From: Jonathan Poynton <JonathanP@pontrilastimber.co.uk>
Sent: 28 June 2021 15:13
To: Jenman, Rebecca <Rebecca.Jenman@herefordshire.gov.uk>; healdptnshp@me.com
Cc: healdptnshp@me.com; Hargraves, Philippa <Philippa.Hargraves@herefordshire.gov.uk>
Subject: RE: 210289 - Treatment building

Hi Rebecca

Please find below an update regarding your questions

Vehicle Generation

The new treatment building does not generate significant additional traffic. The plant will take over the majority of work from the existing plant and carry out some additional treatment meaning that we can treat a higher proportion of the timber we produce. It doesn't increase our number of lorries dispatched. We typically have one artic of treatment concentrate delivered per month, in some months of the year this may increase and be two deliveries per month.

Opus Report including Calculations

I have attached the Opus report and calculations that were originally submitted with the first planning application. I have also given details of the Hydro brake that was installed.

Treatment type and Permit

The treatment that we use is Tanalith, this is a copper based pressure treatment process, this will also be used in our new treatment plant. We have an existing A2 permit for treatment on site. I have been working with Philippa Hargreaves of the EA and she has confirmed that the new plant will be an addition to the existing permit.

If I can be of any further help please don't hesitate to contact me

Best regards

Jonathan

Please note that we do not use email to advise of changes to bank details, this will always be done by telephone through the normal contacts. If you do receive such emails please call us to advise. Be alert to prevent fraud.

From: Jenman, Rebecca [mailto:Rebecca.Jenman@herefordshire.gov.uk]
Sent: 24 June 2021 11:55
To: Jonathan Poynton; healdptnshp@me.com
Subject: 210289 - Treatment building

Good morning,

I have been working on application 210189 this morning which is in connection with a new treatment plant at the sawmills. Unfortunately I'm still waiting on a number of consultations and I would like to apologise for the ongoing delay. I have chased a few up this morning and hope that I will receive comments from the EHO on air quality later this week. Highways and Drainage have asked for some further information so they can assess the impacts of the development. The information requested is as follows:

- Details of vehicle generation from the proposed development, average existing vehicle movements also needed for a comparison;
- a copy of the full Opus Report (including calculations) referred to in the FRA.

If you could also confirm for me if the type of treatment which the development will accommodate and if this already occurs at the site or if this is a new process being introduced to the site. The EHO Officer believes that the process does not currently occur at the site and will require a Local Authority A2 permit.

If you could let me have this information at your earliest convenience and I will continue to keep you updated.

Regards

Rebecca

Rebecca Jenman
Principal Planning Officer Minerals and Waste
Development Management
Economy, Environment & Culture
Herefordshire Council

Email: rjenman@herefordshire.gov.uk

Council's Homepage www.herefordshire.gov.uk

you do receive such emails please call us to advise. Be alert to prevent fraud.

From: Laura K. Curnow <Laura.Curnow@opusinternational.co.uk>
Sent: 07 July 2014 13:01
To: healdptnshp (healdptnshp@me.com) <healdptnshp@me.com>; Jonathan Poynton <JonathanP@pontrilastimber.co.uk>
Subject: C8352 - Pontrilas: Drainage Design Statement
Importance: High

Hi both,

Drainage Design Statement for Planning Submission;

The proposed surface water drainage design will be undertaken in accordance with Building Regulations, Document H. As such, the disposal method has been considered in a sequential manner. Soakaway testing was undertaken in accordance with BRE Digest 365 and deemed unviable to cater for the vast hardstanding area generating surface water run-off. Consequently, it is instead proposed to discharge to the nearest watercourse; Worm Brook which runs along the western boundary of the site.

It is proposed to restrict discharge via complex flow control to the site's greenfield run-off rate. With reference to the attached calculations, this has been determined as 9.0l/s/ha (Qbar) which will be applied to storms up to a 1 in 30 year return period and for storms in excess of this increasing up to a limit of 19.6l/s/ha. Storage provision will be met by a series of ponds along the northern site boundary which will all be sited above and outside of the 1 in 100 year flood level. The ponds will cascade into each other once full via high water level overflows. Retention of the 1 in 100 year return period storm event of 6 hour duration (with a 30% allowance for climate change) on-site will be met in accordance with Ciria C697, SUDs Manual. A series of sluice gates will enable the ponds to be manually drained after a significant storm event and provide an emergency drain down facility.

Water quality measures will include the installation of Class 1, alarmed petrol interceptors to lorry and car park areas in accordance with the EA's PPG3. Furthermore, the filtration system through the biological ponds will further enhance and treat the discharge – please refer to Biological Design for further information.

The biological wetland area within the western end flood zone will be profiled below existing ground level thus providing additional flood storage capacity – cut / fill volumetric analysis will be provided to further evidence this.

Kind regards,
Laura

OPUS

Laura Curnow CEng MICE | Senior Engineer | Opus International Consultants (UK) Ltd
Phone +44 29 2053 5523 | Fax +44 29 2036 3797 | Email laura.curnow@opusinternational.co.uk
Unit 2 Fountain Court, Fountain Lane, St Mellons, Cardiff, CF3 0FB

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ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	4.800	Urban	0.000
SAAR (mm)	716	Region Number	Region 9

Results	**l/s**
QBAR Rural	9.0
QBAR Urban	9.0
Q100 years	19.6
Q1 year	7.9
Q30 years	15.8
Q100 years	19.6

From: Laura K. Curnow <Laura.Curnow@opusinternational.co.uk>
Sent: 11 July 2014 18:13
To: Jonathan Poynton <JonathanP@pontrilastimber.co.uk>; healdptnshp (healdptnshp@me.com) <healdptnshp@me.com>
Cc: Mark Lewis <Mark.Lewis@opusinternational.co.uk>
Subject: C8352 - Pontilas: Drainage Proposals
Importance: High

Hi both

Please find attached preliminary drainage proposals for your review and comment. I hope to issue the cut / fill volumetric analysis for the layout and levels shown on Monday.

I have developed the drainage solution mindful of phasing requirements which should give you flexibility to extend as per Kim's phasing layout. I have tried to minimise the encroachment of the ponds into potential development area. The entirety of the bottom, sawmills operation area (messy end) has been designed to be entirely open in the form of concrete open channels and ditches for ease of maintenance. The ditch is approximately 1m deep and it may be prudent to consider the inclusion of a safety barrier to the edges.

The principle of the design is that 0.5m depth of water would be typically retained as a baseline flow for the wetland biology. A small diameter pipe will be set to this level which allows water to flow through the ponds sequentially at a throttled rate. The water level in more extreme events will rise beyond this, to a maximum depth of up to 1.5m in total (1m effective storage depth with 0.5m baseline depth) at which point a larger overflow pipe will convey water through to the next pond. A complex flow control in the bottom pond ensures that water is released at a greenfield runoff rate into the wetland area. The small diameter pipe set at 0.5m depth means that each pond will drain without manual operation between storm events. The design achieves storage for a 1 in 100 year event of 6 hour duration with a 30% allowance for climate change.

With this design, manual drain down will now only be required to drain the baseline 0.5m depth. As the bottom ponds cannot be drained down by gravity (sited lower than existing ground) a portable pump would be needed to drain this pond when required. This is only envisaged for occasional maintenance or in the event of contamination or similar scenario when full emptying is needed. On the basis that a portable pump is required for the bottom ponds, I have omitted the multiple sluice penstock chambers serving each pond on the grounds that in the event of full drain down being required the same pump can be used instead. This will offer cost saving, health and safety benefits and a better operational solution as the ponds will drain themselves between storm events without manual input.

If you could let me know your initial thoughts and if happy I will forward on to Jay for his comment.

Could you also please confirm who is fulfilling the CDMC duties for our record? Jonathan, please note, if you do not appoint a third party the responsibilities lie with yourself as Client.

Kind regards,
Laura

Laura Curnow CEng MICE | Senior Engineer | Opus International Consultants (UK) Ltd
Phone +44 29 2053 5523 | Fax +44 29 2036 3797 | Email laura.curnow@opusinternational.co.uk
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Calculation Sheet

Project No:	V-C8352	Sheet No:	1 of
Project:	Pontrilas Sawmills	Revision:	R0
	Extenstion of Sawmills	By:	LKC
Element:	Drainage - SWS	Date:	08/07/2014

OPUS

Ref:	Calculation:	Output:

Proposed System Design Criteria

Building Regulations, Document H, as well as planning strategy best practice, requires the means of surface water disposal to be considered in a sequential manner namely; discharge to ground, watercourse and finally to piped sewerage network. This approach is inline with initial consultation advice received from Martin Jackson on behalf of Herefordshire Council 21 March 2014 (correspondence see page 3-4)

Soakaway testing was undertaken by others and the obtained infiltration rate deemed unviable to drain the significant hardstanding area of the proposed development.

It is therefore proposed to discharge to the nearby Worm Brook on the site's western boundary.

With reference to WinDES output (see page 5), a site specific greenfield run-off rate of 3.2l/s/ha (QBar) has been determined. It is proposed to control the discharge to this rate for all storm events simulated under the scenarios described below.

With reference to the same e-mail correspondence, there is a requirement for all surface water attenuation to be sited above the Q100 + cc flood level which with reference to the FRA is taken as 72.50m AOD.

Design Parameters

Site Location: Pontrilas (Southwest of Hereford)

Ratio, R: 0.388 } WinDES integrated mapping facility
M5-60: 19mm }

Total Contributing Run-off Area: 4.546ha (see sketch within calc pack)

Restricted Discharge Rate: QBar @ 3.2l/s/ha = 14.55l/s

Assumed 100% run-off from impermeable areas

Q100 +cc Flood Level: 72.50m AOD

Software, Procedure & Design Criteria

WinDES, MicroDrainage Softare Package: Version 2013.1.1

Modules - Source Control & Network (System 1 and Simulation)

<u>Carrier System Criteria</u>

i) For a 1 in 2 year return period - system to perform with flows contained within full bore of the pipe network i.e. no surcharge / flooding. Worst case storm duration to be iterated. Free Outfall.*

ii) For a 1 in 30 year return period - flow to be contained within sealed carrier drain, below cover i.e. surcharge okay, no flooding. Short, high intensity storm durations represent worst case for upstream carrier system. Free Outfall.*

Calculation	Checked:	WM	Revision	Checked:		Revision Reason:
	Date:	18/7/14		Date:		

Calculation Sheet

Project No:	V-C8352	Sheet No:	2 of
Project:	Pontrilas Sawmills	Revision:	R0
	Extenstion of Sawmills	By:	LKC
Element:	Drainage - SWS	Date:	08/07/2014

OPUS

Ref:	Calculation:	Output:

Storage Criteria

iii) For a 1 in 30 year return period - flow to be contained within sealed carrier drain, below cover i.e. surcharge okay, no flooding. Long duration storm events represent worst case for storage. Simulations to be run for storm durations until peak is reached and worst case is iterated.

iv) For a 1 in 100 year return period - ensure long term storage provision for storm duration of 6 hours. To include a 30% increase in flows as an allowance for climate change. Any volume of flooding to be quantified and retained on-site. Free outfall*.

Above i), ii) and iii) simulated storm durations to be applied in increments of 15, 30, 60, 120... +60 minutes until the peak is reached and worst case storm event is established for each design criteria.

*Free outfall assumed on basis of ponds being outside of the flood zone with the outlet above the 100 year flood level.

Calculation	Checked:	WM	Revision	Checked:		Revision Reason:
	Date:	18/7/14		Date:		

Laura Curnow

From: healdptnshp <healdptnshp@me.com>
Sent: 21 March 2014 15:22
To: Jonathan Poynton
Cc: Laura K. Curnow
Subject: Fwd: PONTRILAS SAWMILLS - proposed expansion

Afternoon Both

SEE below

Kim
01981 241144

Begin forwarded message:

From: "Jackson, Martin" <Martin.Jackson@bblivingplaces.com>
Subject: RE: PONTRILAS SAWMILLS - proposed expansion
Date: 21 March 2014 14:58:26 GMT
To: healdptnshp <healdptnshp@me.com>
Cc: "Klein, Debby" <dhklein@herefordshire.gov.uk>

Kim

I thank you for your patience on this matter. I am now able to comment as follows:

As per the EA's response, the development would require a Flood Risk Assessment (FRA) prepared in accordance with National Planning Policy Framework (NPPF) to support the planning application due to the size of the development being greater than 1 ha. The FRA should assess flood risk from all sources of flooding (i.e. fluvial, surface water, overland flow, groundwater and artificial sources), confirm the nature and extent of flood risk on land immediately adjacent to the site boundary, apply a site-specific sequential approach to the location of vulnerable development within the site, and discuss the proposed measures for managing surface water runoff to ensure no increased risk to the development and/or to people and property elsewhere.

The planning application should be supported by an outline drainage strategy that demonstrates how surface water and foul water from the proposed development will be managed. The surface water drainage strategy must demonstrate that there is no increased risk of flooding to the site or to people and property elsewhere as a result of development, up to and including the 1 in 100 year event and allowing for the potential effects of climate change.

Under Schedule 3 of the Flood Water Management Act 2010 (due to be enacted in late 2014) all new drainage systems for new and redeveloped sites must meet the new National Standards for Sustainable Drainage (currently in draft) and will require approval from the Lead Local Flood Authority (Herefordshire Council). In accordance with the draft National Standards for Sustainable Drainage and Policy DR4 of the Unitary Development Plan, the drainage strategy should incorporate the use of Sustainable Drainage Systems (SUDS) where possible. The surface water drainage strategy should be designed to mimic the existing drainage of the site. Infiltration measures are to be used unless it is demonstrated that infiltration is infeasible due to the underlying soil conditions or groundwater contamination risks. Where infiltration techniques are proposed, you should provide soil infiltration test results prior to construction to support the SUDS design. You should also provide information on groundwater levels as it is recommended that the invert level of a soakaway should be at least 1m above the groundwater level.

If drainage of the site cannot be achieved successfully through infiltration, surface water runoff should be managed via a controlled discharge to the adjacent watercourse. The rate and volume of discharge should be restricted to the pre-development Greenfield values. Reference should be made to Defra/EA document 'Preliminary Rainfall Runoff Management for Developments' (Revision E, January 2012) for guidance on calculating Greenfield runoff rates and volumes.

With regards to the proposed biodiversity area adjacent to the site, this area would not be appropriate for surface water attenuation as all attenuation should be located at an elevation above the 1 in 100 year plus climate change flood level. Raising of the land within the area identified to be at flood risk would also not be acceptable without providing compensatory flood storage elsewhere. However, the use of this area for biodiversity enhancement would be acceptable.

I trust this assists you.

Regards

Martin Jackson | Bridges, Structures and Flood Risk Manager
Balfour Beatty Living Places | Unit 3, Thorn Business Park | Rotherwas | Hereford | HR2 6JT

T :+44(0)1432 349529 | M : +44 (0) 7816 064146|
E: Martin.Jackson@bblivingplaces.com

www.balfourbeattyservices.com

From: Jackson, Martin
Sent: 20 March 2014 13:28
To: 'healdptnshp'
Subject: RE: PONTRILAS SAWMILLS - proposed expansion

Kim

I am sorry for the delay with this reply but due to short term internal factors on workload I have a work backlog. I have detailed to colleague to consider your application and I hope to have a reply very soon.

Again I do apologise for the delay.

Regards

Martin Jackson | Bridges, Structures and Flood Risk Manager
Balfour Beatty Living Places | Unit 3, Thorn Business Park | Rotherwas | Hereford | HR2 6JT

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GREENFIELD RUNOFF RATE 5

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ		Micro Drainage
Date 08/07/2014 13:36 File	Designed by cdlkj0 Checked by	
Micro Drainage	Source Control 2013.1.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	1.000	Urban	0.000
SAAR (mm)	1137	Region Number	Region 9

Results l/s

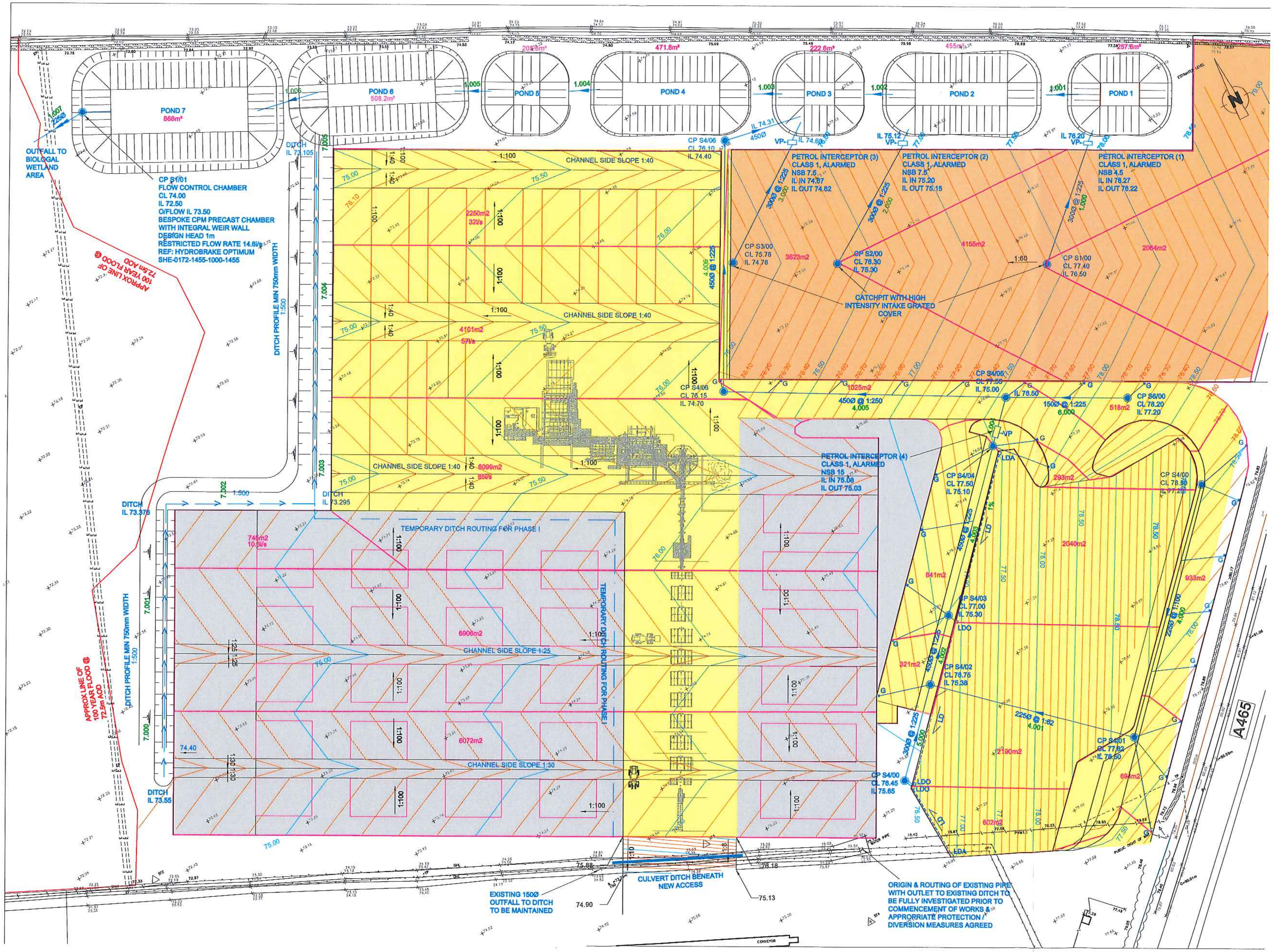
QBAR Rural 3.2
QBAR Urban 3.2

} Pre-developed discharge rate.

Q100 years 7.0

Q1 year 2.8
Q30 years 5.7
Q100 years 7.0

6



POND 7
868m²
POND 6
508.2m³
POND 5
POND 4
471.8m³
POND 3
222.8m³
POND 2
455m³
POND 1
257.6m³
OUTFALL TO BIOLOGICAL WETLAND AREA
CP S1/01
FLOW CONTROL CHAMBER
CL 74.00
IL 72.50
O/FLOW IL 73.50
BESPOKE CPM PRECAST CHAMBER WITH INTEGRAL WEIR WALL
DESIGN HEAD 1m
RESTRICTED FLOW RATE 14.6l/s
REF: HYDROBRAKE OPTIMUM
SHE-0172-1455-1000-1455
APPROX LINE OF 100 YEAR FLOOD @ 72.5m AOD
DITCH PROFILE MIN 750mm WIDTH
DITCH IL 73.105
DITCH IL 73.295
DITCH IL 73.378
DITCH IL 73.55
CHANNEL SIDE SLOPE 1:40
CHANNEL SIDE SLOPE 1:25
CHANNEL SIDE SLOPE 1:30
TEMPORARY DITCH ROUTING FOR PHASE I
CP S4/06
CL 76.10
IL 74.40
CP S4/06
CL 76.15
IL 74.70
PETROL INTERCEPTOR (3)
CLASS 1, ALARMED
NSB 7.5
IL IN 74.87
IL OUT 74.62
PETROL INTERCEPTOR (2)
CLASS 1, ALARMED
NSB 7.5
IL IN 75.20
IL OUT 75.15
PETROL INTERCEPTOR (1)
CLASS 1, ALARMED
NSB 4.5
IL IN 78.27
IL OUT 78.22
PETROL INTERCEPTOR (4)
CLASS 1, ALARMED
NSB 15
IL IN 75.08
IL OUT 75.03
CP S3/00
CL 75.78
IL 74.78
CP S2/00
CL 78.30
IL 75.30
CP S1/00
CL 77.40
IL 76.50
CATCHPIT WITH HIGH INTENSITY INTAKE GRATED COVER
CP S4/05
CL 77.55
IL 75.00
CP S6/00
CL 78.20
IL 77.20
CP S4/04
CL 77.50
IL 75.10
CP S4/03
CL 77.00
IL 75.30
CP S4/02
CL 76.75
IL 75.38
CP S4/01
CL 77.82
IL 76.50
CP S4/00
CL 78.45
IL 75.65
CP S4/00
CL 78.50
IL 77.20
2250m2
4101m2
5099m2
745m2
6906m2
6072m2
3623m2
4155m2
2064m2
1025m2
518m2
293m2
2040m2
841m2
933m2
321m2
2190m2
694m2
602m2
450Ø @ 1:250
150Ø @ 1:225
300Ø @ 1:225
450Ø @ 1:225
225Ø @ 1:62
A465
CULVERT DITCH BENEATH NEW ACCESS
EXISTING 150Ø OUTFALL TO DITCH TO BE MAINTAINED
ORIGIN & ROUTING OF EXISTING PIPE WITH OUTLET TO EXISTING DITCH TO BE FULLY INVESTIGATED PRIOR TO COMMENCEMENT OF WORKS & APPROPRIATE PROTECTION / DIVERSION MEASURES AGREED
74.90
75.13
75.88
76.18

INPUTS

STORM SEWER DESIGN by the Modified Rational Method

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)
1.000	46.840	0.200	234.2	0.206	5.00	0.0	0.600	o	300
1.001	8.700	0.039	223.1	0.000	0.00	0.0	0.600	o	100
2.000	39.800	0.180	221.1	0.416	5.00	0.0	0.600	o	300
1.002	7.500	0.033	227.3	0.000	0.00	0.0	0.600	o	100
3.000	39.121	0.180	217.3	0.362	5.00	0.0	0.600	o	300
4.000	68.600	0.700	98.0	0.093	5.00	0.0	0.600	o	225
4.001	55.700	0.895	62.2	0.069	0.00	0.0	0.600	o	225
5.000	26.100	0.120	217.5	0.279	5.00	0.0	0.600	o	300
4.002	18.800	0.080	235.0	0.032	0.00	0.0	0.600	o	450
4.003	46.060	0.200	230.3	0.288	0.00	0.0	0.600	o	450
4.004	13.200	0.100	132.0	0.029	0.00	0.0	0.600	o	450
6.000	31.900	0.700	45.6	0.052	5.00	0.0	0.600	o	150
4.005	74.500	0.300	248.3	0.103	0.00	0.0	0.600	o	450

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	5.76	76.500	0.206	0.0	0.0	0.0	1.02	72.3	0.0
1.001	0.00	6.05	76.200	0.206	0.0	0.0	0.0	0.51	4.0	0.0
2.000	0.00	5.63	75.300	0.416	0.0	0.0	0.0	1.05	74.5	0.0
1.002	0.00	6.29	74.940	0.622	0.0	0.0	0.0	0.51	4.0	0.0
3.000	0.00	5.61	74.780	0.362	0.0	0.0	0.0	1.06	75.1	0.0
4.000	0.00	5.87	77.200	0.093	0.0	0.0	0.0	1.32	52.5	0.0
4.001	0.00	6.42	76.500	0.162	0.0	0.0	0.0	1.66	66.0	0.0
5.000	0.00	5.41	75.650	0.279	0.0	0.0	0.0	1.06	75.1	0.0
4.002	0.00	6.66	75.380	0.473	0.0	0.0	0.0	1.32	210.2	0.0
4.003	0.00	7.24	75.300	0.761	0.0	0.0	0.0	1.34	212.4	0.0
4.004	0.00	7.36	75.100	0.790	0.0	0.0	0.0	1.77	281.2	0.0
6.000	0.00	5.36	77.200	0.052	0.0	0.0	0.0	1.49	26.4	0.0
4.005	0.00	8.33	75.000	0.945	0.0	0.0	0.0	1.29	204.5	0.0

STORM SEWER DESIGN by the Modified Rational Method

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)
4.006	65.800	0.300	219.3	0.000	0.00	0.0	0.600	o	450
4.007	19.300	0.090	214.4	0.000	0.00	0.0	0.600	o	450
1.003	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	100
1.004	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	100
1.005	10.000	0.001	10000.0	0.000	0.00	0.0	0.600	o	100
7.000	32.450	0.065	500.0	0.607	5.00	0.0	0.600	\/	-6
7.001	39.260	0.079	497.0	0.690	0.00	0.0	0.600	\/	-6
7.002	39.350	0.079	500.0	0.075	0.00	0.0	0.600	\/	-6
7.003	46.320	0.093	500.0	0.610	0.00	0.0	0.600	\/	-6
7.004	46.150	0.092	500.0	0.410	0.00	0.0	0.600	\/	-6
7.005	15.500	0.243	63.8	0.225	0.00	0.0	0.600	\/	-6
1.006	10.000	0.001	10000.0	0.000	0.00	0.0	0.600	o	150
1.007	10.000	0.001	10000.0	0.000	0.00	0.0	0.600	o	225
1.008	10.000	0.001	10000.0	0.000	0.00	0.0	0.600	o	225

DITCH
- Refer to conduit File overleaf

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)
4.006	0.00	9.13	74.700	0.945	0.0	0.0	0.0	1.37	217.7	0.0
4.007	0.00	9.36	74.400	0.945	0.0	0.0	0.0	1.38	220.2	0.0
1.003	0.00	9.67	74.310	1.929	0.0	0.0	0.0	0.54	4.2	0.0
1.004	0.00	9.98	73.500	1.929	0.0	0.0	0.0	0.54	4.2	0.0
1.005	0.00	12.39	73.000	1.929	0.0	0.0	0.0	0.07	0.5	0.0
7.000	0.00	5.34	73.400	0.607	0.0	0.0	0.0	1.57	1178.2	0.0
7.001	0.00	5.76	73.335	1.297	0.0	0.0	0.0	1.58	1181.9	0.0
7.002	0.00	6.18	73.256	1.372	0.0	0.0	0.0	1.57	1178.2	0.0
7.003	0.00	6.67	73.177	1.982	0.0	0.0	0.0	1.57	1178.2	0.0
7.004	0.00	7.16	73.085	2.392	0.0	0.0	0.0	1.57	1178.2	0.0
7.005	0.00	7.22	72.992	2.617	0.0	0.0	0.0	4.42	3316.5	0.0
1.006	0.00	14.20	72.749	4.546	0.0	0.0	0.0	0.09	1.6	0.0
1.007	0.00	15.56	72.501	4.546	0.0	0.0	0.0	0.12	4.8	0.0
1.008	0.00	16.93	72.500	4.546	0.0	0.0	0.0	0.12	4.8	0.0

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)
1.008		74.000	72.499	72.400	300	0

TOTAL IMPERMEABLE AREA 4.546ha @ $\underbrace{3.2 \text{ l/s/ha}}_{\text{Greenfield Rate}}$ = 14.6 l/s Restricted Discharge Rate

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ		Micro Drainage
Date 10/07/2014 16:24 File C8352-Sawmills E...	Designed by cdlkj0 Checked by	
Micro Drainage	Network 2013.1.1	

Conduits

Section		Input	Depth (%)	Wetted Area (m²)	Wetted Perimeter (m)	Base Coordinates X (m)	Base Coordinates Y (m)	Cover Coordinates X (m)	Cover Coordinates Y (m)
1	Symbol	\/	10	1.500	15.200	0.000	1.000		
	Width (mm)	15000	30	4.500	15.600	0.000	0.000		
	Height (mm)	1000	50	7.500	16.000	15.000	0.000		
	C.Height (mm)	300	70	10.500	16.400	15.000	1.000		
	Side Angle (°)	90.0	90	13.500	16.800				
	Splay (mm)	0	100	15.000	17.000				
	Open Section	Yes							
2	Symbol	[]	10	2.000	20.200	0.000	1.000	0.000	1.000
	Width (mm)	20000	30	6.000	20.600	0.001	0.000	20.000	1.000
	Height (mm)	1000	50	10.000	21.000	19.999	0.000		
	C.Height (mm)	450	70	14.000	21.400	20.000	1.000		
	Side Angle (°)	90.0	90	18.000	21.800				
	Splay (mm)	0	100	20.000	42.000				
	Open Section	No							
3	Symbol	\/	10	0.030	0.620	0.000	0.600		
	Width (mm)	500	30	0.090	0.860	0.000	0.000		
	Height (mm)	600	50	0.150	1.100	0.500	0.000		
	C.Height (mm)	600	70	0.210	1.340	0.500	0.600		
	Side Angle (°)	90.0	90	0.270	1.580				
	Splay (mm)	0	100	0.300	1.700				
	Open Section	Yes							
4	Symbol	\/	10	0.050	0.700	0.000	1.000		
	Width (mm)	500	30	0.150	1.100	0.000	0.000		
	Height (mm)	1000	50	0.250	1.500	0.500	0.000		
	C.Height (mm)	1000	70	0.350	1.900	0.500	1.000		
	Side Angle (°)	90.0	90	0.450	2.300				
	Splay (mm)	0	100	0.500	2.500				
	Open Section	Yes							
5	Symbol	\/	10	0.100	1.200	0.000	1.000		
	Width (mm)	1000	30	0.300	1.600	0.000	0.000		
	Height (mm)	1000	50	0.500	2.000	1.000	0.000		
	C.Height (mm)	1000	70	0.700	2.400	1.000	1.000		
	Side Angle (°)	90.0	90	0.900	2.800				
	Splay (mm)	0	100	1.000	3.000				
	Open Section	Yes							
6	Symbol	\/	10	0.075	0.950	0.000	1.000		
	Width (mm)	750	30	0.225	1.350	0.000	0.000		
	Height (mm)	1000	50	0.375	1.750	0.750	0.000		
	C.Height (mm)	1000	70	0.525	2.150	0.750	1.000		
	Side Angle (°)	90.0	90	0.675	2.550				
	Splay (mm)	0	100	0.750	2.750				
	Open Section	Yes							

DITCH
Selected conduit Profile

Online Controls for Storm

Depth/Flow Relationship Manhole: 24, DS/PN: 1.007, Volume (m^3): 1.3

Invert Level (m) 72.501

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.020	0.3110	0.286	14.3760	0.551	13.7700	0.816	13.1400
0.041	1.1940	0.306	14.4010	0.571	13.6570	0.837	13.2940
0.061	2.5600	0.327	14.4040	0.592	13.5230	0.857	13.4460
0.082	4.3070	0.347	14.3880	0.612	13.3590	0.878	13.5970
0.102	6.3150	0.367	14.3580	0.633	13.1590	0.898	13.7450
0.122	8.4340	0.388	14.3170	0.653	12.9160	0.918	13.8920
0.143	10.4930	0.408	14.2680	0.673	12.6210	0.939	14.0370
0.163	12.2520	0.429	14.2130	0.694	12.2650	0.959	14.1800
0.184	13.7070	0.449	14.1540	0.714	12.3390	0.980	14.3220
0.204	13.9370	0.469	14.0910	0.735	12.5040	1.000	14.4620
0.224	14.1110	0.490	14.0230	0.755	12.6660	1.100	15.1300
0.245	14.2370	0.510	13.9480	0.776	12.8260	1.200	15.7670
0.265	14.3230	0.531	13.8650	0.796	12.9840		

SEE HYDROBRAKE DATA SHEETS OVERLEAF
PRODUCT REF SHE-0172-1455-1000-1455.

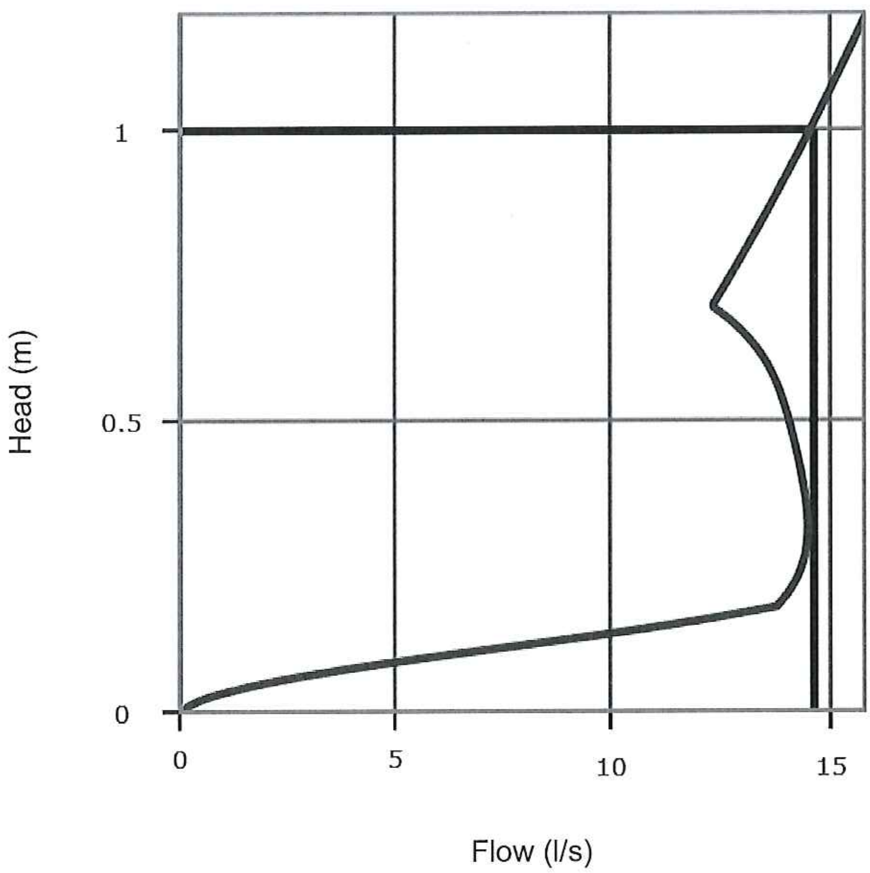
@ 1m Design Head
flow restricted to 14.46 l/s > 14.6 l/s of greenfield run-off rate
∴ OK

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	14.462
Flush-Flo™	0.318	14.405
Kick-Flo®	0.696	12.193
Mean Flow		12.268

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412



Head (m)	Flow (l/s)
0.000	0.000
0.034	0.864
0.069	3.184
0.103	6.459
0.138	10.023
0.172	12.964
0.207	13.964
0.241	14.218
0.276	14.355
0.310	14.403
0.345	14.390
0.379	14.335
0.414	14.253
0.448	14.156
0.483	14.047
0.517	13.921
0.552	13.766
0.586	13.562
0.621	13.281
0.655	12.888
0.690	12.344
0.724	12.419
0.759	12.694
0.793	12.963
0.828	13.226
0.862	13.483
0.897	13.735
0.931	13.982
0.966	14.224
1.000	14.462

DESIGN ADVICE
!

The head/flow characteristics of this SHE-0172-1455-1000-1455 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

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DESIGNER	lauracurnow
REF	

SHE-0172-1455-1000-1455
Hydro-Brake Optimum®

1.6.7.0

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	14.462
Flush-Flo™	0.318	14.405
Kick-Flo®	0.696	12.193
Mean Flow		12.268

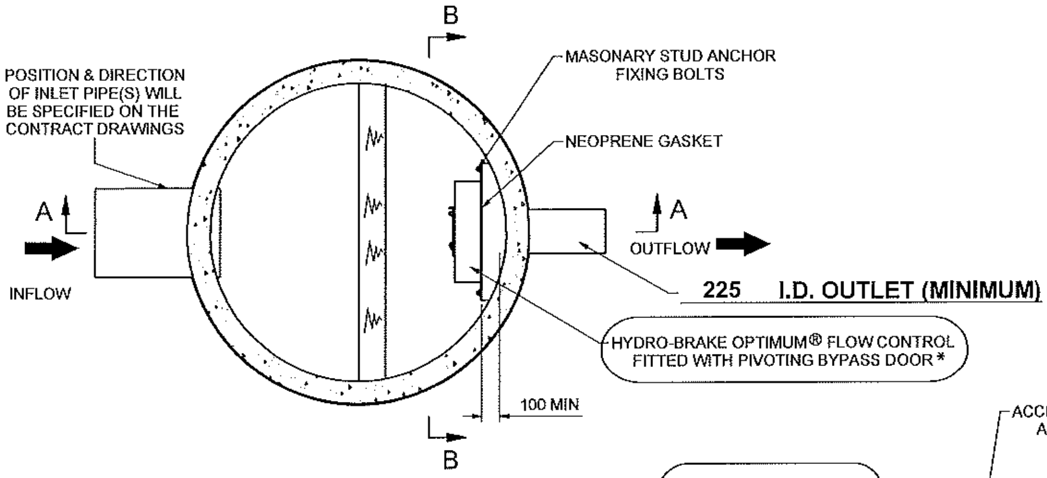
Hydro-Brake Optimum® Flow Control including:

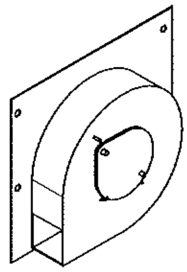
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting bypass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Bead blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Neoprene gasket to seal outlet

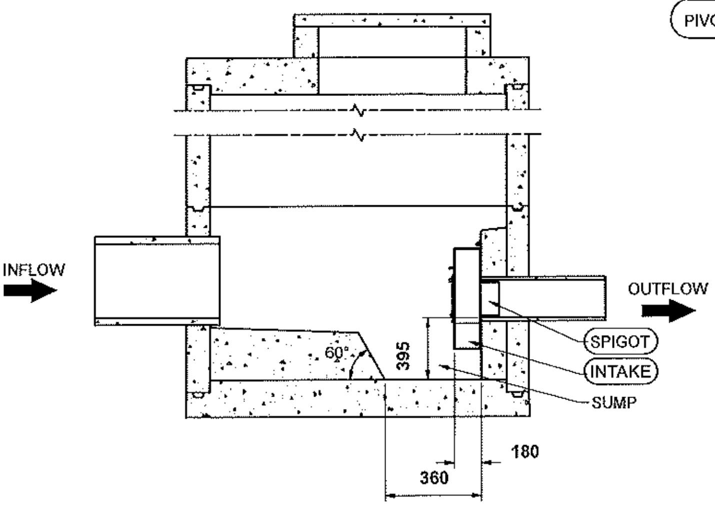
BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE No 08/4595

WRc APPROVED

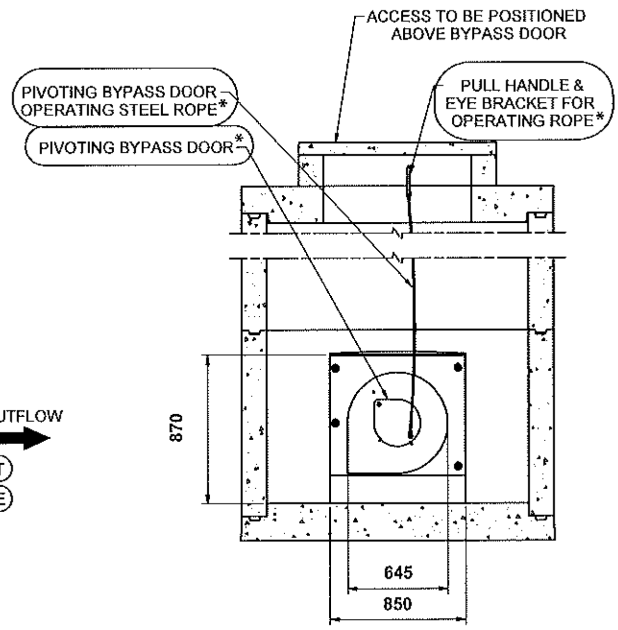
PT/329/0412







SECTION A-A



SECTION B-B

IMPORTANT: ( ) LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE OPTIMUM® FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0172-1455-1000-1455 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International

DATE	10/07/2014 15:04:35
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DESIGNER	lauracurnow
REF	

SHE-0172-1455-1000-1455

Hydro-Brake Optimum®

 Hydro International, Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD. Tel 01275 878371 Fax 01275 874979 Web www.hydro-int.com Email enquiries@hydro-int.com

Offline Controls for Storm

Pipe Manhole: 2, DS/PN: 1.001, Loop to PN: 1.002

Overflow Pond 1 → 2

Diameter (m)	0.100	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	77.200

Pipe Manhole: 4, DS/PN: 1.002, Loop to PN: 1.003

Pond 2 → 3

Diameter (m)	0.100	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	75.940

Pipe Manhole: 16, DS/PN: 1.003, Loop to PN: 1.004

Pond 3 → 4

Diameter (m)	0.225	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	75.310

Pipe Manhole: 21, DS/PN: 1.004, Loop to PN: 1.005

Pond 4 → 5

Diameter (m)	0.100	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	100.000	Upstream Invert Level (m)	74.500

Pipe Manhole: 18, DS/PN: 1.005, Loop to PN: 1.006

Pond 5 → 6

Diameter (m)	0.150	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	74.000

Pipe Manhole: 23, DS/PN: 1.006, Loop to PN: 1.007

Pond 6 → 7

Diameter (m)	0.150	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	73.750

Pipe Manhole: 24, DS/PN: 1.007, Loop to PN: None

Dummy overflow to assess sufficient storage capacity.

Diameter (m)	0.225	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	225.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	73.650

[All overflows between cascade of ponds are looped to ensure no flow escapes the system]

Storage Structures for Storm

Pond (1)

Tank or Pond Manhole: 2, DS/PN: 1.001

Invert Level (m) 76.200

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	144.0	0.300	208.3	0.600	284.2	0.900	371.5
0.100	164.2	0.400	232.3	0.700	312.0	1.000	403.2
0.200	185.6	0.500	257.6	0.800	341.1		

Pond (2)

Tank or Pond Manhole: 4, DS/PN: 1.002

Invert Level (m) 74.940

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	285.0	0.400	418.4	0.800	572.4	1.200	746.8
0.100	316.4	0.500	455.0	0.900	614.0	1.300	793.6
0.200	349.2	0.600	492.8	1.000	657.0	1.400	841.6
0.300	383.2	0.700	532.0	1.100	701.2		

Pond (3)

Tank or Pond Manhole: 16, DS/PN: 1.003

Invert Level (m) 74.310

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	119.0	0.400	199.3	0.800	300.1	1.200	421.4
0.100	137.2	0.500	222.6	0.900	328.5	1.300	454.9
0.200	156.6	0.600	247.2	1.000	358.2	1.400	489.7
0.300	177.3	0.700	273.0	1.100	389.2		

Pond (4)

Tank or Pond Manhole: 21, DS/PN: 1.004

Invert Level (m) 73.500

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	297.0	0.600	510.6	1.200	770.3	1.800	1076.0
0.100	329.4	0.700	550.7	1.300	818.0	1.900	1131.5
0.200	363.1	0.800	592.0	1.400	867.1	2.000	1188.2
0.300	398.0	0.900	634.7	1.500	917.4		
0.400	434.3	1.000	678.6	1.600	969.0		
0.500	471.8	1.100	723.8	1.700	1021.9		

~~Tank or Pond Manhole: 18, DS/PN: 1.005~~

~~Invert Level (m) 73.000~~

Pond 5 Tank or Pond Manhole: 18, DS/PN: 1.005

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	109.0	0.400	186.1	0.800	283.7	1.200	401.8
0.100	126.4	0.500	208.6	0.900	311.3	1.300	434.5
0.200	145.0	0.600	232.4	1.000	340.2	1.400	468.5
0.300	164.9	0.700	257.4	1.100	370.4	1.500	503.8

Pond 6 Tank or Pond Manhole: 23, DS/PN: 1.006

Invert Level (m) 72.750

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	323.0	0.400	468.6	0.800	634.7	1.200	821.2
0.100	357.5	0.500	508.2	0.900	679.4	1.300	871.1
0.200	393.2	0.600	549.1	1.000	725.4	1.400	922.2
0.300	430.3	0.700	591.2	1.100	772.7	1.500	974.6

Pond 7 Tank or Pond Manhole: 24, DS/PN: 1.007

Invert Level (m) 72.501

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	629.6	0.600	920.5	1.200	1257.4	1.800	1640.5
0.100	674.9	0.700	973.4	1.300	1318.1	1.900	1708.8
0.200	721.4	0.800	1027.7	1.400	1380.0	2.000	1778.4
0.300	769.3	0.900	1083.2	1.500	1443.2		
0.400	818.4	1.000	1140.0	1.600	1507.7		
0.500	868.8	1.100	1198.1	1.700	1573.4		

Pond 1

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	10.4	6.0	62.4
0.1	-0.4	11.2	6.8	76.2
0.2	-0.3	12.0	7.6	91.2
0.3	-0.2	12.8	8.4	107.5
0.4	-0.1	13.6	9.2	125.1
0.5	0	14.4	10.0	144.0
0.6	0.1	15.2	10.8	164.2
0.7	0.2	16.0	11.6	185.6
0.8	0.3	16.8	12.4	208.3
0.9	0.4	17.6	13.2	232.3
1.0	0.5	18.4	14.0	257.6
1.1	0.6	19.2	14.8	284.2
1.2	0.7	20.0	15.6	312.0
1.3	0.8	20.8	16.4	341.1
1.4	0.9	21.6	17.2	371.5
1.5	1	22.4	18.0	403.2
1.6	1.1	23.2	18.8	436.2
1.7	1.2	24.0	19.6	470.4
1.8	1.3	24.8	20.4	505.9
1.9	1.4	25.6	21.2	542.7
2.0	1.5	26.4	22.0	580.8
2.1	1.6	27.2	22.8	620.2
2.2	1.7	28.0	23.6	660.8
2.3	1.8	28.8	24.4	702.7
2.4	1.9	29.6	25.2	745.9
2.5	2	30.4	26.0	790.4

Pond 2

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	24.5	6.0	147.0
0.1	-0.4	25.3	6.8	172.0
0.2	-0.3	26.1	7.6	198.4
0.3	-0.2	26.9	8.4	226.0
0.4	-0.1	27.7	9.2	254.8
0.5	0	28.5	10.0	285.0
0.6	0.1	29.3	10.8	316.4
0.7	0.2	30.1	11.6	349.2
0.8	0.3	30.9	12.4	383.2
0.9	0.4	31.7	13.2	418.4
1.0	0.5	32.5	14.0	455.0
1.1	0.6	33.3	14.8	492.8
1.2	0.7	34.1	15.6	532.0
1.3	0.8	34.9	16.4	572.4
1.4	0.9	35.7	17.2	614.0
1.5	1	36.5	18.0	657.0
1.6	1.1	37.3	18.8	701.2
1.7	1.2	38.1	19.6	746.8
1.8	1.3	38.9	20.4	793.6
1.9	1.4	39.7	21.2	841.6
2.0	1.5	40.5	22.0	891.0
2.1	1.6	41.3	22.8	941.6
2.2	1.7	42.1	23.6	993.6
2.3	1.8	42.9	24.4	1046.8
2.4	1.9	43.7	25.2	1101.2
2.5	2	44.5	26.0	1157.0

Pond 3

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	7.9	6.0	47.4
0.1	-0.4	8.7	6.8	59.2
0.2	-0.3	9.5	7.6	72.2
0.3	-0.2	10.3	8.4	86.5
0.4	-0.1	11.1	9.2	102.1
0.5	0	11.9	10.0	119.0
0.6	0.1	12.7	10.8	137.2
0.7	0.2	13.5	11.6	156.6
0.8	0.3	14.3	12.4	177.3
0.9	0.4	15.1	13.2	199.3
1.0	0.5	15.9	14.0	222.6
1.1	0.6	16.7	14.8	247.2
1.2	0.7	17.5	15.6	273.0
1.3	0.8	18.3	16.4	300.1
1.4	0.9	19.1	17.2	328.5
1.5	1	19.9	18.0	358.2
1.6	1.1	20.7	18.8	389.2
1.7	1.2	21.5	19.6	421.4
1.8	1.3	22.3	20.4	454.9
1.9	1.4	23.1	21.2	489.7
2.0	1.5	23.9	22.0	525.8
2.1	1.6	24.7	22.8	563.2
2.2	1.7	25.5	23.6	601.8
2.3	1.8	26.3	24.4	641.7
2.4	1.9	27.1	25.2	682.9
2.5	2	27.9	26.0	725.4

Pond 4

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	25.7	6.0	154.2
0.1	-0.4	26.5	6.8	180.2
0.2	-0.3	27.3	7.6	207.5
0.3	-0.2	28.1	8.4	236.0
0.4	-0.1	28.9	9.2	265.9
0.5	0	29.7	10.0	297.0
0.6	0.1	30.5	10.8	329.4
0.7	0.2	31.3	11.6	363.1
0.8	0.3	32.1	12.4	398.0
0.9	0.4	32.9	13.2	434.3
1.0	0.5	33.7	14.0	471.8
1.1	0.6	34.5	14.8	510.6
1.2	0.7	35.3	15.6	550.7
1.3	0.8	36.1	16.4	592.0
1.4	0.9	36.9	17.2	634.7
1.5	1	37.7	18.0	678.6
1.6	1.1	38.5	18.8	723.8
1.7	1.2	39.3	19.6	770.3
1.8	1.3	40.1	20.4	818.0
1.9	1.4	40.9	21.2	867.1
2.0	1.5	41.7	22.0	917.4
2.1	1.6	42.5	22.8	969.0
2.2	1.7	43.3	23.6	1021.9
2.3	1.8	44.1	24.4	1076.0
2.4	1.9	44.9	25.2	1131.5
2.5	2	45.7	26.0	1188.2

Pond 5

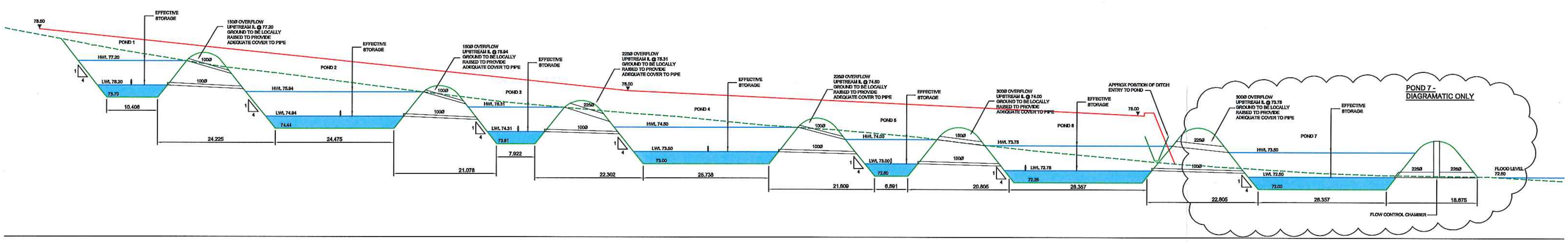
Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	6.9	6.0	41.4
0.1	-0.4	7.7	6.8	52.4
0.2	-0.3	8.5	7.6	64.6
0.3	-0.2	9.3	8.4	78.1
0.4	-0.1	10.1	9.2	92.9
0.5	0	10.9	10.0	109.0
0.6	0.1	11.7	10.8	126.4
0.7	0.2	12.5	11.6	145.0
0.8	0.3	13.3	12.4	164.9
0.9	0.4	14.1	13.2	186.1
1.0	0.5	14.9	14.0	208.6
1.1	0.6	15.7	14.8	232.4
1.2	0.7	16.5	15.6	257.4
1.3	0.8	17.3	16.4	283.7
1.4	0.9	18.1	17.2	311.3
1.5	1	18.9	18.0	340.2
1.6	1.1	19.7	18.8	370.4
1.7	1.2	20.5	19.6	401.8
1.8	1.3	21.3	20.4	434.5
1.9	1.4	22.1	21.2	468.5
2.0	1.5	22.9	22.0	503.8
2.1	1.6	23.7	22.8	540.4
2.2	1.7	24.5	23.6	578.2
2.3	1.8	25.3	24.4	617.3
2.4	1.9	26.1	25.2	657.7
2.5	2	26.9	26.0	699.4

Pond 6

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	28.3	6.0	169.8
0.1	-0.4	29.1	6.8	197.9
0.2	-0.3	29.9	7.6	227.2
0.3	-0.2	30.7	8.4	257.9
0.4	-0.1	31.5	9.2	289.8
0.5	0	32.3	10.0	323.0
0.6	0.1	33.1	10.8	357.5
0.7	0.2	33.9	11.6	393.2
0.8	0.3	34.7	12.4	430.3
0.9	0.4	35.5	13.2	468.6
1.0	0.5	36.3	14.0	508.2
1.1	0.6	37.1	14.8	549.1
1.2	0.7	37.9	15.6	591.2
1.3	0.8	38.7	16.4	634.7
1.4	0.9	39.5	17.2	679.4
1.5	1	40.3	18.0	725.4
1.6	1.1	41.1	18.8	772.7
1.7	1.2	41.9	19.6	821.2
1.8	1.3	42.7	20.4	871.1
1.9	1.4	43.5	21.2	922.2
2.0	1.5	44.3	22.0	974.6
2.1	1.6	45.1	22.8	1028.3
2.2	1.7	45.9	23.6	1083.2
2.3	1.8	46.7	24.4	1139.5
2.4	1.9	47.5	25.2	1197.0
2.5	2	48.3	26.0	1255.8

Pond 7

Depth water above base	Depth of water above outlet	L (m)	W (m)	Area (m^2)
0.0	-0.5	36.1	11.7	422.4
0.1	-0.4	36.9	12.5	461.3
0.2	-0.3	37.7	13.3	501.4
0.3	-0.2	38.5	14.1	542.9
0.4	-0.1	39.3	14.9	585.6
0.5	0	40.1	15.7	629.6
0.6	0.1	40.9	16.5	674.9
0.7	0.2	41.7	17.3	721.4
0.8	0.3	42.5	18.1	769.3
0.9	0.4	43.3	18.9	818.4
1.0	0.5	44.1	19.7	868.8
1.1	0.6	44.9	20.5	920.5
1.2	0.7	45.7	21.3	973.4
1.3	0.8	46.5	22.1	1027.7
1.4	0.9	47.3	22.9	1083.2
1.5	1	48.1	23.7	1140.0
1.6	1.1	48.9	24.5	1198.1
1.7	1.2	49.7	25.3	1257.4
1.8	1.3	50.5	26.1	1318.1
1.9	1.4	51.3	26.9	1380.0
2.0	1.5	52.1	27.7	1443.2
2.1	1.6	52.9	28.5	1507.7
2.2	1.7	53.7	29.3	1573.4
2.3	1.8	54.5	30.1	1640.5
2.4	1.9	55.3	30.9	1708.8
2.5	2	56.1	31.7	1778.4



POND LONGSECTION
NTS

1 in 2 Year
15 MIN
WINTER
Worst case for Upstream Carrier System

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ	C8352 Extension SWS R0	Micro Drainage
Date 08/07/14 File C8352-Sawmills E...	Designed by LKC Checked by	
Micro Drainage	Network 2013.1.1	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	7		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.388		

Summary of Results for 15 minute 2 year Winter (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	76.653	-0.147	0.000	0.51	0.0	34.8	OK
1.001	2	76.292	-0.008	0.000	1.00	0.0	3.7	OK
2.000	2	75.545	-0.055	0.000	1.00	0.0	69.1	OK
* 1.002	4	75.047	0.007	0.000	1.17	0.0	4.2	SURCHARGED
3.000	5	74.999	-0.081	0.000	0.87	0.0	60.8	OK
4.000	6	77.286	-0.139	0.000	0.30	0.0	15.2	OK
4.001	7	76.598	-0.127	0.000	0.39	0.0	24.8	OK
5.000	8	75.836	-0.114	0.000	0.69	0.0	46.3	OK
4.002	9	75.603	-0.227	0.000	0.44	0.0	74.5	OK
4.003	10	75.552	-0.198	0.000	0.59	0.0	112.6	OK
4.004	11	75.365	-0.185	0.000	0.64	0.0	114.8	OK
6.000	12	77.261	-0.089	0.000	0.34	0.0	8.6	OK
4.005	13	75.281	-0.169	0.000	0.68	0.0	130.4	OK
4.006	14	74.962	-0.188	0.000	0.63	0.0	126.9	OK
4.007	15	74.859	0.009	0.000	0.69	0.0	117.2	SURCHARGED
* 1.003	16	74.808	0.398	0.000	3.01	0.0	11.9	SURCHARGED
1.004	21	73.589	-0.011	0.000	1.00	0.0	4.0	OK
1.005	18	73.073	-0.027	0.000	0.76	0.0	1.9	OK
7.000	18	73.647	-0.753	0.000	0.08	0.0	96.3	OK
7.001	19	73.628	-0.707	0.000	0.15	0.0	176.3	OK
7.002	21	73.568	-0.688	0.000	0.15	0.0	177.9	OK
7.003	23	73.518	-0.660	0.000	0.21	0.0	249.7	OK
7.004	23	73.414	-0.671	0.000	0.25	0.0	291.5	OK
7.005	24	73.155	-0.837	0.000	0.19	0.0	312.8	OK
* 1.006	23	73.140	0.240	0.000	4.35	0.0	24.6	SURCHARGED
1.007	24	72.595	-0.131	0.000	0.15	0.0	2.2	OK
1.008	25	72.558	-0.167	0.000	0.15	0.0	2.2	OK

* Pond Interconnecting Pipes
- designed to surcharge OK

PIPE 4.007
SURCHARGE AS A RESULT OF CONNECTION TO POND &
NOT AS A RESULT OF OVER CAPACITY CARRIER PIPE

PIPE 4.007 : 450 Φ @ 1:214
Ref Hydraulic Tables - full bore capacity ≈ 220l/s
220 l/s > 117.2 l/s ∴ CAPACITY OK

Design Criteria
i) satisfied.

1 IN 30 Year
15 MIN
WINTER
Worst Case for upstream Carrier system

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ	C8352 Extension SWS R0	Micro Drainage
Date 08/07/14 File C8352-Sawmills E...	Designed by LKC Checked by	
Micro Drainage	Network 2013.1.1	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * $10m^3$/ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	7		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	15
Ratio R	0.388		

Summary of Results for 15 minute 30 year Winter (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	76.737	-0.063	0.000	0.97	0.0	66.0	OK
1.001	2	76.367	0.067	0.000	1.69	0.0	6.2	SURCHARGED
2.000	2	75.980	0.380	0.000	1.77	0.0	122.6	SURCHARGED
1.002	4	75.139	0.099	0.000	1.95	0.0	7.1	SURCHARGED
3.000	5	75.332	0.252	0.000	1.55	0.0	107.9	SURCHARGED
4.000	6	77.325	-0.100	0.000	0.57	0.0	28.8	OK
4.001	7	76.655	-0.070	0.000	0.79	0.0	50.0	OK
5.000	8	76.137	0.187	0.000	1.17	0.0	78.5	SURCHARGED
4.002	9	75.999	0.169	0.000	0.74	0.0	124.4	SURCHARGED
4.003	10	75.935	0.185	0.000	1.01	0.0	193.0	SURCHARGED
4.004	11	75.722	0.172	0.000	1.12	0.0	200.0	SURCHARGED
6.000	12	77.289	-0.061	0.000	0.65	0.0	16.4	OK
4.005	13	75.588	0.138	0.000	1.19	0.0	228.6	SURCHARGED
4.006	14	75.252	0.102	0.000	0.98	0.0	197.2	SURCHARGED
4.007	15	75.181	0.331	0.000	1.04	0.0	176.6	SURCHARGED
1.003	16	75.091	0.681	0.000	3.84	0.0	15.2	SURCHARGED
1.004	21	73.616	0.016	0.000	1.17	0.0	4.6	SURCHARGED
1.005	18	73.219	0.119	0.000	0.00	0.0	0.0	SURCHARGED
7.000	18	73.862	-0.538	0.000	0.15	0.0	181.3	OK
7.001	19	73.844	-0.492	0.000	0.29	0.0	341.6	OK
7.002	21	73.791	-0.466	0.000	0.30	0.0	350.0	OK
7.003	23	73.740	-0.437	0.000	0.41	0.0	486.7	OK
7.004	23	73.632	-0.452	0.000	0.48	0.0	559.8	OK
7.005	24	73.390	-0.602	0.000	0.36	0.0	596.8	OK
1.006	23	73.382	0.483	0.000	6.12	0.0	34.6	SURCHARGED
1.007	24	72.639	-0.087	0.000	0.25	0.0	3.7	OK
1.008	25	72.576	-0.149	0.000	0.25	0.0	3.7	OK

- SURCHARGE ONLY
- NO FLOODING

Flows therefore retained below cover level

OK

Design Criteria ii) satisfied

1 in 30 Year
1920 min
Winter

Worst case for downstream storage

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ	C8352 Extension SWS R0	Micro Drainage
Date 08/07/14 File C8352-Sawmills E...	Designed by LKC Checked by	
Micro Drainage	Network 2013.1.1	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
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	Run Time (mins)	3840
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	24

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	7		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	1920
Ratio R	0.388		

Storm Peak between 1860 - 1980 mins

Summary of Results for 1920 minute 30 year Winter (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	76.537	-0.263	0.000	0.04	0.0	2.6	OK
1.001	2	76.261	-0.039	0.000	0.68	0.0	2.5	OK
2.000	2	75.354	-0.246	0.000	0.08	0.0	5.2	OK
1.002	4	75.183	0.143	0.000	1.68	0.0	6.1	SURCHARGED
3.000	5	75.133	0.053	0.000	0.06	0.0	4.3	SURCHARGED
4.000	6	77.223	-0.202	0.000	0.02	0.0	1.2	OK
4.001	7	76.526	-0.199	0.000	0.03	0.0	2.0	OK
5.000	8	75.694	-0.256	0.000	0.05	0.0	3.5	OK
4.002	9	75.434	-0.396	0.000	0.04	0.0	5.9	OK
4.003	10	75.364	-0.386	0.000	0.05	0.0	9.5	OK
4.004	11	75.177	-0.373	0.000	0.06	0.0	9.9	OK
6.000	12	77.216	-0.134	0.000	0.03	0.0	0.7	OK
4.005	13	75.156	-0.294	0.000	0.06	0.0	11.8	OK
4.006	14	75.150	0.000	0.000	0.05	0.0	11.1	OK
4.007	15	75.132	0.282	0.000	0.06	0.0	10.7	SURCHARGED
1.003	16	75.129	0.719	0.000	3.93	0.0	15.5	SURCHARGED
1.004	21	74.156	0.556	0.000	2.79	0.0	11.0	SURCHARGED
1.005	18	73.783	0.683	0.000	4.29	0.0	10.5	SURCHARGED
7.000	18	73.442	-0.958	0.000	0.01	0.0	7.6	OK
7.001	19	73.439	-0.896	0.000	0.01	0.0	16.2	OK
7.002	21	73.437	-0.819	0.000	0.01	0.0	17.1	OK
7.003	23	73.436	-0.741	0.000	0.02	0.0	24.5	OK
7.004	23	73.435	-0.650	0.000	0.02	0.0	29.1	OK
7.005	24	73.433	-0.560	0.000	0.02	0.0	31.2	OK
1.006	23	73.432	0.532	0.000	4.72	0.0	26.7	SURCHARGED
1.007	24	73.344	0.618	0.000	0.97	0.0	14.4	SURCHARGED
1.008	25	72.676	-0.049	0.000	0.97	0.0	14.4	OK

14.4 l/s < 14.6 l/s
OK

- Surcharge Only
- No flooding
- No Overflow

∴ Storage Volume Sufficient

Design Criteria iii) satisfied

OK

1 in 100 Year
6 Hour (360min)
Winter
+30% CC

Opus International Consultants (UK) Ltd		Page 1
18D High Street Llandaff Cardiff CF5 2DZ	C8352 Extension SWS R0	
Date 08/07/14 File C8352-Sawmills E...	Designed by LKC Checked by	
Micro Drainage	Network 2013.1.1	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	30.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	720
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	6

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	7		

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)	19.000	Storm Duration (mins)	360
Ratio R	0.388		

Opus International Consultants (UK) Ltd		Page 2
18D High Street Llandaff Cardiff CF5 2DZ	C8352 Extension SWS R0	Micro Drainage
Date 08/07/14 File C8352-Sawmills E...	Designed by LKC Checked by	
Micro Drainage	Network 2013.1.1	

Summary of Results for 360 minute 100 year Winter (Storm)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	76.598	-0.202	0.000	0.23	0.0	15.9	OK
1.001	2	76.487	0.187	0.000	2.43	0.0	9.0	SURCHARGED
2.000	2	75.687	0.087	0.000	0.46	0.0	32.0	SURCHARGED
1.002	4	75.681	0.641	0.000	3.03	0.0	11.0	SURCHARGED
3.000	5	75.626	0.546	0.000	0.38	0.0	26.5	FLOOD RISK
4.000	6	77.256	-0.169	0.000	0.14	0.0	7.2	OK
4.001	7	76.567	-0.158	0.000	0.20	0.0	12.5	OK
5.000	8	76.235	0.285	0.000	0.30	0.0	20.1	FLOOD RISK
4.002	9	76.215	0.385	0.000	0.20	0.0	34.4	SURCHARGED
4.003	10	76.114	0.364	0.000	0.29	0.0	55.8	SURCHARGED
4.004	11	75.998	0.448	0.000	0.32	0.0	57.8	SURCHARGED
6.000	12	77.240	-0.110	0.000	0.16	0.0	4.0	OK
4.005	13	75.890	0.440	0.000	0.36	0.0	69.3	SURCHARGED
4.006	14	75.774	0.624	0.000	0.34	0.0	69.0	SURCHARGED
4.007	15	75.652	0.802	0.000	0.41	0.0	68.7	SURCHARGED
* 1.003	16	75.550	1.140	0.000	4.89	56.8	19.3	FLOOD RISK
1.004	21	74.553	0.953	0.000	3.16	2.2	12.5	SURCHARGED
1.005	18	74.102	1.002	0.000	4.94	2.0	12.1	FLOOD RISK
7.000	18	74.400	0.000	0.000	0.04	0.0	44.0	FLOOD RISK*
7.001	19	74.335	0.000	0.000	0.08	0.0	89.4	FLOOD RISK*
7.002	21	74.256	0.000	0.000	0.08	0.0	89.2	OK
7.003	23	74.177	0.000	0.000	0.11	0.0	129.1	OK
7.004	23	74.085	0.000	0.000	0.13	0.0	153.8	OK
7.005	24	73.992	0.000	0.000	0.10	0.0	165.2	OK
* 1.006	23	73.954	1.055	0.000	8.76	20.8	49.5	SURCHARGED
1.007	24	73.519	0.793	0.000	0.97	0.0	14.4	SURCHARGED
1.008	25	72.676	-0.049	0.000	0.97	0.0	14.4	OK

* - Pond Interconnecting Pipes

- Surcharge Only
- No flooding
- Overflow restricted to pond interconnecting pipes only - as designed & no flow lost from system

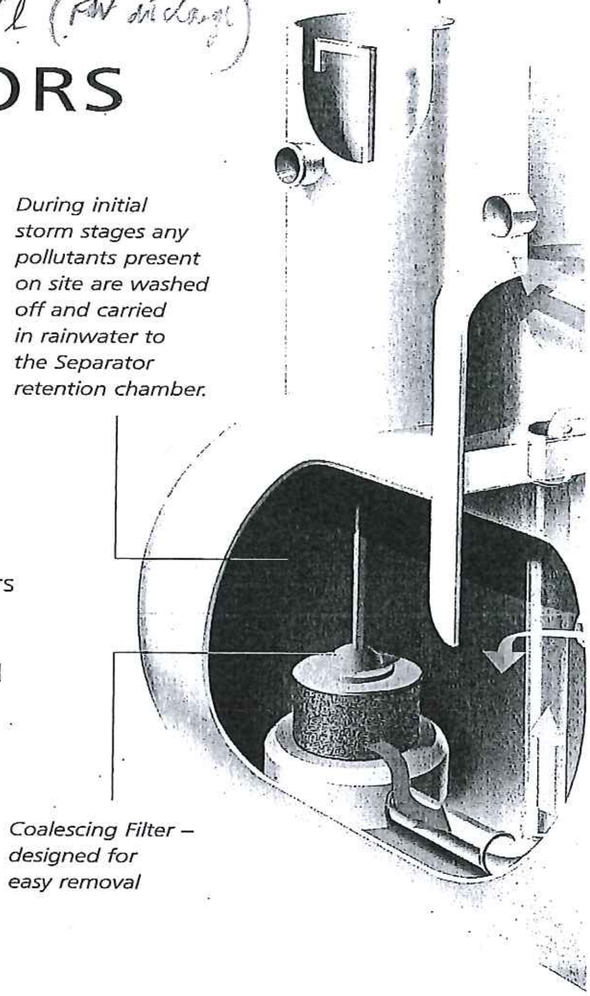
∴ Sufficient Storage Provided

Design Criteria iv) satisfied

Conder

Class 1 ≤ 5mg/l (SW discharge)
2 ≤ 100mg/l (FW discharge)

BYPASS SEPARATORS



APPLICATION AREAS:

- Car parks, hard standings, roads and similar areas of low risk where it is not required to provide full treatment for rare high flows

PERFORMANCE:

- Full treatment of rainfall flows of up to 5mm/hr (99% of rainfall events)
- Automatic closures are not appropriate for bypass Separators, but filters for Class 1 models, and monitors for both Classes, are usually fitted
- Single shaft access on Class 2 models allows improved cost savings

PI ① = 2064m²
② = 4155m²
③ = 3623m²
④ = 7914m²

Treated flow path

Bypass flow path

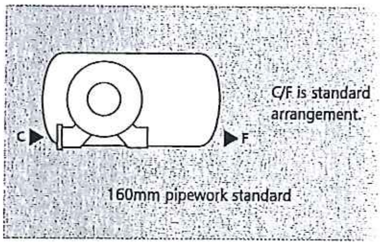
inclusive of silt capacity.

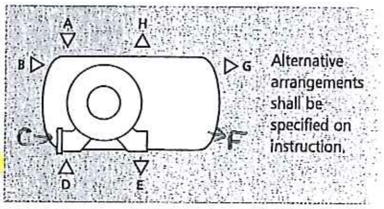
Bypass Separator – Core Range. Class 1 and Class 2. Technical Data

Larger models to 4m diameter are available – largest is NSB515 with 274,447 litres capacity, 22.5m length

Unit Reference	Nominal Size	Area Drained sq.m	Nett Capacity Litres	Length excl. Silt	Diameter	Silt Capacity Litres	Length incl. Silt	Overall Height	Inlet to Base	Outlet to Base	Max Pipe
NSB1.5/2*	1.5	833	1000	1400	1000	150	1657	1650	1150	1100	300
NSB3/2*	3	1667	1000	1650	1000	300	2250	1650	1150	1100	300
① NSB4.5/2*	4.5	2500	1485	2250	1000	450	2594	1650	1150	1100	300
NSB6/2*	6	3333	1980	2650	1000	600	3414	1750	1150	1100	300
② & ③ NSB7.5/2*	7.5	4167	2475	2343	1200	750	3007	1750	1150	1100	300
NSB10/2*	10	5556	3300	3073	1200	1000	3957	2150	1400	1350	300
④ NSB15/2*	15	8333	4950	2995	1500	1500	3844	2545	1750	1700	450
NSB20/2*	20	11111	6600	3929	1500	2000	5060	2545	1750	1700	450
NSB25/2*	25	13889	8250	3542	1800	2500	4524	3400	2100	2050	600
NSB30/2*	30	16667	9900	4190	1800	3000	5369	3400	2100	2050	600
NSB40/2*	40	22222	13200	5487	1800	4000	7059	3400	2100	2050	600
NSB50/2*	50	27778	16500	3978	2500	5000	4992	3900	2400	2350	600
NSB60/2*	60	33333	19800	4450	2500	6000	5673	3900	2400	2350	600
NSB70/2*	70	38889	23100	5323	2500	7000	6749	3900	2400	2350	600
NSB80/2*	80	44444	26400	5795	2500	8000	7425	3900	2400	2350	600
NSB90/2*	90	50000	29700	6467	2500	9000	8301	3900	2400	2350	600
NSB100/2*	100	55556	33000	7139	2500	10000	9177	3900	2400	2350	600

Inlet/Outlet Pipework Configurations





Separator selection example:

NSB3/21/225/CF

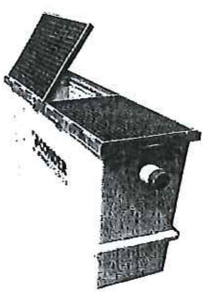
- Separator ref.
- Class selected
- Pipework size
- Pipework configuration

N.B. All dimensions are in mm. *Add class of separator required i.e. class 1 or class 2.

Shaded area's indicate additional capacity and increased length to provide integral silt capacity – add 'S' suffix in front of forward slash in reference code (e.g. NSB3/21 becomes NSB3S/21).

Max. pipe sizes refer to standard models – larger sizes available to request.

SILT TRAPS AND SEDIMENTATION UNITS



- Large quantities of silt can be associated with Separator operations, particularly in car wash facilities. Separator capacity may need to be increased to accommodate this, or a sedimentation unit or silt trap can be installed nearby, upstream to prevent blockages
- A wide range of products are available from Conder with heavy duty access hatches for easy sediment removal by hand or tanker
- A special 530mm trap is available for use with automatic systems with under chassis washing. This model is generally installed between the chassis wash arms. For particularly large capacities, a sedimentation tank can perform the same function

EXTRACT FROM ACO MULTIDRAIN BROCHURE

- SIZE LINEAR DRAINS
  - Worst case Catchment Area = 2190m²
  - LENGTH OF LINEAR DRAIN = 44m
  - APPROX 1% (1:100) SLOPE

Notes for ACO MultiDrain M200D Hydraulic tables

Maximum capacities for each constant depth channel, assuming uniform lateral inflow to the channel.

Q (l/s) is the maximum total flow that the channel can carry.

q (l/s/m) is the maximum possible lateral inflow.

The maximum possible catchment depth is $q_s i$, where i is the rainfall intensity in l/s/m².

A (m²) is the maximum area that can be drained at a rainfall intensity of 50mm/h (0.014 l/s/m²).

At other rainfall intensities, the area can be determined by proportion, e.g. at 75mm/h, the maximum area drained will be the tabulated area x 50/75.

To Ensure Design Achieves Capacity requirements for criteria ii) & flows to be retained below surface for 1:30 Year Return Period this approximately halves the shown capacity

∴ Select nearest to serve; 44m @ 1% for catchment ≈ 4380m²

SELECT M200D 10.0.

ACO M200D constant depth channels

M200D 0.0 Overall depth 265mm

Length to outlet (m)	0% Q (l/s)	0% q (l/s/m)	0% A (m²)	0.5% Q (l/s)	0.5% q (l/s/m)	0.5% A (m²)	1% Q (l/s)	1% q (l/s/m)	1% A (m²)
20	25.5	1.27	1835	32.2	1.61	2318	38.9	1.94	2799
40	23.5	0.59	1693	35.4	0.89	2552	44.4	1.11	3197
60	22.1	0.37	1590	37.3	0.62	2687	47.6	0.79	3426
80	21.0	0.26	1515	38.6	0.48	2776	49.8	0.62	3588
100	19.9	0.20	1433	39.3	0.39	2830	51.1	0.51	3679
120	19.1	0.16	1374	40.1	0.33	2886	52.1	0.43	3750
140	18.3	0.13	1320	40.5	0.29	2913	52.6	0.38	3790
160	17.6	0.11	1267	41.0	0.26	2949	52.8	0.33	3802
180	16.7	0.09	1205	41.2	0.23	2968	52.9	0.29	3810
200	16.4	0.08	1181	41.4	0.21	2981	53.0	0.27	3816

M200D 10.0 Overall depth 315mm

Length to outlet (m)	0% Q (l/s)	0% q (l/s/m)	0% A (m²)	0.5% Q (l/s)	0.5% q (l/s/m)	0.5% A (m²)	1% Q (l/s)	1% q (l/s/m)	1% A (m²)
20	34.5	1.73	2485	42.8	2.14	3082	50.9	2.55	3666
40	32.1	0.80	2313	46.6	1.16	3352	58.0	1.45	4176
60	30.2	0.50	2173	49.0	0.82	3529	61.7	1.03	4441
80	28.6	0.36	2062	50.3	0.63	3623	64.3	0.80	4631
100	27.3	0.27	1966	51.3	0.51	3694	66.3	0.66	4774
120	26.0	0.22	1875	52.1	0.43	3750	67.7	0.56	4873
140	24.9	0.18	1794	52.8	0.38	3800	69.0	0.49	4969
160	24.3	0.15	1751	53.3	0.33	3836	69.8	0.44	5023
180	23.4	0.13	1685	53.6	0.30	3862	70.7	0.39	5093
200	22.6	0.11	1627	53.8	0.27	3874	71.4	0.36	5141

M200D 20.0 Overall depth 365mm

Length to outlet (m)	0% Q (l/s)	0% q (l/s/m)	0% A (m²)	0.5% Q (l/s)	0.5% q (l/s/m)	0.5% A (m²)	1% Q (l/s)	1% q (l/s/m)	1% A (m²)
20	44.6	2.23	3213	54.3	2.71	3907	63.7	3.19	4589
40	41.4	1.04	2984	58.6	1.46	4216	71.8	1.79	5167
60	39.1	0.65	2812	61.1	1.02	4398	76.4	1.27	5504
80	37.0	0.46	2667	63.0	0.79	4533	79.6	1.00	5731
100	35.3	0.35	2542	64.3	0.64	4630	81.7	0.82	5882
120	33.8	0.28	2436	65.0	0.54	4683	83.8	0.70	6031
140	32.4	0.23	2330	65.5	0.47	4717	85.1	0.61	6129
160	31.5	0.20	2269	66.1	0.41	4758	86.2	0.54	6209
180	30.4	0.17	2190	66.4	0.37	4782	87.1	0.48	6273
200	29.6	0.15	2131	66.8	0.33	4810	87.8	0.44	6322

For M200D Shallow channel hydraulics tables see next page

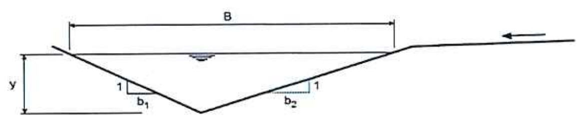
C8352 - Pontrilas Sawmills Extension

Design of drainage channelsbased on HA37/97

G_m	=	2.90×10^6 (2.65-m)		Eq (14)
L	=	Length of road drained (m)		
	=	$G_m \times (S^{0.5}/n) \times (ry)^{0.667} \times (N-0.4)^{-0.362} \times (A/[W_e(2minM50)])^{1.62}$		Eq (13)
r	=	Hydraulic radius factor		
	=	$[b_1 + b_2] / [(1+b_1^2)^{0.5} + (1+b_2^2)^{0.5}]$	(triangular channel)	Eq (7)
	=	$[b_1y_3 + b_2y_1+b_3(y_3-y_1)] / [(b_1^2+1)^{0.5}y_3 + (b_2^2+1)^{0.5}y_1 + (b_3^2+1)^{0.5}(y3-y_1)]$	(Surcharged triangular channel)	Eq (22)
A	=	$0.5[(b_1+b_2)y_3^2 - b_2(y_3-y_1)^2 + b_3(y_3-y_1)^2]$	(Surcharged triangular channel)	Eq (21)
K	=	Hydraulic conveyance factor		
	=	$3/8\ [\ (b_1+b_2)y_3^{8/3} - b_2(y_3-y_1)^{8/3} + (n/nc)b_3(y_3-y_1)^{8/3}\ ]$		Eq (23)
X	=	Factor		
	=	$K / y_3^{2/3} A$		Eq (24)
m	=	Shape factor of channel		
	=	1	(Unsurcharged Triangular channel)	
	=	$1/2\ [\ X - 1 + (X^2 + 14/ 3X + 1)^{1/2}]$	(Surcharged channel)	Eq (25)

where

S	=	Longitudinal gradient of channel (m/m)		
n	=	Mannings roughness coefficient (channel)		
	=	0.013	Concrete channel - average; NO posts in channel	Table 1
n_c	=	Mannings roughness coefficient (concrete slab)		
	=	0.013	Concrete - average	Table 1
y_1	=	Design depth of channel (m)		
y_3	=	Surcharged depth of channel (m)		
N	=	Return period of storm (years)		
A	=	Cross-sectional area of flow (m^2)		
W_e	=	Effective width of drained catchment (m)		
2minM50	=	Rainfall depth occuring in 2 minutes with return period of 5 years(mm)		
	=	3.0	Pontrilas (S.W Hereford)	Fig 3
b_1	=	Side slope of channel remote from carriageway (1in)		
b_2	=	Side slope of channel adjacent to carriageway (1in)		
b_3	=	Transverse slope of carriageway adjacent to channel carriageway (1in)		
H	=	Surcharged width of carriageway (m)		
T_c	=	Critical storm duration		



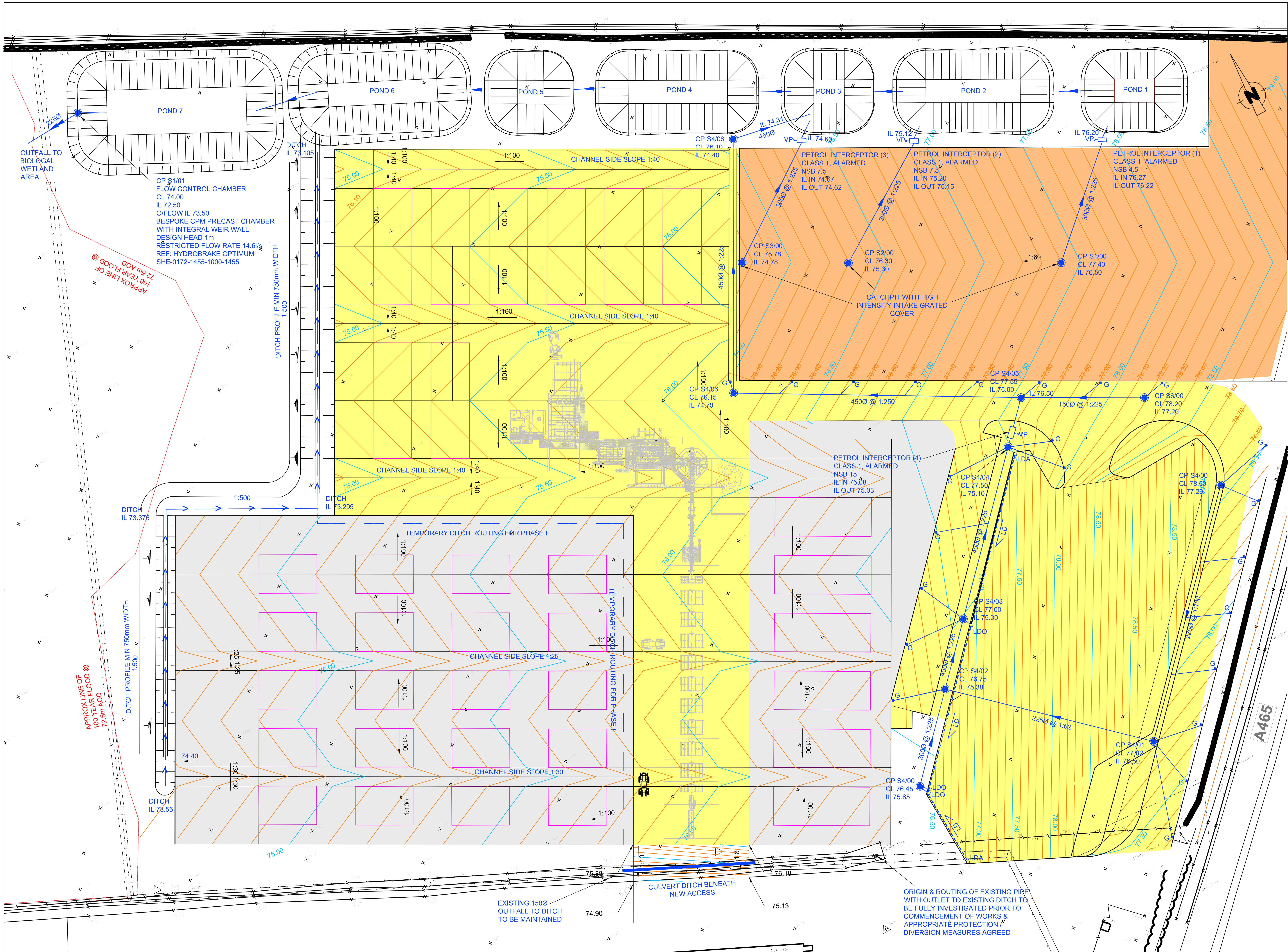
SUMMARY

ALL FLOWS RETAINED WITHIN CHANNEL UP TO 1 IN 5 YEAR EVENT.

FOR 1 IN 30 YEAR EVENT CHANNELS ① & ② WILL ENCROACH ONTO CONCRETE SLAB BY 1.6m & 1.3m RESPECTIVELY TO EACH SIDE OF THE CHANNEL.

South ↓ North

													Unsurcharged				N = 1 yr		N = 5yr		Surcharged						N = 30yr	
Direction	Start Ch	End Ch	S 1 in	S %	b_1 1 in	b_2 1 in	b_3 1 in	H (m)	y_1 (m)	y_3 (m)	2minM50 (mm)	W_e (m)	A (m^2)	r	m	G_m	L (m)	T_c (min)	L (m)	T_c (min)	A (m^2)	r	K	X	m	G_m	L	T_c (min)
Channel 1			100.00	1.000	30	30	100	1.600	0.083	0.099	3.0	32.50	0.207	0.999	1	4785000	392.7	22.8	187.8	10.9	0.294	1.000	0.048	0.763	1.0149	4741760	188.9	9.8
Channel 2			100.00	1.000	25	25	100	1.300	0.100	0.113	3.0	37.30	0.250	0.999	1	4785000	484.1	24.8	231.6	11.9	0.3192	0.999	0.056	0.756	1.007	4764834	189.5	9.0
Channel 3			100.00	1.000	40	40	100	0.000	0.125	0.125	3.0	45.00	0.625	1.000	1	4785000	1829.3	80.9	875.1	38.7	0.625	1.000	0.117	0.750	1	4785000	446.0	19.7
Channel 4			100.00	1.000	40	40	100	0.000	0.125	0.125	3.0	40.00	0.625	1.000	1	4785000	2213.9	97.9	1059.1	46.8	0.625	1.000	0.117	0.750	1	4785000	539.8	23.9
Channel 5			100.00	1.000	40	40	100	0.000	0.125	0.125	3.0	25.20	0.625	1.000	1	4785000	4679.7	206.9	2238.7	99.0	0.625	1.000	0.117	0.750	1	4785000	1141.0	50.4



LEGEND / KEY TO SYMBOLS

- PROPOSED SURFACE WATER SYSTEM
- PROPOSED DITCH ROUTE
- PROPOSED TEMPORARY DITCH (PHASE I ONLY)
- LD — LINEAR DRAIN - ACO MULTIDRAIN REF: M200D 10.0
- CP — CATCHPIT
- G — GULLY
- VP — VENT PIPE
- LDO — LINEAR DRAIN OUTLET
- LDA — LINEAR DRAIN ACCESS UNIT
- EXPANSION LIMIT - PHASE I
- EXPANSION LIMIT - PHASE II
- EXPANSION LIMIT - PHASE III

NOTES

1. DESIGN SUBJECT TO LOCAL AUTHORITY PLANNING APPROVAL
2. PONDS 3 - 7 TO BE CONSTRUCTED TO SERVE PHASE I
3. PONDS 1 - 2 TO BE CONSTRUCTED TO SERVE PHASE II
4. FOR FURTHER NOTES, SCHEDULES AND POND LONG-SECTIONS REFER TO DRAWINGS C8352-102

FOR APPROVAL

Revision	Amendment	Approved	Revision Date

OPUS
Cardiff Office
+44 29 2077 7373
Unit 2 Fountain Court
Fountain Lane, St Mellons
Cardiff CF3 0FB

Project: Pontrilas Sawmill Site Expansion

Sheet: DRAINAGE LAYOUT

DRAFT

Designed	Approved	Approved Date
LKC	MWL	11/07/14

Drawn	Scales	Project Drawing No.	Sheet. No.	Revision
LKC	1:500 @ A1	CD-V-C8352	101	R0

Original Sheet Size A1 [841x594] Plot Date 11 Jul 2014 @ 6:07 PM Path G:\live\C\C8352.00 - Pontrilas Saw Mill Car Park\05 - Documents\02 - Drawings\03 - Civils\A - Preliminary\CD-V-C8352-101-R0-Drainage Layout.dwg Layout1 (2)


POND 7 - DIAGRAMATIC ONLY
78.50
POND 1
EFFECTIVE STORAGE
HWL 77.20
LWL 76.20
75.70
10.406
150Ø OVERFLOW
UPSTREAM IL @ 77.20
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
100Ø
100Ø
24.225
POND 2
EFFECTIVE STORAGE
HWL 75.94
LWL 74.94
74.44
24.475
150Ø OVERFLOW
UPSTREAM IL @ 75.94
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
100Ø
100Ø
21.078
POND 3
EFFECTIVE STORAGE
HWL 75.31
LWL 74.31
73.81
7.922
225Ø OVERFLOW
UPSTREAM IL @ 75.31
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
225Ø
100Ø
76.00
22.302
POND 4
EFFECTIVE STORAGE
HWL 74.50
LWL 73.50
73.00
25.738
225Ø OVERFLOW
UPSTREAM IL @ 74.50
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
100Ø
100Ø
21.809
POND 5
EFFECTIVE STORAGE
HWL 74.00
LWL 73.00
72.50
6.891
300Ø OVERFLOW
UPSTREAM IL @ 74.00
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
150Ø
100Ø
20.805
POND 6
EFFECTIVE STORAGE
HWL 73.75
LWL 72.75
72.25
28.357
APPROX POSITION OF DITCH
ENTRY TO POND
75.00
300Ø OVERFLOW
UPSTREAM IL @ 73.75
GROUND TO BE LOCALLY
RAISED TO PROVIDE
ADEQUATE COVER TO PIPE
225Ø
100Ø
22.805
POND 7
EFFECTIVE STORAGE
HWL 73.50
LWL 72.50
72.00
26.357
225Ø
225Ø
18.675
FLOW CONTROL CHAMBER
FLOOD LEVEL
72.50

From: Laura K. Curnow <Laura.Curnow@opusinternational.co.uk>
Sent: 15 September 2014 15:14
To: jay@biologicdesign.co.uk
Cc: Jonathan Poynton <JonathanP@pontrilastimber.co.uk>; Mark Lewis <Mark.Lewis@opusinternational.co.uk>
Subject: C8352 - Pontrilas Sawmills - Flow Control Chamber

Hi Jay,

For ease of installation our recommendation would be to go for a CPM (or similar) precast chamber - their perfect chamber range may be a good solution as we are looking at a single bespoke chamber in this instance and the perfect chamber range would include base and pre-fit hydrobrake and overflow options.

http://www.cpm-group.com/downloads/CPM-Perfect-Manhole-System-2012.pdf
Tel 01179 812791
sales@cpm-group.com

We are however flexible and would be happy with a traditional catchpit solution benched appropriately as shown in Hydrobrake standard detail attached – it obviously depends on cost and constructability.

Please note should you opt to seek an alternative flow control manufacturer other than the Hydrobrake product we are calling off we will need to re-run their specific head / flow parameters back through our hydraulic model to ensure equivalent performance.

Kind regards,
Laura

OPUS

Laura Curnow | Senior Engineer | Opus International Consultants (UK) Ltd
Phone +44 29 2053 5523 | Fax +44 29 2036 3797 | Email laura.curnow@opusinternational.co.uk
Unit 2 Fountain Court, Fountain Lane, St Mellons, Cardiff, CF3 0FB

Visit us online: www.opusinternational.co.uk

Technical Specification

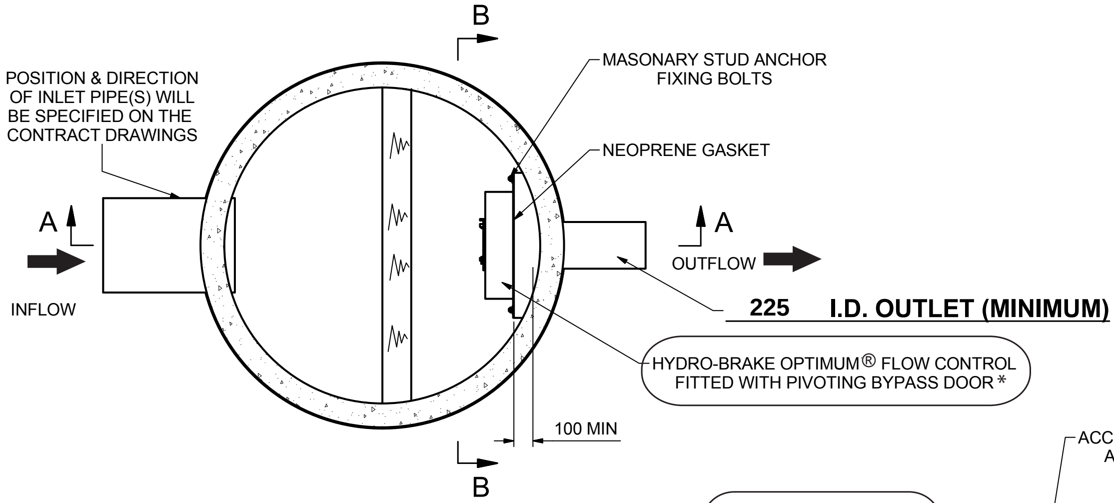
Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	14.462
Flush-Flo™	0.318	14.405
Kick-Flo®	0.696	12.193
Mean Flow		12.268

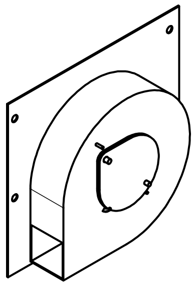
Hydro-Brake Optimum® Flow Control including:

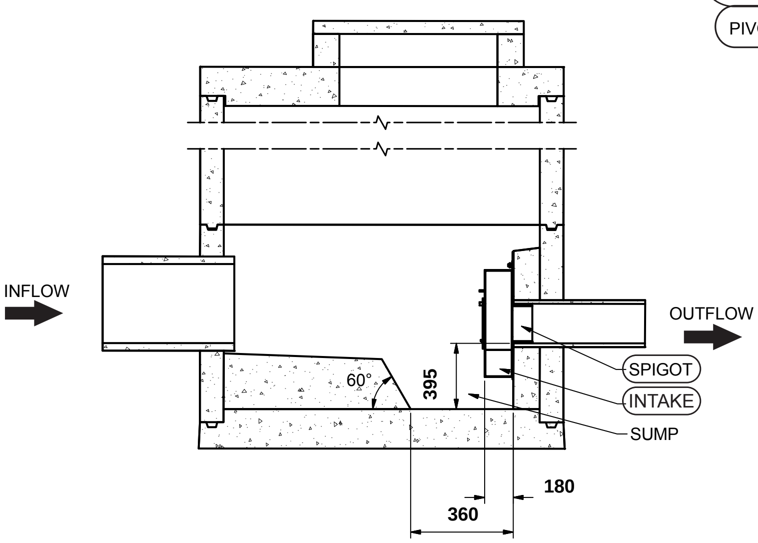
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting bypass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Bead blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Neoprene gasket to seal outlet

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

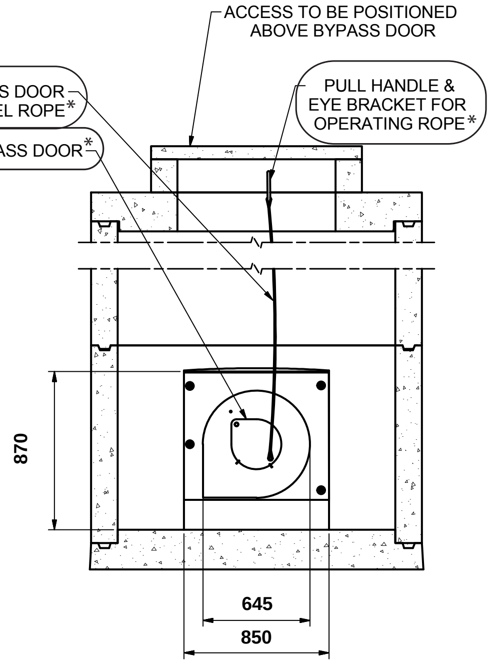
WRc APPROVED
PT/329/0412







SECTION A-A



SECTION B-B

IMPORTANT: (oval) LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE OPTIMUM® FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0172-1455-1000-1455 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International

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DESIGNER	lauracurnow
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SHE-0172-1455-1000-1455

Hydro-Brake Optimum®

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