	1.177	21.5	1676.1	O K
4320 min Summer	27.252	1.052	21.5	1482.1	O K
5760 min Summer	27.097	0.897	21.5	1249.3	O K
7200 min Summer	26.958	0.758	21.5	1044.2	O K
8640 min Summer	26.840	0.640	21.5	873.3	O K
10080 min Summer	26.740	0.540	21.5	730.5	O K
15 min Winter	26.669	0.469	21.5	630.2	O K
30 min Winter	26.850	0.650	21.5	887.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.919	0.0	552.1	26
30 min Summer	74.920	0.0	787.6	41
60 min Summer	50.812	0.0	1098.8	70
120 min Summer	33.237	0.0	1439.8	130
180 min Summer	25.439	0.0	1653.4	188
240 min Summer	20.836	0.0	1805.6	248
360 min Summer	15.743	0.0	2045.4	364
480 min Summer	12.875	0.0	2228.6	482
600 min Summer	11.001	0.0	2377.9	602
720 min Summer	9.667	0.0	2504.2	696
960 min Summer	7.872	0.0	2708.6	810
1440 min Summer	5.875	0.0	2974.1	1068
2160 min Summer	4.369	0.0	3436.9	1476
2880 min Summer	3.534	0.0	3704.8	1904
4320 min Summer	2.625	0.0	4121.1	2732
5760 min Summer	2.128	0.0	4474.9	3512
7200 min Summer	1.809	0.0	4754.5	4248
8640 min Summer	1.586	0.0	4997.9	4928
10080 min Summer	1.420	0.0	5212.1	5648
15 min Winter	105.919	0.0	620.5	26
30 min Winter	74.920	0.0	883.5	40

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	27.057	0.857	21.5	1188.7	O K
120 min Winter	27.278	1.078	21.5	1522.6	O K
180 min Winter	27.398	1.198	21.5	1707.9	O K
240 min Winter	27.471	1.271	21.5	1822.3	O K
360 min Winter	27.567	1.367	21.5	1975.5	O K
480 min Winter	27.622	1.422	21.5	2064.0	O K
600 min Winter	27.654	1.454	21.5	2115.2	O K
720 min Winter	27.670	1.470	21.5	2142.4	O K
960 min Winter	27.676	1.476	21.5	2152.1	O K
1440 min Winter	27.653	1.453	21.5	2113.5	O K
2160 min Winter	27.584	1.384	21.5	2002.1	O K
2880 min Winter	27.493	1.293	21.5	1857.6	O K
4320 min Winter	27.295	1.095	21.5	1549.0	O K
5760 min Winter	27.043	0.843	21.5	1168.3	O K
7200 min Winter	26.832	0.632	21.5	860.7	O K
8640 min Winter	26.667	0.467	21.5	627.8	O K
10080 min Winter	26.550	0.350	21.2	466.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	50.812	0.0	1231.8	70
120 min Winter	33.237	0.0	1613.1	126
180 min Winter	25.439	0.0	1852.0	184
240 min Winter	20.836	0.0	2022.0	242
360 min Winter	15.743	0.0	2289.6	358
480 min Winter	12.875	0.0	2493.2	472
600 min Winter	11.001	0.0	2658.3	584
720 min Winter	9.667	0.0	2796.6	694
960 min Winter	7.872	0.0	3013.5	902
1440 min Winter	5.875	0.0	3177.8	1126
2160 min Winter	4.369	0.0	3849.6	1600
2880 min Winter	3.534	0.0	4149.3	2056
4320 min Winter	2.625	0.0	4613.1	2952
5760 min Winter	2.128	0.0	5012.7	3744
7200 min Winter	1.809	0.0	5326.0	4400
8640 min Winter	1.586	0.0	5599.3	5024
10080 min Winter	1.420	0.0	5841.2	5656

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.261	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.924

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.907	4	8	0.907	8	12	1.111

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Model Details

Storage is Online Cover Level (m) 28.000

Tank or Pond Structure

Invert Level (m) 26.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1294.5	1.800	1705.4

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0198-2150-1500-2150
Design Head (m)	1.500
Design Flow (l/s)	21.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	198
Invert Level (m)	26.200
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	21.5
Flush-Flo™	0.452	21.5
Kick-Flo®	0.988	17.6
Mean Flow over Head Range	-	18.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	1.200	19.3	3.000	30.0	7.000	45.1
0.200	18.6	1.400	20.8	3.500	32.3	7.500	46.6
0.300	20.9	1.600	22.2	4.000	34.4	8.000	48.1
0.400	21.4	1.800	23.5	4.500	36.4	8.500	49.5
0.500	21.4	2.000	24.7	5.000	38.3	9.000	50.9
0.600	21.2	2.200	25.8	5.500	40.1	9.500	52.3
0.800	20.3	2.400	26.9	6.000	41.8		
1.000	17.7	2.600	28.0	6.500	43.5		

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Appendix G. North Site Reservoir Options (2014)

Technical Note

Subject:	North Site Reservoir – Options Summary		
Reference:	5041216-ENG-TN-0001260	**Revision:**	1.2
Author:	Ross Goodchild	**Checker:**	Tim Budd
Issued to:	Neil Williams	**Reviewer:**	Tim Budd
Date:	24/09/14	**Authoriser:**	Mike Poland

North Site Reservoir Options Summary

1. Operational Details Summer 2014

Estimated Water Volume: 306,000m^3

Indicative Depth Range: 1m to 11m (Estimated)

Plan Area (Including Dam): 8.27 hectares

Current Receiving Flows: i) Surface water from Coed Darcy development phase areas 1 and 2 gravity catchments (via a 45"ø railway pipecrossing)

ii) M4 Surface Water discharge (gravity catchment associated with the section of the M4 motorway bordering the reservoir to the east).

iii) Original brook course that flowed along the valley floor (east to west, discharging into the Tal-y-Fedw watercourse) the reservoir now occupies,

is suspected to be tied into the M4 outfall.

Current Outfall: Pumped (3 pumps, only two operational) discharge via a 300mmø railway rising main crossing, into a DCWW public surface water sewer at Bridge House.

Emergency Drawdown: Discharge via piped (single 20 inch ø) network from the dam, westwards, into a watercourse linked to the Tal-y-Fedw watercourse within the railway embankment triangle. A high level emergency spillway is also present at the Reservoirs north-western corner, with a piped connection to the watercourse at the base of the dam.

Notes

- The reservoir falls under the current, and pending revision of the Reservoirs Act, which is enforced by Natural Resources Wales (NRW).
- Remediation of the contaminated reservoir bed was completed in 2012/2013.
- A cut-off drain is present along the northern boundary of the reservoir, intercepting surface water runoff from the gravity catchment to the north of the reservoir and Crymlyn Road, discharging to the line of the original valley watercourse immediately to the west of the reservoir dam base.
- There is a significant surface water disposal cost to St Modwen Developments (SMD) in utilising a pumped discharge to the public sewer at Bridge House. The current discharge is classified as Trade Effluent, however recent negotiations with Natural Resources Wales (NRW) and Dwr Cymru Welsh Water (DCWW) have resulted in a reclassification to standard surface water discharge, likely to auctioned late 2014. This will result in a reduction in costs associated with the existing pumped discharge arrangement.
- The reservoir currently acts as a temporary surface water attenuation feature for Coed Darcy Development Phases 1 and 2 gravity catchments, however capacity within the piped and pumped drainage networks leading to and from the reservoir are limited by associated pipe sizes.
- Pumps have to be operated manually, and are showing signs of age.
- There is a masterplanning opportunity to utilise the existing dam as an embankment for a future valley crossing.

- The NSR has significant value post remediation for recreational, environmental and community use, if maintained in its current form.

2. Options Summary

This Technical Note should be read with an understanding of the current Coed Darcy Surface Water Drainage Strategies and associated information, which can be found in the following standalone documents;

I. 5041216-REM-TN-000432 Drainage Strategy – Briefing Note 4 (Atkins, December 2010).

II. Meeting Minutes – Drainage Briefing Note 4 – CCW Offices, Swansea (Atkins, March 2010).

III. 5041216-ENG-TN-000581 South Site Reservoir Feasibility and South Site Catchment Appraisal (Atkins, July 2011).

IV. CCW Memo – Coed Darcy Drainage Strategy Briefing Note 4 (CCW, April 2011)

Four main reservoir options are presented in this Technical Note, which can be and taken forward or modified with elements combined, as demanded by SMD, in accordance with long term Coed Darcy development objectives.

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2.1 Do Nothing

This is not an option due to a backlog of maintenance and need to rationalise service outfall arrangements.

2.2 Do Minimum

This option assumes all operational details for summer 2014 are maintained

a) The current surface water drainage strategy for the central site is based on Phase 1 and 2 surface water gravity catchments draining to a rehabilitated South Site Reservoir (SSR) Assuming this strategy is taken forward, the existing surface water drainage network leading from the central site to the NSR via a railway pipebridge could be abandoned, thus removing this significant surface water outfall. In the interim, the NSR can be utilised as a temporary outfall and attenuation feature for Phases 1 and 2, however the capacity of the network is limited by the 45”ø railway pipe crossing – there is not sufficient capacity within this existing network to drain both Phase 1 and 2 surface water gravity catchments.
b) The existing M4 outfall will remain and will need to be maintained at the point of outfall.
c) The reservoir can act as a surface water outfall and attenuation feature for the Coed Darcy North Site development phases.
d) An operational model will be required to analyse the requirements of incoming and outgoing flows in relation to the flow limits dictated by the outfall pipe sizes and pump/rising main capacities – as demanded by SMD in respect to planned/required future use as a surface water attenuation feature.
e) Continued pump operation and maintenance will be required. It is likely that the pumps will require replacement within the timeframe of SMD’s Coed Darcy development involvement, as they are old and showing signs of age. If pumps are to maintained long term, consideration should be given to automating pump operation.
f) Assuming reclassification of pumped flows to the public sewer outfall as standard surface water discharge, there will be an ongoing significant cost via DCWW to SMD for maintaining a safe NSR water level, whilst the NSR and associated sewer networks remain in private ownership. This cost will be reduced by the reclassification, but not eliminated.
g) The NSR will continue to fall under the Reservoirs Act (or pending revisions - Enactment of the Flood and Water Management Act has an interim definition of a “large raised reservoir” as holding 10,000m³ of water above the natural level of any part of the surrounding land, with such waterbodies subject to any regulations or orders which the Minister must or may make, and thus SMD will be responsible for planned inspections and maintenance in accordance with the act and directions of the appointed responsible Reservoir Panel Engineer.
h) The valley which the NSR is formed in, excluding lands within the dam footprint, are leased by SMD. Lease security should be considered if the NSR is required to be utilised significantly by the Coed Darcy development for surface water attenuation solutions long term.

i) NRW have enquired about the use of the NSR as a potential water recharge resource for the Crymlyn Bog site. This may preset opportunities to enhance working relationships with the Regulatory body.
j) There may be opportunities for the NSR to receive surface water flows from public sewers and new development to the north of the Coed Darcy site, which in turn present revenue opportunities. This may also present opportunities to hand over control and responsibility of the reservoir to a third party (namely a Local Authority, DCWW or NRW).

2.3 Replace pumped discharge arrangement with an outfall to the former valley brook course, west of the existing dam

Replacing the existing outfall arrangements with a service spillway to outfall to the former valley brook course west of the existing dam, would remove the operational cost of surface water discharge and associated responsibilities (pump operation and maintenance for example would no longer be required), however, its implementation would require the following actions and considerations;

a) Any works to create a gravity outfall into the valley brook course should be undertaken in tandem (where possible for economies of scale) or in advance of any planned works to install infrastructure along the crest of the dam.
b) A study and modelling exercises will need to be commissioned to look at the operating hydraulics of a service spillway, with consideration made to potential downstream brook improvements and the impact on the railway embankment triangle which the brook course is currently routed through. Decisions as to the required long term use of the NSR as an attenuation facility should be determined prior to undertaking any studies or analysis.
c) The design of any new features associated with the operation of the dam, its controls and the reservoir will need to be undertaken under the supervision of a Reservoirs Panel Engineer.
d) Flood modelling/dam break analysis may be required, with a change in reservoir operational arrangements.
e) There is visual evidence of the presence of free product and potentially hydrocarbons within the marshy tree covered area to the west of the embankment between the NSR dam and the railway embankment triangle. No investigations or remedial works have been undertaken in this area so it is possible both will be required as part of an outfall creation scheme.
f) NRW have indicated that before they agree any NSR or SSR discharge arrangements, improvements to the Tal-y-Fedw within Crymlyn Bog where SMD have riparian rights should be undertaken. Historically, BP undertook silt clearance periodically from this section of brook, which maintained an adequate through-flow to prevent a build-up of nutrients detrimental to the Crymlyn Bog fauna and flora immediately to the west of the NSR. The Tal-y-Fedw course has silted up and as a result, the rare habitat in this area is deteriorating, thus, the current status-quo would present a significant constraint to negotiations to obtain discharge consent.
g) Water quality would need to continue to be monitored, particularly in respect to the M4 outfall and the northern cut-off drain (the latter to segregate this outfall, which will tie into the new outfall, from the NSR from a water quality perspective, which will also require negotiations with the Welsh Government/SWTRA with regards to interceptors).
h) The reservoir will continue to fall under the current, and pending revision of the Reservoirs Act, and thus SMD will have continued responsibilities in accordance with the Act (whilst still in their ownership/tenancy).

2.4 Reduce the water level within the reservoir (to fall outside of classification of the Reservoirs Act)

A revision to the current Reservoirs Act and associated Legislation is likely to come into force in 2015, which although the final classifying reservoir volume is yet to be finalised, it is anticipated this volume will be 10,000m³ - 15,000m³.

The NSR would therefore need to be reduced to below this volume, which is a major reduction in capacity and footprint. Reducing the volume in this manner would remove the reservoir from classification under the Reservoirs Act (and thus the inspection and maintenance liabilities), but not from responsibilities associated with open water bodies and the Land Drainage Act 1991 (and 1994 amendment). Undertaking this task would require significant works planning and third-party agreement, based on the discussion below (this also

applies if large scale water level reduction is required generally, but within the classification of the Reservoirs Act);

a) Lowering water levels within the reservoir utilising existing pumping arrangements would not be a cost effective option. Discharge to the brook course to the west of the dam would be the most cost effective option, however, all of the discussion within section 2.3 of this Technical Note will apply.
b) Improvements to existing permanent outfalls, such as the M4 outfall, will need modification due to the dramatic water level reduction.
c) There will be a dramatic reduction in the NSR footprint, which as a result will lead to some ground improvements being required to now exposed banks. Options could include grassing, wetland or woodland creation (linking in the theme of the Coed Darcy name). A reduction in reservoir footprint also presents an opportunity to either create more development land, or renegotiate leased areas.
d) At a reduced volume, the NSR can still operate as a surface water attenuation feature, but with obvious linked capacity limits.
e) There may be opportunity for the feature still to be utilised as a potential water recharge resource for the Crymlyn Burrows site. This may preset opportunities to enhance working relationships with the Regulatory body.
f) Pumping and associated discharge and facility maintenance costs, should no Brook outfall be created, will remain (it should be noted that any 'new' service spillway will require significant capital investment).

2.5 Remove the NSR

Removal of the NSR and returning the land back to its former use (farmland) would remove any responsibilities associated with a reservoir or waterbody, although the Land Drainage Act 1991 (including 1994 amendment), and riparian responsibilities associated with this Legislation would still apply to watercourses under SMD's ownership.

Restoration of the valley and the former watercourse along the valley base will be required, which will require significant hydraulic, environmental, geotechnical and civil engineering input. In addition to this, parts of the discussion in section 2.3 and 2.4 of this Technical Note will apply (in terms of outfall creation and water level reduction), except where references to a water body are present, as no reservoir or reduced capacity 'pool' will be present. The following points should also be taken into account when considering this option;

a) Restoration of the existing brook course along the base of the valley would be required, to restore a flow path in the valley and maintain the existing M4 and 'engineered' brook outfall provision.
b) Any surface water outfalls (likely to be primarily on the North Site) to the restored brook course from the Coed Darcy development would be subject to discharge consent and a likely discharge rate of equivalent Greenfield runoff. As a result attenuation would be required upstream of any planned surface water outfall.
c) Removal of the NSR cannot be undertaken without first completing the SSR rehabilitation works, so Coed Darcy Development Phases 1 and 2 have a surface water outfall.
d) All railway pipe crossings associated with the NSR can potentially be abandoned and/or removed (these will become redundant post rehabilitation of the SSR when surface water flows are diverted to this feature).
e) All NSR pumping facilities can be decommissioned and removed.
f) The lease for the land that the NSR occupies can be surrendered in accordance with the lease terms.
g) Land once occupied by the reservoir may present development opportunities linked with Coed Darcy.

2.6 Recommendation

The options presented demonstrate there is a complex mix of estate management, legal, regulatory and technical issues to be resolved, and we recommend these elements are all considered within a wider strategy for the NSR.

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