

FCC ENVIRONMENT LIMITED



PWLLFAWATKIN LANDFILL SITE
SURFACE WATER MANAGEMENT PLAN
UPDATE 2021

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Project Quality Assurance

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Rev	Date Issued	Amendment Details	Author	Reviewer
4	15/11/2021	Review of Climate Change Allowance to 40%	JD	AK

Purpose

This document was prepared as an update of the previously approved Surface Water Management Plan for Pwllfawatkin landfill Site Ref: FCC-479-SW-2014-03-SW3 Rev 2.1.

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1 2018 AMENDMENTS

1.1 Introduction

The treatment of surface water (SW) from Tip 890 was approved under condition 55 of P2002/1016 . Similarly surface water management (SMW) on Tip 871 was approved under condition 8 of P2014/0693.

Within this approved SWM Plan it is proposed to construct a new settlement lagoon on the eastern side of site. Due to poor ground conditions the implementation of the settlement lagoon has not been possible. Following discussions with FCC an updated SWM scheme is required to allow surface water flows between the two lagoons between Tips 890 and 891 to negate the need for this new eastern lagoon.

To remove the need for this eastern lagoon, the updated plans seeks to split water flows from the western side of Tip 890. The northern half of the western side still follows the original route but the southern half of the western side now drains to the south and into the lagoons in the middle of site between Tip 890 and Tip 891 landfills, Lagoons 4 and 5. Also the link between Lagoons 6-5 has been removed

This is the only change made to the approved system. Revised Micro drainage calculations and drawings have been produced to show this minor amendment.

In addition, FCC is seeking to revise the restoration profile of Tips 890 and 871. The approved SW scheme has been reviewed and it is considered suitable to manage with any changes in flow as the revised restoration profile only reduces catchment/run off areas across the site.

There have been no changes to the proposed run off rates or discharge rate as no additional area have been added into the system it is simply the route that the water will take before it reaches Lagoon 7 then out of site.

It should also be noted that there is a 150mm pump at the entrance to Tip 891 that operates on a float system. Once engineering on site has finished a review of the pump's requirement will be made, as water passing through the pump is clean and could be discharged. This will be reviewed in due course.

The text that references the new lagoon has been stuck through to avoid confusion.

2 2019 AND 2021 AMENDMENTS

Following the construction of the sidewall extension to Cell 4 at Pwllfawatkin Landfill, it shall impact on the amendments made in 2018 (detailed above) as well as the existing scheme approved for the site. Following discussions with FCC in 2019 an updated surface water management scheme is required to allow for surface water to drain off the flanks and also allow for relocation of the far northern part of Lagoon 4.

As a result of the sidewall extension, the southern batter of Cell 4 shall need to be directed into Lagoon 4. It is proposed that a ditch shall be constructed from either side (East and West) of the waste flank and fall under gravity into the Lagoon 4 .

The sidewall extension removes part of Lagoon 4. To compensate for this loss of volume, the lagoon has been extended to the west to provide the same attenuation volume. Although replacing the additional volume is not critical for the surface water management system as the lagoon is oversized, it shall ensure that any previous Flood Risk Assessments undertaken are still valid and the lagoon shall still provide the same area for habitats to form ensuring that these ponds are still a benefit to the local environment.

Minimal additional runoff has been generated as a result of the revised landform from the Cell 4 sidewall engineering work, because the area was included in the gross area calculations in the approved surface water management plan. There is a slight increase as the additional slopes that shall be constructed contribute slightly more surface water runoff, however the overall discharge volume is still within that of greenfield and similar to the values stated in the approved surface water management plan.

The methodology utilised within the remodelling works undertaken in 2019 and 2021 differs from that undertaken in the original surface water management plan, but it has monitored to ensure that the discharge volumes for the storm events are very similar, to ensure that the surface water management plan and any associated flood risk assessments remain valid as the overall areas contributing to the system are not changing only the shape of the lagoon.

Modelling for this scheme has been undertaken using the Rainfall – Runoff method which utilises unit hydrographs for each pipe/ditch which are calculated with the software by inputting rainfall data for the site along with Standard Percentage Runoff (SPR) for the soil, area of sub catchment, length of sub catchment and levels at two points along the length of catchment to calculate the gradient. The SAAR has been derived from FSR data contained within the Microdrainage programme.

The rainfall – runoff method has been chosen for this scheme over the Wallingford Rational Method as it takes into account the fact that the runoff generated will be slower entering the system than if it was falling onto a paved surface, meaning slower peak flows which are representative of site conditions.

The rational method was not designed to be used where sites contained <20% paved area. The rainfall – runoff method has been designed for catchments which are sloped and are mainly containing undeveloped/rural environments where no urbanisation has occurred.

Time area diagrams have been utilised for the southern part of northern landfill for the revised design as a way of representing the slowing of the flow via the in situ cap deflection and diversion bunds. The total catchment area for these has been reduced by 40% in line with the statement in the approved report.

The manning's number for the surface water ditch channels has been selected as $n=0.030$ which is a maintained grassed channel. A maintenance programme shall be undertaken on the surface water assets when these are constructed, to ensure that hydraulic performance of the system is maintained.

The values used within the Rainfall – Runoff method have been derived from site conditions. The soils that have been/will be used as restoration material have been mainly clayey material. A SPR value of 47 has been chosen which correlates to a SOIL class of 0.45 to represent (as outlined in Wallingford/Flood Studies Report) a clayey material over an impermeable layer, which best reflects the restoration conditions (worst case) at Pwllfawatkin Landfill Site.

Due to the slight increase in the slopes as a result of the cell sidewall extension works and subsequent tipping profile, the discharge rate from site increases slightly as a result. Table 1 below shows the catchment area for the northern network along with the revised greenfield runoff rates.

The Microdrainage network has been analysed with an additional allowance of 40% for climate change, this is an increase from that included within the calculations submitted in 2019. This additional allowance has been included to ensure that the surface water design is in accordance with latest guidance. This additional climate change allowance from the 30% assessed in the 2019 submission compared with 40% climate change allowance, has a slight impact to the remaining freeboard with certain surface water attenuation lagoons around the site. No flooding is indicated within any of the surface water attenuation lagoons, however a couple of the lagoons have a reduced freeboard volume between 100mm and 200mm. These lagoons are already constructed and form part of the current operational surface water control system for the site. Due to site restrictions with the existing landfill waste mass and site boundary restrictions, these lagoons cannot be expanded from the current attenuation volumes. As part of this assessment the exceedance route for both these lagoons has been assessed and these are shown on the drawing contained within Appendix 3.

2.1 Northern Landfill Network

The following section replaces Section 1.1.1 of the approved report.

The existing landfill site in its final state discharges to the river by the bridge by the site weighbridge. This is the primary monitored discharge point for the site WP12.

The drainage for this area of the site has an existing dual cascade lagoon system with a discharge to a wetland area and a third smaller lagoon with a culvert connecting to the WP12 outlet. This outlet shall collect approximately 25ha of the site area, this is made up of the majority of capped landfill areas.

Utilising Micro Drainage ICP SUDS for the current landfill catchment, the Q_{Bar} drainage rate with factored rates for the noted storm durations were run. This indicated that the current discharge via the existing 500mm HDPE outfall pipework had a maximum off-site discharge rate of 531.2l/s for in a 1:100 year storm event. See Table 1 below and calculations within the appendices. Table 1 below shows the greenfield runoff rates for the site.

Table 1 : Greenfield Runoff Rates		
Parameter	Value	
Catchment Area	25Ha	
SAAR	1721	
Soil Type Factor	0.4	
Region Number	9	
Storm Return Period	Estimated Peak Runoff Rate	
	l/s	l/s/ha
Q_{Bar}	243.7	9.748
Q_1	214.4	8.576
Q_{30}	429.6	17.184
Q_{100}	531.2	21.248

Table 2 below show the improvement on the greenfield outfall rates and supersedes that of the one in the FCC Report.

Table 2 : Greenfield Runoff Rates vs Proposed Rates		
Storm Return Period	Estimated Peak Runoff l/s	Proposed Peak Runoff l/s
1:1 year storm	214.4	173.0
1:30 year storm	429.6	280.4
1:100 year + 40%	531.2	380.7

Within the revised Microdrainage printouts pipe 6.000 indicates flooding however this has been included as a dummy pipe to simulate the flow from the southern part of the landfill as this runoff is proposed to be collected by the already constructed cap deflection bunds which are very difficult to simulate in Microdrainage so in reality this situation wont exist. Although this part of the network sits outside of the planning redline boundary and also remains unchanged from the approved surface water management plan, with the calculations remaining valid from the original report, it has been included in these calculation to generate an accurate discharge rate from Lagoon 7 to the outfall to ensure discharge rates remained within greenfield rates.

Conclusion

This slight change to adjust the footprint of the lagoon due to the site engineering works to the sidewall of Cell 4 and resultant changes to the restoration contours from the resultant infill phase for the area, has minimal impact on the overall approved surface management scheme for the site. The revised calculations including 40% climate change allowance indicate no flooding and show that the site is not increasing the flood risk in the downstream environment as a result of landfilling activities.

Appendix 1	Approved SWM Plan FCC-479-SW-2014-03-SW3 Rev 2.1. (Microdrainage and Previous Drawings Removed)
Appendix 2	Revised Microdrainage Calculations for Northern Network
Appendix 3	Amended Drawings

APPENDIX 1

**Approved SWM Plan FCC-479-SW-2014-03-SW3 rev 2.1.
(Microdrainage and Previous Drawings Removed.)**



PWLLFAWATKIN LANDFILL

SURFACE WATER MANAGEMENT SCHEME
DESIGN REPORT

REPORT FCC 479-SW-2014-03-SW3

VERSION 2.1, OCTOBER 2015

Status	Date	Prepared by	Reviewed by	Approved by
Version 1.0	03/08/2015	Scott McLean Design Engineer	Andy Kirk Engineering Design Manager	Anthony Porter Regional Engineering Manager
Version 2.0	30/09/2015	Scott McLean Design Engineer	Andy Kirk Engineering Design Manager	Anthony Porter Regional Engineering Manager
Version 2.1	20/10/2015	Scott McLean Design Engineer	Andy Kirk Engineering Design Manager	Anthony Porter Regional Engineering Manager

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Appendix B	Micro Drainage Calculation For Northern Landfill Drainage
Appendix C	Micro Drainage Calculation For Tip 871 Network

LIST OF DRAWINGS

Drawing 479 SW 2014 03 PLAN 01	Site GA Northern End
Drawing 479 SW 2014 03 PLAN 02	Site GA Central
Drawing 479 SW 2014 03 PLAN 03	Site GA Tip 871 area

1.0 INTRODUCTION

This report refers to the design of the proposed and existing surface water management of the spoil haul road and tip 871 area at Pwllfawatkin Landfill.

Pwllfawatkin Landfill site is located at Ordnance Survey grid reference SN698088, 15km north east of Swansea and 10km north west of Pontardawe in the county borough of Neath Port Talbot, South Wales. The site is situated just off the A474 between Pontardawe and Gwuan-Cae-Gurwen.

The Site is located in the valley of the upper Clydach River, which flows north to south close to the eastern boundary of the site. The valley floor is at an elevation of approximately 160m AOD.

Land use in the vicinity is mainly agricultural, however there are buildings associated with the former colliery approximately 200m to the south east of the site, which are now occupied by small businesses. There are several scattered farm houses and dwellings within 1Km of the site and Pwllfawatkin Farm buildings are located 150 to the south of the site. These buildings are used by the operator as an office and store. The village of Cwmgors is situated 500m north east of the installation.

The address of the site is:

Pwllfawatkin Landfill
Rhy-Dy-Fro-Pontardawe
Swansea
West Glamorgan
SA8 4RX

The site operates under PPC Permit BU8819IV.

1.1 Existing Drainage

The site is located next to a watercourse, namely Upper Clydach River. The river runs north to south to the Eastern edge of the site. The site has two permitted discharge points labelled WP12 and WP13. WP12 is currently the outfall for the main landfill site and is fed from two existing settlement lagoons. The Southern end of the site has a currently unpermitted discharge into the River next to the entrance to the Tip 871 area and the Tip 871 area has its own discharge via a settlement lagoon at restricted green field run off rates.

Existing permitted discharges to the River are all restricted in the permit under table 2.2.4 to a PH 6-9, suspended solids at less than 40mg/l and no visible oil or grease. Under table 2.10.15 extra monitoring on a monthly basis will take place at various points but will also monitor for Temperature, EC, Ammoniacal Nitrogen and Chloride. Then On A quarterly basis looking for, Total Alkalinity, mecoprop, magnesium, potassium, total sulphates, calcium, sodium, BOD,

COD, TOC, TON, Iron, zinc, cadmium, lead, chromium, manganese, nickel, mercury, toluene, benzene, xylene, total petroleum hydrocarbons, phenol, tributyltin compounds pentachlorephenol and naphthalene.

1.1.1 Northern Landfill area

~~The existing landfill site in its final state discharge to the river by the bridge by the site weighbridge, this is the primary monitored discharge point for the site WP12.~~

~~The drainage for this area of the site has an existing dual cascade lagoon system with a discharge to a wetland area and a third smaller lagoon with a culvert connecting to the WP12 outlet. This outlet will collect approximately 32.1ha of the site area, this is made up of the majority of capped landfill areas with a small amount of offsite catchment being collected at our perimeter from upper valley areas.~~

~~Utilising Micro Drainage ICP SUDS for the current landfill catchment the Qbar drainage rate with factored rates for noted storm durations was run. This indicated that the current discharge via the existing 500mm had a maximum off site discharge rate of 682l/s in a 1:100 year storm event. See table below and calculation in the Appendices~~

Parameter	Value	
Catchment Area	32.1Ha	
SAAR	1721	
Soil type factor	0.4	
Region Number	9	
Storm Return Period	Estimated Peak rate of runoff	
	l/s	l/s/ha
QBar	312.9	9.75
1:1 year storm	275.3	8.58
1:30 year storm	551.7	17.19
1:100 year	682.1	21.25

Consultations with Micro Drainage Green field runoff FEH volume have recommended that a value of 23.1 should be used for the Soil Percentage Runoff (PR). However as this is a capped landfill site and the soils above are not typical a more conservative rate of 60% has been applied to better represent the vegetated slope areas.

1.1.2 Tip 871 Area

The existing tip 871 area outfall is a constructed tributary into the Upper Clydach River. This tributary was constructed to be approximately 225m long running parallel to the river and leading to a small settlement pond prior to discharge into the Upper Clydach River. This discharge is consented under the consent BP0306701 and allows for a 160mm outfall. The tributary was engineered to provide settlement of suspended solids running off the colliery spoil tip area to keep the water quality within recognised limits.

Utilising Micro Drainage ICP SUDS for the current Haul road catchment the Qbar drainage rate with factored rates for noted storm durations was run. This indicated that the current discharge via the existing 225mm had a maximum off site discharge rate of 65.9l/s in a 1:100 year storm event. See table below and calculation Print off in the Appendices

Parameter	Value	
Catchment Area	5.7Ha	
SAAR	1721	
Soil type factor	0.4	
Region Number	9	
Storm Return Period	Estimated Peak rate of runoff	
	l/s	l/s/ha
QBar	55.6	9.75
1:1 year storm	48.9	8.58
1:30 year storm	98.0	17.19
1:100 year	121.1	21.25

Consultations with Micro Drainage Green field runoff FEH volume have recommended that a value of 23.1 should be used for the Soil Percentage Runoff (PR). However as this is an un-vegetated colliery spoil heap and the soils above are not typical a more conservative rate of 75% has been applied to better represent the catchment areas.

1.2 Aims of Report

The SWMP has been prepared to address the following issues:

- ensure that surface water runoff generated by the site is of a suitable quality;
- ensure that runoff does not cause localised flooding at the site; and
- ensure that flow rates do not increase the risk of flooding in the downstream environment.

2.0 PROPOSED SURFACE WATER MANAGEMENT SCHEME

2.1 Design Constraints

Ground conditions at the site are not considered suitable for infiltration SuDS because of the low permeability clay that exists within the existing ground strata.

2.2 Proposed Northern Landfill Area

The outline surface water management plan is presented in the drawings in the Appendix.

The northern landfill area currently manages surface water utilising 2 cascading settlement lagoons that discharge into a wetland area that finally discharges into the existing 500mm permitted outlet to the River. The site also has a third settlement lagoon series collecting from the completed phase 1 area and will collect diverted flow from the southern side of the site. This outfall system also collects a below ground culvert from a series of adits to the west of the site in a trapped valley.

~~To allow the final catchment system for the site and to retain a flooding boundary to the river it is proposed to build a new 3rd cascade lagoon before the existing wetland area. To do this will require replacing the existing bund between the river and the site with a new bund with a crown level at 162.0m AOD. This new lagoon will be restricted with a new headwall with a 225mm outlet pipe. The existing cascade lagoons and the wetland area all need general maintenance and desilting in places, but do have the capacity to make this system work.~~

To feed the lagoons a revised perimeter drainage system will be installed consisting of ditches ranging from 500mm deep to 1000mm deep to divert water to the lagoons and the outfall. The new catchment is now all positively drained and designed to flow through the cascading lagoons which will attenuate and sweeten the water during major storm events allowing improvements to the greenfield outfall rates as seen in the table below

Storm Return Period	Estimated Peak rate of runoff l/s	Proposed Peak rate of runoff l/s
1:1 year storm	275.3	189.4
1:30 year storm	551.7	304.8
1:100 year +30%	682.1	349.0

This shows that we will be reducing offsite discharge in all storm events including improving the 1:100yr storm +30% storms discharge by almost 50%. Full Micro Drainage calculations can be found in Appendix B.

2.3 Tip 871 Network

The current drainage for the tip 871 area is overland flow to the constructed tributary to the east of the site. To provide a controlled system and attenuate the site a perimeter Ditch system connecting to an Attenuation pond with restricted outlet headwall to the consented 160mm outlet will be constructed.

Due to the limited permeability in the local material, it is proposed to install an unlined ditch system to collect water and direct it to an un-lined settlement lagoon area with a controlled outfall to the existing tributary. This will provide attenuation and a reduction in suspended solids reducing potential contamination entering the river and reducing flooding in this corner of the site.

The new attenuation lagoon and restricted 160mm outflow now offers control to the sites surface water system to below the Qbar limit of 55.6l/s. The table below shows that the controlled outlet is discharging at similar or improved rates compared to the anticipated ICP SUDS rates.

Storm Return Period	Estimated Peak rate of runoff l/s	Proposed Peak rate of runoff l/s
1:1 year storm	48.9	27.0
1:30 year storm	98.0	39.0
1:100 year + 30%	121.1	51.0

This shows that we will be reducing offsite discharge in all major storm events. Full Micro Drainage calculations can be found in Appendix C.

The Tip area final restoration is not yet completed and a restoration plan currently exists that has a series of smaller lagoons making up this plan. It is proposed that this final lagoon shape will replace the series of lagoons previously proposed upon site restoration. When constructed the lagoon will be sized to meet final restoration requirements. However for the remaining operational life of Tip 871 the lagoon will be constructed as a depression. The lagoon is anticipated to process large volumes of silts due to the import of materials and the un-vegetated nature of the area and will require regular clearing to retain its volume. Upon restoration of the Tip 871 site the requirement to de-silt the lagoon will be greatly reduced and it will become an integrated feature of the final site restoration scheme.

2.4 Further Design Considerations

The Landfill and the Tip Drainage scheme detailed above is designed for events with an annual probability of occurrence of up to 1% (1:100) including a 30% allowance for climate change.

The drainage ditches will be constructed as open trapezoidal channels wherever possible. Vegetation should be encouraged to grow along the banks of the drainage ditches to slow flows and prevent potential erosion problems within the channel.

All drainage ditches should be created with a minimum gradient of 1:250 to ensure surface water can flow freely. The outline designs for the cascade lagoons include a permanent water body below the outfall from the pond which provides the following benefits:

- increased residence time to encourage settlement of suspended solids; and
- to ensure that the outflow will still function should the base of the pond fills with sediment.

3.0 CONCLUSIONS

It is concluded that the proposed landfill pond sizing and ditch system will be able to cope with the required volume of water out falling from the WP12 site outfall, and has all been designed to be sufficient to handle the required 100 year storm with an additional 30% climate change in line with the SUDS Manual and current guidance.

The Tip 871 area pond sizing and ditch system will be able to cope with the required volume of water out falling from the site, and has all been designed to be sufficient to handle the required 100 year storm with an additional 30% climate change in line with the SUDS Manual and current guidance. The lagoon for the tip area will be incorporated into the restoration scheme for the Tip 871 site, replacing the set of smaller lagoons previously approved. Upon site restoration a permanent outfall structure for the lagoon will be needed. The proposed straw bale retention system while now unnecessary may be retained as a secondary system in the event of greater storms than the 100year+30% event but this is not a designed system, just recognised as offering improvement in severe storms.

APPENDICES

APPENDIX A

MICRODRAINAGE CALCULATIONS FOR GREENFIELD RUNOFF RATES

FCC Environment		Page 1
6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 Arae Run off	
Date 10 June 2014 File ICP SUDs Tip 871 Area.srcx	Designed by S.McLean Checked by	
Micro Drainage Source Control 2014.1.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.400 Area (ha) 5.700 Urban 0.000 SAAR (mm) 1721 Region Number Region 9 Results 1/s QBAR Rural 55.6 QBAR Urban 55.6 Q100 years 121.1 Q1 year 48.9 Q30 years 98.0 Q100 years 121.1		
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~~APPENDIX B~~

~~MICRODRAINAGE CALCULATIONS FOR LANDFILL NETWORK~~

APPENDIX C

MICRODRAINAGE CALCULATIONS FOR TIP 871 NETWORK

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
Date 17 June 2014 File TIP 871 160MM OUTFALL S...	Designed by S.McLean Checked by	
Micro Drainage	Network 2014.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.200	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	200.000	2.750	72.7	0.621	5.00	0.0	0.600	\	-3	
1.001	200.000	2.750	72.7	0.621	0.00	0.0	0.600	\	-3	
1.002	200.000	2.750	72.7	0.621	0.00	0.0	0.600	\	-3	
1.003	200.000	2.750	72.7	0.621	0.00	0.0	0.600	\	-4	
2.000	130.000	2.500	52.0	0.601	5.00	0.0	0.600	\	-3	
2.001	132.000	2.500	52.8	0.501	0.00	0.0	0.600	\	-3	
2.002	42.000	0.840	50.0	0.000	0.00	0.0	0.600	o	400	
1.004	10.000	0.100	100.0	0.100	0.00	0.0	0.600	o	160	

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)
1.000	0.00	6.12	169.500	0.621	0.0	0.0	0.0	2.98	750.1	0.0
1.001	0.00	7.24	166.750	1.242	0.0	0.0	0.0	2.98	750.1	0.0
1.002	0.00	8.36	164.000	1.863	0.0	0.0	0.0	2.98	750.1	0.0
1.003	0.00	9.21	161.050	2.484	0.0	0.0	0.0	3.93	2423.1	0.0
2.000	0.00	5.62	164.000	0.601	0.0	0.0	0.0	3.52	887.7	0.0
2.001	0.00	6.24	161.500	1.102	0.0	0.0	0.0	3.50	880.9	0.0
2.002	0.00	6.51	158.500	1.102	0.0	0.0	0.0	2.67	336.1	0.0
1.004	0.00	9.37	157.600	3.686	0.0	0.0	0.0	1.05	21.1	0.0

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
Date 17 June 2014 File TIP 871 160MM OUTFALL S...	Designed by S.McLean Checked by	
Micro Drainage	Network 2014.1.1	

Manhole Schedules for Storm

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)
1	170.000	0.500	Junction		1.000	169.500	-3				
2	167.250	0.500	Junction		1.001	166.750	-3	1.000	166.750	-3	
3	164.500	0.500	Junction		1.002	164.000	-3	1.001	164.000	-3	
4	161.750	0.700	Junction	0	1.003	161.050	-4	1.002	161.250	-3	
5	164.500	0.500	Junction		2.000	164.000	-3				
6	162.000	0.500	Junction		2.001	161.500	-3	2.000	161.500	-3	
7	159.500	1.000	Junction	0	2.002	158.500	400	2.001	159.000	-3	400
8	159.000	1.400	Open Manhole	10000	1.004	157.600	160	1.003	158.300	-4	1040
								2.002	157.660	400	300
	158.500	1.000	Open Manhole	0		OUTFALL		1.004	157.500	160	

FCC Environment		Page 3
6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkyn LFS Tip 871 SW Design	
Date 17 June 2014 File TIP 871 160MM OUTFALL S...	Designed by S.McLean Checked by	
Micro Drainage	Network 2014.1.1	

PIPELINE SCHEDULES for Storm

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)
1.000	\	-3	1	170.000	169.500	0.200	Junction	
1.001	\	-3	2	167.250	166.750	0.200	Junction	
1.002	\	-3	3	164.500	164.000	0.200	Junction	
1.003	\	-4	4	161.750	161.050	0.200	Junction	
2.000	\	-3	5	164.500	164.000	0.200	Junction	
2.001	\	-3	6	162.000	161.500	0.200	Junction	
2.002	o	400	7	159.500	158.500	0.600	Junction	
1.004	o	160	8	159.000	157.600	1.240	Open Manhole	10000

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)
1.000	200.000	72.7	2	167.250	166.750	0.200	Junction	
1.001	200.000	72.7	3	164.500	164.000	0.200	Junction	
1.002	200.000	72.7	4	161.750	161.250	0.200	Junction	
1.003	200.000	72.7	8	159.000	158.300	0.200	Open Manhole	10000
2.000	130.000	52.0	6	162.000	161.500	0.200	Junction	
2.001	132.000	52.8	7	159.500	159.000	0.200	Junction	
2.002	42.000	50.0	8	159.000	157.660	0.940	Open Manhole	10000
1.004	10.000	100.0		158.500	157.500	0.840	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		158.500	157.500	157.500	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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 Online Controls	1	Number of Storage Structures	1

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
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Simulation Criteria for Storm

Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type Summer
Return Period (years)	2	Cv (Summer) 0.750
Region England and Wales		Cv (Winter) 0.840
M5-60 (mm)	20.000	Storm Duration (mins) 30
Ratio R	0.200	

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
Date 17 June 2014 File TIP 871 160MM OUTFALL S...	Designed by S.McLean Checked by	
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Online Controls for Storm

Complex Manhole: 8, DS/PN: 1.004, Volume (m³): 234.7

Orifice

Diameter (m) 0.160 Discharge Coefficient 0.600 Invert Level (m) 157.600

Weir

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 158.600

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Storage Structures for Storm

Tank or Pond Manhole: 8, DS/PN: 1.004

Invert Level (m) 157.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2610.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	2725.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	2850.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	2975.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	3100.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	3230.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 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 Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%					
1.001	15 Winter	1	0%					
1.002	15 Winter	1	0%					
1.003	15 Winter	1	0%					
2.000	15 Winter	1	0%					
2.001	15 Winter	1	0%					
2.002	15 Winter	1	0%	100/15 Summer				
1.004	1440 Winter	1	0%	1/120 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	169.595	-0.205	0.000	0.08	0.0	63.7	OK
1.001	2	166.873	-0.177	0.000	0.15	0.0	113.7	OK
1.002	3	164.148	-0.152	0.000	0.22	0.0	166.0	OK
1.003	4	161.216	-0.334	0.000	0.09	0.0	212.9	OK
2.000	5	164.085	-0.215	0.000	0.07	0.0	64.8	OK
2.001	6	161.609	-0.191	0.000	0.12	0.0	108.4	OK
2.002	7	158.656	-0.244	0.000	0.32	0.0	108.3	OK*
1.004	8	157.935	0.175	0.000	1.45	0.0	27.0	SURCHARGED

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6 Sidings Court White Rose Way Doncaster DN4 5NU	Pwllfawatkin LFS Tip 871 SW Design	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 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 Storage Structures 1
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%					
1.001	30 Summer	100	+30%					
1.002	30 Summer	100	+30%					
1.003	30 Summer	100	+30%					
2.000	15 Winter	100	+30%					
2.001	15 Winter	100	+30%					
2.002	15 Winter	100	+30%	100/15	Summer			
1.004	960 Winter	100	+30%	1/120	Summer			

PN	US/MH Name	Water		Flooded		Pipe		Status
		Level (m)	Surch'd Depth (m)	Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	
1.000	1	169.691	-0.109	0.000	0.35	0.0	265.2	OK
1.001	2	166.999	-0.051	0.000	0.63	0.0	474.0	FLOOD RISK*
1.002	3	164.292	-0.008	0.000	0.90	0.0	673.8	FLOOD RISK*
1.003	4	161.371	-0.179	0.000	0.36	0.0	876.0	OK
2.000	5	164.173	-0.127	0.000	0.30	0.0	266.1	OK
2.001	6	161.723	-0.077	0.000	0.51	0.0	451.0	FLOOD RISK*
2.002	7	159.456	0.556	0.000	1.29	0.0	435.1	FLOOD RISK*
1.004	8	158.592	0.832	0.000	2.74	0.0	51.0	SURCHARGED

APPENDIX 2

Revised Microdrainage Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Inverts

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
1.000	273.000	2.006	136.1	0.000	5.00	0.0		0.030	\/	-46	Pipe/Conduit	🔒
1.001	182.000	5.994	30.4	0.000	0.00	0.0		0.030	\/	-46	Pipe/Conduit	🔒
1.002	10.000	0.050	200.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.000	170.000	2.050	82.9	0.000	5.00	0.0		0.030	\/	-46	Pipe/Conduit	🔒
1.003	10.000	0.050	200.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
1.004	390.000	2.520	154.8	0.000	0.00	0.0		0.030	\/	-46	Pipe/Conduit	🔒
3.000	8.000	0.900	8.9	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit	🔒

Network Results Table

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PIPELINE SCHEDULES for Storm

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)
1.000	\/	-46	1	174.000	173.500	0.000	Junction	
1.001	\/	-46	2	172.000	171.494	0.006	Junction	
1.002	o	225	3	166.000	163.500	2.275	Open Manhole	10000
2.000	\/	-46	4	166.000	165.500	0.000	Junction	
1.003	o	225	4	164.000	162.400	1.375	Open Manhole	10000
1.004	\/	-46	6	163.000	162.350	0.150	Open Manhole	10000
3.000	o	300	7	166.500	165.400	0.800	Open Manhole	1200
4.000	\/	-46	8	174.000	173.500	0.000	Junction	
5.000	\/	-46	10	167.500	167.000	0.000	Junction	
3.001	o	300	7	166.500	164.500	1.700	Open Manhole	10000
6.000	o	300	12	166.000	164.310	1.390	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)
1.000	273.000	136.1	2	172.000	171.494	0.006	Junction	
1.001	182.000	30.4	3	166.000	165.500	0.000	Open Manhole	10000
1.002	10.000	200.0	4	164.000	163.450	0.325	Open Manhole	10000
2.000	170.000	82.9	4	164.000	163.450	0.050	Open Manhole	10000
1.003	10.000	200.0	6	163.000	162.350	0.425	Open Manhole	10000
1.004	390.000	154.8	7	161.000	159.830	0.670	Open Manhole	10000
3.000	8.000	8.9	7	166.500	164.500	1.700	Open Manhole	10000
4.000	126.000	16.8	7	166.500	166.000	0.000	Open Manhole	10000
5.000	120.000	120.0	7	166.500	166.000	0.000	Open Manhole	10000
3.001	150.000	33.3	7	161.000	160.000	0.700	Open Manhole	10000
6.000	10.000	1000.0	12	166.000	164.300	1.400	Open Manhole	1200

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<u>PIPELINE SCHEDULES for Storm</u> <u>Upstream Manhole</u> <table><tr><th>PN</th><th>Hyd</th><th>Diam</th><th>MH</th><th>C.Level</th><th>I.Level</th><th>D.Depth</th><th>MH</th><th>MH DIAM., L*W</th></tr><tr><th></th><th>Sect</th><th>(mm)</th><th>Name</th><th>(m)</th><th>(m)</th><th>(m)</th><th>Connection</th><th>(mm)</th></tr><tr><td>6.001</td><td>o</td><td>300</td><td>12</td><td>166.000</td><td>164.000</td><td>1.700</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.005</td><td>o</td><td>500</td><td>7</td><td>161.000</td><td>159.600</td><td>0.900</td><td>Open Manhole</td><td>10000</td></tr></table> <u>Downstream Manhole</u> <table><tr><th>PN</th><th>Length</th><th>Slope</th><th>MH</th><th>C.Level</th><th>I.Level</th><th>D.Depth</th><th>MH</th><th>MH DIAM., L*W</th></tr><tr><th></th><th>(m)</th><th>(1:X)</th><th>Name</th><th>(m)</th><th>(m)</th><th>(m)</th><th>Connection</th><th>(mm)</th></tr><tr><td>6.001</td><td>50.000</td><td>13.5</td><td>7</td><td>161.000</td><td>160.300</td><td>0.400</td><td>Open Manhole</td><td>10000</td></tr><tr><td>1.005</td><td>74.000</td><td>154.8</td><td></td><td>160.500</td><td>159.122</td><td>0.878</td><td>Open Manhole</td><td>0</td></tr></table> <u>Free Flowing Outfall Details for Storm</u> <table><tr><th>Outfall</th><th>Outfall</th><th>C. Level</th><th>I. Level</th><th>Min</th><th>D,L</th><th>W</th></tr><tr><th>Pipe Number</th><th>Name</th><th>(m)</th><th>(m)</th><th>I. Level</th><th>(mm)</th><th>(mm)</th></tr><tr><td></td><td></td><td></td><td></td><td>(m)</td><td></td><td></td></tr><tr><td>1.005</td><td></td><td>160.500</td><td>159.122</td><td>0.000</td><td>0</td><td>0</td></tr></table>			PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W		Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	6.001	o	300	12	166.000	164.000	1.700	Open Manhole	1200	1.005	o	500	7	161.000	159.600	0.900	Open Manhole	10000	PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W		(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)	6.001	50.000	13.5	7	161.000	160.300	0.400	Open Manhole	10000	1.005	74.000	154.8		160.500	159.122	0.878	Open Manhole	0	Outfall	Outfall	C. Level	I. Level	Min	D,L	W	Pipe Number	Name	(m)	(m)	I. Level	(mm)	(mm)					(m)			1.005		160.500	159.122	0.000	0	0
PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W																																																																																														
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)																																																																																														
6.001	o	300	12	166.000	164.000	1.700	Open Manhole	1200																																																																																														
1.005	o	500	7	161.000	159.600	0.900	Open Manhole	10000																																																																																														
PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W																																																																																														
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)																																																																																														
6.001	50.000	13.5	7	161.000	160.300	0.400	Open Manhole	10000																																																																																														
1.005	74.000	154.8		160.500	159.122	0.878	Open Manhole	0																																																																																														
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<u>Online Controls for Storm</u> <u>Orifice Manhole: 4, DS/PN: 1.003, Volume (m³): 208.2</u> Diameter (m) 0.178 Discharge Coefficient 0.600 Invert Level (m) 162.400 <u>Orifice Manhole: 7, DS/PN: 3.001, Volume (m³): 275.2</u> Diameter (m) 0.200 Discharge Coefficient 0.600 Invert Level (m) 164.500 <u>Orifice Manhole: 12, DS/PN: 6.001, Volume (m³): 2.9</u> Diameter (m) 0.257 Discharge Coefficient 0.600 Invert Level (m) 164.000		
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<u>Storage Structures for Storm</u> <u>Tank or Pond Manhole: 3, DS/PN: 1.002</u> Invert Level (m) 163.500 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1419.0</td><td>2.500</td><td>3162.0</td></tr></table> <u>Tank or Pond Manhole: 4, DS/PN: 1.003</u> Invert Level (m) 162.400 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1073.0</td><td>1.600</td><td>1647.0</td></tr></table> <u>Tank or Pond Manhole: 7, DS/PN: 3.000</u> Invert Level (m) 165.400 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>900.0</td><td>1.100</td><td>1273.0</td></tr></table> <u>Tank or Pond Manhole: 7, DS/PN: 3.001</u> Invert Level (m) 164.500 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>2757.0</td><td>2.000</td><td>3620.0</td></tr></table> <u>Tank or Pond Manhole: 12, DS/PN: 6.001</u> Invert Level (m) 164.000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>800.0</td><td>2.000</td><td>1920.0</td></tr></table> <u>Tank or Pond Manhole: 7, DS/PN: 1.005</u> Invert Level (m) 159.600			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1419.0	2.500	3162.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1073.0	1.600	1647.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	900.0	1.100	1273.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2757.0	2.000	3620.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	800.0	2.000	1920.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																							
0.000	1419.0	2.500	3162.0																																							
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																							
0.000	1073.0	1.600	1647.0																																							
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																							
0.000	900.0	1.100	1273.0																																							
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																							
0.000	2757.0	2.000	3620.0																																							
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0.000	800.0	2.000	1920.0																																							
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LS15 8GB										
Date 11/10/2021 14:08	Designed by jdavies									
File REVISED NORTHERN NETWORK...	Checked by									
Innovyze	Network 2020.1									
<u>Tank or Pond Manhole: 7, DS/PN: 1.005</u> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>125.0</td><td>1.400</td><td>325.0</td></tr></table>			Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	0.000	125.0	1.400	325.0
Depth (m)	Area (m ²)	Depth (m)	Area (m ²)							
0.000	125.0	1.400	325.0							
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PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		Exceeded
1.000	1	173.641	-0.359	0.000	0.10			55.9		OK
1.001	2	171.602	-0.392	0.000	0.06			78.5		OK
1.002	3	163.692	-0.033	0.000	1.00			30.5		OK
2.000	4	165.594	-0.406	0.000	0.05			38.0		OK
1.003	4	162.812	0.187	0.000	1.02			31.2	SURCHARGED	
1.004	6	162.481	-0.369	0.000	0.09			46.7		OK
3.000	7	165.535	-0.165	0.000	0.42			99.1		OK
4.000	8	173.540	-0.460	0.000	0.01			21.7		OK
5.000	10	167.086	-0.414	0.000	0.04			27.3		OK
3.001	7	164.870	0.070	0.000	0.23			43.4	SURCHARGED	
6.000	12	165.302	0.692	0.000	7.11			212.1	SURCHARGED	30
6.001	12	164.622	0.322	0.000	0.34			96.8	SURCHARGED	
1.005	7	159.863	-0.237	0.000	0.55			173.0		OK

Input Hydrograph Type: FSR Dynamic

Region	England and Wales	Area (Ha)	2.507
M5-60 (mm)	19.900	SAAR (mm)	1677
Ratio R	0.223	CWI	125.383
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	100.610	SPR	47.000
H(85%) (m)	199.100	LAG (hrs)	0.000
H(10%) (m)	175.600	Base Flow (l/s)	(Calculated)

TP(0) (mins)	27	Q (l/s)	112.9	PR (%)	47.096
T (mins)	4	TB (mins)	74	S1085 (m/km)	311.434
TPT (mins)	29	Base Flow (l/s)	1.3		

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Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
32	6.9	64	27.7	96	54.7	128	20.6	160	4.6	192	1.3	224	1.3
36	8.2	68	33.7	100	51.6	132	17.0	164	3.8	196	1.3	228	1.3
40	9.5	72	39.8	104	47.6	136	14.1	168	3.1	200	1.3	232	1.3
44	11.0	76	45.8	108	43.2	140	11.8	172	2.5	204	1.3	236	1.3
48	12.7	80	51.0	112	38.6	144	9.9	176	2.0	208	1.3	240	1.3
52	15.0	84	54.9	116	33.9	148	8.2	180	1.7	212	1.3		
56	18.1	88	56.9	120	29.3	152	6.8	184	1.4	216	1.3		
60	22.4	92	56.7	124	24.7	156	5.6	188	1.3	220	1.3		

Region	England and Wales	Area (Ha)	1.025
M5-60 (mm)	19.900	SAAR (mm)	1677
Ratio R	0.223	CWI	125.383
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	106.960	SPR	47.000
H(85%) (m)	197.900	LAG (hrs)	0.000
H(10%) (m)	173.900	Base Flow (l/s)	(Calculated)

TP(0) (mins)	28	Q (l/s)	45.0	PR (%)	47.096
T (mins)	4	TB (mins)	76	S1085 (m/km)	299.177
TPT (mins)	30	Base Flow (l/s)	0.5		

Time	Flow	Time	Flow	Time	Flow	Time	Flow	Time	Flow	Time	Flow	Time	Flow
(mins)	(l/s)	(mins)	(l/s)	(mins)	(l/s)	(mins)	(l/s)	(mins)	(l/s)	(mins)	(l/s)	(mins)	(l/s)
4	0.6	24	1.8	44	4.4	64	11.0	84	21.9	104	19.6	124	10.6
8	0.7	28	2.2	48	5.1	68	13.4	88	22.8	108	17.9	128	8.9
12	0.9	32	2.7	52	6.0	72	15.8	92	22.9	112	16.1	132	7.3
16	1.1	36	3.2	56	7.2	76	18.2	96	22.3	116	14.3	136	6.0
20	1.4	40	3.8	60	8.9	80	20.3	100	21.1	120	12.5	140	5.0

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
144	4.2	160	2.0	176	0.9	192	0.5	208	0.5	224	0.5	240	0.5
148	3.5	164	1.6	180	0.7	196	0.5	212	0.5	228	0.5		
152	2.9	168	1.3	184	0.6	200	0.5	216	0.5	232	0.5		
156	2.4	172	1.1	188	0.6	204	0.5	220	0.5	236	0.5		

Region	England and Wales	Area (Ha)	1.666
M5-60 (mm)	19.900	SAAR (mm)	1677
Ratio R	0.223	CWI	125.383
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	109.550	SPR	47.000
H(85%) (m)	196.600	LAG (hrs)	0.000
H(10%) (m)	168.100	Base Flow (l/s)	(Calculated)

TP(0) (mins)	27	Q (l/s)	76.1	PR (%)	47.096
T (mins)	4	TB (mins)	73	S1085 (m/km)	346.874
TPt (mins)	29	Base Flow (l/s)	0.8		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.9	40	6.4	76	31.0	112	25.3	148	5.3	184	0.9	220	0.8
8	1.1	44	7.4	80	34.4	116	22.1	152	4.4	188	0.9	224	0.8
12	1.4	48	8.6	84	37.0	120	18.9	156	3.6	192	0.8	228	0.8
16	1.9	52	10.2	88	38.2	124	15.9	160	2.9	196	0.8	232	0.8
20	2.4	56	12.2	92	37.9	128	13.2	164	2.4	200	0.8	236	0.8
24	3.1	60	15.1	96	36.4	132	10.9	168	1.9	204	0.8	240	0.8
28	3.9	64	18.7	100	34.2	136	9.1	172	1.6	208	0.8		
32	4.7	68	22.8	104	31.5	140	7.6	176	1.3	212	0.8		
36	5.5	72	27.0	108	28.4	144	6.4	180	1.1	216	0.8		

Input Hydrograph Manhole 6, DS/PN 1.004 (Storm)
960 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Hydrograph Manhole 8, DS/PN 4.000 (Storm)
120 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Region	England and Wales	Area (Ha)	0.850
M5-60 (mm)	19.900	SAAR (mm)	1677
Ratio R	0.223	CWI	125.383
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	39.140	SPR	47.000
H(85%) (m)	185.300	LAG (hrs)	0.000
H(10%) (m)	175.400	Base Flow (l/s)	(Calculated)

TP(0) (mins)	21	Q (l/s)	47.9	PR (%)	47.096
T (mins)	4	TB (mins)	59	S1085 (m/km)	337.251
TPt (mins)	23	Base Flow (l/s)	0.4		

Sirius Environmental Ltd		Page 14									
4245 Park Approach											
Leeds											
LS15 8GB											
Date 11/10/2021 14:08	Designed by jdavies										
File REVISED NORTHERN NETWORK...	Checked by										
Innovyze	Network 2020.1										
<u>Input Hydrograph Manhole 10, DS/PN 5.000 (Storm)</u> <u>120 minute 1 year Summer I+0%</u> <u>Input Hydrograph Type: FSR Dynamic</u>											
Input Variables											
Region	England and Wales	Area (Ha) 1.200									
M5-60 (mm)	19.900	SAAR (mm) 1677									
Ratio R	0.223	CWI 125.383									
Areal Reduction Factor	1.000	Urban 0.000									
Main Stream Length (m)	105.660	SPR 47.000									
H(85%) (m)	194.900	LAG (hrs) 0.000									
H(10%) (m)	168.600	Base Flow (l/s) (Calculated)									
Output Variables											
TP(0) (mins)	27	Q (l/s) 54.5 PR (%) 47.096									
T (mins)	4	TB (mins) 73 S1085 (m/km) 331.882									
TPt (mins)	29	Base Flow (l/s) 0.6									
Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.7	40	4.6	76	22.2	112	18.3	148	3.9	184	0.7
8	0.8	44	5.3	80	24.7	116	16.0	152	3.2	188	0.6
12	1.0	48	6.2	84	26.5	120	13.8	156	2.6	192	0.6
16	1.3	52	7.3	88	27.4	124	11.6	160	2.2	196	0.6
20	1.7	56	8.8	92	27.2	128	9.6	164	1.8	200	0.6
24	2.2	60	10.8	96	26.2	132	7.9	168	1.4	204	0.6
28	2.8	64	13.4	100	24.6	136	6.6	172	1.2	208	0.6
32	3.4	68	16.3	104	22.7	140	5.5	176	0.9	212	0.6
36	4.0	72	19.3	108	20.6	144	4.7	180	0.8	216	0.6
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Input Variables

Output Variables

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
24	1.0	456	3.9	888	12.3	1320	2.9	1752	0.9	2184	0.9	2616	0.9
48	1.4	480	4.1	912	10.6	1344	2.8	1776	0.9	2208	0.9	2640	0.9
72	1.9	504	4.5	936	9.1	1368	2.8	1800	0.9	2232	0.9	2664	0.9
96	2.2	528	4.9	960	7.8	1392	2.7	1824	0.9	2256	0.9	2688	0.9
120	2.5	552	5.5	984	6.7	1416	2.7	1848	0.9	2280	0.9	2712	0.9
144	2.7	576	6.2	1008	5.8	1440	2.6	1872	0.9	2304	0.9	2736	0.9
168	2.7	600	7.2	1032	5.2	1464	2.4	1896	0.9	2328	0.9	2760	0.9
192	2.7	624	8.4	1056	4.7	1488	2.0	1920	0.9	2352	0.9	2784	0.9
216	2.8	648	9.8	1080	4.3	1512	1.5	1944	0.9	2376	0.9	2808	0.9
240	2.8	672	11.4	1104	4.0	1536	1.2	1968	0.9	2400	0.9	2832	0.9
264	2.9	696	13.3	1128	3.8	1560	1.0	1992	0.9	2424	0.9	2856	0.9
288	3.0	720	15.3	1152	3.6	1584	0.9	2016	0.9	2448	0.9	2880	0.9
312	3.1	744	17.3	1176	3.5	1608	0.9	2040	0.9	2472	0.9		
336	3.2	768	18.7	1200	3.3	1632	0.9	2064	0.9	2496	0.9		
360	3.3	792	18.8	1224	3.2	1656	0.9	2088	0.9	2520	0.9		
384	3.4	816	17.9	1248	3.1	1680	0.9	2112	0.9	2544	0.9		
408	3.5	840	16.2	1272	3.0	1704	0.9	2136	0.9	2568	0.9		
432	3.7	864	14.2	1296	2.9	1728	0.9	2160	0.9	2592	0.9		

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
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	7	Number of Offline Controls	0	Number of Time/Area Diagrams	2
Number of Online Controls	3	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.223
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.900	Cv (Winter)	0.840

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Margin for Flood Risk Warning (mm) 300.0      DVD Status OFF
      Analysis Timestep   Fine Inertia Status OFF
      DTS Status          ON
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Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

	US/MH		Return Climate		First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
1.000	1	120	Summer	30	+0%			
1.001	2	120	Summer	30	+0%			
1.002	3	480	Summer	30	+0%	30/60	Summer	
2.000	4	120	Summer	30	+0%			
1.003	4	960	Summer	30	+0%	1/120	Summer	
1.004	6	240	Summer	30	+0%			
3.000	7	120	Winter	30	+0%	100/30	Summer	
4.000	8	60	Summer	30	+0%			
5.000	10	120	Summer	30	+0%			
3.001	7	960	Winter	30	+0%	1/360	Winter	
6.000	12	120	Winter	30	+0%	1/15	Summer	30/30 Summer
6.001	12	360	Winter	30	+0%	1/30	Summer	
1.005	7	480	Summer	30	+0%	100/120	Summer	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)	
1.000	1	173.725	-0.275	0.000	0.22			128.0	FLOOD RISK*
1.001	2	171.671	-0.323	0.000	0.15			179.6	OK
1.002	3	163.885	0.160	0.000	2.10			64.1	SURCHARGED
2.000	4	165.657	-0.343	0.000	0.12			87.0	OK
1.003	4	163.185	0.560	0.000	1.60			48.9	SURCHARGED
1.004	6	162.557	-0.293	0.000	0.19			102.8	OK
3.000	7	165.637	-0.063	0.000	0.98			233.5	OK
4.000	8	173.570	-0.430	0.000	0.03			51.2	OK
5.000	10	167.145	-0.355	0.000	0.10			62.5	OK
3.001	7	165.224	0.424	0.000	0.35			66.0	SURCHARGED
6.000	12	166.373	1.763	372.648	10.56			315.1	FLOOD
6.001	12	165.269	0.969	0.000	0.51			147.1	SURCHARGED
1.005	7	159.965	-0.135	0.000	0.88			280.4	OK

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
2.000	4	
1.003	4	
1.004	6	
3.000	7	
4.000	8	
5.000	10	
3.001	7	
6.000	12	30
6.001	12	
1.005	7	

Input Variables

Output Variables

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	1.6	40	20.4	76	104.4	112	87.8	148	17.4	184	1.7	220	1.3
8	2.3	44	23.8	80	116.5	116	76.9	152	14.1	188	1.4	224	1.3
12	3.3	48	27.9	84	125.6	120	66.1	156	11.3	192	1.3	228	1.3
16	4.7	52	33.2	88	130.1	124	55.7	160	9.0	196	1.3	232	1.3
20	6.5	56	40.3	92	129.7	128	46.0	164	7.0	200	1.3	236	1.3
24	8.7	60	50.2	96	125.2	132	37.6	168	5.4	204	1.3	240	1.3
28	11.5	64	62.5	100	117.8	136	30.9	172	4.1	208	1.3		
32	14.4	68	76.4	104	108.7	140	25.7	176	3.0	212	1.3		
36	17.3	72	90.7	108	98.5	144	21.3	180	2.2	216	1.3		

Input Variables

Output Variables

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.8	40	9.9	76	50.5	112	41.6	148	8.2	184	0.8	220	0.6
8	1.1	44	11.5	80	56.3	116	36.3	152	6.6	188	0.6	224	0.6
12	1.6	48	13.5	84	60.6	120	31.1	156	5.3	192	0.6	228	0.6
16	2.3	52	16.0	88	62.7	124	26.1	160	4.2	196	0.6	232	0.6
20	3.2	56	19.5	92	62.3	128	21.5	164	3.3	200	0.6	236	0.6
24	4.3	60	24.3	96	60.0	132	17.6	168	2.5	204	0.6	240	0.6
28	5.6	64	30.3	100	56.3	136	14.5	172	1.9	208	0.6		
32	7.0	68	37.0	104	51.8	140	12.1	176	1.4	212	0.6		
36	8.4	72	43.9	108	46.8	144	10.0	180	1.0	216	0.6		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
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	7	Number of Offline Controls	0	Number of Time/Area Diagrams	2
Number of Online Controls	3	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.223
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.900	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

US/MH				Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm	Period	Change		Surcharge	Flood	Overflow	Act.
1.000	1	120	Summer	100	+40%				
1.001	2	120	Summer	100	+40%				
1.002	3	480	Summer	100	+40%	30/60	Summer		
2.000	4	120	Summer	100	+40%				
1.003	4	960	Summer	100	+40%	1/120	Summer		
1.004	6	120	Summer	100	+40%				
3.000	7	120	Winter	100	+40%	100/30	Summer		
4.000	8	120	Summer	100	+40%				
5.000	10	120	Summer	100	+40%				
3.001	7	960	Winter	100	+40%	1/360	Winter		
6.000	12	120	Winter	100	+40%	1/15	Summer	30/30	Summer
6.001	12	360	Winter	100	+40%	1/30	Summer		
1.005	7	480	Summer	100	+40%	100/120	Summer		

Input Variables

Output Variables

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.8	40	15.8	76	83.4	112	74.0	148	14.6	184	1.0	220	0.5
8	1.3	44	18.6	80	93.3	116	65.3	152	11.7	188	0.7	224	0.5
12	2.1	48	21.9	84	101.0	120	56.6	156	9.4	192	0.5	228	0.5
16	3.2	52	26.2	88	105.4	124	48.0	160	7.4	196	0.5	232	0.5
20	4.6	56	32.0	92	105.8	128	39.9	164	5.7	200	0.5	236	0.5
24	6.4	60	39.8	96	102.8	132	32.5	168	4.3	204	0.5	240	0.5
28	8.6	64	49.8	100	97.4	136	26.5	172	3.2	208	0.5		
32	10.9	68	60.8	104	90.4	140	21.7	176	2.3	212	0.5		
36	13.3	72	72.3	108	82.4	144	17.9	180	1.5	216	0.5		

Sirius Environmental Ltd			Page 29																																																																																																																																
4245 Park Approach Leeds LS15 8GB																																																																																																																																			
Date 11/10/2021 14:08 File REVISED NORTHERN NETWORK...		Designed by jdavies Checked by																																																																																																																																	
Innovyze		Network 2020.1																																																																																																																																	
<u>Input Hydrograph Manhole 4, DS/PN 2.000 (Storm)</u> <u>120 minute 100 year Summer I+40%</u> <u>Input Hydrograph Type: FSR Dynamic</u>																																																																																																																																			
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<table><tr><td>Region</td><td>England and Wales</td><td>Area (Ha)</td><td>1.666</td></tr><tr><td>M5-60 (mm)</td><td>19.900</td><td>SAAR (mm)</td><td>1677</td></tr><tr><td>Ratio R</td><td>0.223</td><td>CWI</td><td>125.383</td></tr><tr><td>Areal Reduction Factor</td><td>1.000</td><td>Urban</td><td>0.000</td></tr><tr><td>Main Stream Length (m)</td><td>109.550</td><td>SPR</td><td>47.000</td></tr><tr><td>H(85%) (m)</td><td>196.600</td><td>LAG (hrs)</td><td>0.000</td></tr><tr><td>H(10%) (m)</td><td>168.100</td><td>Base Flow (l/s)</td><td>(Calculated)</td></tr></table>				Region	England and Wales	Area (Ha)	1.666	M5-60 (mm)	19.900	SAAR (mm)	1677	Ratio R	0.223	CWI	125.383	Areal Reduction Factor	1.000	Urban	0.000	Main Stream Length (m)	109.550	SPR	47.000	H(85%) (m)	196.600	LAG (hrs)	0.000	H(10%) (m)	168.100	Base Flow (l/s)	(Calculated)																																																																																																				
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<table><tr><td>TP(0) (mins)</td><td>27</td><td>Q (l/s)</td><td>76.1</td><td>PR (%)</td><td>52.501</td></tr><tr><td>T (mins)</td><td>4</td><td>TB (mins)</td><td>73</td><td>S1085 (m/km)</td><td>346.874</td></tr><tr><td>TPt (mins)</td><td>29</td><td>Base Flow (l/s)</td><td>0.8</td><td></td><td></td></tr></table>				TP(0) (mins)	27	Q (l/s)	76.1	PR (%)	52.501	T (mins)	4	TB (mins)	73	S1085 (m/km)	346.874	TPt (mins)	29	Base Flow (l/s)	0.8																																																																																																																
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Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)																																																																																																																								
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©1982-2020 Innovyze																																																																																																																																			

Sirius Environmental Ltd		Page 30									
4245 Park Approach											
Leeds											
LS15 8GB											
Date 11/10/2021 14:08	Designed by jdavies										
File REVISED NORTHERN NETWORK...	Checked by										
Innovyze	Network 2020.1										
<u>Input Hydrograph Manhole 6, DS/PN 1.004 (Storm)</u> <u>120 minute 100 year Summer I+40%</u> <u>Input Hydrograph Type: FSR Dynamic</u>											
Input Variables											
Region England and Wales	Area (Ha)	1.860									
M5-60 (mm)	SAAR (mm)	1677									
Ratio R	CWI	125.383									
Areal Reduction Factor	Urban	0.000									
Main Stream Length (m)	SPR	47.000									
H(85%) (m)	LAG (hrs)	0.000									
H(10%) (m)	Base Flow (l/s)	(Calculated)									
Output Variables											
TP(0) (mins) 29	Q (l/s) 79.4	PR (%) 52.501									
T (mins) 4	TB (mins) 78	S1085 (m/km) 311.945									
TPt (mins) 31	Base Flow (l/s) 0.9										
Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	1.4	40	27.7	76	146.4	112	137.5	148	28.3	184	2.3
8	2.3	44	32.6	80	164.2	116	122.6	152	22.8	188	1.5
12	3.7	48	38.5	84	178.5	120	107.5	156	18.3	192	1.1
16	5.6	52	46.1	88	187.5	124	92.4	160	14.6	196	0.9
20	8.0	56	56.2	92	189.7	128	77.6	164	11.4	200	0.9
24	11.1	60	70.0	96	185.6	132	63.9	168	8.8	204	0.9
28	14.7	64	87.2	100	177.0	136	52.0	172	6.6	208	0.9
32	18.9	68	106.6	104	165.4	140	42.4	176	4.8	212	0.9
36	23.2	72	126.8	108	152.0	144	34.7	180	3.4	216	0.9
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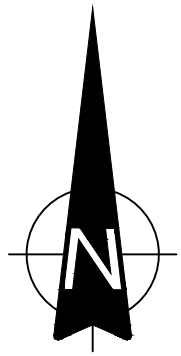
Input Variables

Output Variables

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
16	0.9	304	17.6	592	58.1	880	12.5	1168	0.9	1456	0.9	1744	0.9
32	1.3	320	19.6	608	55.1	896	12.3	1184	0.9	1472	0.9	1760	0.9
48	2.1	336	22.1	624	51.5	912	12.0	1200	0.9	1488	0.9	1776	0.9
64	3.4	352	24.9	640	47.6	928	11.7	1216	0.9	1504	0.9	1792	0.9
80	5.0	368	28.1	656	43.6	944	11.0	1232	0.9	1520	0.9	1808	0.9
96	6.8	384	31.6	672	39.6	960	10.0	1248	0.9	1536	0.9	1824	0.9
112	8.4	400	35.3	688	35.7	976	8.5	1264	0.9	1552	0.9	1840	0.9
128	9.8	416	39.2	704	31.9	992	6.7	1280	0.9	1568	0.9	1856	0.9
144	10.8	432	43.2	720	28.4	1008	5.0	1296	0.9	1584	0.9	1872	0.9
160	11.5	448	47.3	736	25.2	1024	3.4	1312	0.9	1600	0.9	1888	0.9
176	11.9	464	51.2	752	22.4	1040	2.3	1328	0.9	1616	0.9	1904	0.9
192	12.2	480	54.8	768	19.9	1056	1.5	1344	0.9	1632	0.9	1920	0.9
208	12.4	496	58.0	784	17.8	1072	1.1	1360	0.9	1648	0.9		
224	12.6	512	60.5	800	16.1	1088	0.9	1376	0.9	1664	0.9		
240	13.0	528	62.1	816	14.8	1104	0.9	1392	0.9	1680	0.9		
256	13.7	544	62.7	832	13.8	1120	0.9	1408	0.9	1696	0.9		
272	14.6	560	62.1	848	13.1	1136	0.9	1424	0.9	1712	0.9		
288	15.9	576	60.6	864	12.7	1152	0.9	1440	0.9	1728	0.9		

APPENDIX 3

Amended Drawings



Issues

Drain

Drain

Drain

Collects
NEW SURFACE WATER DITCH 500mm X 500mm
IL : 173.500mAO
CL : 174.000mAO

EXISTING DITCH AND MINE
ADIT COLLECTING LANDFILL
AND OFFSITE FLOWS

IL : 173.500mAO
CL : 174.000mAO

NEW 300mm CULVERT TO BE FITTED
WITH ALTHON H3C PC INLET HEADWALL
WITH ISOLATION PENSTOCK AND
CONCRETE SANDBAG OUTLET HEADWALL.
PIPEWORK TO FALL AT A MINIMUM OF
1:225 WITH A 200mm ORIFICE PLATE
IL : 164.500mAO
CL : 166.500mAO

EXISTING 300mm CULVERT
IL : 165.400mAO
CL : 166.500mAO

Ex. 300mm CULVERT
TO BE BLOCKED

Ex. 300mm CULVERT

Ex. 300mm CULVERT

NEW 300mm CULVERT WITH ALTHON
H3C PC INLET HEADWALL WITH
ISOLATION PENSTOCK AND CONCRETE
SANDBAG OUTLET HEADWALL. PIPEWORK
TO FALL AT A MINIMUM OF 1:225 WITH
A 257mm ORIFICE PLATE
IL : 164.000mAO
CL : 166.000mAO

Ex. 300mm CULVERT

NEW 500mm
ISOLATION STOP LOG

EXISTING 500mm CULVERT
PIPE 1.005

EXISTING 500mm CULVERT
PIPE 1.005

PERMITTED OUTFALL

EXISTING APPROVED
OUTFALL TO THE
UPPER CLYDACH RIVER

EXISTING CAPPED SITE TO BE BUNDED
TO PREVENT SURFACE WATER RUNOFF
GETTING TO THE HAUL ROAD. CAP BUND
TO EXTEND AROUND THE CAP CONTOURS
FALLING TO THE EXISTING MAIN SITE
SETTLEMENT LAGOONS ON THE
NORTHERN SIDE.

IL : 165.500mAO
CL : 166.000mAO

EXISTING SETTLEMENT LAGOON
IL : 163.500mAO
CL : 166.000mAO

EXISTING 225mm CULVERT
PIPE 1.002
IL : 163.500mAO
CL : 166.000mAO

EXISTING SETTLEMENT
LAGOON
IL : 162.400mAO
CL : 164.000mAO

EXISTING 225mm CULVERT
PIPE 1.003
NEW 178mm ORIFICE
PLATE TO BE INSTALLED TO
HEADWALL
IL : 162.400mAO
CL : 164.000mAO

EXISTING 500mm X 500mm
SURFACE WATER DITCH
THROUGH WETLAND AREA
PIPE 1.004

NEW SURFACE
WATER DITCH
500mm X 500mm
IL : 167.000mAO
CL : 167.500mAO

EXISTING SETTLEMENT
LAGOON
IL : 164.500mAO
CL : 166.500mAO

EXISTING SETTLEMENT LAGOON
IL : 165.400mAO
CL : 166.500mAO

IL : 159.600mAO
CL : 161.000mAO

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS
IN METERS ABOVE ORDNANCE DATUM.

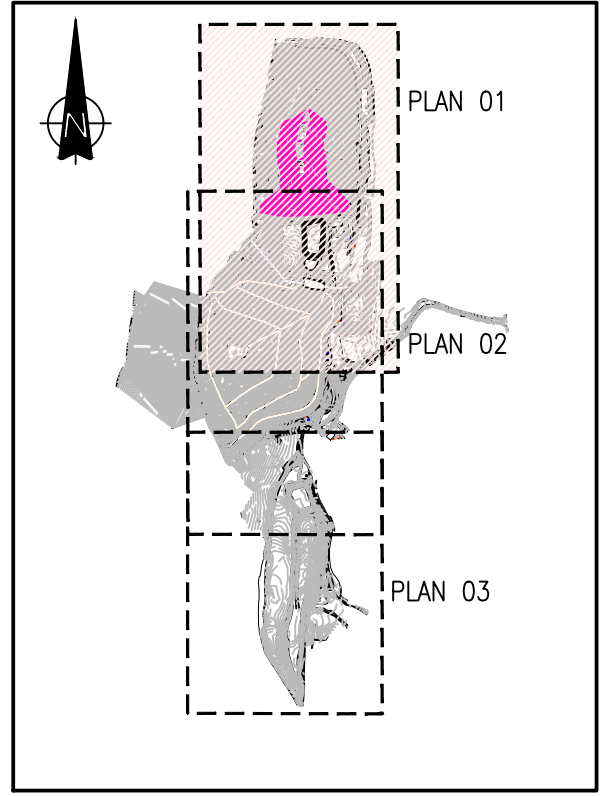
2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS
SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO
THE ATTENTION OF SIRIUS ENVIRONMENTAL LIMITED
PRIOR TO CONSTRUCTION WORKS COMMENCING.

LEGEND:

- 18.5— EXISTING SITE SURVEY
- 19.5— PROPOSED WASTE CONTOURS
- EXISTING CAP DIVERSION BUND
- PROPOSED DITCH 500mm DEEP
- EXISTING SETTLEMENT LAGOON,
IL 163.50, GL 166.00 WITH 225
CULVERT TO LAGOON 2
- EXISTING SETTLEMENT LAGOON,
IL 162.00, GL 163.70 WITH 225
CULVERT
- EXISTING WETLAND TO BE
RETAINED
- EXISTING SETTLEMENT LAGOON
OVERFLOWING INTO LAGOON 7
IL 164.50, GL 166.5
- EXISTING SETTLEMENT LAGOON
OVERFLOWING INTO THE MAIN
LAGOON 4
IL 164.60, GL 166.00
- EXISTING SETTLEMENT LAGOON
WITH NEW OUTLET CULVERT
IL 164.20, GL 166.00
- EXISTING SETTLEMENT LAGOON,
IL 159.65, GL 161.00
- PROPOSED 0.5m CAP DIVERSION
BUND
- NEW CULVERT

H	REVISED TOPO ADDED, PROPOSED WASTE CONTOURS ADDED, MINOR AMENDMENTS	07/10/21	M.C
G	INVERT LEVELS AND PIPE NUMBERS ADDED	23/09/19	M.C
F	PROPOSED LAGOON EXTENSION ADD NEW SURFACE WATER DITCH ADDED ON BUND OF REVISED CELL 5 DESIGN	16/08/19	M.C
E	WESTERN AND SOUTHERN DITCH MOVED DUE TO CELL 5	23/05/19	J.D
REV	DESCRIPTION	DATE	BY



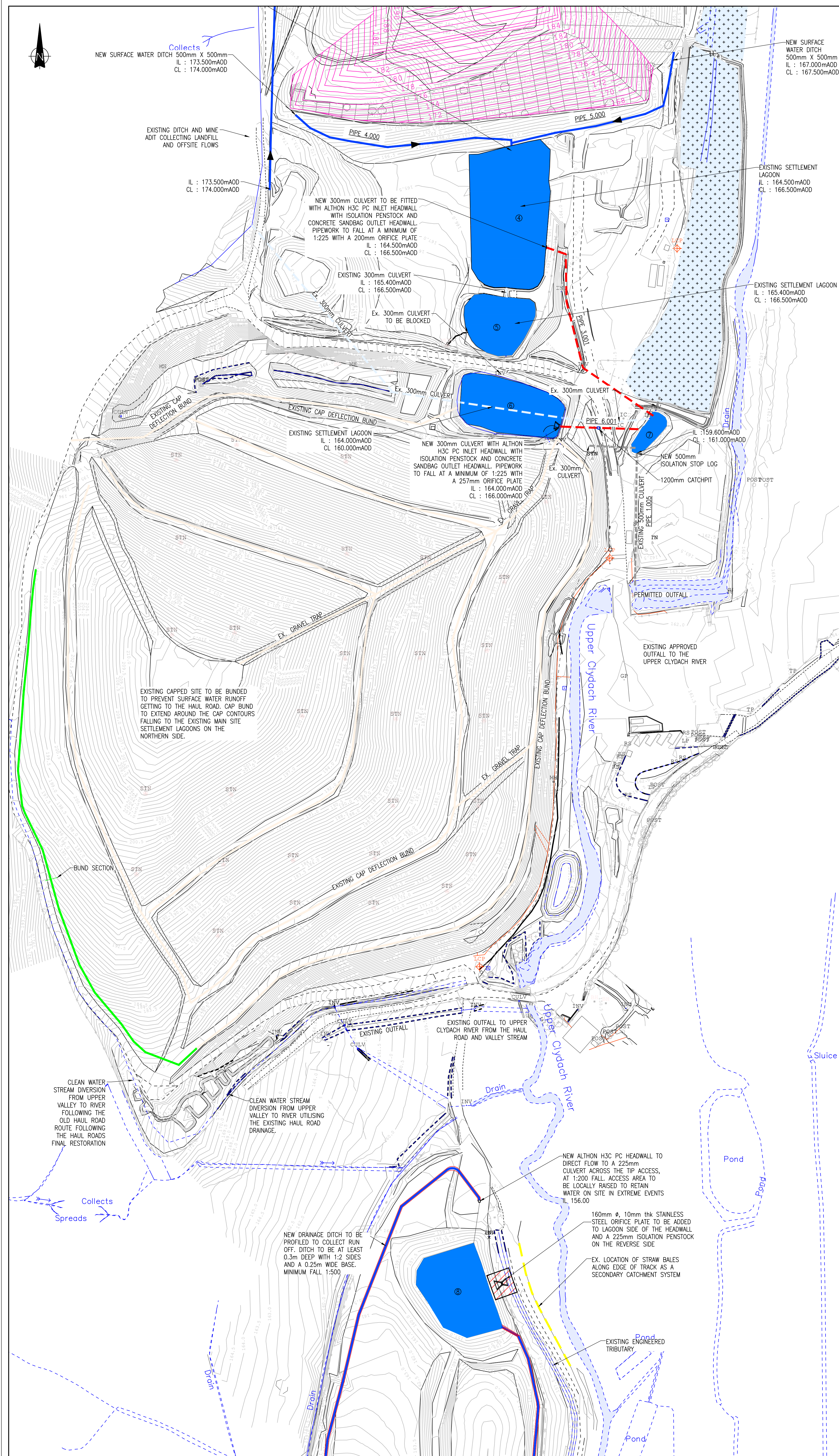
JOB TITLE

PWLLFAWATKIN SWM

DRAWING TITLE

Proposed Haul Road and Tip 871
Drainage Improvements

DRAWN	DATE	APPROVED	DATE
ARK	06/06/2018	ARK	06/06/2018
SCALE	SHEET	DRAWING NUMBER	REVISION
1:1000	1	WR7470 01 01	G



NOTES:

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METERS ABOVE ORDNANCE DATUM.
2. DO NOT SCALE FROM THIS DRAWING.
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LEGEND:

—18.5— EXISTING SITE SURVEY

—19.5— PROPOSED WASTE CONTOURS

EXISTING CAP DIVERSION BUND

PROPOSED DITCH 500mm DEEP

EXISTING SETTLEMENT LAAGOON,
IL 163.50, GL 166.00 WITH 225
CULVERT TO LAAGOON 2

EXISTING SETTLEMENT LAAGOON,
IL 162.00, GL 163.70 WITH 225
CULVERT

EXISTING WETLAND TO BE
RETAINED

EXISTING SETTLEMENT LAAGOON
OVERFLOWING INTO LAAGOON 7
IL 164.50, GL 166.5

EXISTING SETTLEMENT LAAGOON
OVERFLOWING INTO THE MAIN
LAAGOON 4
IL 164.60, GL 166.00

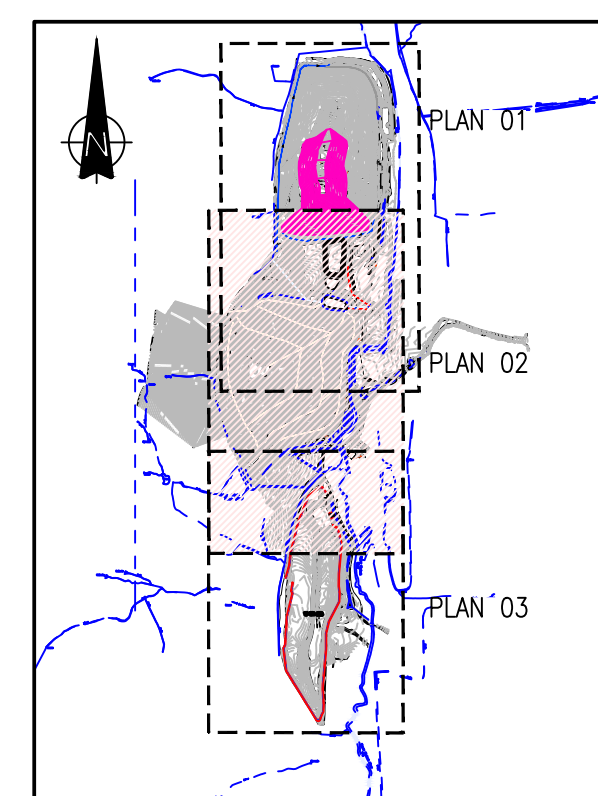
EXISTING SETTLEMENT LAAGOON
WITH NEW OUTLET CULVERT
IL 164.20, GL 166.00

EXISTING SETTLEMENT LAAGOON,
IL 159.65, GL 161.00

PROPOSED 0.5m CAP DIVERSION
BUND

NEW CULVERT

G	REVISED TOPO ADDED, PROPOSED WASTE CONTOURS ADDED, MINOR AMENDMENTS	07/10/21	M.C.
F	INVERT LEVELS AND PIPE NUMBERS ADDED	23/09/19	M.C.
E	PROPOSED LAGOON EXTENSION ADD. NEW SURFACE WATER DITCH ADDED ON BUND OF REVISED CELL 5 DESIGN	16/08/19	M.C.
REV	DESCRIPTION	DATE	BY



CLIENT



4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

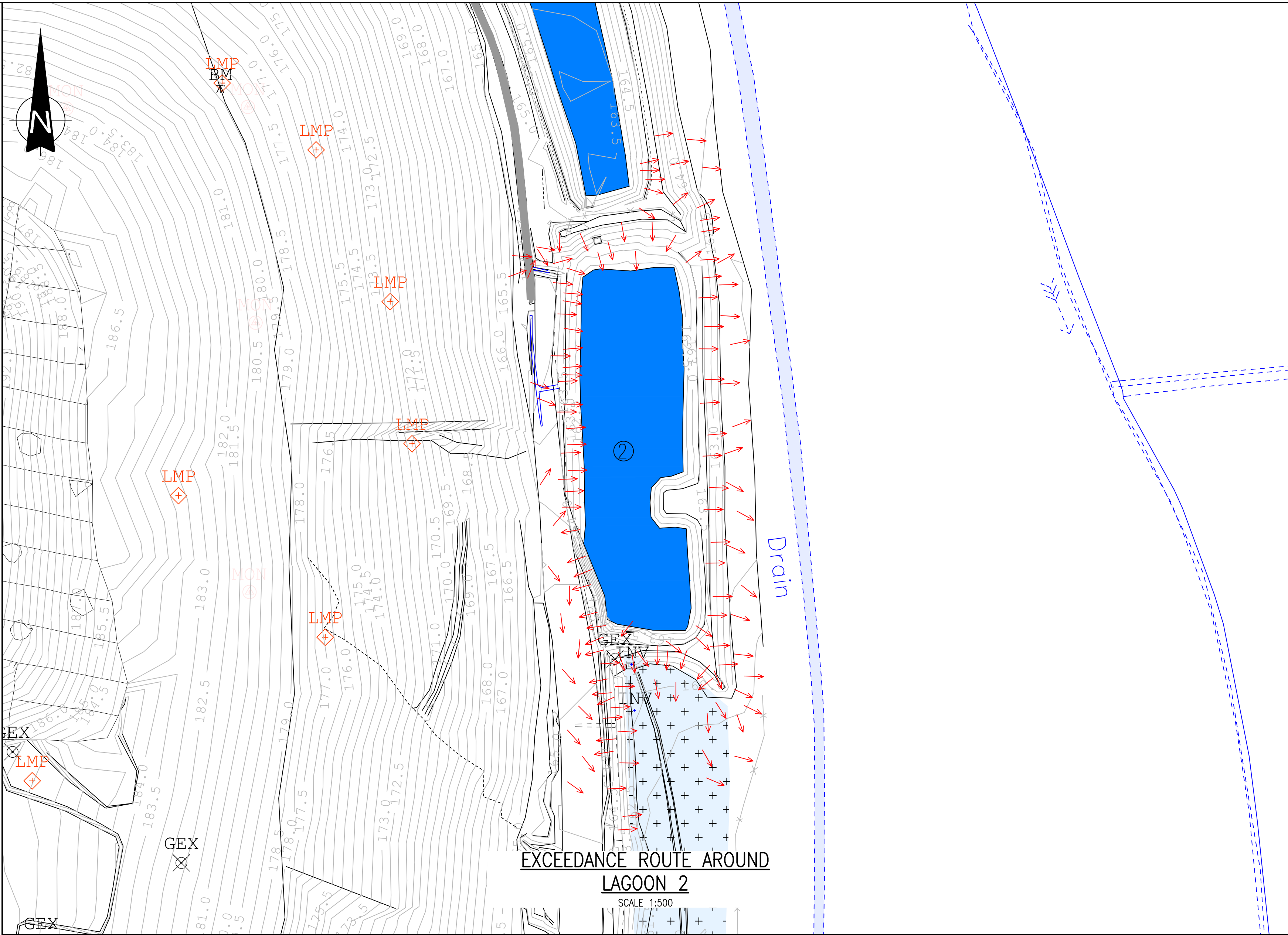
JOB TITLE

PWLLFAWATKIN SWM

DRAWING TITLE

Proposed Haul Road and Tip 871 Drainage Improvements

DRAWN		DATE		APPROVED		DATE	
ARK		06/06/2018		ARK		06/06/2018	
SCALE		SHEET		DRAWING NUMBER		REVISION	
1:1000		2		WR7470 01 01		F	

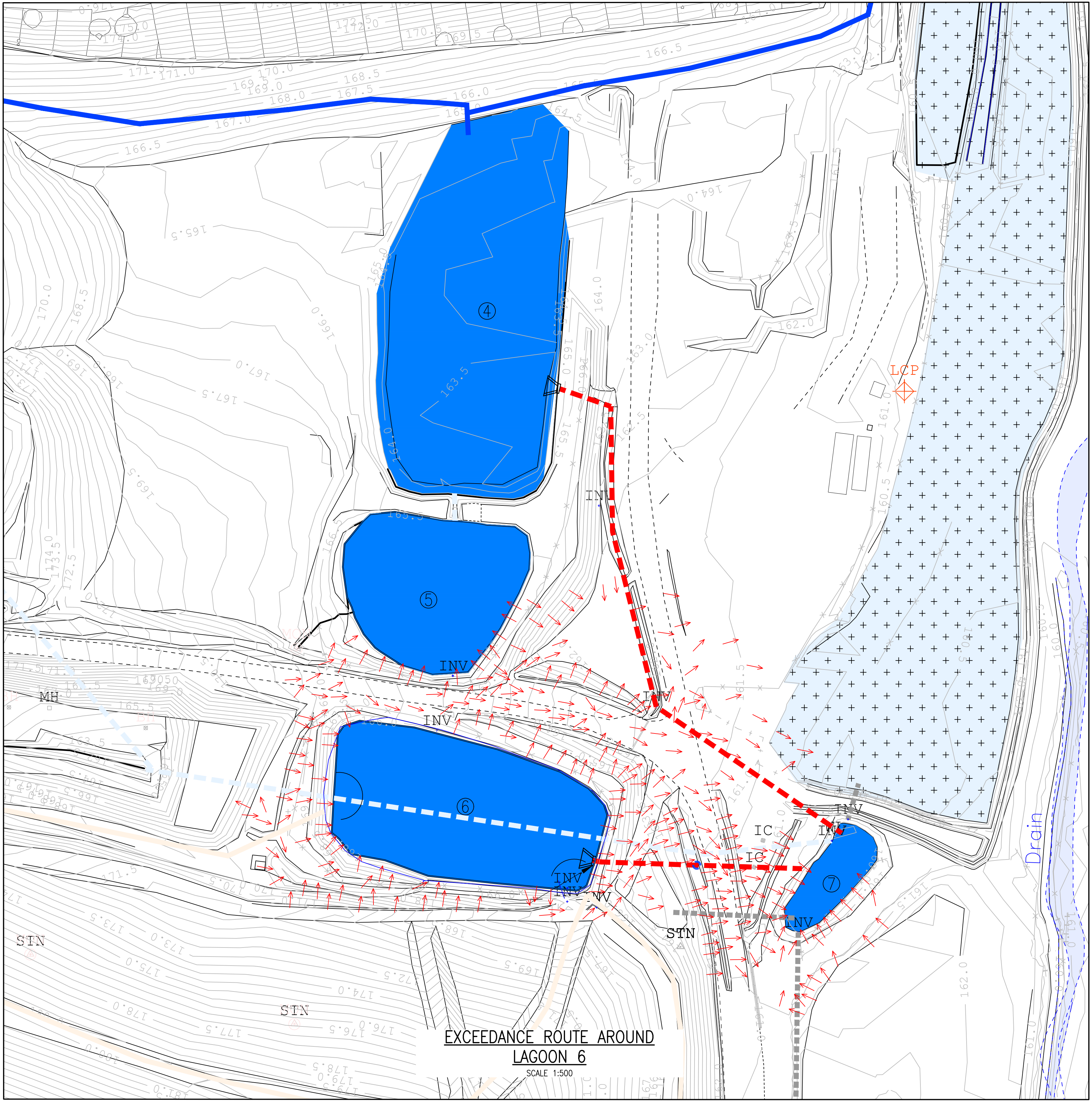


NOTES:

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3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL LIMITED PRIOR TO CONSTRUCTION WORKS COMMENCING.

LEGEND:

—18.5— EXISTING SITE SURVEY



REV	DESCRIPTION	DATE	BY
CLIENT			



4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

PWLLFAWATKIN SWM

DRAWING TITLE

EXCEEDANCE ROUTES

DRAWN	DATE	APPROVED	DATE
M.C	11/10/2021	J.D	11/10/2021
SCALE	SHEET	DRAWING NUMBER	REVISION
1:500	1	WR7470 01 03	0