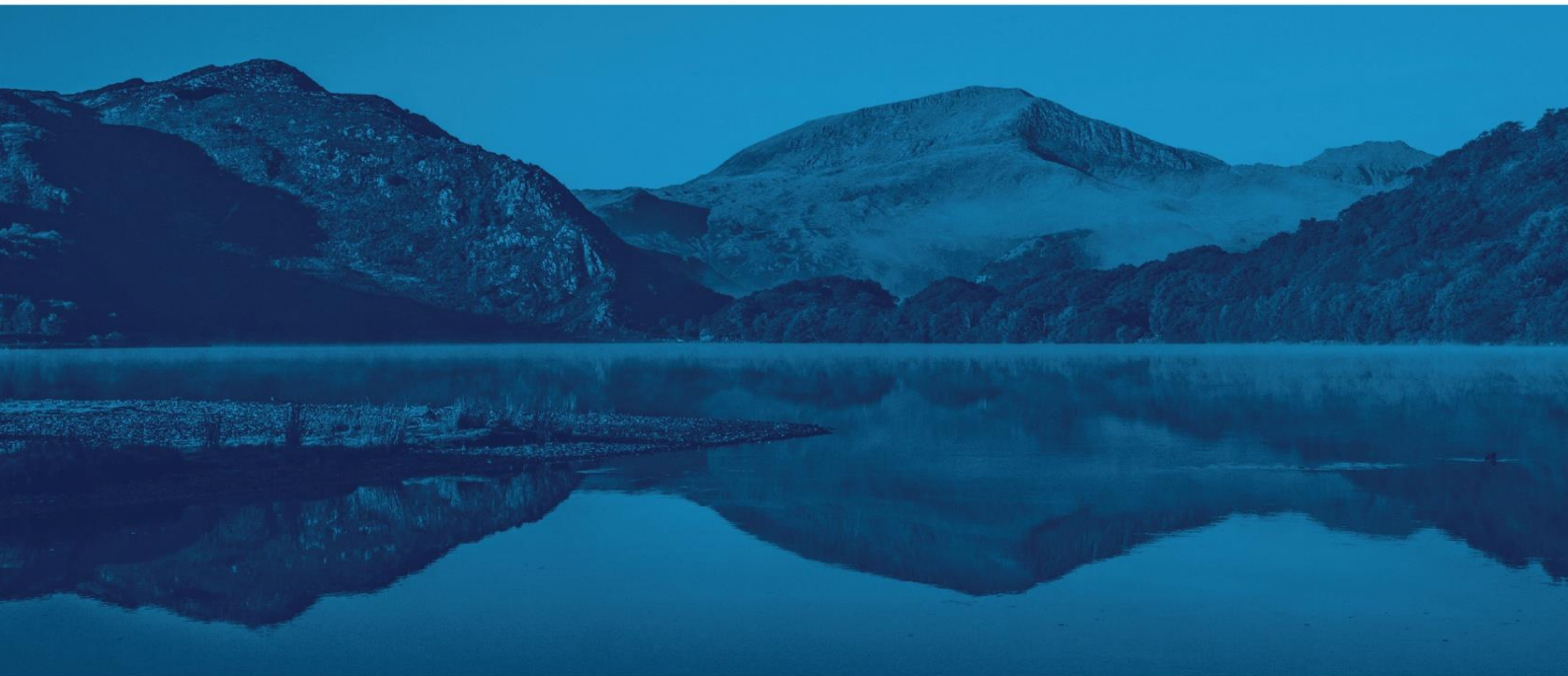




Holt Road, Rossett

Flood Consequences Assessment & Drainage Strategy

June 2018



Assessment / Modelling / Design

waterco.co.uk

DOCUMENT VERIFICATION RECORD

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DOCUMENT REVIEW & APPROVAL

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Introduction

Waterco Consultants have been instructed to prepare a Flood Consequences Assessment (FCA) and Drainage Strategy in respect of a proposed residential development on land off Holt Road (B5102), Rossett, Wrexham, LL12 0ED.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified flood risk. The report has been prepared in accordance with the guidance contained in Planning Policy Wales (PPW) and Technical Advice Note 15 (TAN15): Development and Flood Risk.

Wrexham County Council as a Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment

This report has been prepared in consultation with Natural Resources Wales (NRW) and Dwr Cymru Welsh Water (DCWW).

Site Description

The development is divided into 2 land parcels. Parcel 1 (grid reference: 337350, 357371) is located to the north of Holt Road and covers an area of 2.798ha. Parcel 2 (grid reference 337283, 357183) is located to the south of Holt Road and covers an area of 3.454ha. A location plan and an aerial image are included in Appendix A.

Land parcel 1 comprises agricultural land and is bordered by residential properties and agricultural land to the north, agricultural land to the east, Holt Road to the south and residential properties to the west.

Land parcel 2 comprises agricultural land and is bordered by Holt Road to the north, agricultural land and a single residential property to the east, Harwood's Lane (road) to the south and residential properties and Trevalyn Way (road) to the west.

Local Topography

A topographical survey has been undertaken by MB Surveying Limited in January 2015 and is included in Appendix B. The topographical survey is relative to an arbitrary site datum. The topographical survey shows that land in the northern parcel slopes from approximately 51.25m Above Datum (AD) in the south-west to approximately 48.75m AD in the north. Site levels fall from south to north. There is a topographical depression identified in the northern extent of the site with a minimum level of 48.93m AD.

Site levels in the southern land parcel slope from approximately 52.13m AD in the south-west to approximately 50.16m AD in the east.

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (NRW) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that land in the northern parcel slopes from 13.58m AOD in the south-west to 11.55m AOD in the north. Land in the southern parcel falls from 14.2m AOD in the south-west to 12.58m AOD in the east. A LiDAR extract is included in Appendix B.

Ground Conditions

Reference to the British Geological Survey online mapping (1:50,000 scale) indicates that the majority of the site is underlain by superficial River Terrace Deposits (undifferentiated) generally comprising sand and gravel. The north-western extent of land parcel 1 is underlain by Alluvium generally comprising clay, silt, sand and gravel. The superficial deposits are identified as being underlain by The Alop Formation consisting of mudstone, sandstone and conglomerate.

According to the Environment Agency online Groundwater Vulnerability Mapping, the superficial River Terrace Deposits and Alluvium Deposits are classified as a Secondary A aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases form an important source of base flow to rivers. The underlying bedrock is also classified as a Secondary A aquifer.

The Cranfield University 'Soilscapes' map indicates that the site is underlain by freely 'draining loamy soils'.

Infiltration tests have been conducted by Waterco Consultants in October 2015 (report reference w1938-151014-Infiltration Report). The infiltration testing concluded that the majority of the site is well drained and suitable for infiltration drainage techniques. An isolated area in the eastern extent

of the southern land parcel was shown to be underlain by clay. The infiltration tests were unsuccessful in this area.

A Geophysical Survey Report has been undertaken by TigerGeo in March 2016 (reference: RWB161). The Geophysical Survey identified an area of waterlogged ground in the northern extent of the northern land parcel. The area of waterlogged ground corresponds to an isolated area of Alluvium deposits (clay) and a topographical low point.

Local Drainage

DCWW sewer records shows that there are no public sewers crossing through the site. There is a 375mm public combined sewer located to the west of Parcel 1 and a 150mm public combined sewer in Trevalyn Way (Road) to the west of Parcel 2. There is also a private surface water sewer located adjacent to the north-western boundary of Parcel 1.

Development Proposals

The proposed development is for approximately 132 dwellings with associated access roads and landscaping. 61 dwellings are proposed in Parcel 1 with 71 dwellings proposed in parcel 2. A proposed development plan is included in Appendix C.

The proposed development will introduce approximately 12,767m² of hardstanding in the form of buildings and roads. Land parcel 1 will introduce approximately 6,382m² of hardstanding. Land parcel 2 will introduce approximately 6,383m² of hardstanding.

Flood Zone Category and Policy Context

Flood Zone Category

The Welsh Government Development Advice Map, included in Appendix D, shows that the majority of the site is located within Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 0.1% (1 in 1000) annual probability of flooding. The north-western extent of land parcel 1 is located within Flood Zone B - an area known to have flooded in the past (evidenced by superficial deposits).

The NRW 'Flood Map for Planning', included in Appendix D, shows that the site is located within an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding.

Development Vulnerability Classification

The proposed residential development is considered to be 'highly vulnerable' in accordance with Figure 2 of the Welsh Government's Technical Advice Note 15 – Development and Flood Risk (TAN15).

TAN15 states that highly vulnerable development can be considered in Flood Zone A and Flood Zone B subject to demonstrating that the site falls outside of the 0.1% annual probability flood extent and demonstrating that the development will not increase flood risk elsewhere.

Local Policy

The currently adopted Wrexham Unitary Development Plan 1996 – 2011, contains the following policies in relation to flood risk and drainage.

Policy EC12 – Development and Flood Risk

'Development (including the raising of land) within defined flood plains will only be permitted if it:- a) would not be subject to an unacceptable risk of flooding on-site; and/or b) does not result in an unacceptable risk of flooding on or off-site; and/or c) does not adversely affect flood management or maintenance schemes.'

Policy EC13 – Surface Water Run-off

Development which would result in an unacceptable adverse impact on the water environment due to additional surface water run-off will not be permitted.'

The Welsh Government: 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales' (2017) contains the following standards for surface water drainage:

S1 - Surface water runoff destination

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority levels 5: Surface water runoff is discharged to a combined sewer.

G2.33 *The design of the site drainage system should take account of the potential for runoff which might flow onto the site during an extreme event up to the 1:100 year event.*

Local guidance documents including the Wrexham Council Preliminary Flood Risk Assessment (PFRA) (June 2011) have been reviewed for site specific information.

Consultation

A pre-planning opinion request was submitted to the DCWW in May 2018 with regards to development foul flows. A response is included in Appendix E. DCWW have stated:

'The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be taken to the foul sewer at or beyond manhole SJ37572301 within Holt Road/Rossett Road...

...With reference to the surface water flows from the proposed development, you are required to fully exhaust all technical options outlined under Sections 3.2 and 3.4 of Part H of the publication 'Building Regulations 2000; Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to watercourses in liaison with the Land Drainage Authority and/or Natural Resources Wales. Discharge of surface water to the public sewer is only to be made as a last resort...

...In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system. ADVISORY The applicant may need to apply to Dwr Cymru / Welsh Water for any connection to the public sewer under S106 of the Water industry Act 1991...

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.'

Waterco contacted Wrexham County Council (LLFA) regarding surface water disposal from the site. A response is currently awaited.

Sources of Flooding and Probability

Fluvial

The nearest watercourse is an unnamed land drain which is located approximately 75m north-east of parcel 1. The unnamed land drain flows north in this location and away from the site. The nearest designated main river is the River Alyn which is located approximately 150m south of Parcel 2. The River Alyn flows east in this location to its confluence with the River Dee, approximately 2.7km south-east of the site. Other watercourses in the area include Lavister Brook which is located approximately 560m north-west of Parcel 1. Lavister Brook flows north-east in this location to its confluence with Pulford Brook, approximately 1.1km from the site.

The PFRA contains no records of fluvial flooding at the site. An internet search found records of flooding from the River Alyn in 2000. This flooding affected properties on Station Road approximately 730m west of the site. The site was not affected during this event.

Any potential flooding from the unnamed land drain located 80m north-east of the northern land parcel would be directed north away from the site following the local topography.

The southern land parcel is in close proximity to the extreme 1% and 0.1% annual probability fluvial flood extents associated with the River Alyn. The flood extent reaches the southern side of Harwood's Lane. As shown on the topographical survey, Harwood's Lane, where it is shown in Flood Zone 3, is situated at approximately 51.07m AOD and 600mm below adjacent site levels.

The site is situated outside of the 0.1% annual probability fluvial flood extent and as such, it can be concluded that the risk of fluvial flooding is very low.

Tidal

The site is situated at a minimum of 12m AOD. The site is therefore not at risk of tidal flooding.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events, however can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The NRW 'Flood Map for Surface Water' (Appendix D) shows that the majority of the site is at very low risk of surface water flooding, meaning it has a less than 0.1% annual probability of flooding. An area at low risk of surface water flooding is identified centrally within Parcel 1. An isolated area of low flood risk is also identified in the eastern extent of parcel 2. Low risk is classified as having between a 1% and 0.1% annual probability of occurrence.

The PFRA 'Flooding Incidents within WCBC' map, provided as Appendix F, shows no records of surface water flooding at or near to the site.

An area of waterlogged ground has been identified in the northern extent of parcel 1. A photograph of the waterlogged ground is provided as Figure 1. The waterlogged ground corresponds with an isolated topographical low point and underlying Alluvium (clay) deposits. The underlying clay is limited in extent. A map showing the location and approximate extent of the waterlogged area, extracted from the TigerGeo Geophysical Survey Report, is included in Appendix G.



Figure 1 – Waterlogged Ground.

There are no distinct flow routes in the area that would direct any potential surface water flooding towards the site. Any potential surface water flooding on site would be associated with ponding in isolated topographical low points which are underlain by isolated outcrops of clay.

It can be concluded that the majority of the site is not at risk of surface water flooding. Isolated areas of the site, underlain by superficial Alluvium deposits (clay), are at potential risk of waterlogging, especially during wet winter months.

Sewer Flooding

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

DCWW sewer records shows that there are no public sewers crossing through the site. There is a 375mm public combined sewer located to the west of Parcel 1 and a 150mm public combined sewer in Trevalyn Way (Road) to the west of Parcel 2. There is also a private surface water sewer located adjacent to the north-western boundary of Parcel 1.

The PFRA states that *'there were no records of properties affected by sewer flooding with significant consequences'* in WCBC. The PFRA 'Sewer Flooding Incidents' map (Appendix F) shows no records of sewer flooding at or near to the site.

There are no distinct flow routes in this area which would direct any potential sewer flooding towards the site. It can therefore be concluded that the risk of sewer flooding is low.

Groundwater Flooding

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

The PFRA states: *'there were no records of past groundwater flooding within Wrexham County Borough Council (WCBC); this is due to the topography and geology of the area'*.

There are no records of groundwater flooding at the site.

It can therefore be concluded that the risk of groundwater flooding is low.

Artificial Sources of Flooding

There are no canals in the immediate vicinity of the site.

The online NRW 'Risk of Flooding from Reservoirs' map shows that the site is not at risk of flooding from reservoirs.

Summary of Potential Flooding

It can be concluded that the majority of the site is at low risk of flooding from all sources. Waterlogged ground has been identified in the northern extent of parcel 1. The waterlogged ground is attributed to the underlying superficial Alluvium deposits (clay), which are limited in extent, and isolated topographical low points. The compacted nature of the existing agricultural ground may also be a contributing factor to the waterlogging. The risk associated with the waterlogged ground has been used to inform mitigation design as discussed further in this report.

Mitigation

Waterlogged ground is identified in the northern extent of land parcel 1. The waterlogging is limited in extent and attributed to underlying superficial Alluvium deposits (clay) and isolated topographical low points.

The following mitigation measures will reduce the risk of waterlogging in the northern extent of parcel 1:

- Undertake ground levelling to eliminate topographical low points;
- Introduce a topsoil layer above the clay. The site comprises of agricultural land whereby the soil is compacted. The development will introduce garden areas where topsoil and planting will be incorporated to improve natural drainage characteristics.
- Surface water drainage from areas underlain by clay (waterlogged areas) will be directed to communal soakaways located in areas with suitable infiltration characteristics.

Finished floor levels should be set 150mm above surrounding ground levels.

Surface Water Management

The site is not formally drained and is considered to be 100% permeable.

The proposed development will introduce approximately 12,767m² of hardstanding in the form of buildings and roads. Land parcel 1 will introduce approximately 6,382m² of hardstanding. Land parcel 2 will introduce approximately 6,383m² of hardstanding.

In accordance with TAN15, new development should not create additional runoff when compared with the undeveloped situation.

In order to ensure no increase in surface water runoff as a result of the development, sustainable drainage systems will be used to accommodate the 1 in 100 year plus 30% climate change storm event.

Discharge Method

The Welsh Government: 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales' (2017) contains the following standards for surface water drainage:

S1 - Surface water runoff destination

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority levels 5: Surface water runoff is discharged to a combined sewer.

Priority Level 1: Surface water runoff collected for use

Surface water re-use is applicable for residential properties. A water butt will be provided for each dwelling to promote external water re-use where practical. Rainwater harvesting systems are not proposed. In line with section G1.4 of the 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales', rainwater harvesting is not proposed for this site as:

- 1) There is no foreseeable need to harvest water at the site and Welsh Water have not identified potential stresses on mains water supplies in this area;
- 2) The use of rainwater harvesting is not a cost-effective part of the solution for managing surface water runoff on the site, taking account of the potential water supply benefits of such a system.

With regards to point 2 above, section G1.6 of the 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales' states that; in most cases, rainwater harvesting alone will not

be adequate to deal with the site drainage and provision will be required for an overflow to a Level 2 or lower priority runoff destination. As downstream provision of attenuation storage will be required to accommodate for rainwater harvesting system overflows, rainwater harvesting is not considered a cost-effective solution for managing surface water runoff.

It should be noted that rainwater harvesting is not considered suitable to accommodate rainwater runoff from driveways and roads. In consideration that water butts will require overflows and that water re-use is not possible for drainage from driveways and roads, a lower priority runoff destination is required.

Priority Level 2: Surface water runoff is infiltrated to ground

Infiltration tests have been carried out by Waterco Consultants in October 2015. The infiltration tests were carried out in accordance with the BRE 365 specification.

Infiltration test results show that all trial pits with the exception of trial pits 5 and 6 drained to 100% empty during all 3 repeated tests. The location of the trial pits can be found in the 'Trial Pit Locations' map in Appendix H.

The eastern extent of parcel 2 (location of trial pits 5 and 6) is underlain by clay. Furthermore, the northern extent of parcel 1 is also underlain by clay with historic records of waterlogging. Soakaways will not be suitable within clay areas.

Properties and adopted roads located within clay areas could drain to communal soakaways within public open space located in areas with suitable infiltration characteristics.

Infiltration Test Results

The infiltration test results are shown in the Infiltration Test Report (reference w1938-151014-Infiltration Report). The Infiltration Test Report provides an average infiltration rate across the 3 tests repeated at each trial pit. However, the infiltration rate used for design should be taken from the 3rd and most conservative infiltration test at each trial pit. Infiltration rates from the third test for each trial pit are provided in Table 1:

Table 1 – Infiltration Rates

Trial Pit	Infiltration Rate (m/s)	Infiltration Rate (m/h)
1	1.028E-04	0.37008
2	6.355E-05	0.22878
3	3.22E-05	0.115992
4	7.15E-05	0.2574
5	-	-
6	-	-
7	7.83E-05	0.28188
8	6.33E-04	2.2788
9	1.22E-04	0.43812
10	1.42E-05	0.051012
11	3.86E-05	0.13896
12	6.18E-05	0.222444

No infiltration rate is calculated for trial pits 5 and 6. The test was abandoned at trial pits 5 and 6 due to the underlying clay and resulting slow infiltration.

It can be concluded that soakaway drainage will be a feasible option for surface water disposal from the site. Properties and adopted roads near to trial pits 5 and 6, and in the northern extent of parcel 1 (where waterlogging has been identified), will need to be drained via communal soakaways in public open space outside of the clay areas.

Soakaway Design

Soakaways should be located a minimum of 5m from habitable dwellings.

Surface water from individual dwellings, located within an area with suitable infiltration characteristics, will be discharged to private soakaways located in individual property gardens.

Surface water from dwellings located within clay areas and from adopted roads will be discharged to communal soakaways / infiltration devices located in areas of public open space with suitable infiltration characteristics.

Individual Property Soakaways

Soakaway sizing has been based upon an average house size of 60m² and infiltration rates obtained from the trial pits closest to the individual dwellings. A 'Trial Pit Designations' map is included in Appendix H. The map shows the trial pit (infiltration rate) designated to individual properties.

Soakaway sizing estimates for individual property soakaways are included in Appendix I with a summary provided in Table 2. A 95% void ratio has been used within the soakaway design which is applicable to storm crate (geo-cellular) style soakaways.

Table 2 – Average Private Soakaway Sizing

Trial Pit Designation	Length (m)	Width (m)	Depth (m)	Infiltration Rate (m/h)
TP 1	2	1.5	1	0.37008
TP 2	2	2	0.8	0.22878
TP 3	2	2	1	0.115992
TP 4	2	1.5	1	0.2574
TP 7	2	1.5	1	0.28188
TP 8	1.5	1	1	2.2788
TP 9	2	1.5	1	0.43812
TP 10	2.5	2	1	0.051012
TP 11	2	2	1	0.13896
TP 12	2	2	0.8	0.222444

Communal Soakaways

Surface water from dwellings within clay areas and adoptable roads will be directed to communal infiltration devices located within open space in areas with suitable infiltration characteristics. Communal infiltration devices will include geo-cellular style soakaways, with a 95% void ratio, and the sub-grade material of shared (non-adopted) permeable access roads, with a 30% void ratio (applicable to typical stone aggregate).

Soakaway and permeable paving sub-grade sizing estimates are included in Appendix I.

A Concept Drainage Sketch is included in Appendix J and shows the location and sizes of all communal drainage features. Individual property soakaways are also identified on the Concept Drainage Sketch.

Driveways and Non-adoptable Roads

Permeable surfaces will be used for all driveways and private roads on site. In accordance with Section G1.15 of the 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales', *"effective infiltration can be achieved with lower [infiltration] rates under units such as permeable paving due to the large storage and infiltration surface area available.... All permeable surfaces, weather lined or not, can be assessed to comply provided that there is no additional area drained to the permeable paving."*

No additional area is drained to the majority of private roads and driveways on site. Areas of permeable paving which do accommodate inflow from other areas of the site have been designed appropriately.

Concept Surface Water Drainage Scheme

Surface water runoff will be disposed of using infiltration techniques. Private individual property soakaways will be used for properties located in areas with suitable infiltration characteristics. Communal soakaways and permeable paving sub-grade storage will be used to accommodate surface water runoff from adoptable roads and dwellings located in clay areas. The communal soakaways and permeable paving sub-grade storage will be located in areas of open space with suitable infiltration characteristics. Permeable paving will be used for all driveways and non-adoptable shared roads.

Infiltration devices (soakaways and permeable paving) will be sized to accommodate the 1 in 100 year plus 30% CC event. A 'Concept Drainage Sketch' is included in Appendix J.

Further infiltration testing may be required to validate the detailed design prior to the development commencing as per any standard drainage condition.

The proposed drainage system will ensure no increase in flood risk elsewhere.

Exceedance Event

Storage will be provided for the 1 in 100 year plus 30% CC event. Storm events in excess of the 1 in 100 year plus 30% CC event should be permitted to produce temporary shallow depth flooding within the access roads, driveways and landscaped areas. Exceedance events of individual property soakaways will be contained within private gardens.

Finished floor levels will be set at a minimum of 150mm above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), residential roofs have a 'very low' pollution hazard level, with low traffic roads classified as having a 'low' pollution hazard level. Table 3 shows the pollution hazard indices for each land use.

Table 3 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

** Indices values range from 0-1.*

Runoff will be directed to permeable paving and soakaways. Table 4 demonstrates the pollution mitigation indices of soakaways and permeable paving.

Table 4 – SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Soakaways	0.3	0.5	0.6

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3 & Table 26.15

As shown in Table 4, permeable paving provides sufficient treatment for runoff. Soakaways also provide sufficient treatment however do not provide sufficient removal of suspended solids i.e. silt. All soakaways will be installed with an upstream silt / sediment-trap for ease of sediment removal.

Maintenance

Maintenance of communal drainage features such as permeable paving or soakaways will be the responsibility of the site owner. Maintenance of shared surface water drainage systems can be arranged through appointment of a site management company.

Maintenance of private drainage features such as water butts and individual property soakaways will be the responsibility of individual property owners.

Maintenance schedules for soakaways and permeable paving are included in Appendix K. Maintenance of water butts will include frequent removal of debris from the inlet filter.

Foul Drainage

DCWW have stated:

'The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be taken to the foul sewer at or beyond manhole SJ37572301 within Holt Road/Rossett Road.'

Manhole SJ37572301 is located in Holt Road immediately west of the site.

A survey of the public combined sewer manhole SJ37572301 should be undertaken to determine invert levels and whether a gravity connection can be achieved. Should gravity discharge not be possible for the entire site, a pumped connection will be required. A pumping station could be located in the northern extent of the northern land parcel. In accordance with Sewers for Adoption 7th Edition, a 15m stand-off is required from the wet well of a pumping station to habitable dwellings.

Conclusions

The proposed development is for approximately 132 dwellings with associated access roads and landscaping.

The site is located outside of the extreme flood extent on the Natural Resources Wales Flood Map for Planning, with a less than 0.1% (1 in 1000) annual probability of flooding.

The majority of the site is identified at very low risk of flooding from all sources. Waterlogged ground has been identified in the northern extent of the northern land parcel. The waterlogged ground is attributed to the underlying superficial Alluvium deposits (clay), which are limited in extent, and isolated topographical low points. The compacted nature of the existing agricultural ground may also be a contributing factor to the waterlogging.

The following mitigation measures are proposed to reduce the risk of waterlogging in the northern extent of the site:

- Undertake ground levelling to eliminate topographical low points;
- Introduce a topsoil layer above the clay. The site comprises of agricultural land whereby the soil is compacted. The development will introduce garden areas where topsoil and planting will be incorporated to improve natural drainage characteristics.
- Surface water drainage from areas underlain by clay (waterlogged areas) will be directed to communal soakaways located in areas with suitable infiltration characteristics.
- Finished floor will be set 150mm above surrounding ground levels.

The proposed development will introduce impermeable drainage area in the form of buildings and roads. In order to ensure no increase in surface water runoff as a result of the development, sustainable drainage systems will be used to accommodate the 1 in 100 year plus 30% climate change storm event.

Infiltration test results show that the majority of the site is underlain by sand and gravel with infiltration characteristics suitable to support infiltration drainage. Isolated areas in the northern extent of the northern land parcel and eastern extent of the southern land parcel are underlain by clay. Infiltration drainage would not be suitable in clay areas.

Private individual property soakaways will be used for properties located in areas with suitable infiltration characteristics. Communal soakaways and permeable paving sub-grade storage will be used to accommodate surface water runoff from adoptable roads and dwellings located in clay areas. The communal soakaways and permeable paving sub-grade storage will be located in areas of open space with suitable infiltration characteristics. Permeable paving will be used for all driveways and non-adoptable shared roads.

All infiltration features will be sized to accommodate the 1 in 100 year plus 30% climate change event.

Treatment of surface water will be provided by soakaways and permeable paving. Sediment traps should be placed upstream of infiltration drainage features.

DCWW have confirmed that foul flows can discharge to 375mm public combined sewer in Holt Road. A survey of the public combined sewer system in Holt Road should be undertaken to determine invert levels and whether a gravity connection can be achieved.

Recommendations

1. Submit this Flood Risk Assessment and Drainage Strategy to the Planning Authority in support of the Planning Application.

Appendix A – Location Plan & Aerial Image



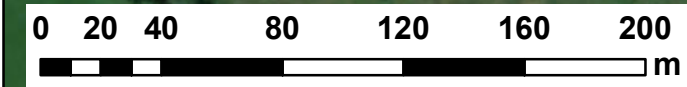
NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Watercourses / Water Bodies



CLIENT:			
BELLIS BROTHERS LTD			
 www.waterco.co.uk			
SCHEME:			
LAND OFF HALT ROAD, ROSSETT			
PLOT TITLE:			
LOCATION PLAN			
PLOT STATUS:		DATE:	
FINAL		06/06/2018	
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
HW	AW	VG	1:2,500 (UNLESS STATED OTHERWISE)
PLOT NAME:			REV:
w10685-Location_Plan			-



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

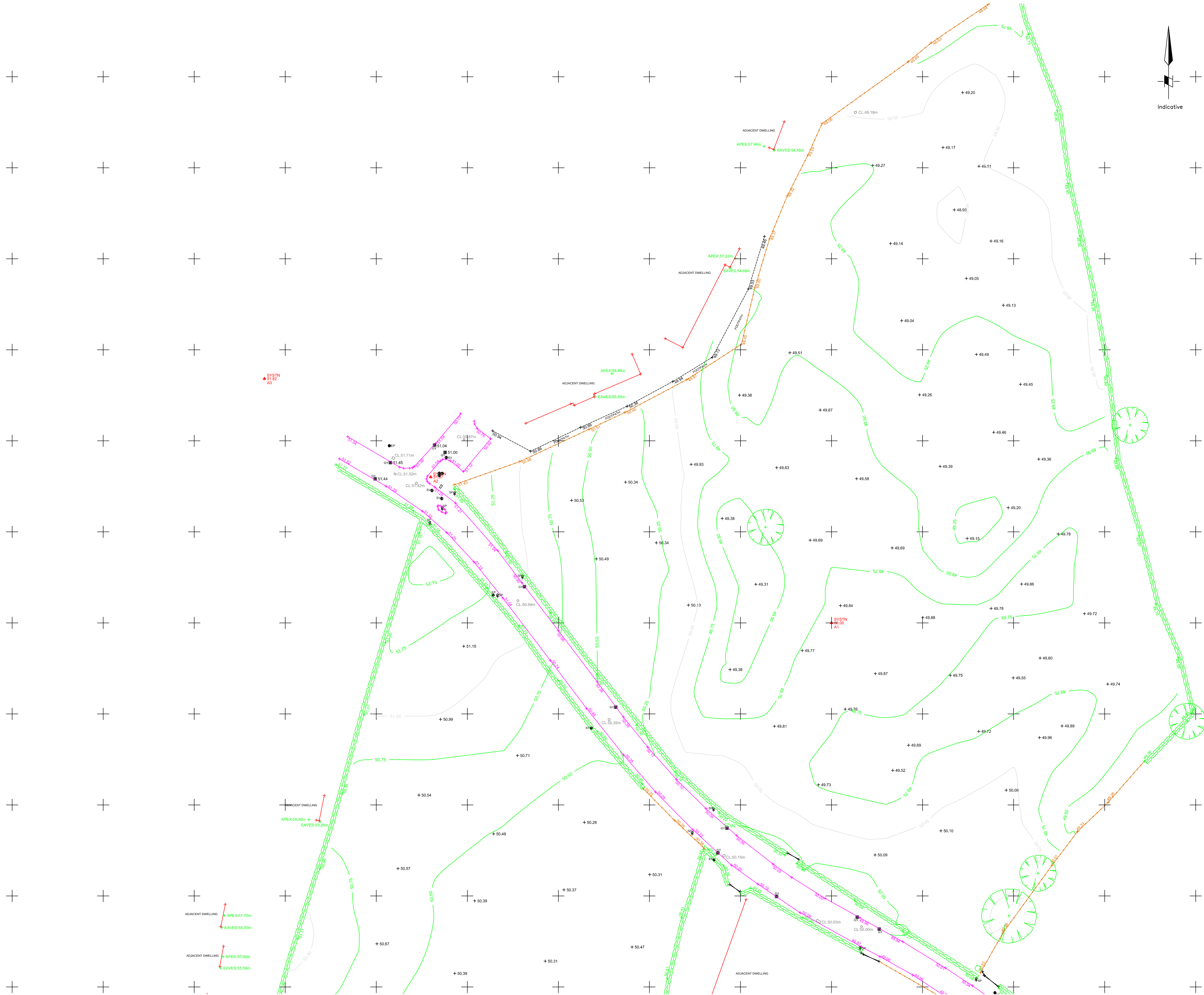
LEGEND

Site Boundary



CLIENT:			
BELLIS BROTHERS LTD			
 www.waterco.co.uk			
SCHEME:			
LAND OFF HALT ROAD, ROSSETT			
PLOT TITLE:			
AERIAL PLAN			
PLOT STATUS:			DATE:
FINAL			06/06/2018
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
HW	AW	VG	1:2,500 (UNLESS STATED OTHERWISE)
PLOT NAME:			REV:
w10685-Aerial_Image			-

Appendix B – Topographical Data



NOTES

Copyright of this drawing remains with M.B.Surveying Ltd. Do not scale from this drawing, work to figured dimensions. Check all dimensions on-site. In the event of any discrepancy, please refer query to M.B.Surveying Limited.

Legend

AV	Air valve
BH	Borehole
BOL	Bollard
BT	British Telecom cover
CATV	Cable television cover
CL	Cover level
DPC	Damp proof coursing level
Earth/ER	Earthing rod
ELEC	Electric cover
EP	Electricity pole
Fence VR	Iron railing fence
Fence CB	Closeboard fence
Fence CP&P	Concrete post & panel fence
Fence Pa	Palisade fence
Fence PW	Post and wire fence
Fence PIR	Post and rail fence
Fence P/P	Post and panel fence
FFL	Finished floor level
FIB	Flower bed
FH	Fire Hydrant
GY	Gully
GAS	Gas cover
IC	Inspection chamber
IL	Invert level
INV	Invert level
LP	Lamp post
LT	Light
MH	Manhole
Nymex	Telecommunications cover
OSBM	Ordnance Survey Bench Mark
PTM	Parking ticket machine
RE	Rodding eye
RS	Road sign
R/W	Retaining wall
SBX	Switch box
SP	Sign post
SPS	Safety playing surface
ST	Stop tap
SV	Service valve
TBM	Temporary Bench Mark
TP	Telegraph pole
TRP	Trail pit
TRL	Traffic light
W	Water cover
WL	Water level
WO	Wash out

Building
Building overhead / Foundations / Ruins
Road edge / Change of surface / Drain
Change of slope
Fence

Safety barrier
Overhead cable
Gate
Hedge
Limit of foliage/tree
canopies
Spot level

Co-ordinates and Levels related to Local Site Grid.
Origin 1000.000mE 1000.000mN 50.000mAD at survey station A1

SURVEY STATIONS			
Name	Easting	Northing	Height
A1	1000.000	1000.000	50.000
A2	889.945	1040.057	51.367
A3	844.275	1067.062	51.623
A4	897.558	832.498	50.893
A5	812.368	774.472	51.115
A6	827.309	759.763	51.232

REV	DESCRIPTION	DWN	CHKD	DATE
-----	-------------	-----	------	------

CLIENT Bellis Bros

PROJECT Land Off Rossett Rd, Rossett.

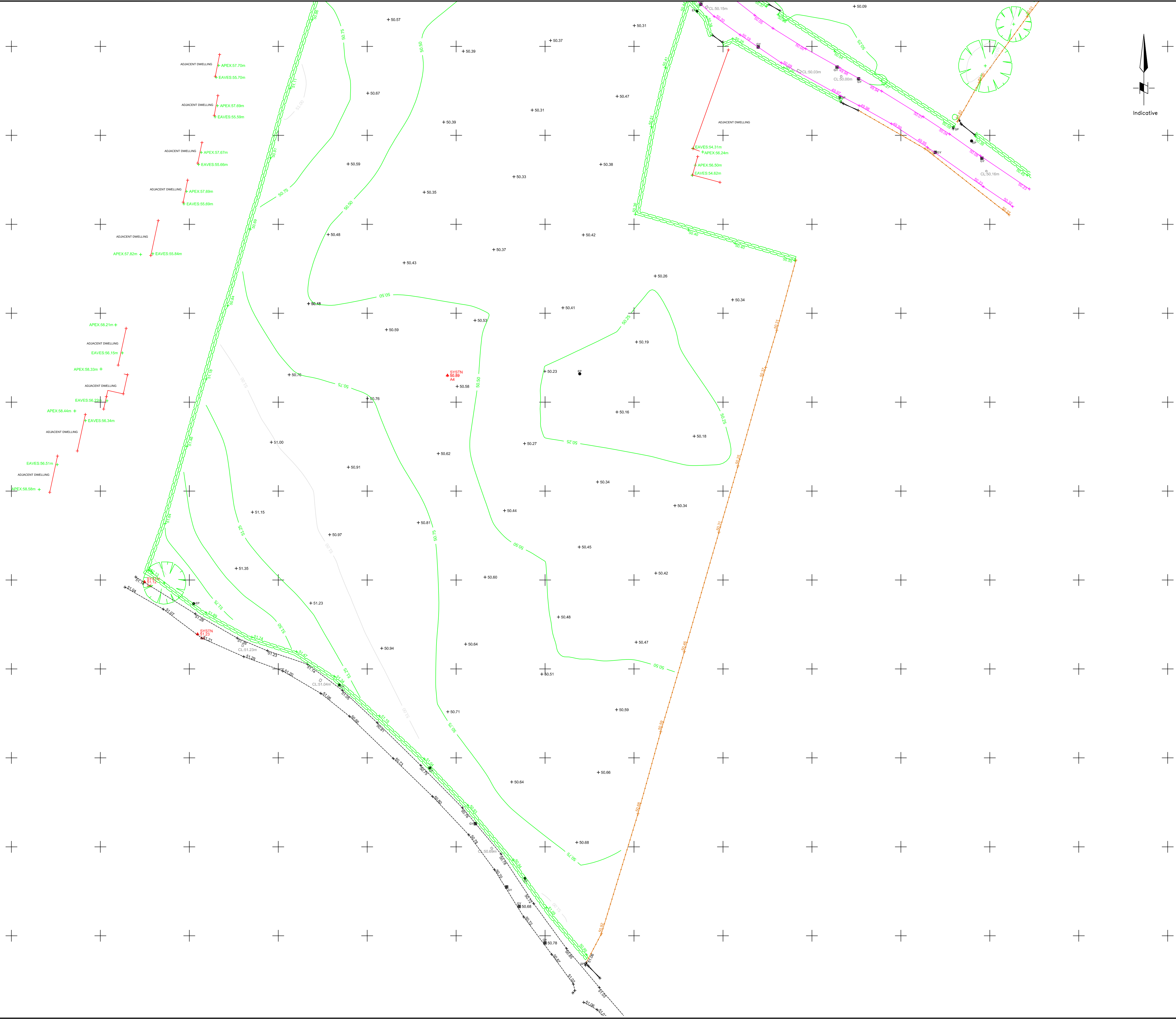
TITLE Topographical Survey

DWN	DATE	CHKD	DATE	APPD	DATE	SCALE
MB	20/01/15					1-500@A1

Land & Engineering Surveyors
MB
Surveying
Limited
Pine Cottage, Kelsall Road,
Ashton Hayes, Cheshire, CH3 8BH
Tel: 01829 759306
www.mbsurveying.co.uk

Drawing Number MBS688 REV A1





NOTES

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Legend	
AV	Air valve
BH	Borehole
BOL	Bollard
BT	British Telecom cover
CATV	Cable television cover
CL	Cover level
DPC	Damp proof coarsing level
Earth/ER	Earthing rod
ELEC	Electric cover
EP	Electricity pole
Fence VR	Iron railing fence
Fence CB	Closeboard fence
Fence CP&P	Concrete post & panel fence
Fence Pa	Palisade fence
Fence PW	Post and wire fence
Fence PIR	Post and rail fence
Fence P/P	Post and panel fence
FFL	Finished floor level
FIB	Flower bed
FH	Fire Hydrant
GY	Gully
GAS	Gas cover
IC	Inspection chamber
IL	Invert level
INV	Invert level
LP	Lamp post
LT	Light
MH	Manhole
Nymex	Telecommunications cover
OSBM	Ordnance Survey Bench Mark
PTM	Parking ticket machine
RE	Rodding eye
RS	Road sign
R/Wall	Retaining wall
SBX	Switch box
SP	Sign post
SPS	Safety playing surface
ST	Stop tap
SV	Service valve
TBM	Temporary Bench Mark
TP	Telegraph pole
TRP	Trail pit
TRL	Traffic light
W	Water cover
WL	Water level
WO	Wash out

Building	Building overhead / Foundations / Ruins
Building overhead / Foundations / Ruins	Building overhead / Foundations / Ruins
Road edge / Change of surface / Drain	Road edge / Change of surface / Drain
Change of slope	Change of slope
Fence	Fence
Safety barrier	Safety barrier
Overhead cable	Overhead cable
Gate	Gate
Hedge	Hedge
Limit of foliage/tree canopies	Limit of foliage/tree canopies
Stile	Stile
Tree	Tree
Spot level	Spot level

Co-ordinates and Levels related to Local Site Grid.
Origin 1000.000mE 1000.000mN 50.000mAD at survey station A1

SURVEY STATIONS			
Name	Easting	Northing	Height
A1	1000.000	1000.000	50.000
A2	889.945	1040.057	51.367
A3	844.275	1067.062	51.623
A4	897.558	832.498	50.893
A5	812.368	774.472	51.115
A6	827.309	759.763	51.232

REV	DESCRIPTION	DWN	CHK'D	DATE
MB	08/01/15			
CLIENT				
Bellis Bros				
PROJECT				
Land Off Rossett Rd, Rossett.				
TITLE				
Topographical Survey				
DWN	DATE	CHK'D	DATE	APP'D
MB	08/01/15			
SCALE				
1-500@A1				
Land & Engineering Surveyors				
MB Surveying Limited				
Pine Cottage, Kelsall Road, Ashton Hayes, Cheshire, CH3 8BH Tel: 01829 759306 www.mbsurveying.co.uk				
Drawing Number				A1
MBS688				REV

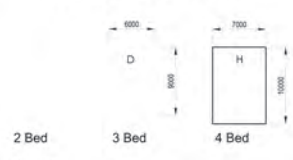


Appendix C – Development Plans



NORTH					
REF	BEDS	SQ FT	QTY	TOTAL	TYPE
A	2	700	10	7000	2 BED TERRACE
B	2	720	0	0	2 BED TERRACE
C	3	900	11	9900	3 BED TERRACE
D	3	1000	17	17000	3 BED TERRACE
E	3	1024	4	4096	3 BED SEMI
G	4	1350	0	0	4 BED DETACHED
H	4	1350	10	13500	4 BED DETACHED
I	4	1380	3	4140	4 BED DETACHED
J	4	1240	6	7440	4 BED DETACHED
TOTAL			61	63076	
Units / Net/ Hectare / Acre 31 / 12					
Gross area 6.94 acres					
POS area 1.17 acres					
Undevelopable area 0.4 acres					
Net area 5.37 acres					
SOUTH					
REF	BEDS	SQ FT	QTY	TOTAL	TYPE
A	2	700	1	700	2 BED TERRACE
B	2	720	1	720	2 BED TERRACE
C	3	900	21	18900	3 BED TERRACE
D	3	1000	11	11000	3 BED TERRACE
E	3	1024	9	9216	3 BED SEMI
G	4	1350	2	2700	4 BED DETACHED
H	4	1350	19	25650	4 BED DETACHED
I	4	1380	3	4140	4 BED DETACHED
J	4	1240	4	4960	4 BED DETACHED
TOTAL			71	77986	
Units / Net/ Hectare / Acre 30 / 11					
Gross area 8.41 acres					
POS area 1.69 acres					
Undevelopable area 0.5 acres					
Net area 6.20 acres					

Typical Property Sizes.



KEY

EXISTING TREES

EXISTING HEDGEROWS

PROPOSED TREES

PROPOSED HEDGEROWS

PROPOSED PARK

PROPOSED HOUSING

PROPOSED STREET

PROPOSED SHARED SURFACES

PROPOSED SUDS POND

REV. AMENDMENT. DATE

Parkinson
First Floor, 5 Union Court, Liverpool, L2 4SJ
T: 07970 686 302 E: ian@parkinsoninc.co.uk

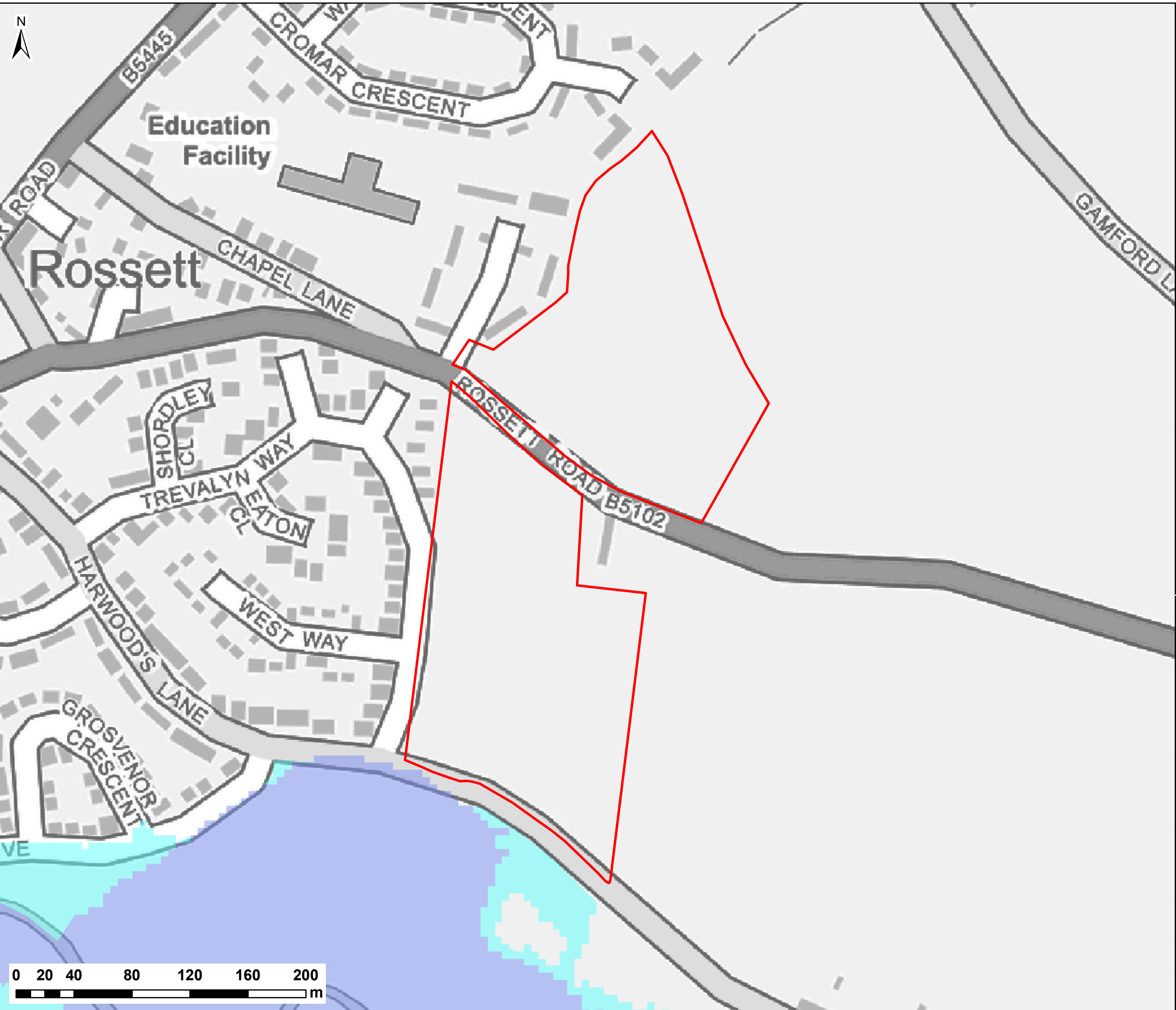
PROJECT
HOLT ROAD / ROSSETT ROAD,
ROSSETT, CLYWD.

CLIENT
BELLIS BROS

DRAWING TITLE
MASTER PLAN (RENDERED)

SCALE 1:500 @A0 REV. G PROJECT REF ROSSETT
DATE Sept 2017 DRAWING No. Pinc 100-37-SMP-01
CHECKED IP

Appendix D – Natural Resources Wales Flood Maps



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- NRW Flood Zone 3
- NRW Flood Zone 2

CLIENT:

BELLIS BROTHERS LTD

www.waterco.co.uk

SCHEME:

**LAND OFF HALT ROAD,
ROSSETT**

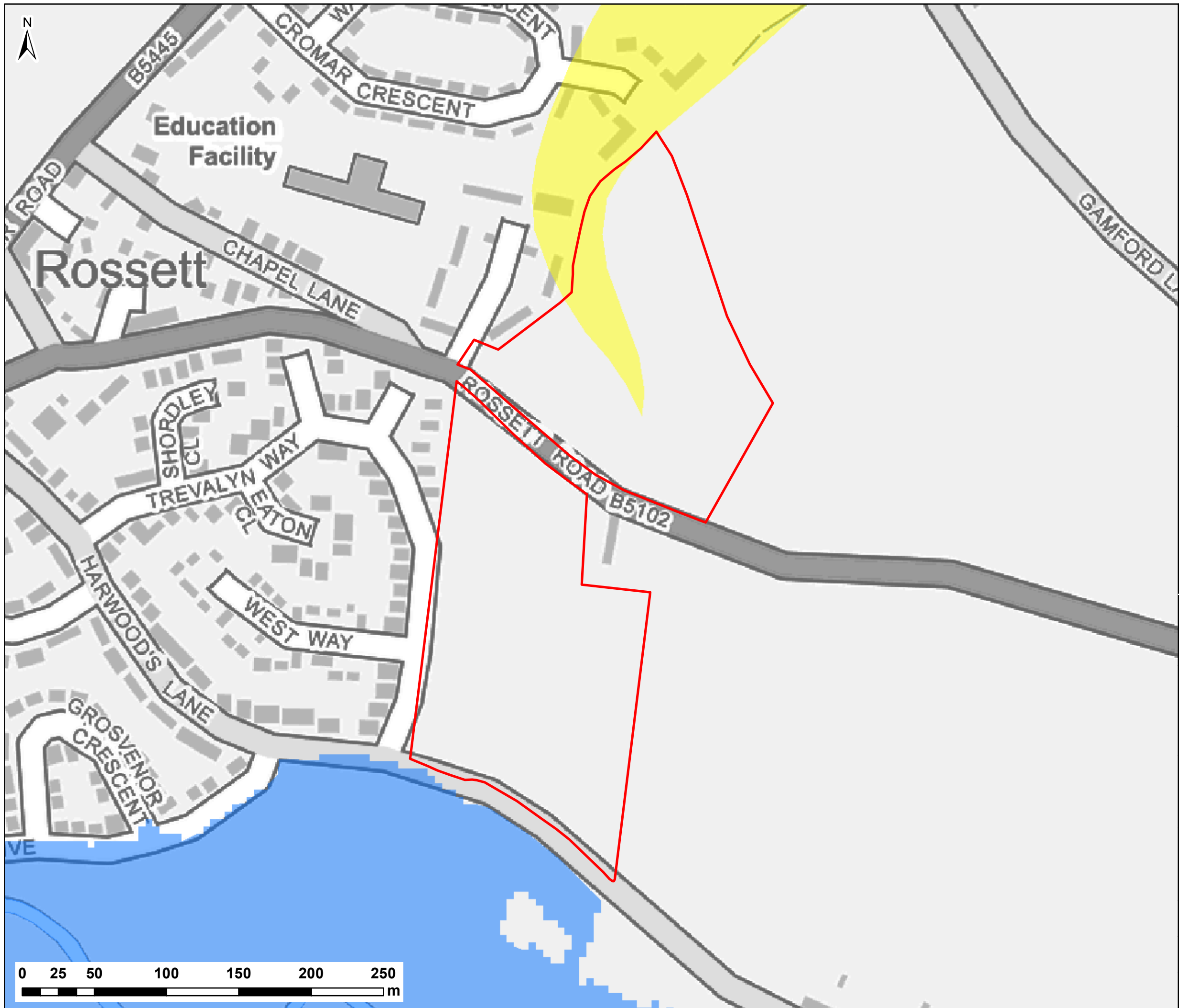
PLOT TITLE:

NRW FLOOD MAP FOR PLANNING
MAY 2018

PLOT STATUS:			DATE:
FINAL			06/06/2018

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
HW	AW	VG	1:2,500
			(UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
w10685-EA_FZ	-



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

 Site Boundary

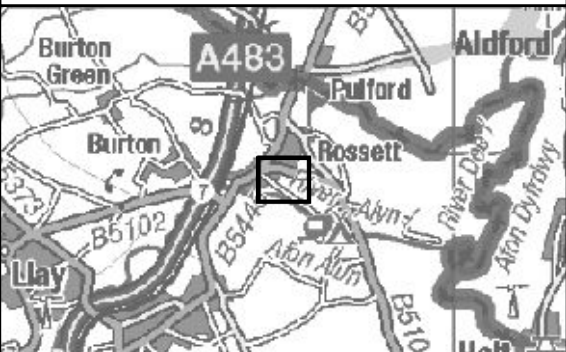
TAN15 Classification

 Zone A

 Zone B

 Zone C1

 Zone C2



CLIENT:

BELLIS BROTHERS LTD



www.waterco.co.uk

SCHEME:

**LAND OFF HALT ROAD,
ROSSETT**

PLOT TITLE:

**WELSH GOVERNMENT
DEVELOPMENT ADVICE MAP
JUNE 2018**

PLOT STATUS:

FINAL

DATE:

06/06/2018

DRAWN:

HW

CHECKED:

AW

APPROVED:

VG

PLOT SCALE @ A3:

1:2,500

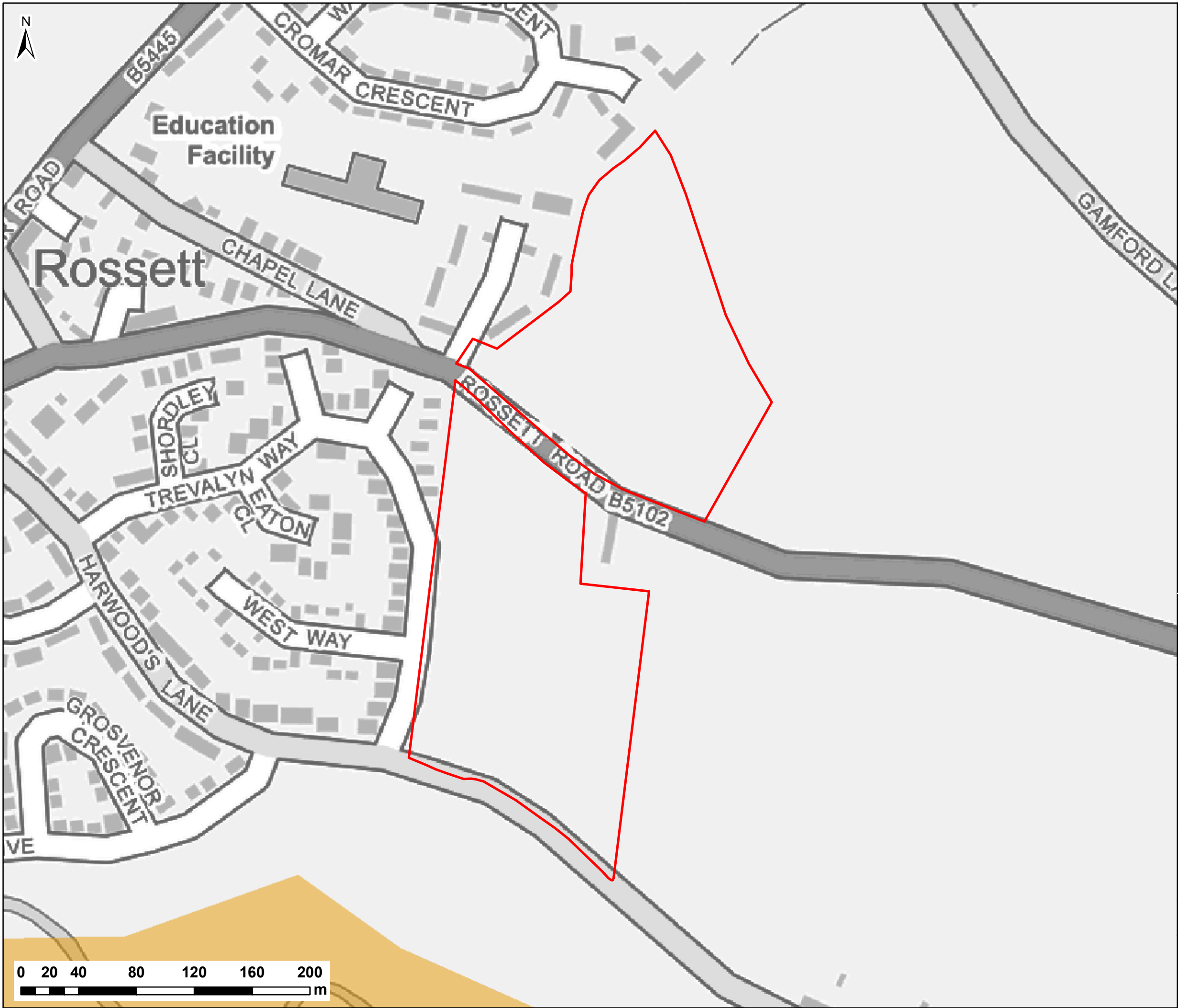
(UNLESS STATED OTHERWISE)

PLOT NAME:

w10685-EA_RES

REV:

-



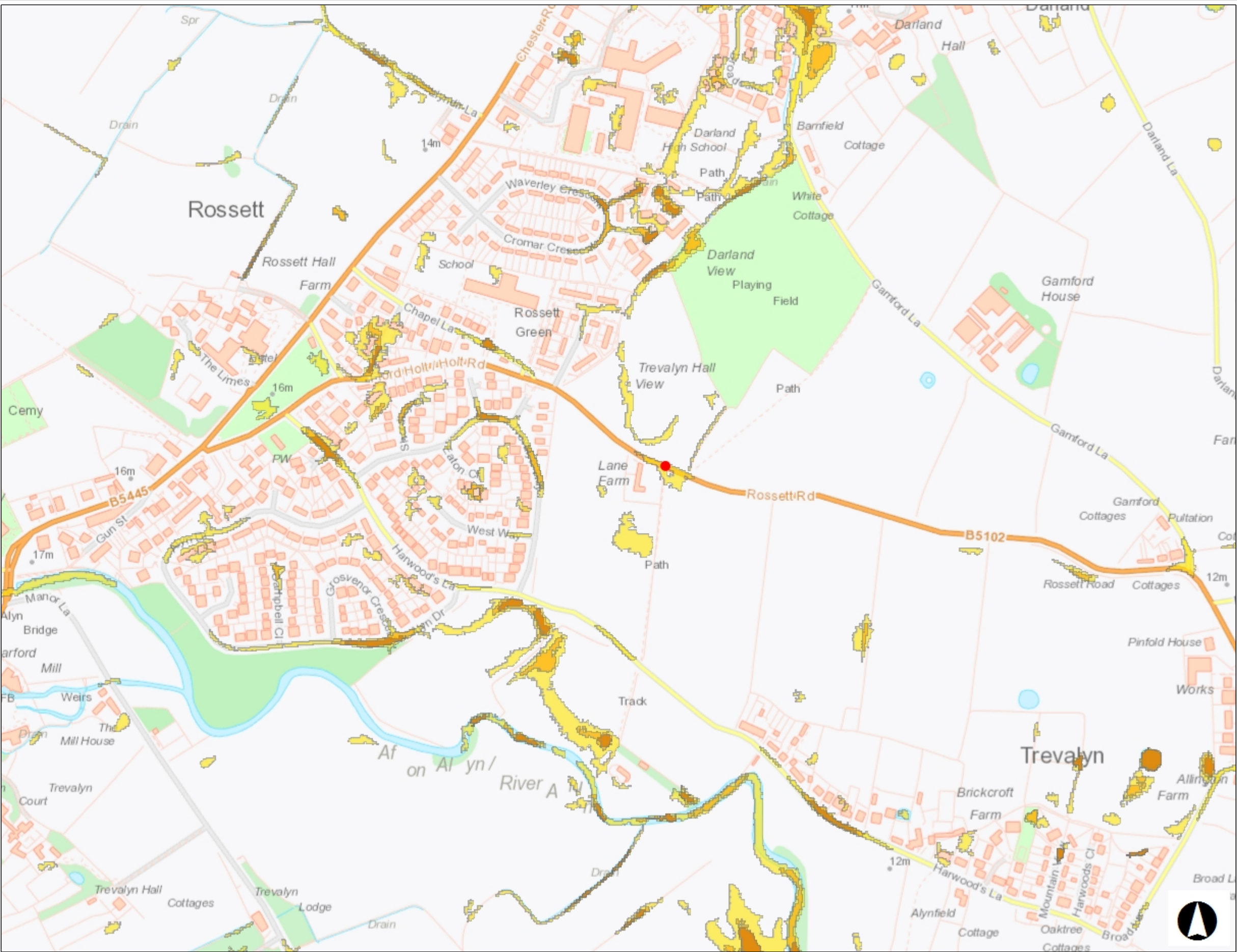
NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

-  Site Boundary
-  NRW Historic Flood Map



CLIENT:			
BELLIS BROTHERS LTD			
 www.waterco.co.uk			
SCHEME:			
LAND OFF HALT ROAD, ROSSETT			
PLOT TITLE:			
NRW HISTORIC FLOOD MAP			
PLOT STATUS:			DATE:
FINAL			06/06/2018
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
HW	AW	VG	1:2,500 (UNLESS STATED OTHERWISE)
PLOT NAME:			REV:
w10685-EA_HIS			-



Flood Map for Surface Water

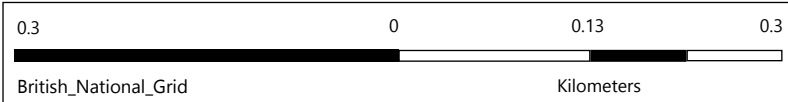
Map Perygl Llifogydd / Flood Risk Map

Allwedd / Map Key

-  High Surface Water Flood Risk - Extent
-  Medium Surface Water Flood Risk - Extent
-  Low Surface Water Flood Risk - Extent

Graddfa / Scale 1: 5,001

Dyddiad / Date
06/06/2018



Ceir rhestr lawn o delerau ac amondau yn <https://naturalresources.wales/rhybuddsafonol> neu drwy gysylltu ag ymholiadau@cyfoethnaturiolcymru.gov.uk. A full list of terms and conditions is available from the <https://naturalresources.wales/StandardNotice> or by contacting enquire@naturalresourceswales.gov.uk © Crown copyright and database rights 2017 Ordnance Survey 100019741. Geological mapping: British Geological Survey ©NERC. Centre for Ecology & Hydrology © NERC (CEH). Defra and Met Office © Crown copyright. © Cranfield University. © James Hutton Institute. Land & Property Services © Crown copyright and database right.

Appendix E – Consultation

Mr Harri Williams
Waterco Consultants
Eden Court
Lon Parcwr Business Park
Ruthin
Denbighshire
LL15 1NJ

Date: 25/05/2018
Our Ref: PPA0003089

Dear Mr Williams

Grid Ref: 337319 357262
Site Address: Land off Holt Road, Rossett
Development: Residential development – 132 units

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

SEWERAGE

The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be taken to the foul sewer at or beyond manhole SJ37572301 within Holt Road/Rossett Road.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.

However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

SURFACE WATER

With reference to the surface water flows from the proposed development, you are required to fully exhaust all technical options outlined under Sections 3.2 and 3.4 of Part H of the publication 'Building Regulations 2000; Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to watercourses in liaison with the Land Drainage Authority

and/or Natural Resources Wales. Discharge of surface water to the public sewer is only to be made as a last resort. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note.

In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

ADVISORY

The applicant may need to apply to Dwr Cymru / Welsh Water for any connection to the public sewer under S106 of the Water Industry Act 1991. If the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Gravity Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

Some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect your proposal. In order to assist us in dealing with the proposal we request that you contact our Operations Contact Centre on 0800 085 3968 to establish the location and status of the sewer. Under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

SEWAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.



Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dwr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Yours faithfully,



Owain George
Planning Liaison Manager
Developer Services

Please Note that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

Appendix F – PFRA Maps

4. Historic/Past Flood Risk

All records of previous flooding incidents in WCBC were collected from the data sets listed in Chapter 3, methodology, within Table 2. These flood events came from a range of flood sources, and in many cases the source of flooding was unknown or not recorded. A summary of information specific to each source of flooding considered as part of the PFRA are included below. The locally agreed surface water information was determined by combining a number of data sets from a range of organisations as described in Table 2 Chapter 3. The figure within this Chapter show the data sets used to determine the impacts of historic flood risk.

4.1. Surface Water Flooding

Surface Water Flooding (SWF) occurs following intense rainfall which, due to the large volume of water exceeds the ability of the drainage systems to cope. Due to its sudden nature there is no lead time as is often the case with pluvial and fluvial flooding. This sudden rise in water levels can cause localised flooding, often affecting individual streets and/or properties as the drainage network is unable to cope.

Within the WCBC area this was the most prominent cause of flooding from the three sources the LLFA is required to assess. The main source of flooding was predominantly from surface water run off from paved surfaces frequently becoming an issue as the flooded property was below the level of the road surface. Insufficient drainage or blockages of the drainage system was also a major cause of this surface water runoff. Figure 3 below shows the results of both the external questionnaire, as well as the internal data collection.

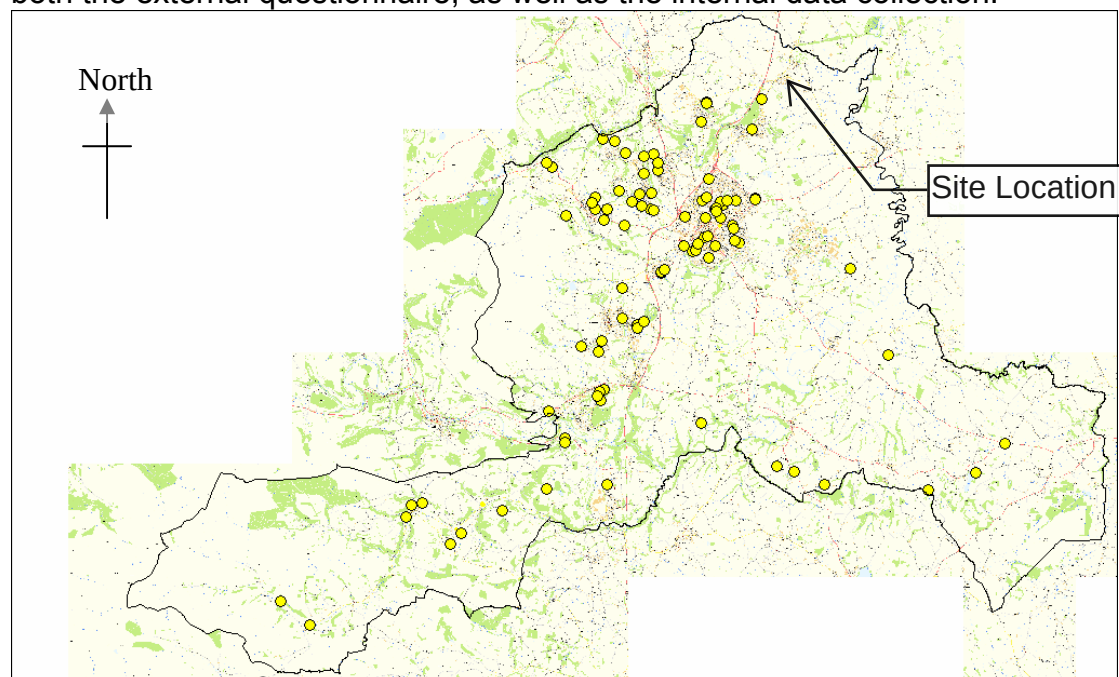


Figure 3 - Flooding Incidents within WCBC

still the case as with surface water none of the affected areas meet the requirements set by EA/WAG to be counted as an IFRA. Figure 4 below shows all sewer flooding incidents within the WCBC area over the last 10 years. This information was taken from the data set provided by WW/DC. Note that all flooding incidents in figure 4 are a combination of both internal and external flooding.

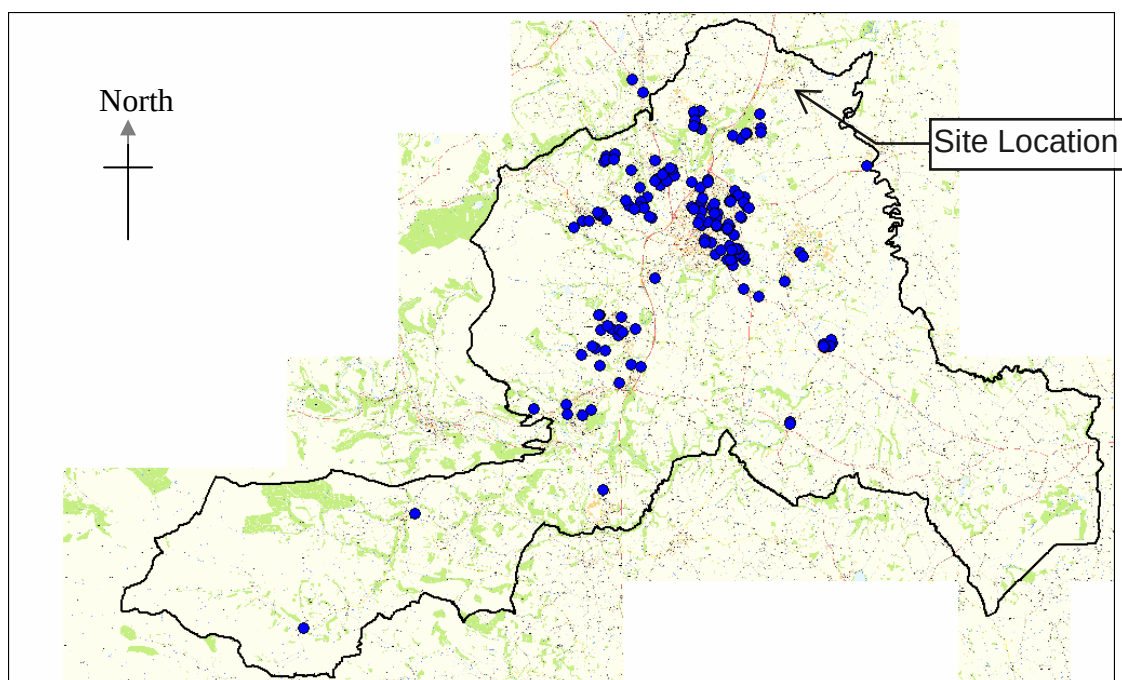


Figure 4 - Sewer Flooding Incident

4.4. Canal and Ordinary Watercourse Flooding

Information was obtained from British Waterways detailing the canal network throughout WCBC including the location of canals, weirs, sluices and locks. There are no historic records of canal overtopping or flooding issues from a canal within WCBC which meet the criteria for a significant flooding. There were a few events of canal breach/overtopping within the WCBC area which only affected rural areas and were caused by badgers burrowing under the canal in two cases. The first, in 2004, only flooded rural areas; the second in 2009 caused flooding and the evacuation of 1 property as well as causing water damage to a car. Both these incidents occurred around the village of Bettisfield. All incidents are shown on Figure 5 overleaf.

Appendix G – Location of Waterlogged Area



RWB161 Rossett, Wrexham, Denbighshire
DWG 02 Magnetic Data

Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing
File: RWB161.map Copyright TigerGeo Limited 2016 OS OpenData Crown Copyright & Database Right 2016



Appendix H – Infiltration Location Maps



Aerial Photograph
(Source: Google Maps)



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
- THIS DESIGN IS PROPOSED ON THE BASIS OF CLIENT BRIEF, SPECIFICATIONS, BEST PRACTICE AND RISK REDUCTION / ELIMINATION. THE DESIGNER MUST BE CONSULTED ON ANY PROPOSED CHANGES, BEFORE THEY ARE CONSIDERED FOR IMPLEMENTATION.

1	06-06-2018	-	HW	AW	VG
REV.	DATE	DESCRIPTION	DSGND	CHK'D	APP'D
CLIENT					
BELLIS BROTHERS LTD					
PRINCIPAL DESIGNER					
-					
					
Waterco Ltd., Eden Court, Lon Parcwr Business Park, Ruthin LL15 1NJ					
tel (+44) 1824 702220 www.waterco.co.uk					
SCHEME					
HOLT ROAD, ROSSETT					
TITLE					
TRIAL PIT DESIGNATIONS					
STATUS					
DESIGNED HW	CHECKED AW	APPROVED VG	SCALE / SHEET SIZE 1 : A3		
DRAWING NO. w10685					REV 1

Appendix I – MicroDrainage Calculations

Waterco Ltd			Page 1																																																																																																																																																																																																																			
Eden Court		w10685																																																																																																																																																																																																																				
Lon Parcwr Business Park		Holt Road, Rossett																																																																																																																																																																																																																				
Denbighshire LL15 1NJ		TP1 House Soakaway																																																																																																																																																																																																																				
Date 23/05/2018		Designed by HW																																																																																																																																																																																																																				
File w10685-180523-TP1_House...		Checked by AW																																																																																																																																																																																																																				
XP Solutions		Source Control 2018.1																																																																																																																																																																																																																				
<u>Summary of Results for 100 year Return Period (+30%)</u> Half Drain Time : 98 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>9.535</td><td>0.535</td><td>0.2</td><td>1.5</td><td>O K</td></tr><tr><td>30 min Summer</td><td>9.677</td><td>0.677</td><td>0.2</td><td>1.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>9.779</td><td>0.779</td><td>0.3</td><td>2.2</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>9.816</td><td>0.816</td><td>0.3</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>9.818</td><td>0.818</td><td>0.3</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>9.805</td><td>0.805</td><td>0.3</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>9.763</td><td>0.763</td><td>0.3</td><td>2.2</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>9.715</td><td>0.715</td><td>0.3</td><td>2.0</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.669</td><td>0.669</td><td>0.2</td><td>1.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>9.628</td><td>0.628</td><td>0.2</td><td>1.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>9.560</td><td>0.560</td><td>0.2</td><td>1.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>9.461</td><td>0.461</td><td>0.2</td><td>1.3</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.365</td><td>0.365</td><td>0.1</td><td>1.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.304</td><td>0.304</td><td>0.1</td><td>0.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.229</td><td>0.229</td><td>0.1</td><td>0.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.186</td><td>0.186</td><td>0.1</td><td>0.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.161</td><td>0.161</td><td>0.1</td><td>0.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.144</td><td>0.144</td><td>0.1</td><td>0.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.133</td><td>0.133</td><td>0.0</td><td>0.4</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.599</td><td>0.599</td><td>0.2</td><td>1.7</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>30</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>56</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>86</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>120</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>154</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>222</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>288</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>354</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>418</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>540</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>792</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1164</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1528</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2248</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>2992</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3680</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></tbody></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.535	0.535	0.2	1.5	O K	30 min Summer	9.677	0.677	0.2	1.9	O K	60 min Summer	9.779	0.779	0.3	2.2	Flood Risk	120 min Summer	9.816	0.816	0.3	2.3	Flood Risk	180 min Summer	9.818	0.818	0.3	2.3	Flood Risk	240 min Summer	9.805	0.805	0.3	2.3	Flood Risk	360 min Summer	9.763	0.763	0.3	2.2	Flood Risk	480 min Summer	9.715	0.715	0.3	2.0	Flood Risk	600 min Summer	9.669	0.669	0.2	1.9	O K	720 min Summer	9.628	0.628	0.2	1.8	O K	960 min Summer	9.560	0.560	0.2	1.6	O K	1440 min Summer	9.461	0.461	0.2	1.3	O K	2160 min Summer	9.365	0.365	0.1	1.0	O K	2880 min Summer	9.304	0.304	0.1	0.9	O K	4320 min Summer	9.229	0.229	0.1	0.7	O K	5760 min Summer	9.186	0.186	0.1	0.5	O K	7200 min Summer	9.161	0.161	0.1	0.5	O K	8640 min Summer	9.144	0.144	0.1	0.4	O K	10080 min Summer	9.133	0.133	0.0	0.4	O K	15 min Winter	9.599	0.599	0.2	1.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	30	60 min Summer	61.531	0.0	56	120 min Summer	36.920	0.0	86	180 min Summer	27.160	0.0	120	240 min Summer	21.763	0.0	154	360 min Summer	15.835	0.0	222	480 min Summer	12.539	0.0	288	600 min Summer	10.433	0.0	354	720 min Summer	8.964	0.0	418	960 min Summer	7.046	0.0	540	1440 min Summer	4.991	0.0	792	2160 min Summer	3.510	0.0	1164	2880 min Summer	2.731	0.0	1528	4320 min Summer	1.912	0.0	2248	5760 min Summer	1.496	0.0	2992	7200 min Summer	1.260	0.0	3680	8640 min Summer	1.110	0.0	4408	10080 min Summer	1.010	0.0	5144	15 min Winter	143.930	0.0	16
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Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP1 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP1_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.761	0.761	0.3	2.2	Flood Risk
60 min Winter	9.879	0.879	0.3	2.5	Flood Risk
120 min Winter	9.909	0.909	0.3	2.6	Flood Risk
180 min Winter	9.897	0.897	0.3	2.6	Flood Risk
240 min Winter	9.869	0.869	0.3	2.5	Flood Risk
360 min Winter	9.801	0.801	0.3	2.3	Flood Risk
480 min Winter	9.732	0.732	0.3	2.1	Flood Risk
600 min Winter	9.670	0.670	0.2	1.9	O K
720 min Winter	9.617	0.617	0.2	1.8	O K
960 min Winter	9.533	0.533	0.2	1.5	O K
1440 min Winter	9.417	0.417	0.1	1.2	O K
2160 min Winter	9.314	0.314	0.1	0.9	O K
2880 min Winter	9.252	0.252	0.1	0.7	O K
4320 min Winter	9.182	0.182	0.1	0.5	O K
5760 min Winter	9.144	0.144	0.1	0.4	O K
7200 min Winter	9.122	0.122	0.0	0.3	O K
8640 min Winter	9.108	0.108	0.0	0.3	O K
10080 min Winter	9.099	0.099	0.0	0.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	58		
120 min Winter	36.920	0.0	90		
180 min Winter	27.160	0.0	128		
240 min Winter	21.763	0.0	166		
360 min Winter	15.835	0.0	236		
480 min Winter	12.539	0.0	304		
600 min Winter	10.433	0.0	372		
720 min Winter	8.964	0.0	438		
960 min Winter	7.046	0.0	566		
1440 min Winter	4.991	0.0	820		
2160 min Winter	3.510	0.0	1188		
2880 min Winter	2.731	0.0	1556		
4320 min Winter	1.912	0.0	2288		
5760 min Winter	1.496	0.0	3000		
7200 min Winter	1.260	0.0	3744		
8640 min Winter	1.110	0.0	4416		
10080 min Winter	1.010	0.0	5144		
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XP Solutions	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 337309 357277	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

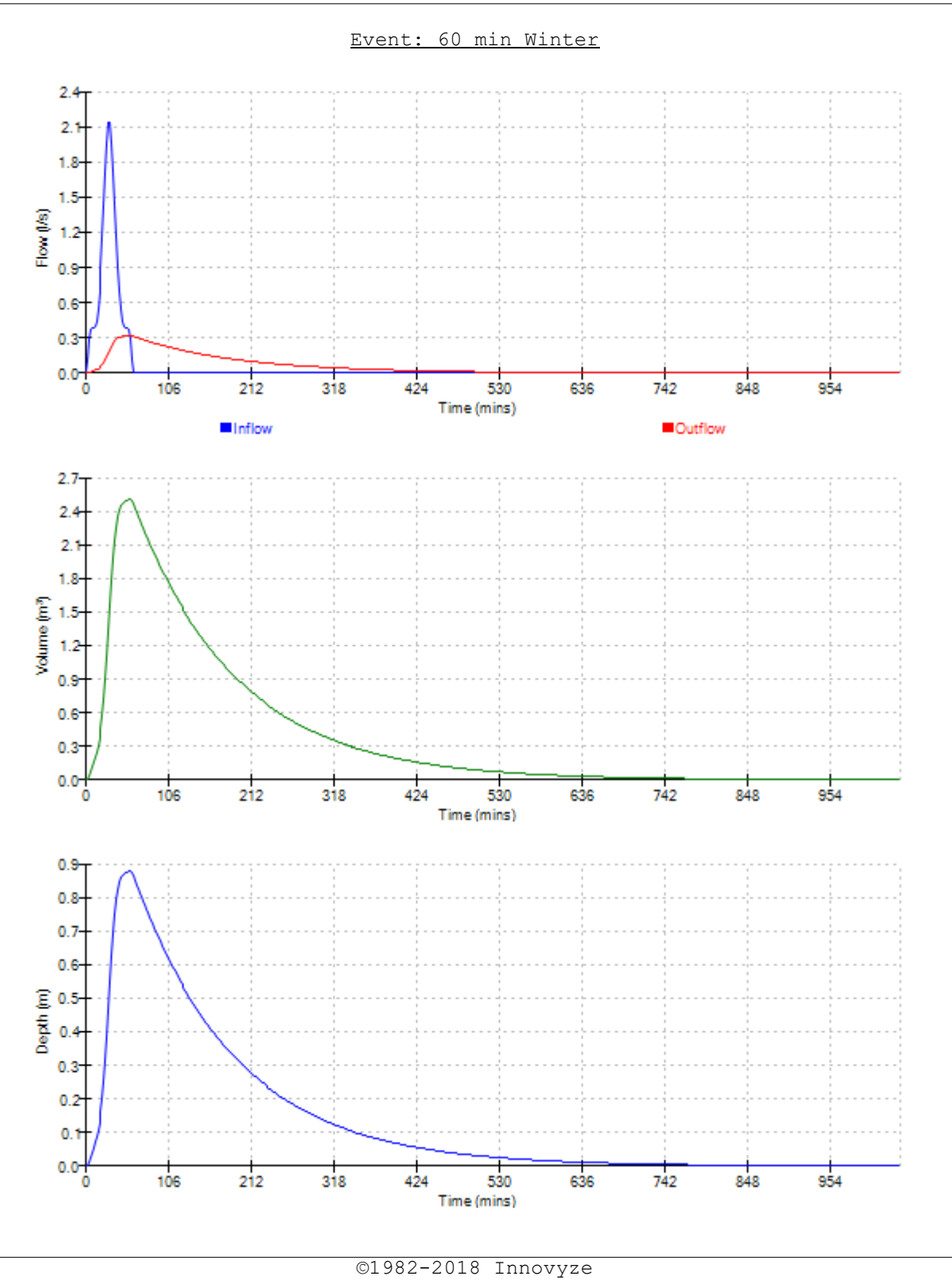
Total Area (ha) 0.006

Time (mins)	Area
From:	To: (ha)

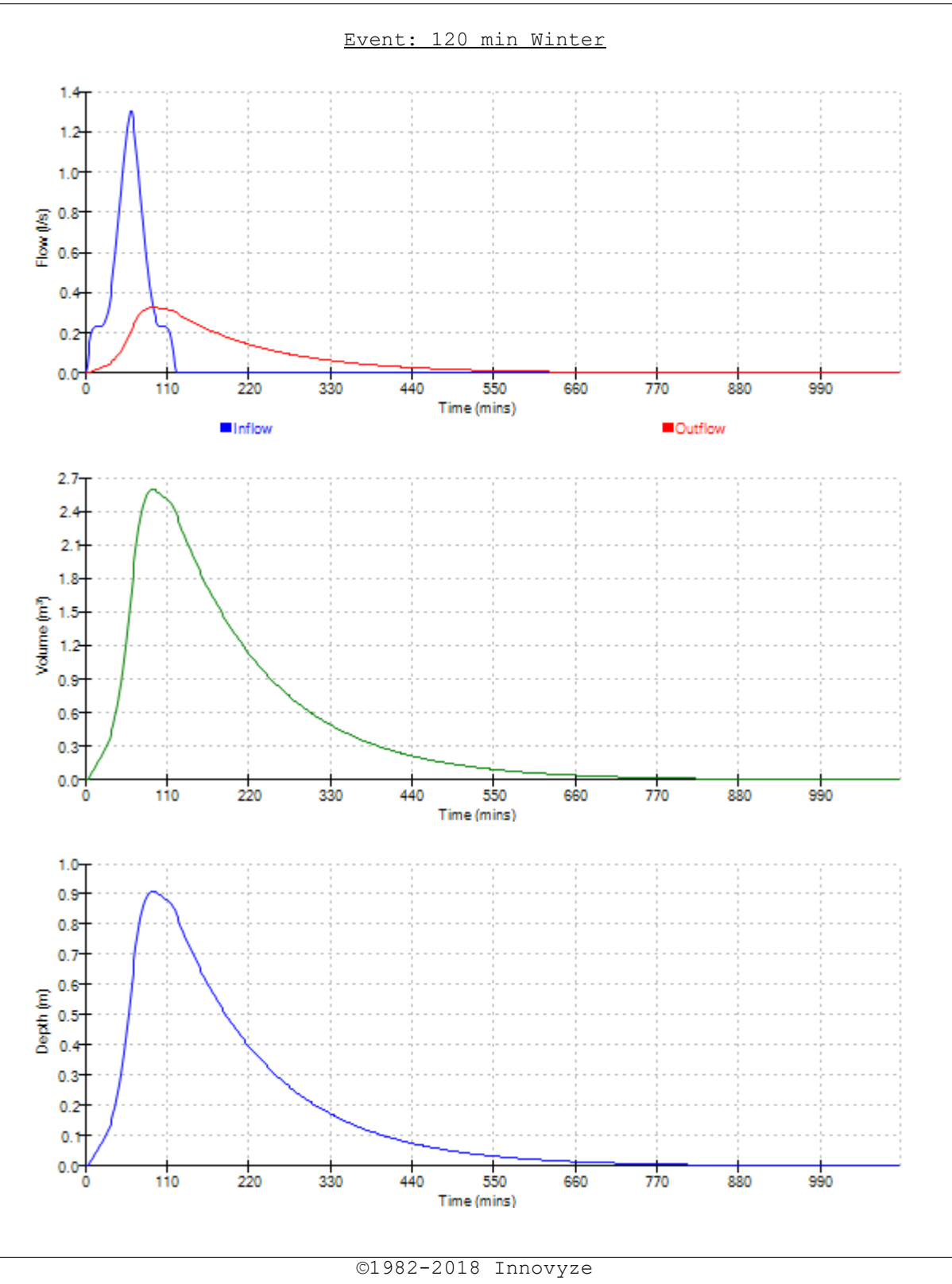
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>1.5</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.37008</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5	Infiltration Coefficient Side (m/hr)	0.37008	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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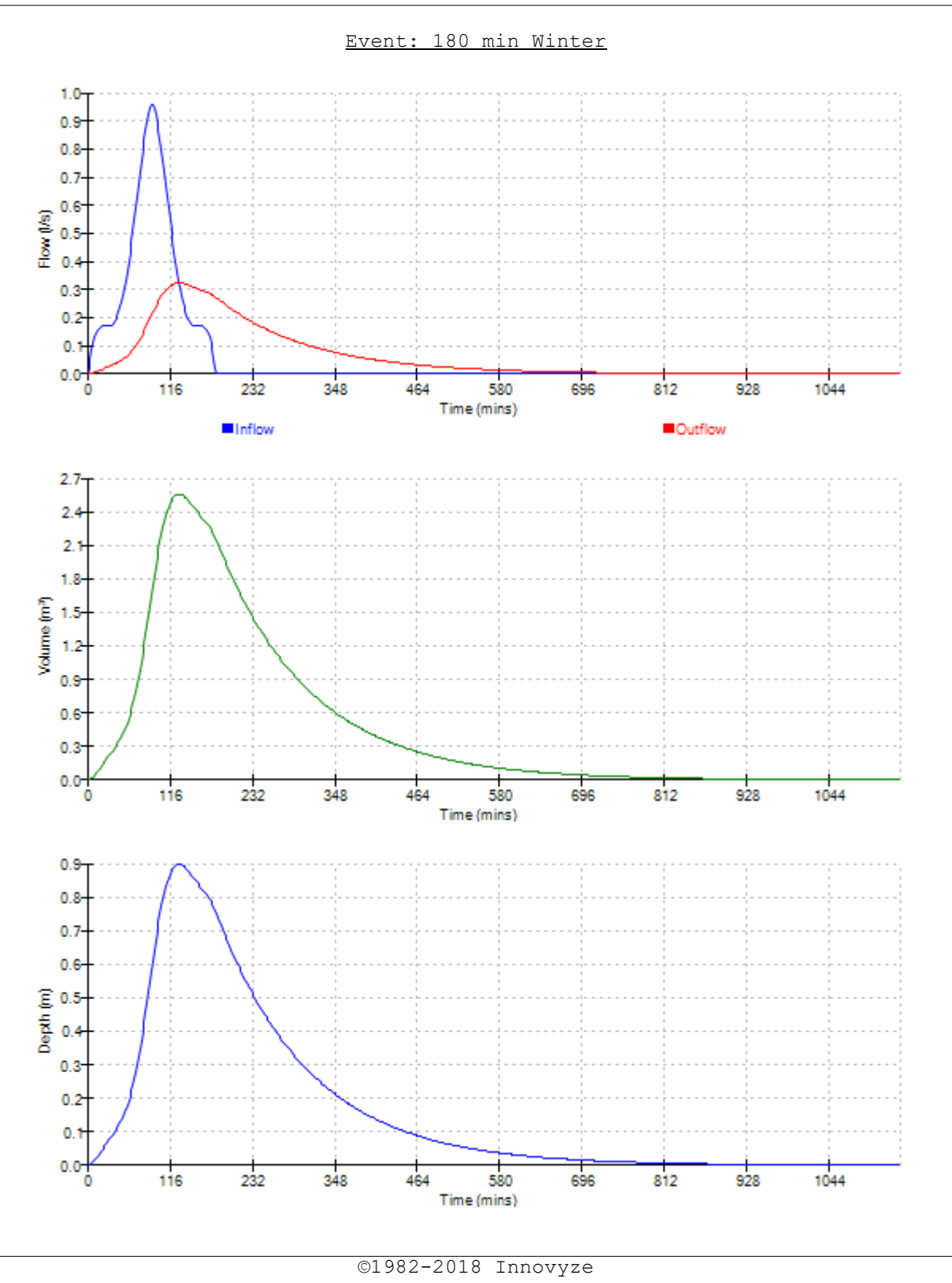
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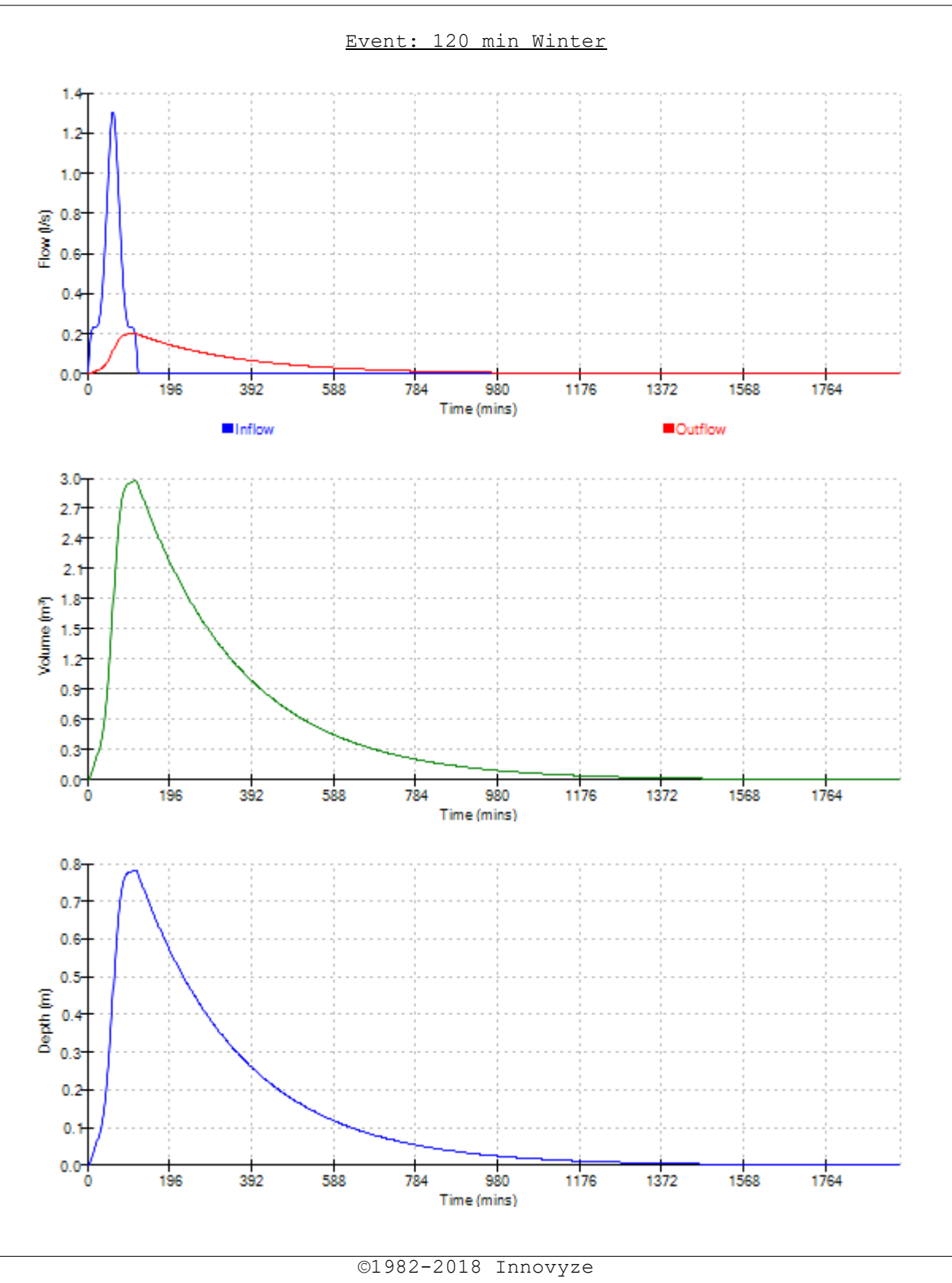


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min Summer</td><td>9.390</td><td>0.190</td><td>0.0</td><td>0.7</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.376</td><td>0.176</td><td>0.0</td><td>0.7</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.662</td><td>0.462</td><td>0.1</td><td>1.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>60</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>106</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>136</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>168</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>236</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>306</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>374</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>440</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>576</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>834</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1208</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1584</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2296</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3048</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3752</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4496</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5240</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.613	0.413	0.1	1.6	O K	30 min Summer	9.735	0.535	0.1	2.0	Flood Risk	60 min Summer	9.845	0.645	0.2	2.5	Flood Risk	120 min Summer	9.893	0.693	0.2	2.6	Flood Risk	180 min Summer	9.908	0.708	0.2	2.7	Flood Risk	240 min Summer	9.913	0.713	0.2	2.7	Flood Risk	360 min Summer	9.905	0.705	0.2	2.7	Flood Risk	480 min Summer	9.883	0.683	0.2	2.6	Flood Risk	600 min Summer	9.859	0.659	0.2	2.5	Flood Risk	720 min Summer	9.834	0.634	0.2	2.4	Flood Risk	960 min Summer	9.787	0.587	0.1	2.2	Flood Risk	1440 min Summer	9.708	0.508	0.1	1.9	Flood Risk	2160 min Summer	9.623	0.423	0.1	1.6	O K	2880 min Summer	9.563	0.363	0.1	1.4	O K	4320 min Summer	9.486	0.286	0.1	1.1	O K	5760 min Summer	9.438	0.238	0.1	0.9	O K	7200 min Summer	9.410	0.210	0.1	0.8	O K	8640 min Summer	9.390	0.190	0.0	0.7	O K	10080 min Summer	9.376	0.176	0.0	0.7	O K	15 min Winter	9.662	0.462	0.1	1.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	60	120 min Summer	36.920	0.0	106	180 min Summer	27.160	0.0	136	240 min Summer	21.763	0.0	168	360 min Summer	15.835	0.0	236	480 min Summer	12.539	0.0	306	600 min Summer	10.433	0.0	374	720 min Summer	8.964	0.0	440	960 min Summer	7.046	0.0	576	1440 min Summer	4.991	0.0	834	2160 min Summer	3.510	0.0	1208	2880 min Summer	2.731	0.0	1584	4320 min Summer	1.912	0.0	2296	5760 min Summer	1.496	0.0	3048	7200 min Summer	1.260	0.0	3752	8640 min Summer	1.110	0.0	4496	10080 min Summer	1.010	0.0	5240	15 min Winter	143.930	0.0	16
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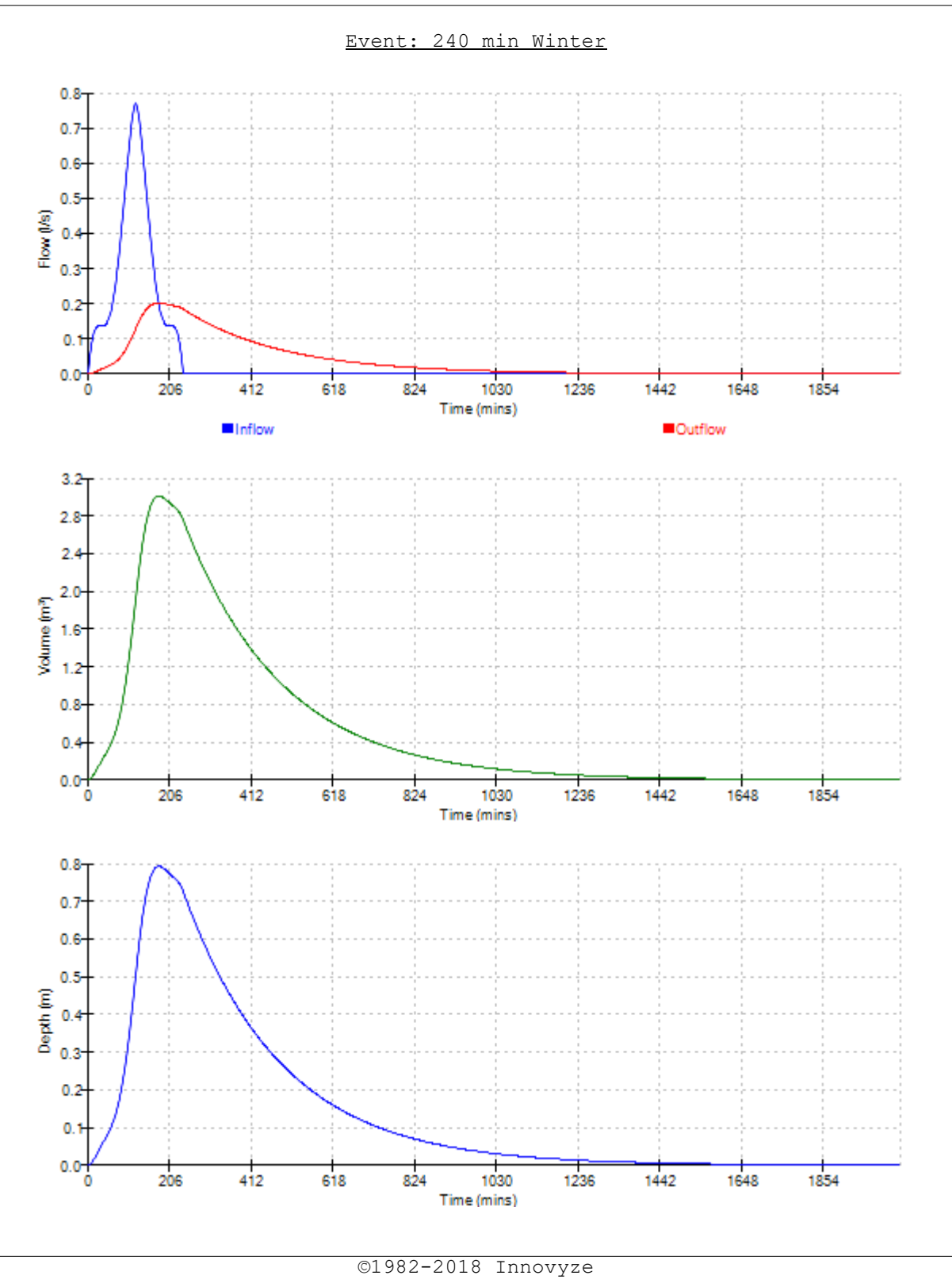
Waterco Ltd				Page 2	
Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP2 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP2_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.800	0.600	0.2	2.3	Flood Risk
60 min Winter	9.925	0.725	0.2	2.8	Flood Risk
120 min Winter	9.983	0.783	0.2	3.0	Flood Risk
180 min Winter	9.993	0.793	0.2	3.0	Flood Risk
240 min Winter	9.993	0.793	0.2	3.0	Flood Risk
360 min Winter	9.971	0.771	0.2	2.9	Flood Risk
480 min Winter	9.935	0.735	0.2	2.8	Flood Risk
600 min Winter	9.897	0.697	0.2	2.7	Flood Risk
720 min Winter	9.861	0.661	0.2	2.5	Flood Risk
960 min Winter	9.797	0.597	0.2	2.3	Flood Risk
1440 min Winter	9.697	0.497	0.1	1.9	O K
2160 min Winter	9.594	0.394	0.1	1.5	O K
2880 min Winter	9.526	0.326	0.1	1.2	O K
4320 min Winter	9.444	0.244	0.1	0.9	O K
5760 min Winter	9.396	0.196	0.0	0.7	O K
7200 min Winter	9.368	0.168	0.0	0.6	O K
8640 min Winter	9.350	0.150	0.0	0.6	O K
10080 min Winter	9.337	0.137	0.0	0.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	60		
120 min Winter	36.920	0.0	114		
180 min Winter	27.160	0.0	140		
240 min Winter	21.763	0.0	180		
360 min Winter	15.835	0.0	254		
480 min Winter	12.539	0.0	328		
600 min Winter	10.433	0.0	398		
720 min Winter	8.964	0.0	468		
960 min Winter	7.046	0.0	606		
1440 min Winter	4.991	0.0	866		
2160 min Winter	3.510	0.0	1252		
2880 min Winter	2.731	0.0	1616		
4320 min Winter	1.912	0.0	2376		
5760 min Winter	1.496	0.0	3104		
7200 min Winter	1.260	0.0	3816		
8640 min Winter	1.110	0.0	4504		
10080 min Winter	1.010	0.0	5248		
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Lon Parcwr Business Park	Holt Road, Rossett																					
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>2.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.22878</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.200</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	2.0	Infiltration Coefficient Side (m/hr)	0.22878	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.200	Cap Infiltration Depth (m)	0.000
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685	
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<u>Summary of Results for 100 year Return Period (+30%)</u> Half Drain Time : 335 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>9.419</td><td>0.419</td><td>0.1</td><td>1.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>9.552</td><td>0.552</td><td>0.1</td><td>2.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>9.684</td><td>0.684</td><td>0.1</td><td>2.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>9.774</td><td>0.774</td><td>0.1</td><td>2.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>9.805</td><td>0.805</td><td>0.1</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>9.815</td><td>0.815</td><td>0.1</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>9.824</td><td>0.824</td><td>0.1</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>9.819</td><td>0.819</td><td>0.1</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.808</td><td>0.808</td><td>0.1</td><td>3.1</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.795</td><td>0.795</td><td>0.1</td><td>3.0</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.765</td><td>0.765</td><td>0.1</td><td>2.9</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.702</td><td>0.702</td><td>0.1</td><td>2.7</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>9.618</td><td>0.618</td><td>0.1</td><td>2.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.552</td><td>0.552</td><td>0.1</td><td>2.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.457</td><td>0.457</td><td>0.1</td><td>1.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.394</td><td>0.394</td><td>0.1</td><td>1.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.355</td><td>0.355</td><td>0.0</td><td>1.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.328</td><td>0.328</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.310</td><td>0.310</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.470</td><td>0.470</td><td>0.1</td><td>1.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>180</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>210</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>270</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>336</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>404</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>470</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>608</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>880</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1276</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1648</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2420</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3168</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3888</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4592</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5344</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.419	0.419	0.1	1.6	O K	30 min Summer	9.552	0.552	0.1	2.1	O K	60 min Summer	9.684	0.684	0.1	2.6	O K	120 min Summer	9.774	0.774	0.1	2.9	Flood Risk	180 min Summer	9.805	0.805	0.1	3.1	Flood Risk	240 min Summer	9.815	0.815	0.1	3.1	Flood Risk	360 min Summer	9.824	0.824	0.1	3.1	Flood Risk	480 min Summer	9.819	0.819	0.1	3.1	Flood Risk	600 min Summer	9.808	0.808	0.1	3.1	Flood Risk	720 min Summer	9.795	0.795	0.1	3.0	Flood Risk	960 min Summer	9.765	0.765	0.1	2.9	Flood Risk	1440 min Summer	9.702	0.702	0.1	2.7	Flood Risk	2160 min Summer	9.618	0.618	0.1	2.3	O K	2880 min Summer	9.552	0.552	0.1	2.1	O K	4320 min Summer	9.457	0.457	0.1	1.7	O K	5760 min Summer	9.394	0.394	0.1	1.5	O K	7200 min Summer	9.355	0.355	0.0	1.4	O K	8640 min Summer	9.328	0.328	0.0	1.2	O K	10080 min Summer	9.310	0.310	0.0	1.2	O K	15 min Winter	9.470	0.470	0.1	1.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	62	120 min Summer	36.920	0.0	120	180 min Summer	27.160	0.0	180	240 min Summer	21.763	0.0	210	360 min Summer	15.835	0.0	270	480 min Summer	12.539	0.0	336	600 min Summer	10.433	0.0	404	720 min Summer	8.964	0.0	470	960 min Summer	7.046	0.0	608	1440 min Summer	4.991	0.0	880	2160 min Summer	3.510	0.0	1276	2880 min Summer	2.731	0.0	1648	4320 min Summer	1.912	0.0	2420	5760 min Summer	1.496	0.0	3168	7200 min Summer	1.260	0.0	3888	8640 min Summer	1.110	0.0	4592	10080 min Summer	1.010	0.0	5344	15 min Winter	143.930	0.0	16
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Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP3 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP3_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.618	0.618	0.1	2.3	O K
60 min Winter	9.768	0.768	0.1	2.9	Flood Risk
120 min Winter	9.870	0.870	0.1	3.3	Flood Risk
180 min Winter	9.908	0.908	0.1	3.5	Flood Risk
240 min Winter	9.920	0.920	0.1	3.5	Flood Risk
360 min Winter	9.922	0.922	0.1	3.5	Flood Risk
480 min Winter	9.910	0.910	0.1	3.5	Flood Risk
600 min Winter	9.891	0.891	0.1	3.4	Flood Risk
720 min Winter	9.868	0.868	0.1	3.3	Flood Risk
960 min Winter	9.821	0.821	0.1	3.1	Flood Risk
1440 min Winter	9.732	0.732	0.1	2.8	Flood Risk
2160 min Winter	9.621	0.621	0.1	2.4	O K
2880 min Winter	9.539	0.539	0.1	2.0	O K
4320 min Winter	9.425	0.425	0.1	1.6	O K
5760 min Winter	9.354	0.354	0.0	1.3	O K
7200 min Winter	9.309	0.309	0.0	1.2	O K
8640 min Winter	9.279	0.279	0.0	1.1	O K
10080 min Winter	9.259	0.259	0.0	1.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	31		
60 min Winter	61.531	0.0	60		
120 min Winter	36.920	0.0	118		
180 min Winter	27.160	0.0	174		
240 min Winter	21.763	0.0	226		
360 min Winter	15.835	0.0	280		
480 min Winter	12.539	0.0	356		
600 min Winter	10.433	0.0	432		
720 min Winter	8.964	0.0	506		
960 min Winter	7.046	0.0	654		
1440 min Winter	4.991	0.0	936		
2160 min Winter	3.510	0.0	1340		
2880 min Winter	2.731	0.0	1732		
4320 min Winter	1.912	0.0	2504		
5760 min Winter	1.496	0.0	3232		
7200 min Winter	1.260	0.0	3968		
8640 min Winter	1.110	0.0	4752		
10080 min Winter	1.010	0.0	5448		
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XP Solutions	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 337309 357277	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

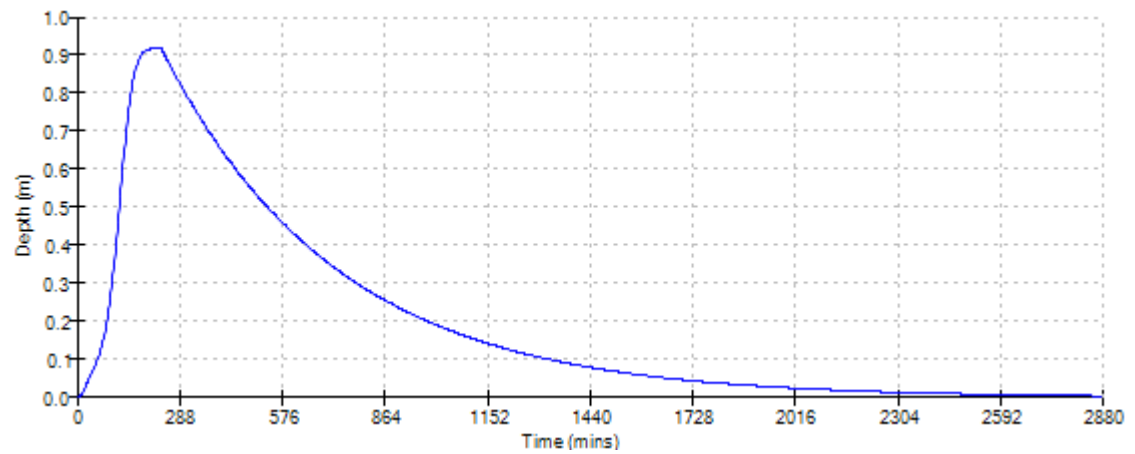
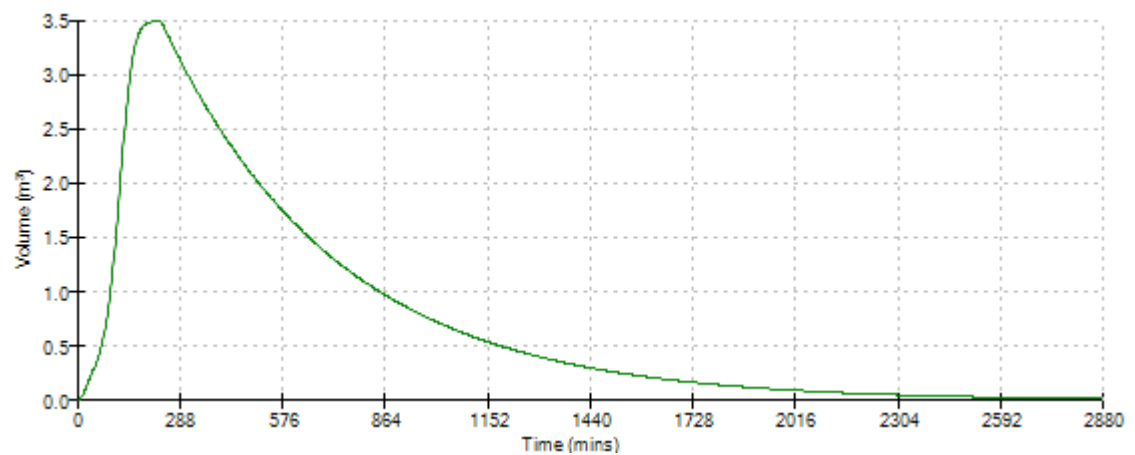
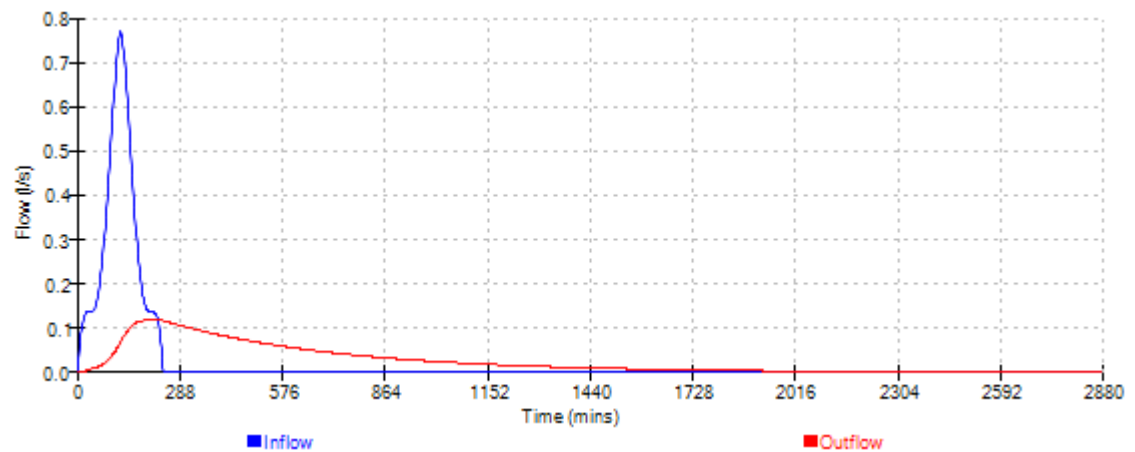
Time Area Diagram

Total Area (ha) 0.006

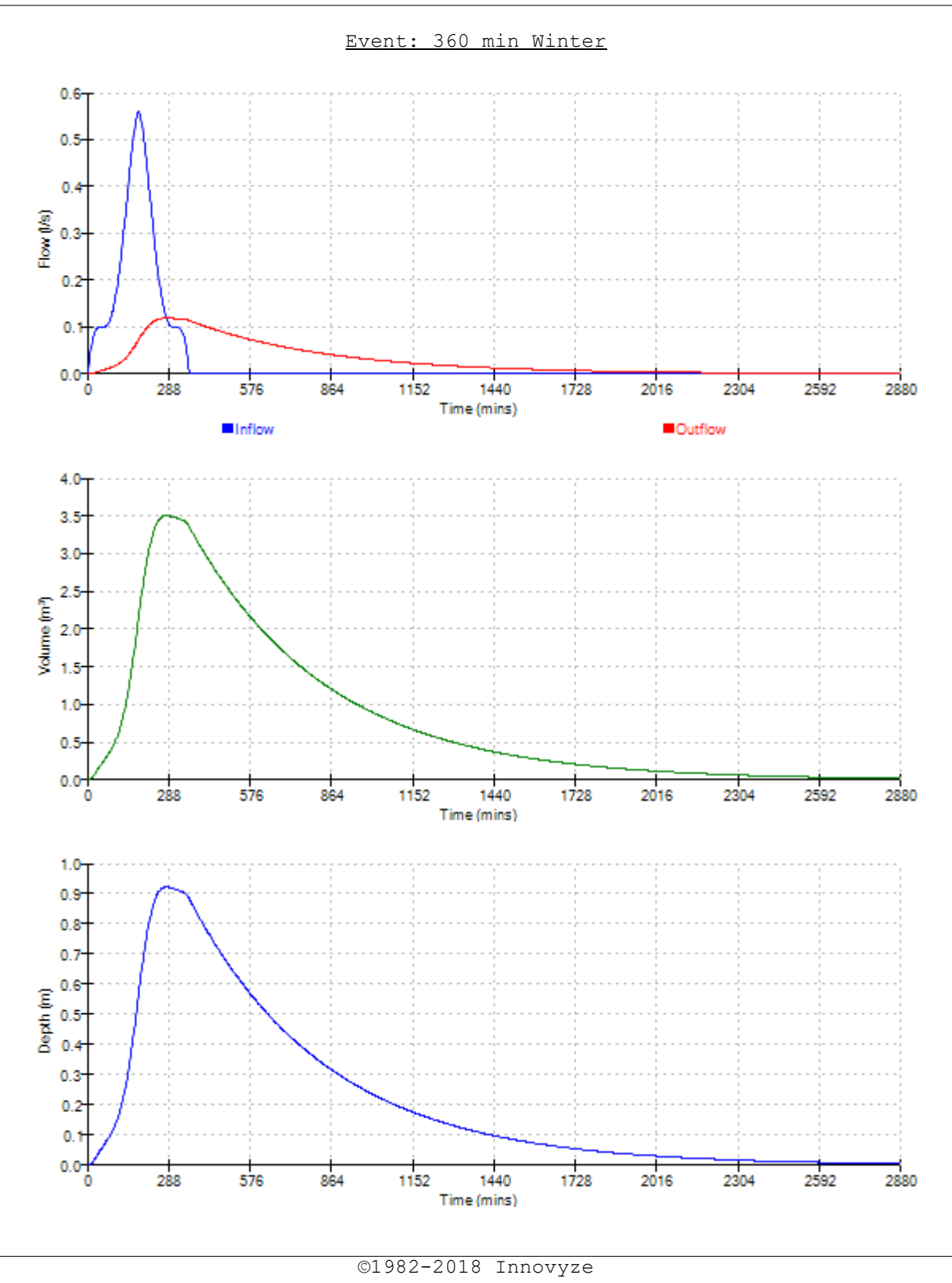
Time (mins)		Area
From:	To:	(ha)
0	1	0.006

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Lon Parcwr Business Park	Holt Road, Rossett																					
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>2.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.11599</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	2.0	Infiltration Coefficient Side (m/hr)	0.11599	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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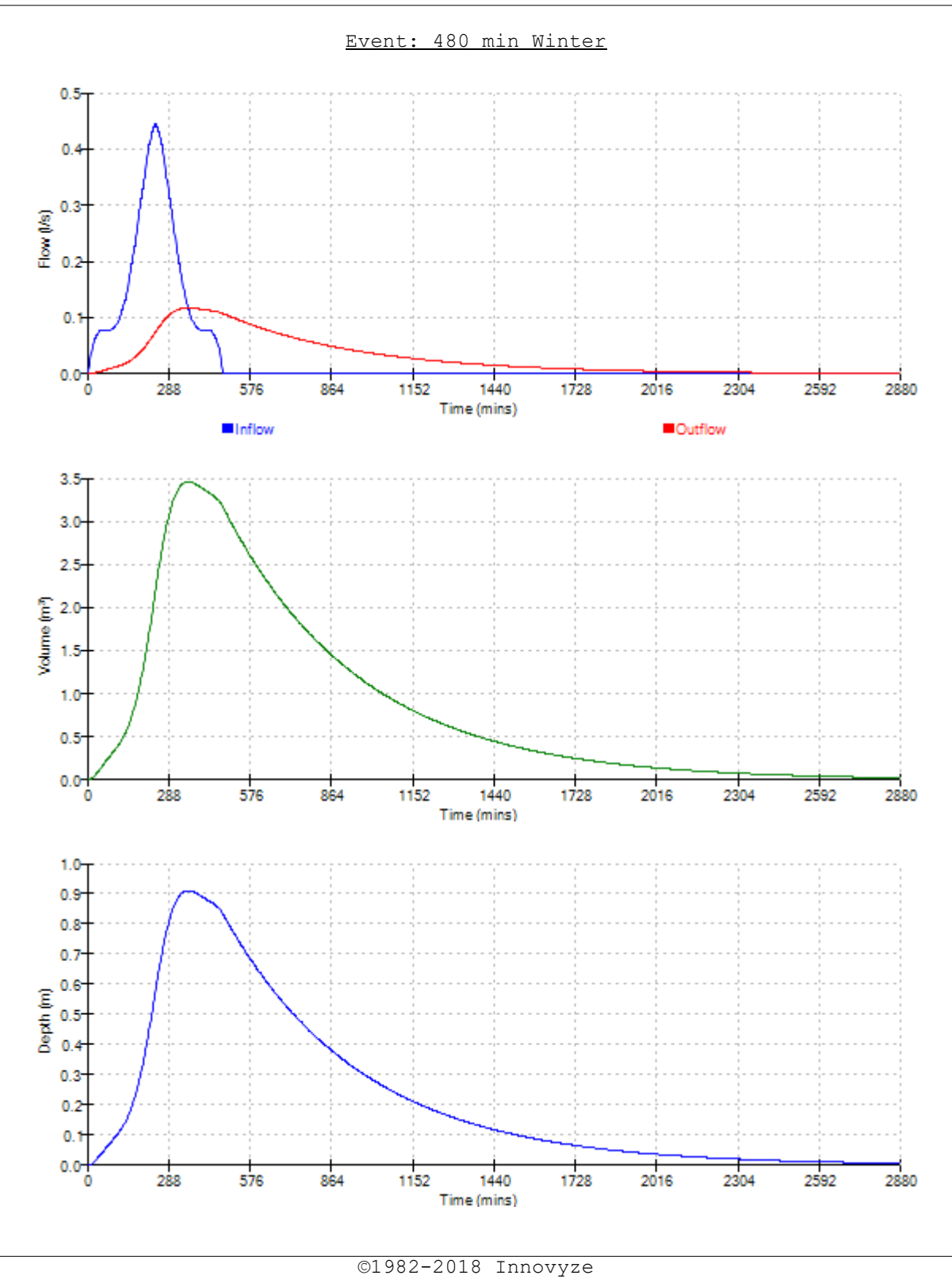
Event: 240 min Winter



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Denbighshire LL15 1NJ	TP3 House Soakaway	
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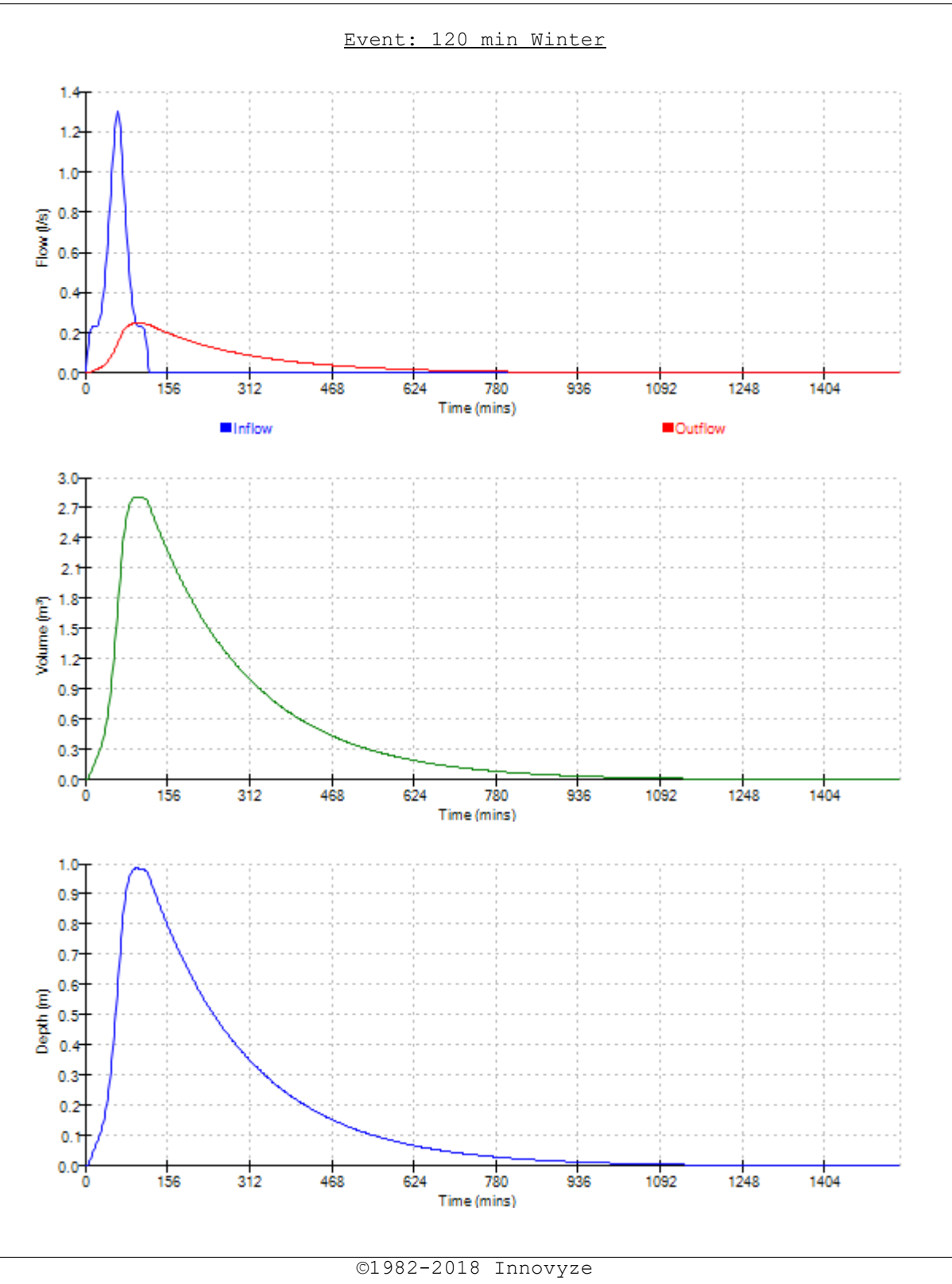


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Summer</td><td>9.830</td><td>0.830</td><td>0.2</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.790</td><td>0.790</td><td>0.2</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.752</td><td>0.752</td><td>0.2</td><td>2.1</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.685</td><td>0.685</td><td>0.2</td><td>2.0</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>9.580</td><td>0.580</td><td>0.1</td><td>1.7</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.472</td><td>0.472</td><td>0.1</td><td>1.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.400</td><td>0.400</td><td>0.1</td><td>1.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.309</td><td>0.309</td><td>0.1</td><td>0.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.255</td><td>0.255</td><td>0.1</td><td>0.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.222</td><td>0.222</td><td>0.1</td><td>0.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.199</td><td>0.199</td><td>0.0</td><td>0.6</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.185</td><td>0.185</td><td>0.0</td><td>0.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.610</td><td>0.610</td><td>0.2</td><td>1.7</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>60</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>96</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>128</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>162</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>230</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>298</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>366</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>432</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>558</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>808</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1188</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1556</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2288</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3000</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3744</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4416</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5152</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.545	0.545	0.1	1.6	O K	30 min Summer	9.700	0.700	0.2	2.0	O K	60 min Summer	9.830	0.830	0.2	2.4	Flood Risk	120 min Summer	9.878	0.878	0.2	2.5	Flood Risk	180 min Summer	9.893	0.893	0.2	2.5	Flood Risk	240 min Summer	9.891	0.891	0.2	2.5	Flood Risk	360 min Summer	9.867	0.867	0.2	2.5	Flood Risk	480 min Summer	9.830	0.830	0.2	2.4	Flood Risk	600 min Summer	9.790	0.790	0.2	2.3	Flood Risk	720 min Summer	9.752	0.752	0.2	2.1	Flood Risk	960 min Summer	9.685	0.685	0.2	2.0	O K	1440 min Summer	9.580	0.580	0.1	1.7	O K	2160 min Summer	9.472	0.472	0.1	1.3	O K	2880 min Summer	9.400	0.400	0.1	1.1	O K	4320 min Summer	9.309	0.309	0.1	0.9	O K	5760 min Summer	9.255	0.255	0.1	0.7	O K	7200 min Summer	9.222	0.222	0.1	0.6	O K	8640 min Summer	9.199	0.199	0.0	0.6	O K	10080 min Summer	9.185	0.185	0.0	0.5	O K	15 min Winter	9.610	0.610	0.2	1.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	60	120 min Summer	36.920	0.0	96	180 min Summer	27.160	0.0	128	240 min Summer	21.763	0.0	162	360 min Summer	15.835	0.0	230	480 min Summer	12.539	0.0	298	600 min Summer	10.433	0.0	366	720 min Summer	8.964	0.0	432	960 min Summer	7.046	0.0	558	1440 min Summer	4.991	0.0	808	2160 min Summer	3.510	0.0	1188	2880 min Summer	2.731	0.0	1556	4320 min Summer	1.912	0.0	2288	5760 min Summer	1.496	0.0	3000	7200 min Summer	1.260	0.0	3744	8640 min Summer	1.110	0.0	4416	10080 min Summer	1.010	0.0	5152	15 min Winter	143.930	0.0	16
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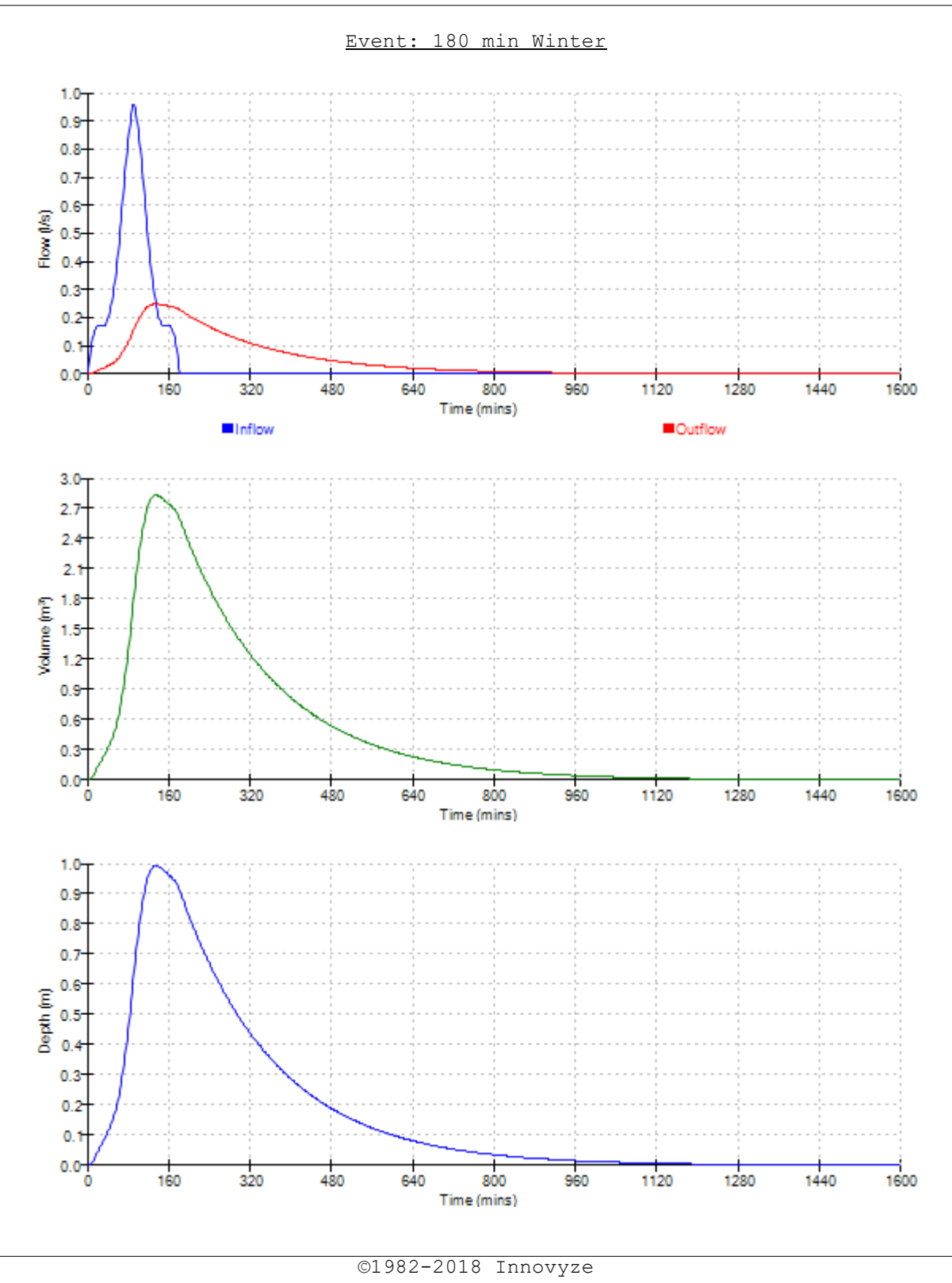
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Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP4 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP4_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.786	0.786	0.2	2.2	Flood Risk
60 min Winter	9.934	0.934	0.2	2.7	Flood Risk
120 min Winter	9.985	0.985	0.2	2.8	Flood Risk
180 min Winter	9.993	0.993	0.2	2.8	Flood Risk
240 min Winter	9.981	0.981	0.2	2.8	Flood Risk
360 min Winter	9.934	0.934	0.2	2.7	Flood Risk
480 min Winter	9.875	0.875	0.2	2.5	Flood Risk
600 min Winter	9.818	0.818	0.2	2.3	Flood Risk
720 min Winter	9.767	0.767	0.2	2.2	Flood Risk
960 min Winter	9.679	0.679	0.2	1.9	O K
1440 min Winter	9.549	0.549	0.1	1.6	O K
2160 min Winter	9.425	0.425	0.1	1.2	O K
2880 min Winter	9.347	0.347	0.1	1.0	O K
4320 min Winter	9.255	0.255	0.1	0.7	O K
5760 min Winter	9.204	0.204	0.1	0.6	O K
7200 min Winter	9.174	0.174	0.0	0.5	O K
8640 min Winter	9.154	0.154	0.0	0.4	O K
10080 min Winter	9.141	0.141	0.0	0.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	58		
120 min Winter	36.920	0.0	98		
180 min Winter	27.160	0.0	134		
240 min Winter	21.763	0.0	172		
360 min Winter	15.835	0.0	246		
480 min Winter	12.539	0.0	318		
600 min Winter	10.433	0.0	386		
720 min Winter	8.964	0.0	454		
960 min Winter	7.046	0.0	586		
1440 min Winter	4.991	0.0	848		
2160 min Winter	3.510	0.0	1216		
2880 min Winter	2.731	0.0	1588		
4320 min Winter	1.912	0.0	2332		
5760 min Winter	1.496	0.0	3048		
7200 min Winter	1.260	0.0	3752		
8640 min Winter	1.110	0.0	4496		
10080 min Winter	1.010	0.0	5240		
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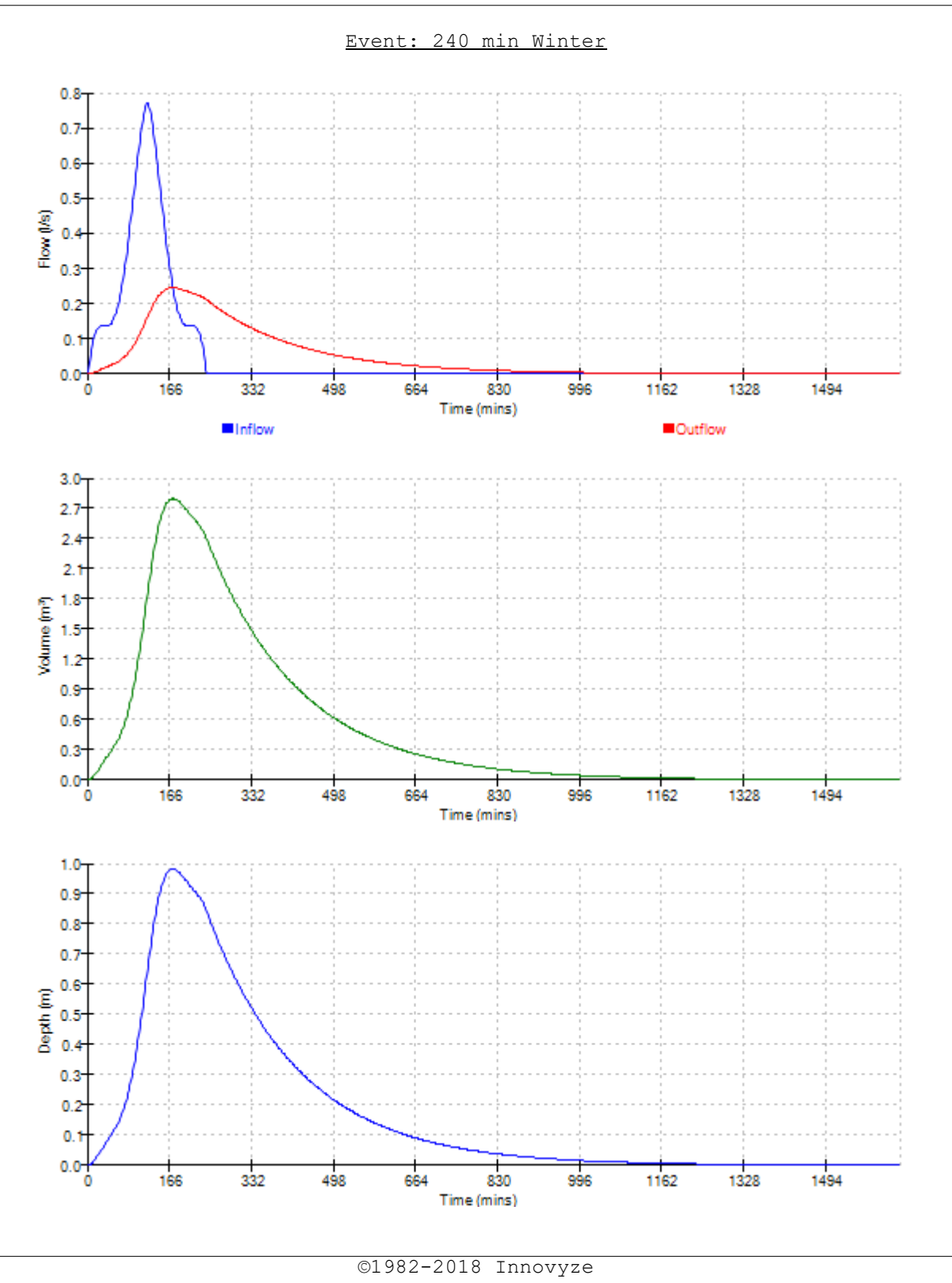
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Summer</td><td>9.801</td><td>0.801</td><td>0.2</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.760</td><td>0.760</td><td>0.2</td><td>2.2</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.721</td><td>0.721</td><td>0.2</td><td>2.1</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.653</td><td>0.653</td><td>0.2</td><td>1.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>9.549</td><td>0.549</td><td>0.2</td><td>1.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.444</td><td>0.444</td><td>0.1</td><td>1.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.374</td><td>0.374</td><td>0.1</td><td>1.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.287</td><td>0.287</td><td>0.1</td><td>0.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.236</td><td>0.236</td><td>0.1</td><td>0.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.205</td><td>0.205</td><td>0.1</td><td>0.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.184</td><td>0.184</td><td>0.1</td><td>0.5</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.170</td><td>0.170</td><td>0.0</td><td>0.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.608</td><td>0.608</td><td>0.2</td><td>1.7</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>60</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>92</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>126</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>160</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>228</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>294</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>362</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>426</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>556</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>808</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1172</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1532</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2252</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3000</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3744</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4416</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.543	0.543	0.1	1.5	O K	30 min Summer	9.695	0.695	0.2	2.0	O K	60 min Summer	9.818	0.818	0.2	2.3	Flood Risk	120 min Summer	9.863	0.863	0.2	2.5	Flood Risk	180 min Summer	9.875	0.875	0.2	2.5	Flood Risk	240 min Summer	9.871	0.871	0.2	2.5	Flood Risk	360 min Summer	9.842	0.842	0.2	2.4	Flood Risk	480 min Summer	9.801	0.801	0.2	2.3	Flood Risk	600 min Summer	9.760	0.760	0.2	2.2	Flood Risk	720 min Summer	9.721	0.721	0.2	2.1	Flood Risk	960 min Summer	9.653	0.653	0.2	1.9	O K	1440 min Summer	9.549	0.549	0.2	1.6	O K	2160 min Summer	9.444	0.444	0.1	1.3	O K	2880 min Summer	9.374	0.374	0.1	1.1	O K	4320 min Summer	9.287	0.287	0.1	0.8	O K	5760 min Summer	9.236	0.236	0.1	0.7	O K	7200 min Summer	9.205	0.205	0.1	0.6	O K	8640 min Summer	9.184	0.184	0.1	0.5	O K	10080 min Summer	9.170	0.170	0.0	0.5	O K	15 min Winter	9.608	0.608	0.2	1.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	60	120 min Summer	36.920	0.0	92	180 min Summer	27.160	0.0	126	240 min Summer	21.763	0.0	160	360 min Summer	15.835	0.0	228	480 min Summer	12.539	0.0	294	600 min Summer	10.433	0.0	362	720 min Summer	8.964	0.0	426	960 min Summer	7.046	0.0	556	1440 min Summer	4.991	0.0	808	2160 min Summer	3.510	0.0	1172	2880 min Summer	2.731	0.0	1532	4320 min Summer	1.912	0.0	2252	5760 min Summer	1.496	0.0	3000	7200 min Summer	1.260	0.0	3744	8640 min Summer	1.110	0.0	4416	10080 min Summer	1.010	0.0	5144	15 min Winter	143.930	0.0	16
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Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP7 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP5_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.780	0.780	0.2	2.2	Flood Risk
60 min Winter	9.922	0.922	0.3	2.6	Flood Risk
120 min Winter	9.967	0.967	0.3	2.8	Flood Risk
180 min Winter	9.970	0.970	0.3	2.8	Flood Risk
240 min Winter	9.954	0.954	0.3	2.7	Flood Risk
360 min Winter	9.901	0.901	0.2	2.6	Flood Risk
480 min Winter	9.839	0.839	0.2	2.4	Flood Risk
600 min Winter	9.781	0.781	0.2	2.2	Flood Risk
720 min Winter	9.728	0.728	0.2	2.1	Flood Risk
960 min Winter	9.641	0.641	0.2	1.8	O K
1440 min Winter	9.514	0.514	0.1	1.5	O K
2160 min Winter	9.395	0.395	0.1	1.1	O K
2880 min Winter	9.321	0.321	0.1	0.9	O K
4320 min Winter	9.234	0.234	0.1	0.7	O K
5760 min Winter	9.187	0.187	0.1	0.5	O K
7200 min Winter	9.159	0.159	0.0	0.5	O K
8640 min Winter	9.141	0.141	0.0	0.4	O K
10080 min Winter	9.129	0.129	0.0	0.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	58		
120 min Winter	36.920	0.0	96		
180 min Winter	27.160	0.0	134		
240 min Winter	21.763	0.0	170		
360 min Winter	15.835	0.0	244		
480 min Winter	12.539	0.0	314		
600 min Winter	10.433	0.0	384		
720 min Winter	8.964	0.0	450		
960 min Winter	7.046	0.0	578		
1440 min Winter	4.991	0.0	836		
2160 min Winter	3.510	0.0	1212		
2880 min Winter	2.731	0.0	1584		
4320 min Winter	1.912	0.0	2296		
5760 min Winter	1.496	0.0	3048		
7200 min Winter	1.260	0.0	3744		
8640 min Winter	1.110	0.0	4488		
10080 min Winter	1.010	0.0	5152		
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Denbighshire LL15 1NJ	TP7 House Soakaway	
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File w10685-180523-TP5_House...	Checked by AW	
XP Solutions	Source Control 2018.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 337309 357277	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

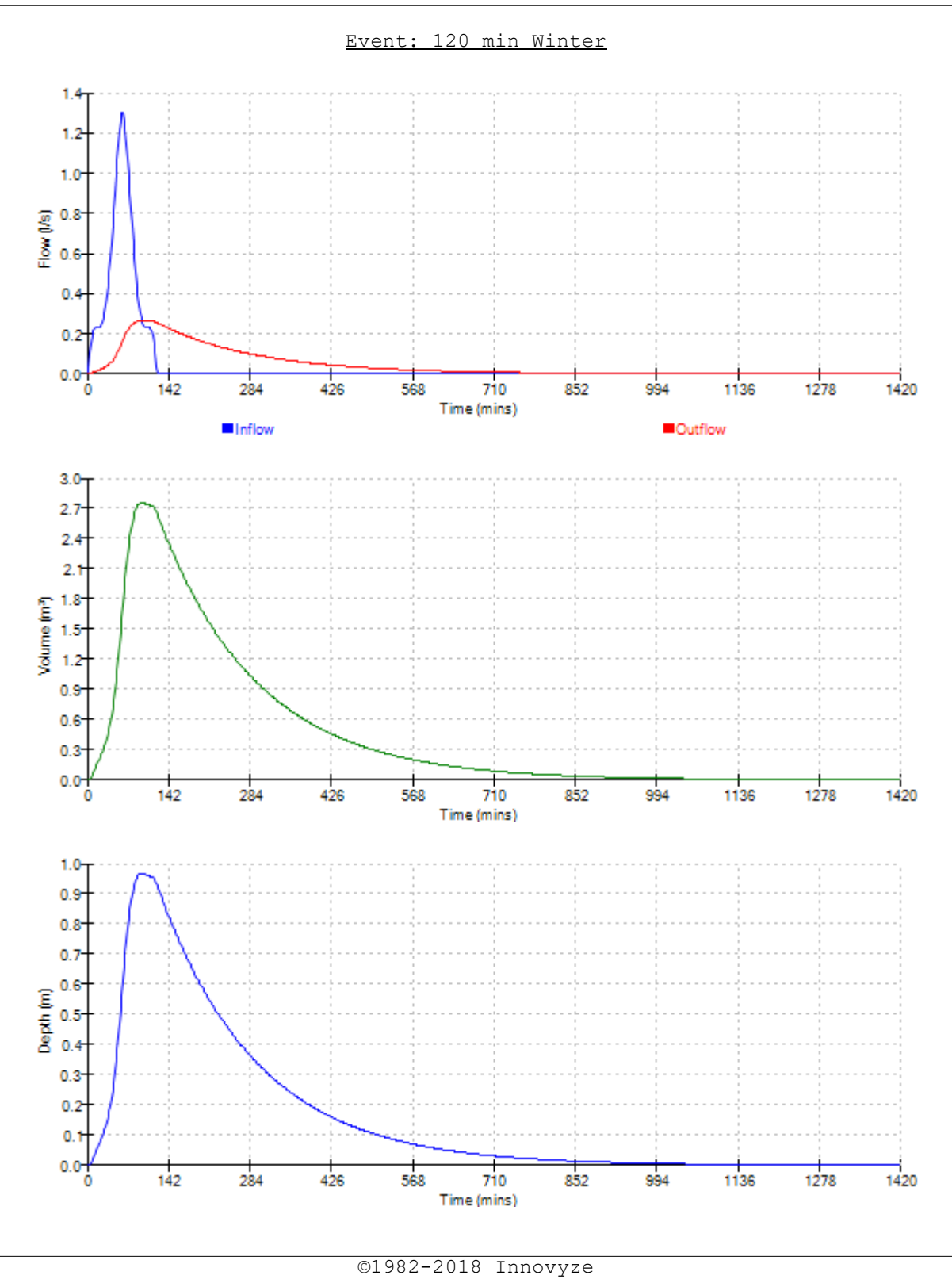
Total Area (ha) 0.006

Time (mins)	Area
From:	To: (ha)

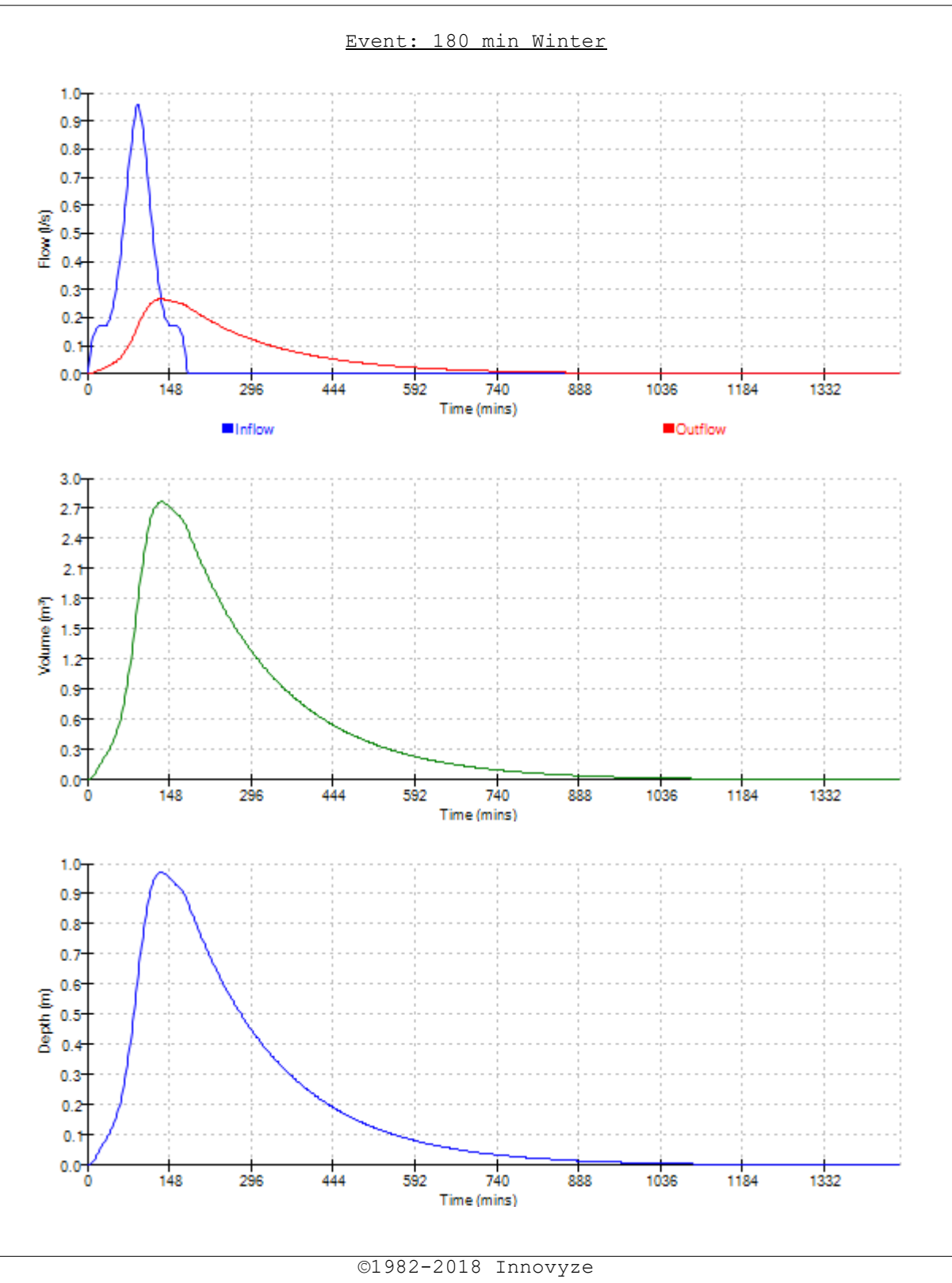
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>1.5</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.28188</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5	Infiltration Coefficient Side (m/hr)	0.28188	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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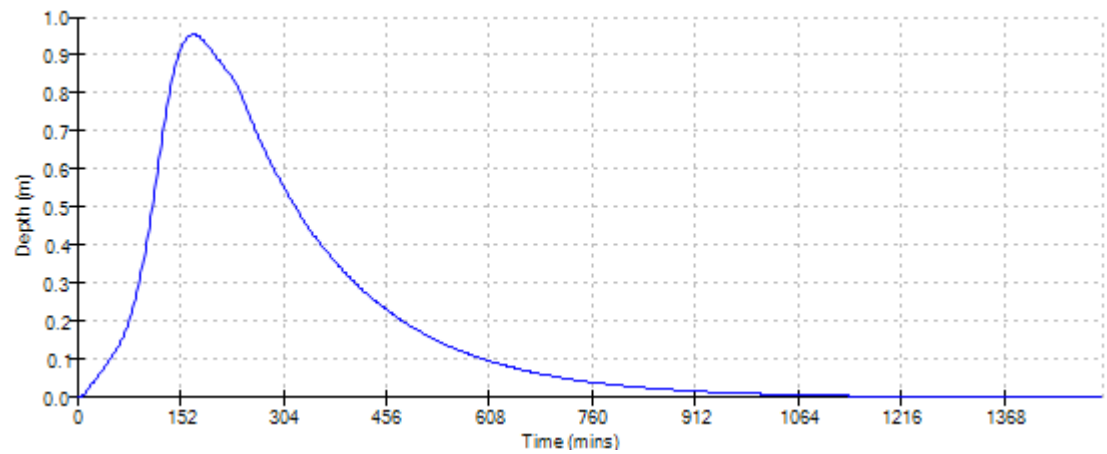
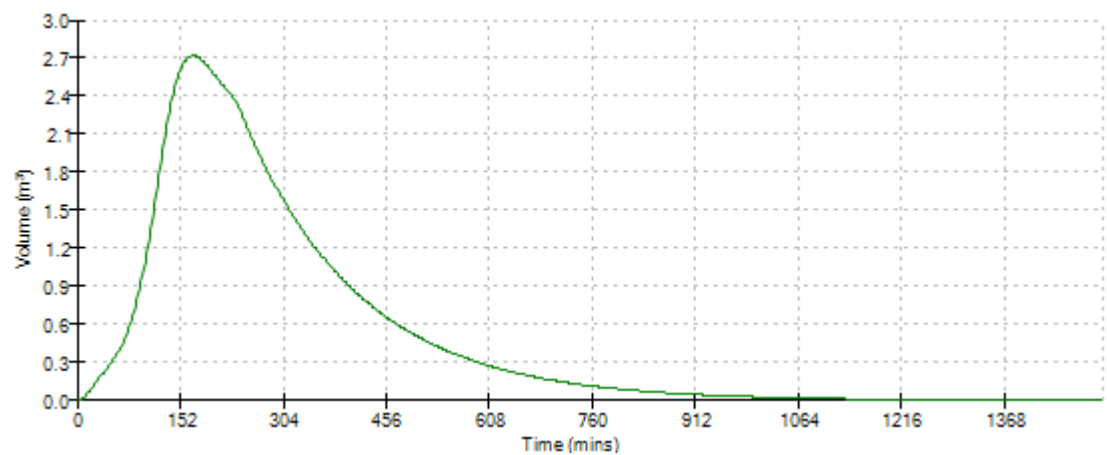
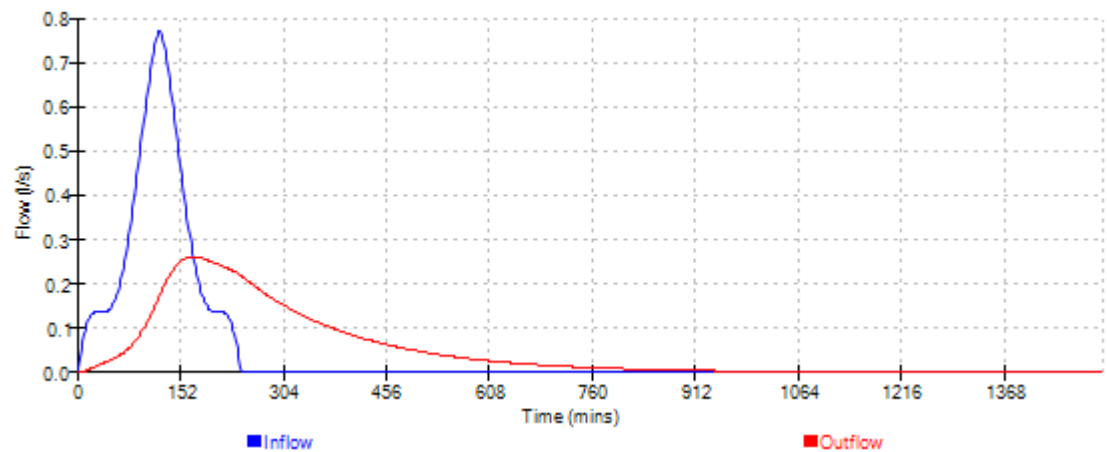
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	Holt Road, Rossett TP7 House Soakaway	
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File w10685-180523-TP5_House...	Checked by AW	
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Event: 240 min Winter

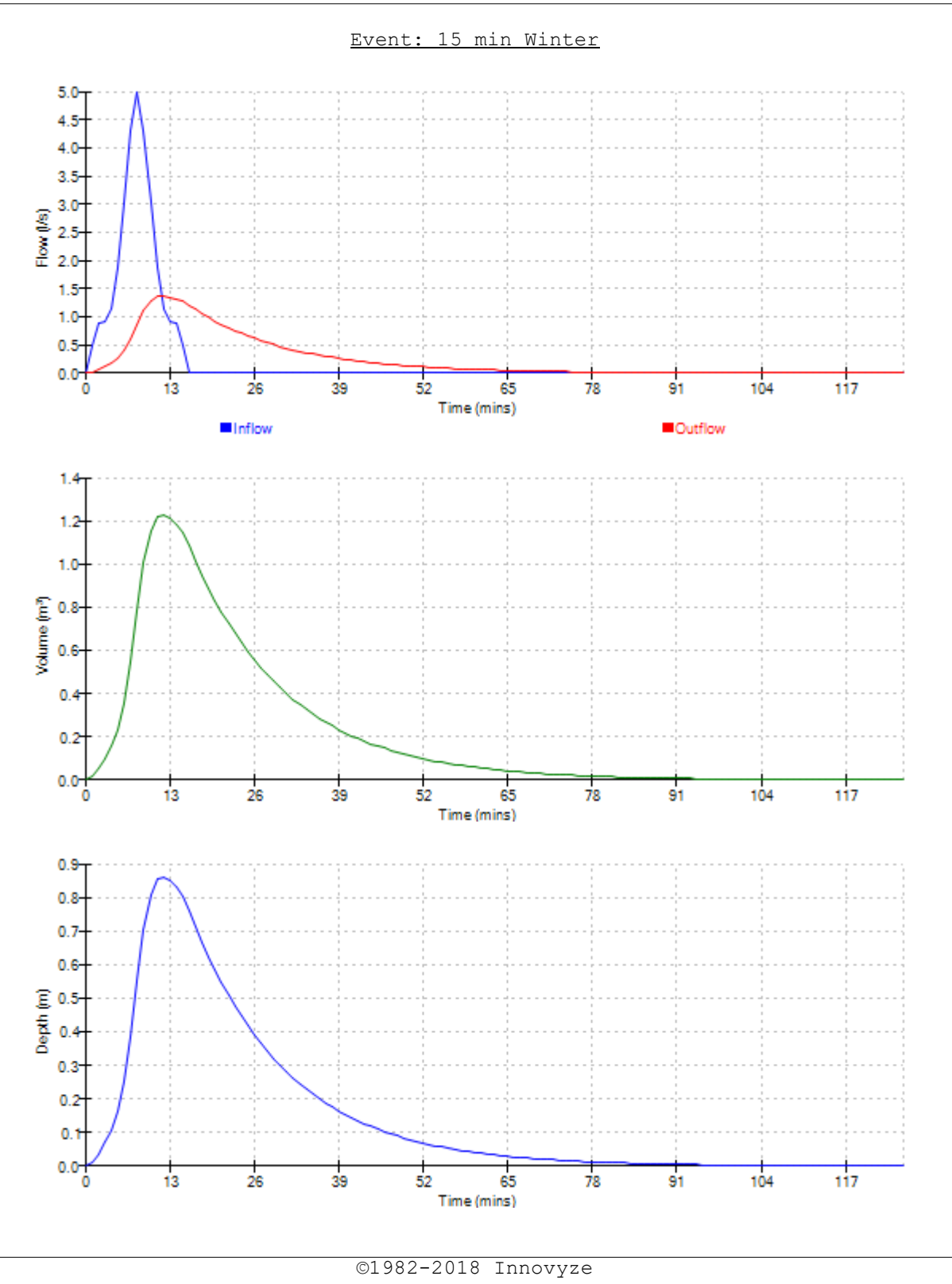


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Summer</td><td>9.340</td><td>0.340</td><td>0.5</td><td>0.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>9.292</td><td>0.292</td><td>0.5</td><td>0.4</td><td>O K</td></tr><tr><td>720 min Summer</td><td>9.256</td><td>0.256</td><td>0.4</td><td>0.4</td><td>O K</td></tr><tr><td>960 min Summer</td><td>9.207</td><td>0.207</td><td>0.3</td><td>0.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>9.151</td><td>0.151</td><td>0.2</td><td>0.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.108</td><td>0.108</td><td>0.2</td><td>0.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.084</td><td>0.084</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.059</td><td>0.059</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.046</td><td>0.046</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.039</td><td>0.039</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.035</td><td>0.035</td><td>0.1</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.031</td><td>0.031</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.862</td><td>0.862</td><td>1.4</td><td>1.2</td><td>Flood Risk</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>11</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>20</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>36</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>68</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>100</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>130</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>190</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>250</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>312</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>370</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>490</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>734</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2196</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3616</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4352</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5136</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>12</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.777	0.777	1.2	1.1	Flood Risk	30 min Summer	9.859	0.859	1.4	1.2	Flood Risk	60 min Summer	9.833	0.833	1.3	1.2	Flood Risk	120 min Summer	9.691	0.691	1.1	1.0	O K	180 min Summer	9.586	0.586	0.9	0.8	O K	240 min Summer	9.511	0.511	0.8	0.7	O K	360 min Summer	9.408	0.408	0.6	0.6	O K	480 min Summer	9.340	0.340	0.5	0.5	O K	600 min Summer	9.292	0.292	0.5	0.4	O K	720 min Summer	9.256	0.256	0.4	0.4	O K	960 min Summer	9.207	0.207	0.3	0.3	O K	1440 min Summer	9.151	0.151	0.2	0.2	O K	2160 min Summer	9.108	0.108	0.2	0.2	O K	2880 min Summer	9.084	0.084	0.1	0.1	O K	4320 min Summer	9.059	0.059	0.1	0.1	O K	5760 min Summer	9.046	0.046	0.1	0.1	O K	7200 min Summer	9.039	0.039	0.1	0.1	O K	8640 min Summer	9.035	0.035	0.1	0.0	O K	10080 min Summer	9.031	0.031	0.0	0.0	O K	15 min Winter	9.862	0.862	1.4	1.2	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	11	30 min Summer	96.151	0.0	20	60 min Summer	61.531	0.0	36	120 min Summer	36.920	0.0	68	180 min Summer	27.160	0.0	100	240 min Summer	21.763	0.0	130	360 min Summer	15.835	0.0	190	480 min Summer	12.539	0.0	250	600 min Summer	10.433	0.0	312	720 min Summer	8.964	0.0	370	960 min Summer	7.046	0.0	490	1440 min Summer	4.991	0.0	734	2160 min Summer	3.510	0.0	1100	2880 min Summer	2.731	0.0	1468	4320 min Summer	1.912	0.0	2196	5760 min Summer	1.496	0.0	2936	7200 min Summer	1.260	0.0	3616	8640 min Summer	1.110	0.0	4352	10080 min Summer	1.010	0.0	5136	15 min Winter	143.930	0.0	12
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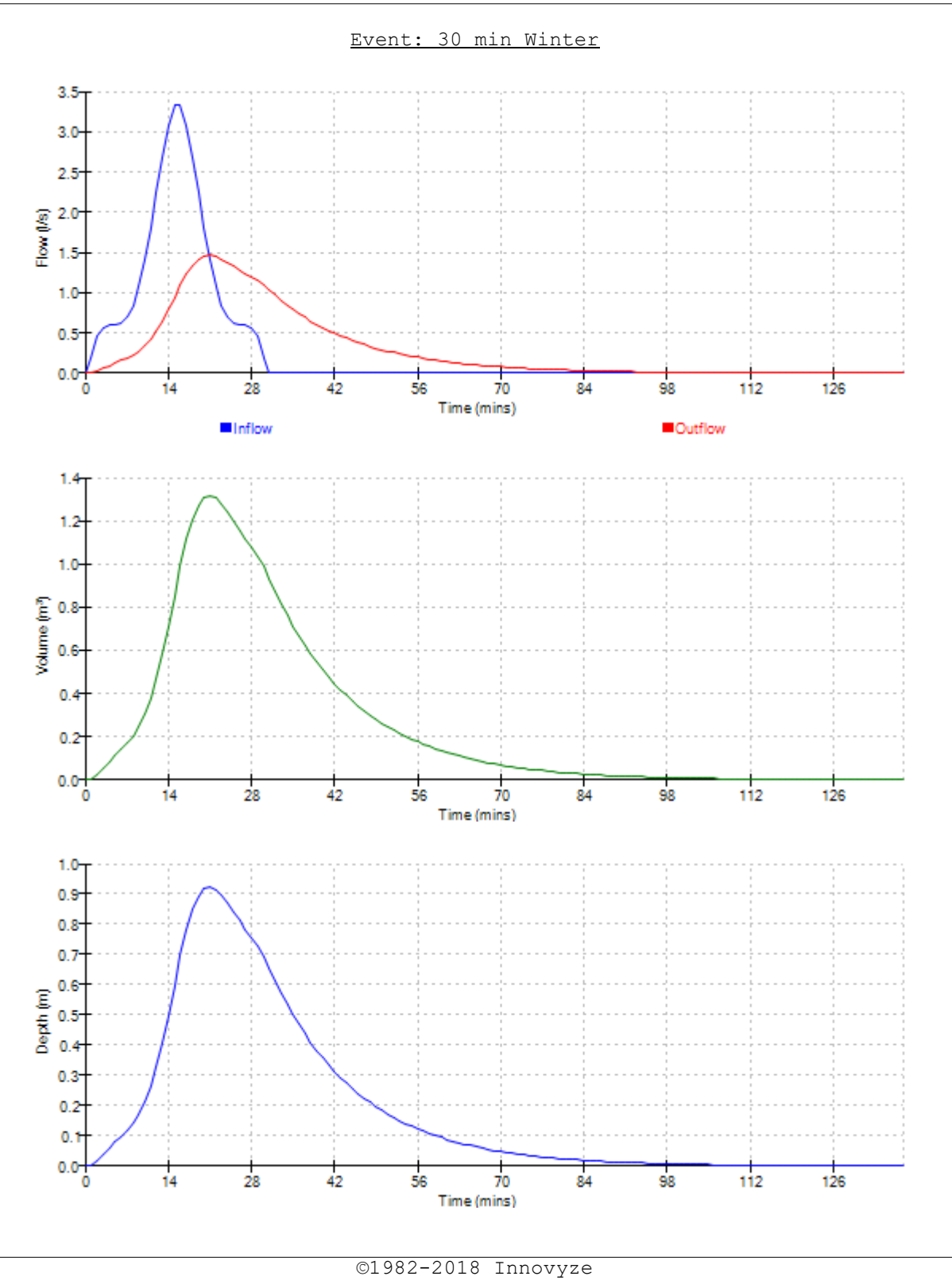
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Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP8 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP8_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.924	0.924	1.5	1.3	Flood Risk
60 min Winter	9.848	0.848	1.3	1.2	Flood Risk
120 min Winter	9.650	0.650	1.0	0.9	O K
180 min Winter	9.525	0.525	0.8	0.7	O K
240 min Winter	9.440	0.440	0.7	0.6	O K
360 min Winter	9.335	0.335	0.5	0.5	O K
480 min Winter	9.271	0.271	0.4	0.4	O K
600 min Winter	9.228	0.228	0.4	0.3	O K
720 min Winter	9.197	0.197	0.3	0.3	O K
960 min Winter	9.156	0.156	0.2	0.2	O K
1440 min Winter	9.111	0.111	0.2	0.2	O K
2160 min Winter	9.078	0.078	0.1	0.1	O K
2880 min Winter	9.061	0.061	0.1	0.1	O K
4320 min Winter	9.043	0.043	0.1	0.1	O K
5760 min Winter	9.034	0.034	0.1	0.0	O K
7200 min Winter	9.028	0.028	0.0	0.0	O K
8640 min Winter	9.025	0.025	0.0	0.0	O K
10080 min Winter	9.023	0.023	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	21		
60 min Winter	61.531	0.0	38		
120 min Winter	36.920	0.0	72		
180 min Winter	27.160	0.0	102		
240 min Winter	21.763	0.0	132		
360 min Winter	15.835	0.0	194		
480 min Winter	12.539	0.0	254		
600 min Winter	10.433	0.0	314		
720 min Winter	8.964	0.0	374		
960 min Winter	7.046	0.0	492		
1440 min Winter	4.991	0.0	734		
2160 min Winter	3.510	0.0	1100		
2880 min Winter	2.731	0.0	1468		
4320 min Winter	1.912	0.0	2200		
5760 min Winter	1.496	0.0	2864		
7200 min Winter	1.260	0.0	3656		
8640 min Winter	1.110	0.0	4304		
10080 min Winter	1.010	0.0	5128		
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>1.5</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>2.27880</td> <td>Trench Length (m)</td> <td>1.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5	Infiltration Coefficient Side (m/hr)	2.27880	Trench Length (m)	1.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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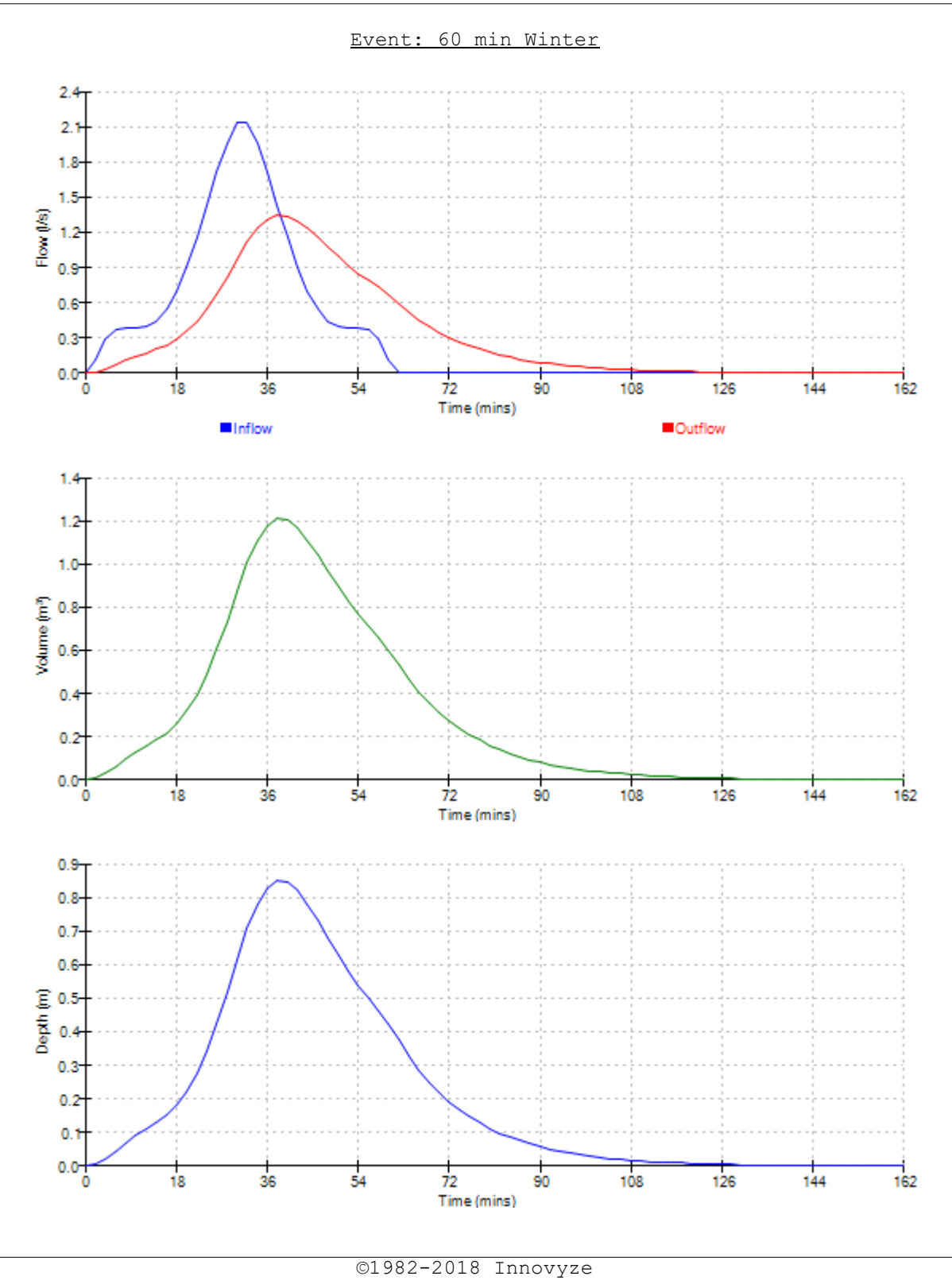
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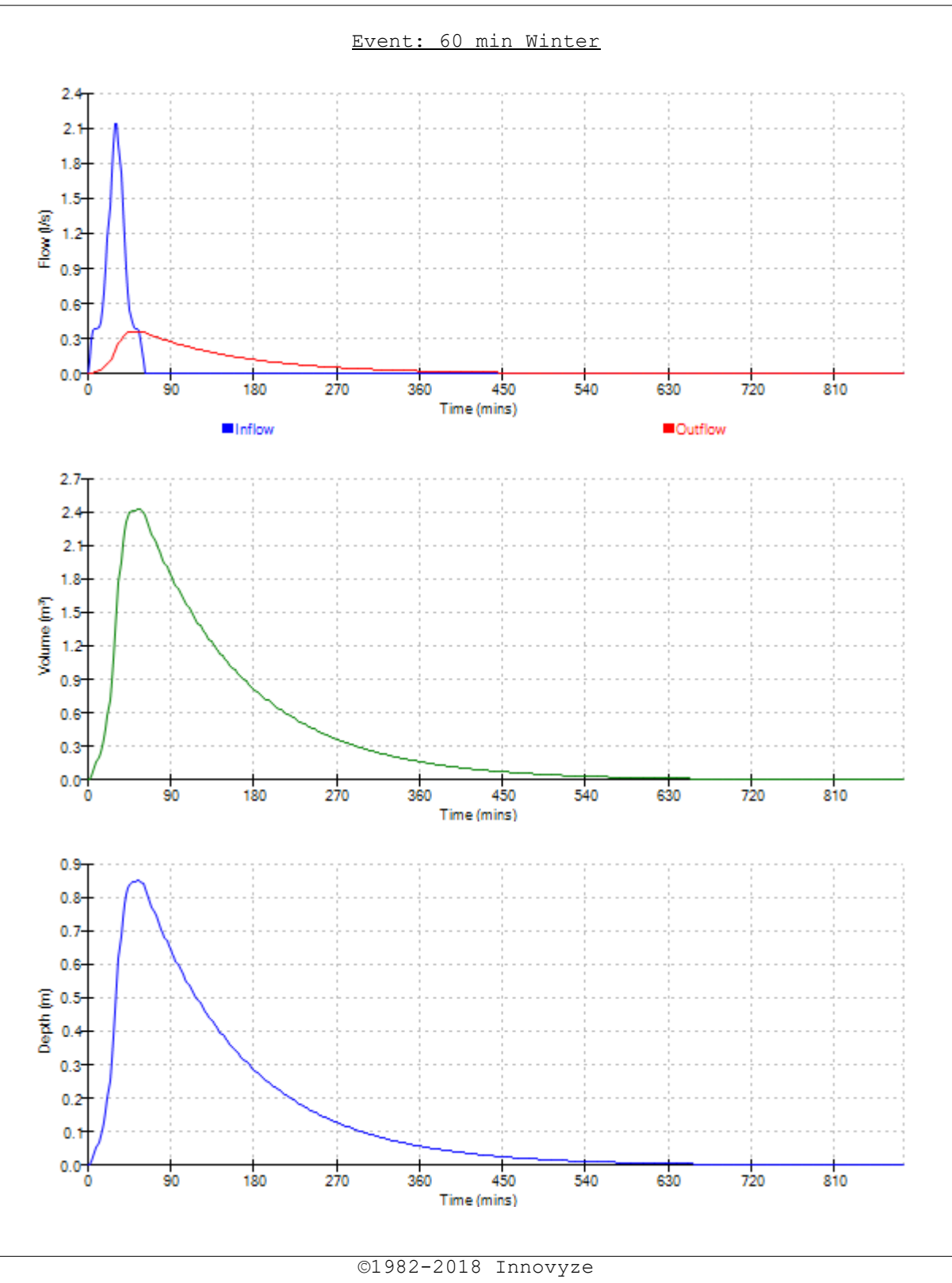


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Summer</td><td>9.661</td><td>0.661</td><td>0.3</td><td>1.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>9.614</td><td>0.614</td><td>0.3</td><td>1.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>9.572</td><td>0.572</td><td>0.2</td><td>1.6</td><td>O K</td></tr><tr><td>960 min Summer</td><td>9.505</td><td>0.505</td><td>0.2</td><td>1.4</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>9.410</td><td>0.410</td><td>0.2</td><td>1.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.321</td><td>0.321</td><td>0.1</td><td>0.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.265</td><td>0.265</td><td>0.1</td><td>0.8</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.198</td><td>0.198</td><td>0.1</td><td>0.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.160</td><td>0.160</td><td>0.1</td><td>0.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.138</td><td>0.138</td><td>0.1</td><td>0.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.124</td><td>0.124</td><td>0.1</td><td>0.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.113</td><td>0.113</td><td>0.0</td><td>0.3</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.593</td><td>0.593</td><td>0.3</td><td>1.7</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>30</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>52</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>84</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>118</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>152</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>218</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>284</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>348</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>412</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>538</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>780</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1148</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1504</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2244</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>2944</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3680</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4408</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>15</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.529	0.529	0.2	1.5	O K	30 min Summer	9.663	0.663	0.3	1.9	O K	60 min Summer	9.755	0.755	0.3	2.2	Flood Risk	120 min Summer	9.786	0.786	0.3	2.2	Flood Risk	180 min Summer	9.781	0.781	0.3	2.2	Flood Risk	240 min Summer	9.762	0.762	0.3	2.2	Flood Risk	360 min Summer	9.713	0.713	0.3	2.0	Flood Risk	480 min Summer	9.661	0.661	0.3	1.9	O K	600 min Summer	9.614	0.614	0.3	1.7	O K	720 min Summer	9.572	0.572	0.2	1.6	O K	960 min Summer	9.505	0.505	0.2	1.4	O K	1440 min Summer	9.410	0.410	0.2	1.2	O K	2160 min Summer	9.321	0.321	0.1	0.9	O K	2880 min Summer	9.265	0.265	0.1	0.8	O K	4320 min Summer	9.198	0.198	0.1	0.6	O K	5760 min Summer	9.160	0.160	0.1	0.5	O K	7200 min Summer	9.138	0.138	0.1	0.4	O K	8640 min Summer	9.124	0.124	0.1	0.4	O K	10080 min Summer	9.113	0.113	0.0	0.3	O K	15 min Winter	9.593	0.593	0.3	1.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	30	60 min Summer	61.531	0.0	52	120 min Summer	36.920	0.0	84	180 min Summer	27.160	0.0	118	240 min Summer	21.763	0.0	152	360 min Summer	15.835	0.0	218	480 min Summer	12.539	0.0	284	600 min Summer	10.433	0.0	348	720 min Summer	8.964	0.0	412	960 min Summer	7.046	0.0	538	1440 min Summer	4.991	0.0	780	2160 min Summer	3.510	0.0	1148	2880 min Summer	2.731	0.0	1504	4320 min Summer	1.912	0.0	2244	5760 min Summer	1.496	0.0	2944	7200 min Summer	1.260	0.0	3680	8640 min Summer	1.110	0.0	4408	10080 min Summer	1.010	0.0	5144	15 min Winter	143.930	0.0	15
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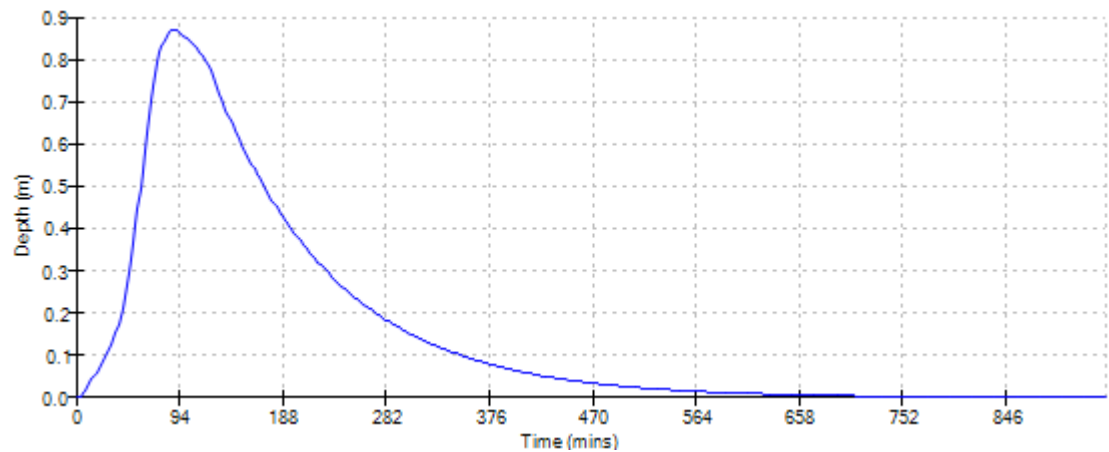
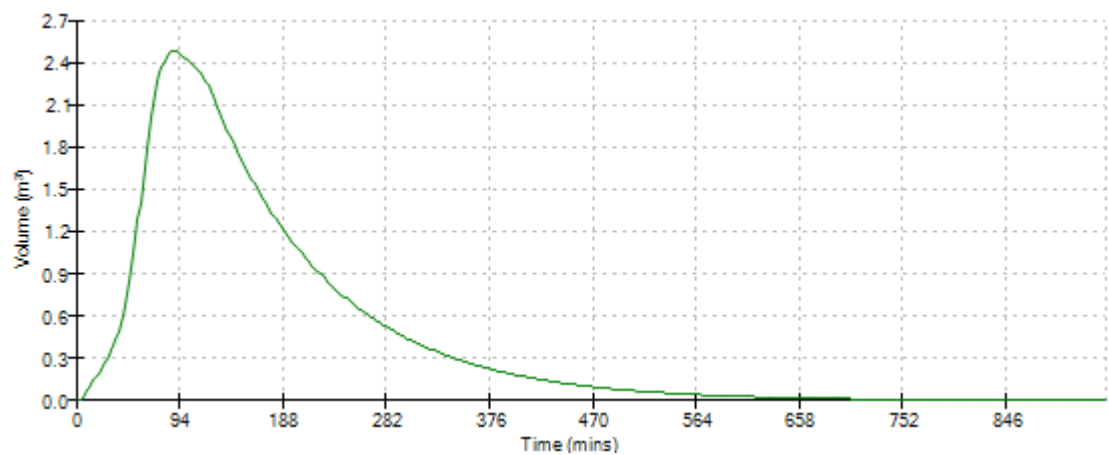
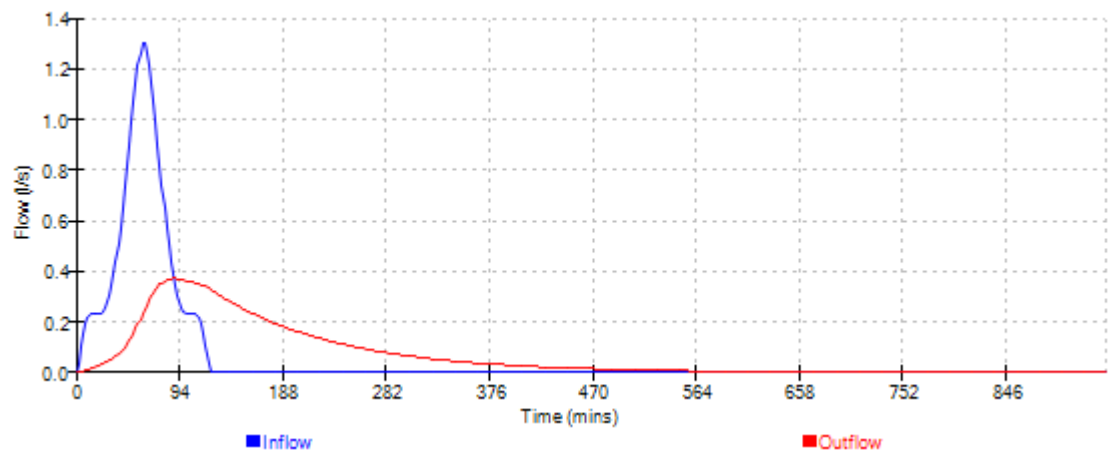
Waterco Ltd				Page 2	
Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP9 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP9_House...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.746	0.746	0.3	2.1	Flood Risk
60 min Winter	9.849	0.849	0.4	2.4	Flood Risk
120 min Winter	9.871	0.871	0.4	2.5	Flood Risk
180 min Winter	9.849	0.849	0.4	2.4	Flood Risk
240 min Winter	9.814	0.814	0.3	2.3	Flood Risk
360 min Winter	9.737	0.737	0.3	2.1	Flood Risk
480 min Winter	9.665	0.665	0.3	1.9	O K
600 min Winter	9.604	0.604	0.3	1.7	O K
720 min Winter	9.552	0.552	0.2	1.6	O K
960 min Winter	9.471	0.471	0.2	1.3	O K
1440 min Winter	9.363	0.363	0.2	1.0	O K
2160 min Winter	9.270	0.270	0.1	0.8	O K
2880 min Winter	9.216	0.216	0.1	0.6	O K
4320 min Winter	9.155	0.155	0.1	0.4	O K
5760 min Winter	9.122	0.122	0.1	0.3	O K
7200 min Winter	9.104	0.104	0.0	0.3	O K
8640 min Winter	9.092	0.092	0.0	0.3	O K
10080 min Winter	9.084	0.084	0.0	0.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	56		
120 min Winter	36.920	0.0	88		
180 min Winter	27.160	0.0	126		
240 min Winter	21.763	0.0	162		
360 min Winter	15.835	0.0	232		
480 min Winter	12.539	0.0	300		
600 min Winter	10.433	0.0	366		
720 min Winter	8.964	0.0	432		
960 min Winter	7.046	0.0	558		
1440 min Winter	4.991	0.0	806		
2160 min Winter	3.510	0.0	1168		
2880 min Winter	2.731	0.0	1532		
4320 min Winter	1.912	0.0	2248		
5760 min Winter	1.496	0.0	2992		
7200 min Winter	1.260	0.0	3680		
8640 min Winter	1.110	0.0	4408		
10080 min Winter	1.010	0.0	5136		
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Lon Parcwr Business Park	Holt Road, Rossett																					
Denbighshire LL15 1NJ	TP9 House Soakaway																					
Date 23/05/2018	Designed by HW																					
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XP Solutions		Source Control 2018.1																				
<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>1.5</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.43812</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5	Infiltration Coefficient Side (m/hr)	0.43812	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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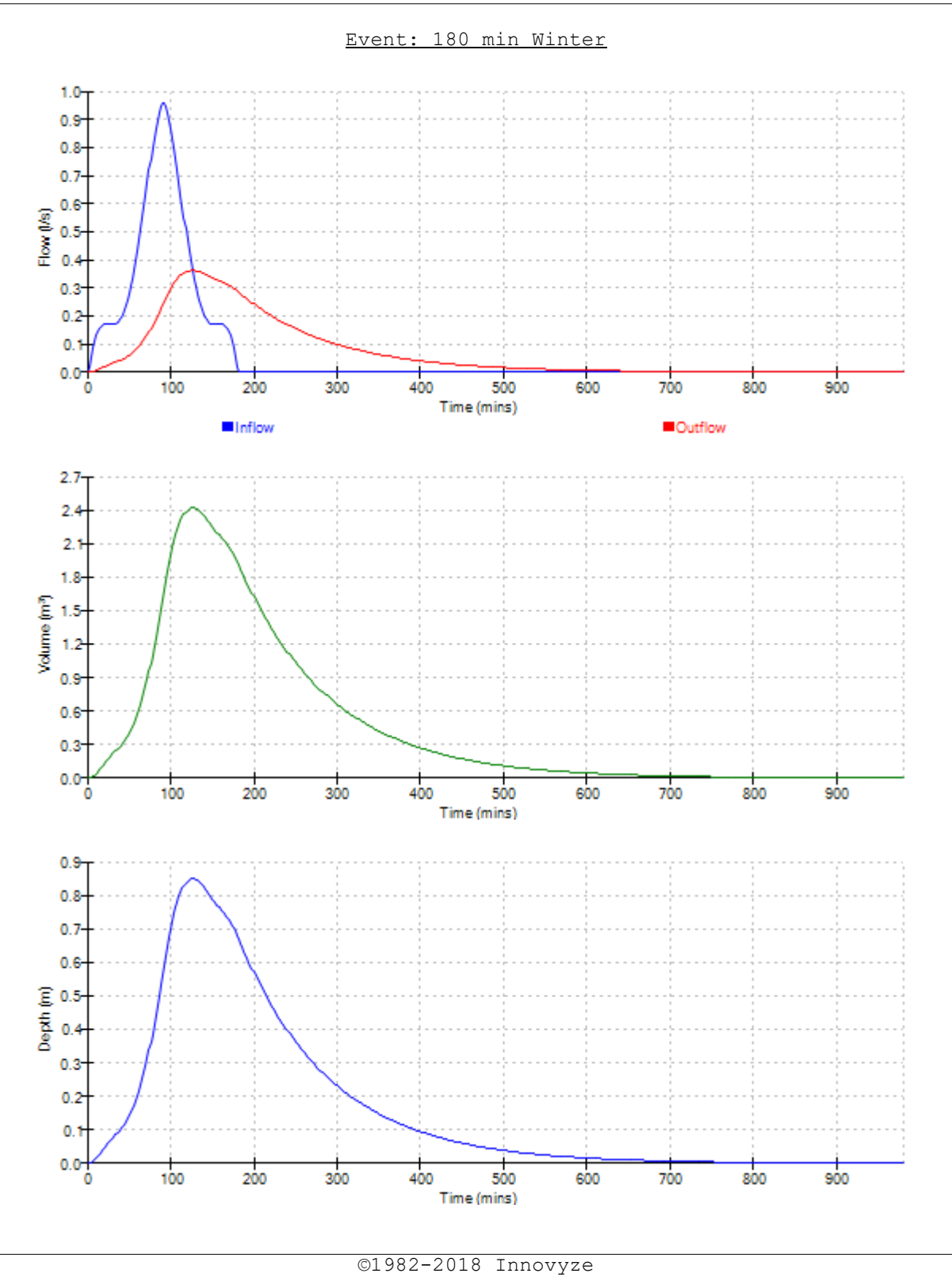
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685	
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Event: 120 min Winter



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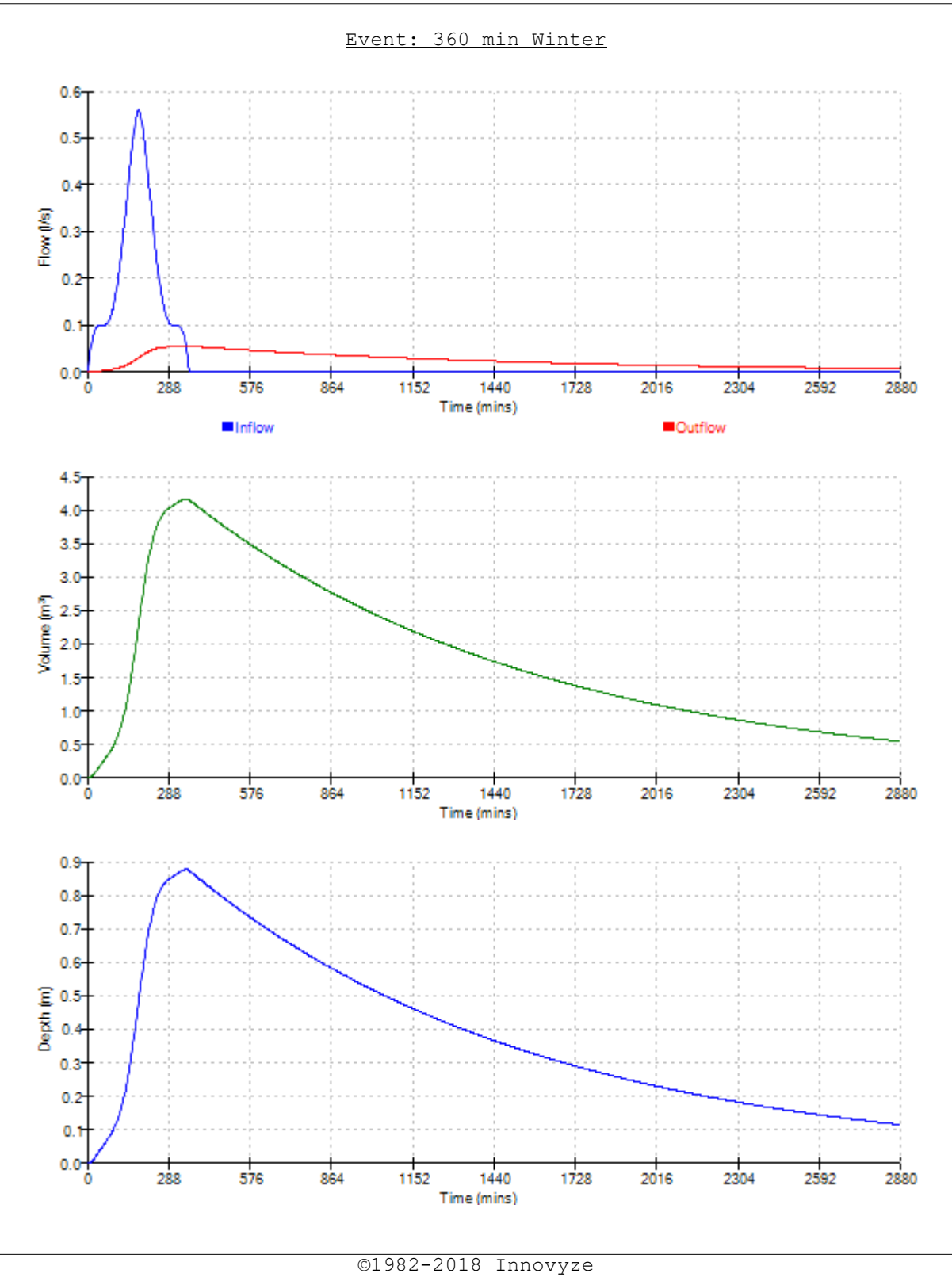


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Summer</td><td>9.785</td><td>0.785</td><td>0.1</td><td>3.7</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.783</td><td>0.783</td><td>0.0</td><td>3.7</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.781</td><td>0.781</td><td>0.0</td><td>3.7</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.773</td><td>0.773</td><td>0.0</td><td>3.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.752</td><td>0.752</td><td>0.0</td><td>3.6</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>9.711</td><td>0.711</td><td>0.0</td><td>3.4</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>9.671</td><td>0.671</td><td>0.0</td><td>3.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.601</td><td>0.601</td><td>0.0</td><td>2.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.547</td><td>0.547</td><td>0.0</td><td>2.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.513</td><td>0.513</td><td>0.0</td><td>2.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.489</td><td>0.489</td><td>0.0</td><td>2.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.473</td><td>0.473</td><td>0.0</td><td>2.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.379</td><td>0.379</td><td>0.0</td><td>1.8</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>524</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>584</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>710</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>978</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1384</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1792</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2596</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3392</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>4176</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4920</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5648</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.339	0.339	0.0	1.6	O K	30 min Summer	9.450	0.450	0.0	2.1	O K	60 min Summer	9.569	0.569	0.0	2.7	O K	120 min Summer	9.666	0.666	0.0	3.2	O K	180 min Summer	9.718	0.718	0.0	3.4	Flood Risk	240 min Summer	9.749	0.749	0.0	3.6	Flood Risk	360 min Summer	9.780	0.780	0.0	3.7	Flood Risk	480 min Summer	9.785	0.785	0.1	3.7	Flood Risk	600 min Summer	9.783	0.783	0.0	3.7	Flood Risk	720 min Summer	9.781	0.781	0.0	3.7	Flood Risk	960 min Summer	9.773	0.773	0.0	3.7	Flood Risk	1440 min Summer	9.752	0.752	0.0	3.6	Flood Risk	2160 min Summer	9.711	0.711	0.0	3.4	Flood Risk	2880 min Summer	9.671	0.671	0.0	3.2	O K	4320 min Summer	9.601	0.601	0.0	2.9	O K	5760 min Summer	9.547	0.547	0.0	2.6	O K	7200 min Summer	9.513	0.513	0.0	2.4	O K	8640 min Summer	9.489	0.489	0.0	2.3	O K	10080 min Summer	9.473	0.473	0.0	2.2	O K	15 min Winter	9.379	0.379	0.0	1.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	62	120 min Summer	36.920	0.0	122	180 min Summer	27.160	0.0	182	240 min Summer	21.763	0.0	240	360 min Summer	15.835	0.0	360	480 min Summer	12.539	0.0	480	600 min Summer	10.433	0.0	524	720 min Summer	8.964	0.0	584	960 min Summer	7.046	0.0	710	1440 min Summer	4.991	0.0	978	2160 min Summer	3.510	0.0	1384	2880 min Summer	2.731	0.0	1792	4320 min Summer	1.912	0.0	2596	5760 min Summer	1.496	0.0	3392	7200 min Summer	1.260	0.0	4176	8640 min Summer	1.110	0.0	4920	10080 min Summer	1.010	0.0	5648	15 min Winter	143.930	0.0	16
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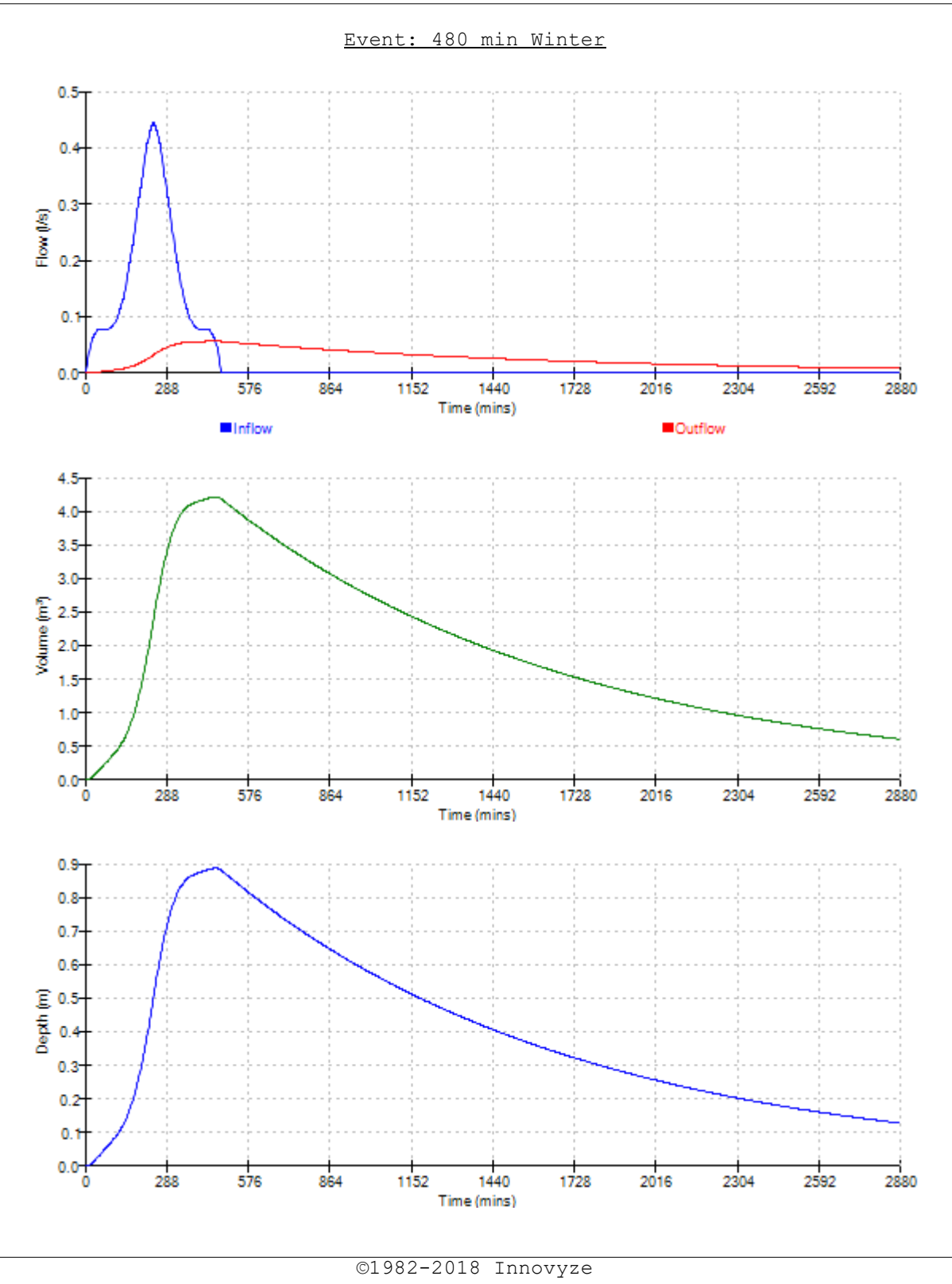
Waterco Ltd				Page 2	
Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP10 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP10_Hous...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.504	0.504	0.0	2.4	O K
60 min Winter	9.637	0.637	0.0	3.0	O K
120 min Winter	9.747	0.747	0.0	3.5	Flood Risk
180 min Winter	9.805	0.805	0.1	3.8	Flood Risk
240 min Winter	9.841	0.841	0.1	4.0	Flood Risk
360 min Winter	9.877	0.877	0.1	4.2	Flood Risk
480 min Winter	9.887	0.887	0.1	4.2	Flood Risk
600 min Winter	9.884	0.884	0.1	4.2	Flood Risk
720 min Winter	9.876	0.876	0.1	4.2	Flood Risk
960 min Winter	9.865	0.865	0.1	4.1	Flood Risk
1440 min Winter	9.831	0.831	0.1	3.9	Flood Risk
2160 min Winter	9.769	0.769	0.0	3.7	Flood Risk
2880 min Winter	9.713	0.713	0.0	3.4	Flood Risk
4320 min Winter	9.617	0.617	0.0	2.9	O K
5760 min Winter	9.547	0.547	0.0	2.6	O K
7200 min Winter	9.501	0.501	0.0	2.4	O K
8640 min Winter	9.468	0.468	0.0	2.2	O K
10080 min Winter	9.444	0.444	0.0	2.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	31		
60 min Winter	61.531	0.0	62		
120 min Winter	36.920	0.0	120		
180 min Winter	27.160	0.0	178		
240 min Winter	21.763	0.0	236		
360 min Winter	15.835	0.0	350		
480 min Winter	12.539	0.0	460		
600 min Winter	10.433	0.0	564		
720 min Winter	8.964	0.0	642		
960 min Winter	7.046	0.0	740		
1440 min Winter	4.991	0.0	1040		
2160 min Winter	3.510	0.0	1492		
2880 min Winter	2.731	0.0	1928		
4320 min Winter	1.912	0.0	2764		
5760 min Winter	1.496	0.0	3568		
7200 min Winter	1.260	0.0	4328		
8640 min Winter	1.110	0.0	5104		
10080 min Winter	1.010	0.0	5856		
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>2.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.05101</td> <td>Trench Length (m)</td> <td>2.5</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	2.0	Infiltration Coefficient Side (m/hr)	0.05101	Trench Length (m)	2.5	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.000	Cap Infiltration Depth (m)	0.000
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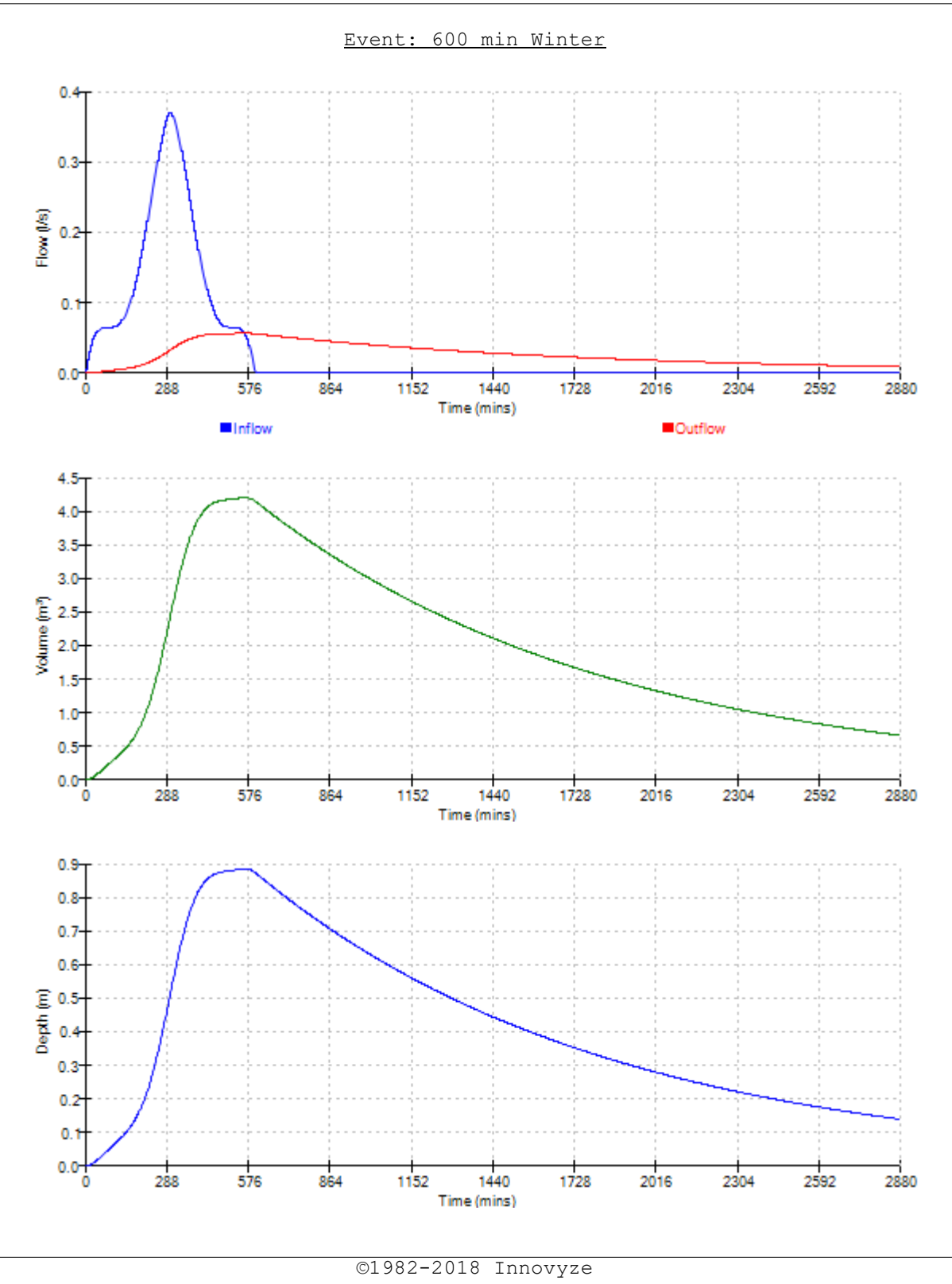
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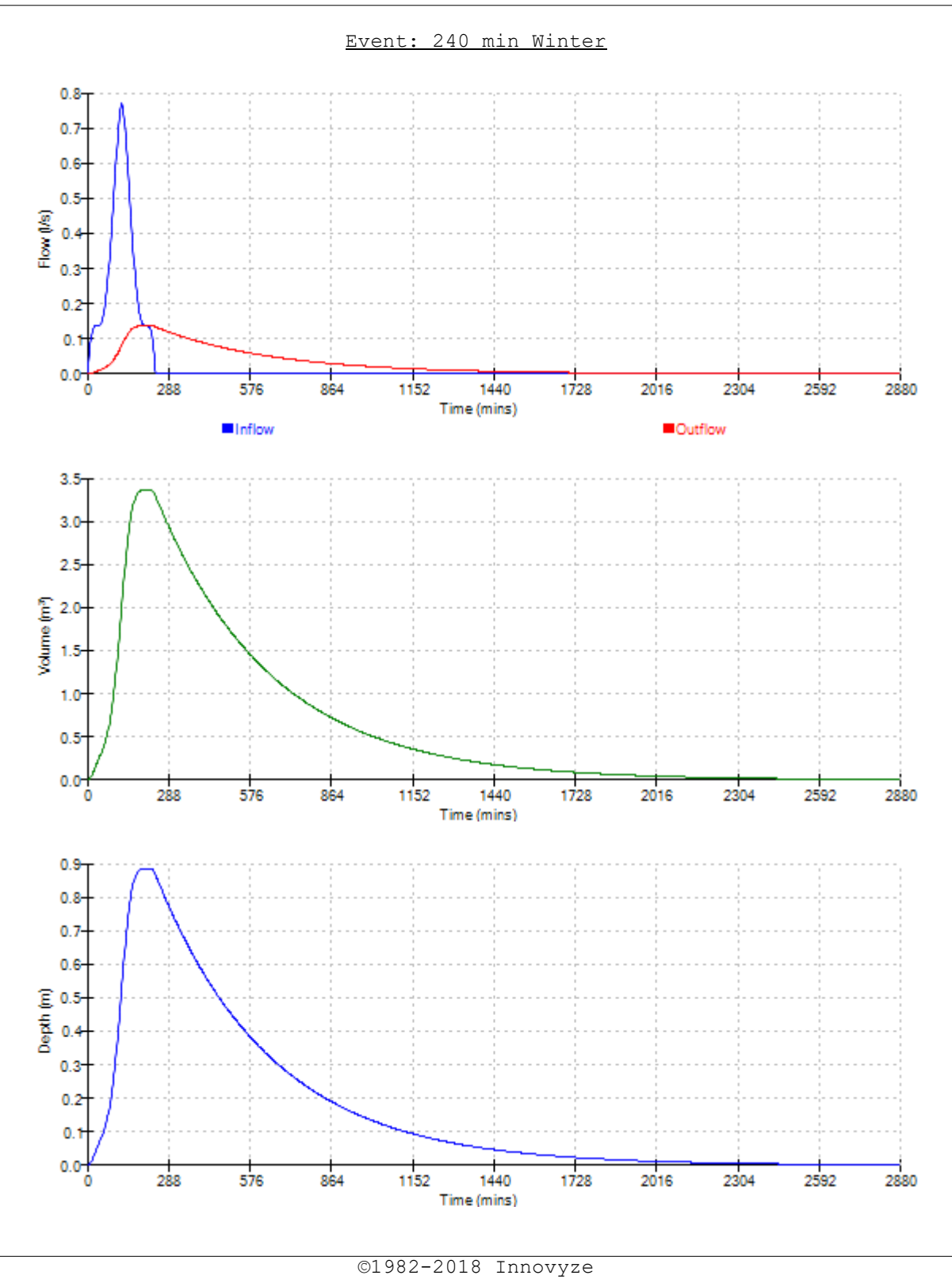


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Summer</td><td>9.785</td><td>0.785</td><td>0.1</td><td>3.0</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.771</td><td>0.771</td><td>0.1</td><td>2.9</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.754</td><td>0.754</td><td>0.1</td><td>2.9</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.719</td><td>0.719</td><td>0.1</td><td>2.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.651</td><td>0.651</td><td>0.1</td><td>2.5</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>9.564</td><td>0.564</td><td>0.1</td><td>2.1</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.498</td><td>0.498</td><td>0.1</td><td>1.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.407</td><td>0.407</td><td>0.1</td><td>1.5</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.348</td><td>0.348</td><td>0.1</td><td>1.3</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.311</td><td>0.311</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.286</td><td>0.286</td><td>0.0</td><td>1.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.268</td><td>0.268</td><td>0.0</td><td>1.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.468</td><td>0.468</td><td>0.1</td><td>1.8</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>168</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>194</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>258</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>326</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>392</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>462</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>598</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>864</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1256</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1640</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2376</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3112</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3824</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4584</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5336</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.418	0.418	0.1	1.6	O K	30 min Summer	9.548	0.548	0.1	2.1	O K	60 min Summer	9.676	0.676	0.1	2.6	O K	120 min Summer	9.756	0.756	0.1	2.9	Flood Risk	180 min Summer	9.779	0.779	0.1	3.0	Flood Risk	240 min Summer	9.788	0.788	0.1	3.0	Flood Risk	360 min Summer	9.794	0.794	0.1	3.0	Flood Risk	480 min Summer	9.785	0.785	0.1	3.0	Flood Risk	600 min Summer	9.771	0.771	0.1	2.9	Flood Risk	720 min Summer	9.754	0.754	0.1	2.9	Flood Risk	960 min Summer	9.719	0.719	0.1	2.7	Flood Risk	1440 min Summer	9.651	0.651	0.1	2.5	O K	2160 min Summer	9.564	0.564	0.1	2.1	O K	2880 min Summer	9.498	0.498	0.1	1.9	O K	4320 min Summer	9.407	0.407	0.1	1.5	O K	5760 min Summer	9.348	0.348	0.1	1.3	O K	7200 min Summer	9.311	0.311	0.0	1.2	O K	8640 min Summer	9.286	0.286	0.0	1.1	O K	10080 min Summer	9.268	0.268	0.0	1.0	O K	15 min Winter	9.468	0.468	0.1	1.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	62	120 min Summer	36.920	0.0	120	180 min Summer	27.160	0.0	168	240 min Summer	21.763	0.0	194	360 min Summer	15.835	0.0	258	480 min Summer	12.539	0.0	326	600 min Summer	10.433	0.0	392	720 min Summer	8.964	0.0	462	960 min Summer	7.046	0.0	598	1440 min Summer	4.991	0.0	864	2160 min Summer	3.510	0.0	1256	2880 min Summer	2.731	0.0	1640	4320 min Summer	1.912	0.0	2376	5760 min Summer	1.496	0.0	3112	7200 min Summer	1.260	0.0	3824	8640 min Summer	1.110	0.0	4584	10080 min Summer	1.010	0.0	5336	15 min Winter	143.930	0.0	16
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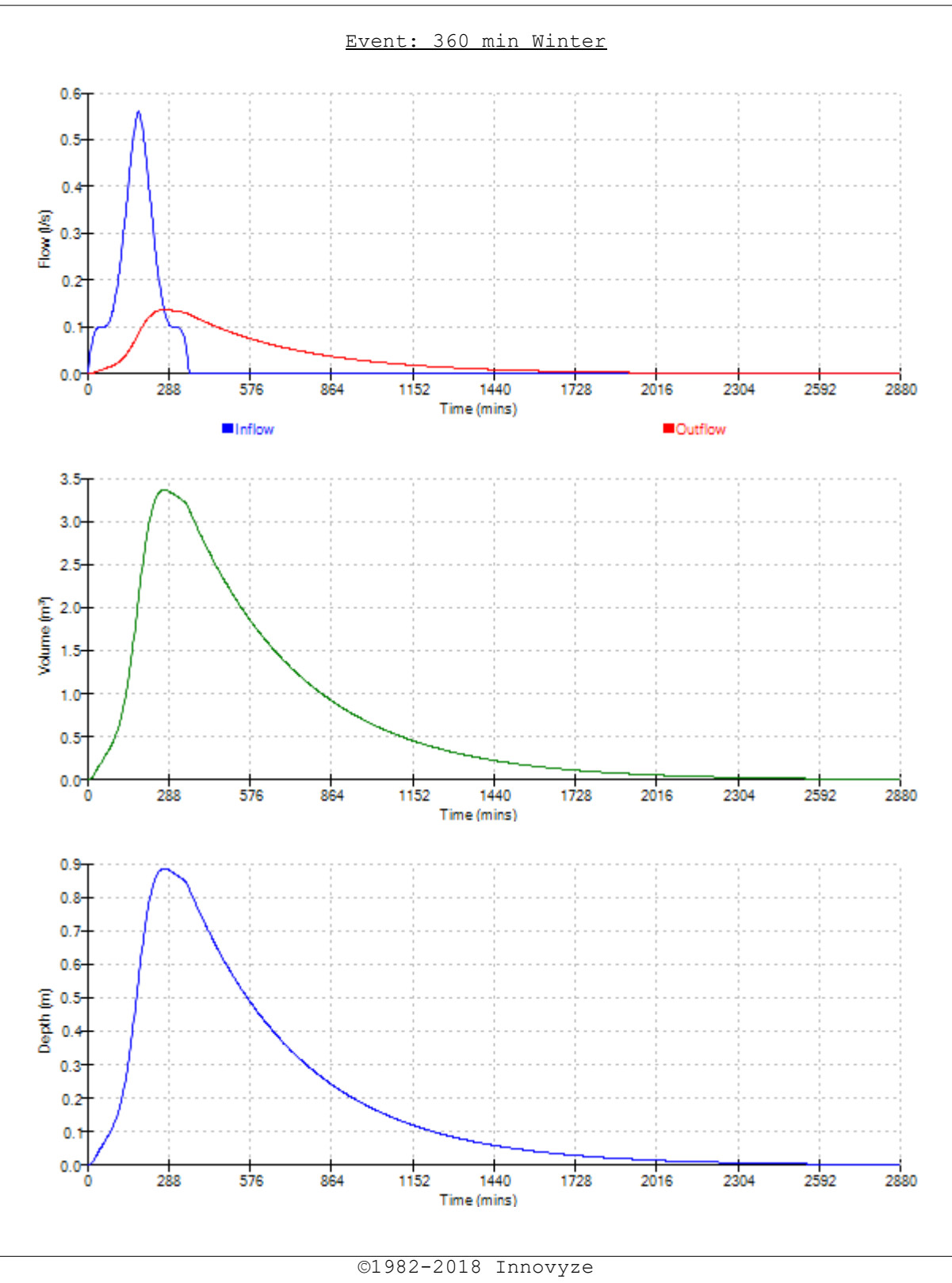
Waterco Ltd				Page 2	
Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP11 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP11_Hous...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.614	0.614	0.1	2.3	O K
60 min Winter	9.759	0.759	0.1	2.9	Flood Risk
120 min Winter	9.851	0.851	0.1	3.2	Flood Risk
180 min Winter	9.880	0.880	0.1	3.3	Flood Risk
240 min Winter	9.884	0.884	0.1	3.4	Flood Risk
360 min Winter	9.885	0.885	0.1	3.4	Flood Risk
480 min Winter	9.867	0.867	0.1	3.3	Flood Risk
600 min Winter	9.843	0.843	0.1	3.2	Flood Risk
720 min Winter	9.816	0.816	0.1	3.1	Flood Risk
960 min Winter	9.763	0.763	0.1	2.9	Flood Risk
1440 min Winter	9.668	0.668	0.1	2.5	O K
2160 min Winter	9.556	0.556	0.1	2.1	O K
2880 min Winter	9.476	0.476	0.1	1.8	O K
4320 min Winter	9.369	0.369	0.1	1.4	O K
5760 min Winter	9.304	0.304	0.0	1.2	O K
7200 min Winter	9.265	0.265	0.0	1.0	O K
8640 min Winter	9.238	0.238	0.0	0.9	O K
10080 min Winter	9.219	0.219	0.0	0.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	60		
120 min Winter	36.920	0.0	116		
180 min Winter	27.160	0.0	172		
240 min Winter	21.763	0.0	202		
360 min Winter	15.835	0.0	272		
480 min Winter	12.539	0.0	348		
600 min Winter	10.433	0.0	422		
720 min Winter	8.964	0.0	498		
960 min Winter	7.046	0.0	642		
1440 min Winter	4.991	0.0	920		
2160 min Winter	3.510	0.0	1320		
2880 min Winter	2.731	0.0	1700		
4320 min Winter	1.912	0.0	2464		
5760 min Winter	1.496	0.0	3176		
7200 min Winter	1.260	0.0	3960		
8640 min Winter	1.110	0.0	4664		
10080 min Winter	1.010	0.0	5352		
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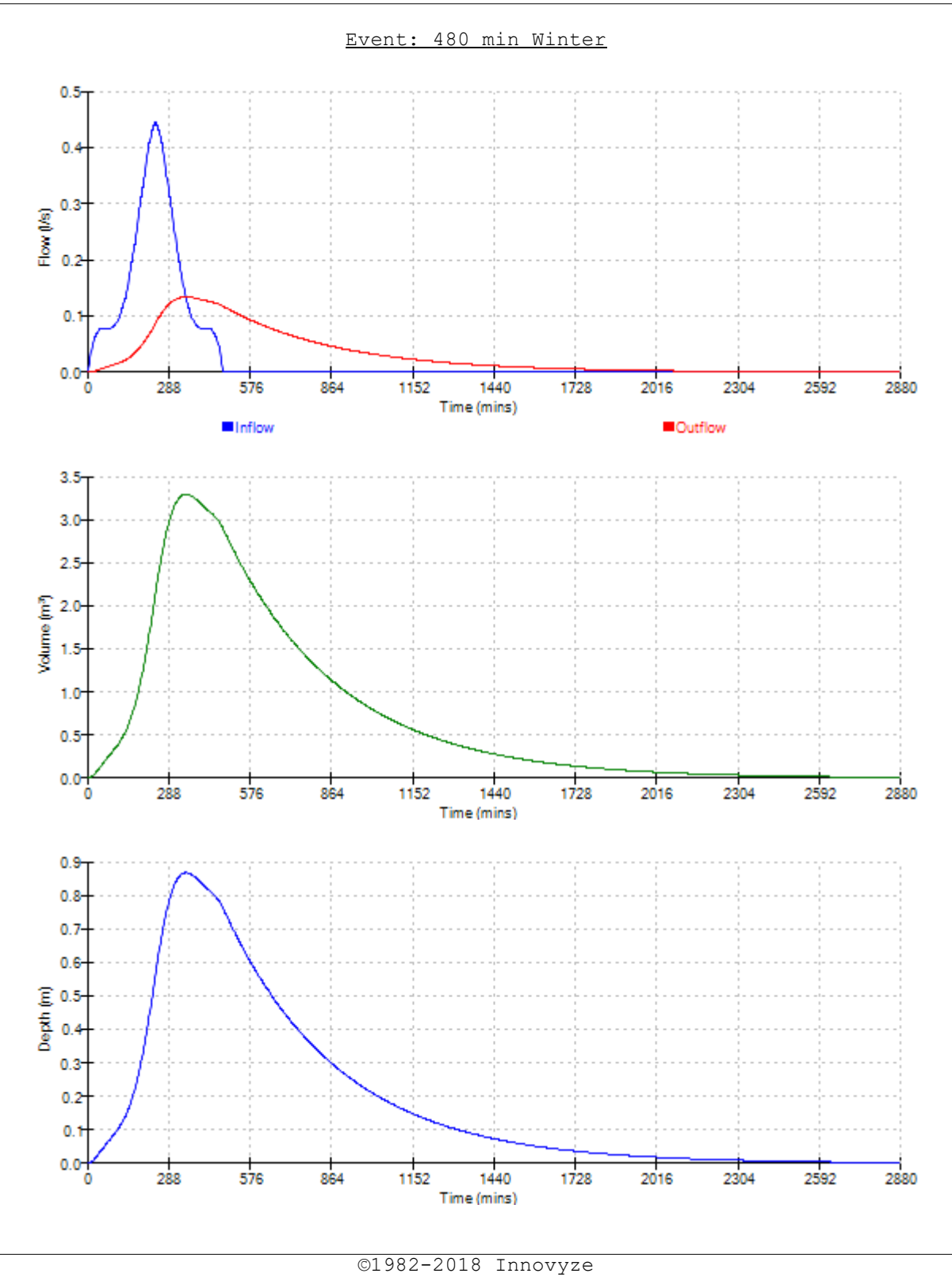
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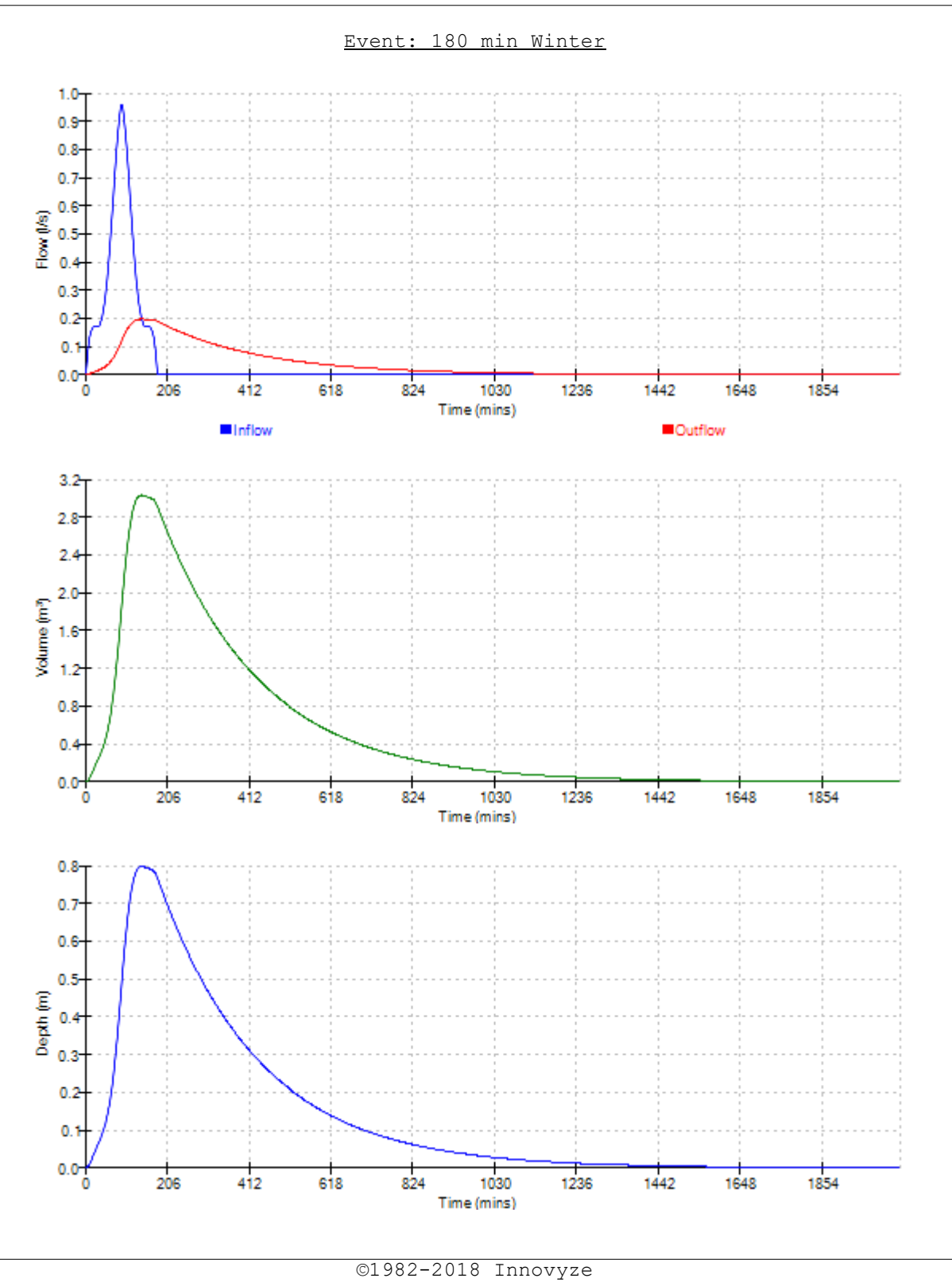


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Summer</td><td>9.890</td><td>0.690</td><td>0.2</td><td>2.6</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.865</td><td>0.665</td><td>0.2</td><td>2.5</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.841</td><td>0.641</td><td>0.2</td><td>2.4</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.795</td><td>0.595</td><td>0.1</td><td>2.3</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.716</td><td>0.516</td><td>0.1</td><td>2.0</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>9.630</td><td>0.430</td><td>0.1</td><td>1.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>9.571</td><td>0.371</td><td>0.1</td><td>1.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>9.491</td><td>0.291</td><td>0.1</td><td>1.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.444</td><td>0.244</td><td>0.1</td><td>0.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.414</td><td>0.214</td><td>0.1</td><td>0.8</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.395</td><td>0.195</td><td>0.0</td><td>0.7</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.381</td><td>0.181</td><td>0.0</td><td>0.7</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.663</td><td>0.463</td><td>0.1</td><td>1.8</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>143.930</td><td>0.0</td><td>16</td></tr><tr><td>30 min Summer</td><td>96.151</td><td>0.0</td><td>31</td></tr><tr><td>60 min Summer</td><td>61.531</td><td>0.0</td><td>60</td></tr><tr><td>120 min Summer</td><td>36.920</td><td>0.0</td><td>108</td></tr><tr><td>180 min Summer</td><td>27.160</td><td>0.0</td><td>138</td></tr><tr><td>240 min Summer</td><td>21.763</td><td>0.0</td><td>170</td></tr><tr><td>360 min Summer</td><td>15.835</td><td>0.0</td><td>238</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>306</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>374</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>440</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>576</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>834</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1212</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1584</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2296</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3056</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3752</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4496</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5240</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>16</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	9.613	0.413	0.1	1.6	O K	30 min Summer	9.736	0.536	0.1	2.0	Flood Risk	60 min Summer	9.847	0.647	0.2	2.5	Flood Risk	120 min Summer	9.897	0.697	0.2	2.6	Flood Risk	180 min Summer	9.912	0.712	0.2	2.7	Flood Risk	240 min Summer	9.917	0.717	0.2	2.7	Flood Risk	360 min Summer	9.910	0.710	0.2	2.7	Flood Risk	480 min Summer	9.890	0.690	0.2	2.6	Flood Risk	600 min Summer	9.865	0.665	0.2	2.5	Flood Risk	720 min Summer	9.841	0.641	0.2	2.4	Flood Risk	960 min Summer	9.795	0.595	0.1	2.3	Flood Risk	1440 min Summer	9.716	0.516	0.1	2.0	Flood Risk	2160 min Summer	9.630	0.430	0.1	1.6	O K	2880 min Summer	9.571	0.371	0.1	1.4	O K	4320 min Summer	9.491	0.291	0.1	1.1	O K	5760 min Summer	9.444	0.244	0.1	0.9	O K	7200 min Summer	9.414	0.214	0.1	0.8	O K	8640 min Summer	9.395	0.195	0.0	0.7	O K	10080 min Summer	9.381	0.181	0.0	0.7	O K	15 min Winter	9.663	0.463	0.1	1.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	60	120 min Summer	36.920	0.0	108	180 min Summer	27.160	0.0	138	240 min Summer	21.763	0.0	170	360 min Summer	15.835	0.0	238	480 min Summer	12.539	0.0	306	600 min Summer	10.433	0.0	374	720 min Summer	8.964	0.0	440	960 min Summer	7.046	0.0	576	1440 min Summer	4.991	0.0	834	2160 min Summer	3.510	0.0	1212	2880 min Summer	2.731	0.0	1584	4320 min Summer	1.912	0.0	2296	5760 min Summer	1.496	0.0	3056	7200 min Summer	1.260	0.0	3752	8640 min Summer	1.110	0.0	4496	10080 min Summer	1.010	0.0	5240	15 min Winter	143.930	0.0	16
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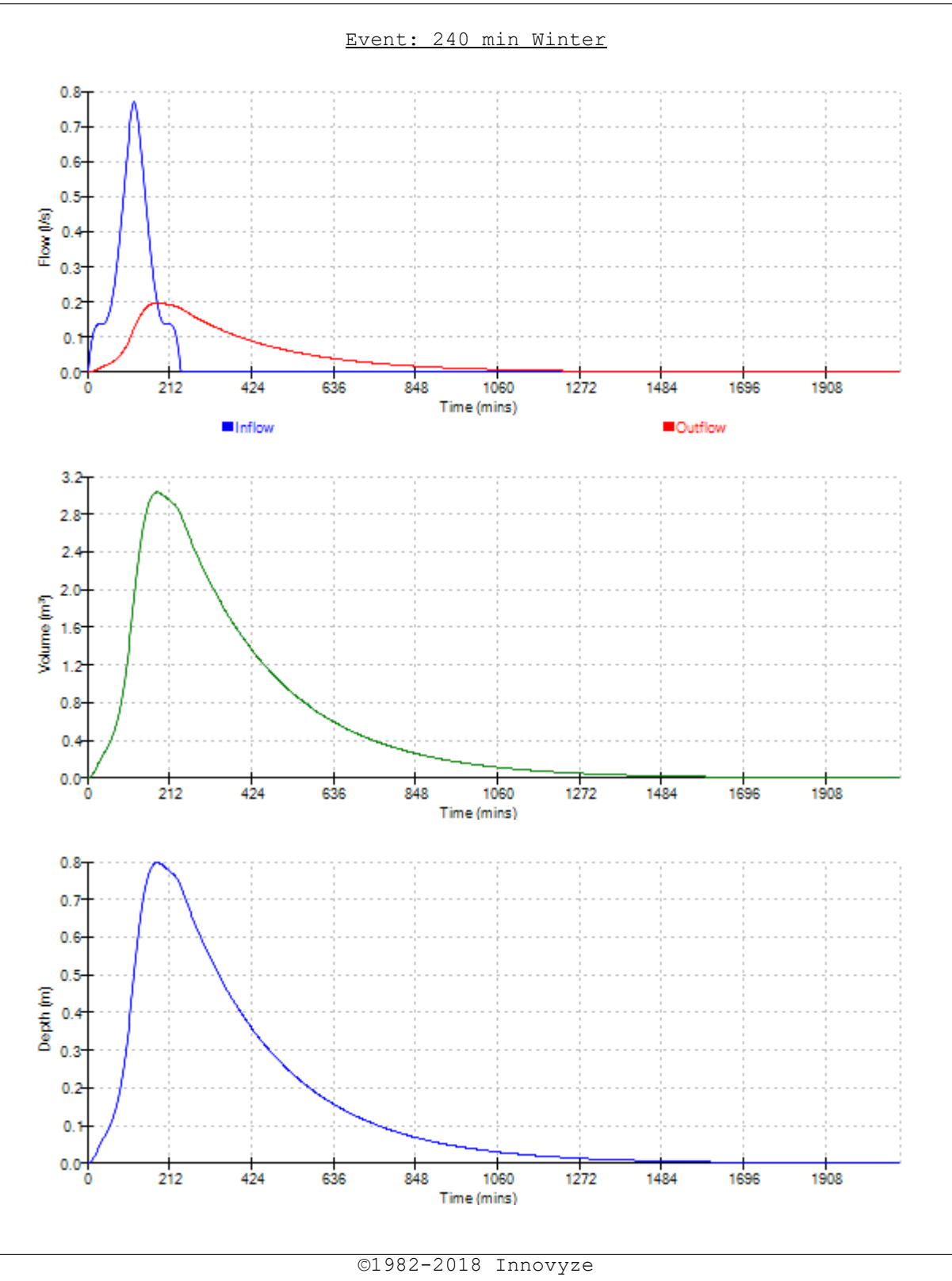
Waterco Ltd				Page 2	
Eden Court		w10685			
Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		TP12 House Soakaway			
Date 23/05/2018		Designed by HW			
File w10685-180523-TP12_Hous...		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.801	0.601	0.1	2.3	Flood Risk
60 min Winter	9.928	0.728	0.2	2.8	Flood Risk
120 min Winter	9.987	0.787	0.2	3.0	Flood Risk
180 min Winter	9.998	0.798	0.2	3.0	Flood Risk
240 min Winter	9.998	0.798	0.2	3.0	Flood Risk
360 min Winter	9.978	0.778	0.2	3.0	Flood Risk
480 min Winter	9.943	0.743	0.2	2.8	Flood Risk
600 min Winter	9.906	0.706	0.2	2.7	Flood Risk
720 min Winter	9.870	0.670	0.2	2.5	Flood Risk
960 min Winter	9.807	0.607	0.1	2.3	Flood Risk
1440 min Winter	9.706	0.506	0.1	1.9	Flood Risk
2160 min Winter	9.602	0.402	0.1	1.5	O K
2880 min Winter	9.534	0.334	0.1	1.3	O K
4320 min Winter	9.450	0.250	0.1	0.9	O K
5760 min Winter	9.401	0.201	0.0	0.8	O K
7200 min Winter	9.373	0.173	0.0	0.7	O K
8640 min Winter	9.354	0.154	0.0	0.6	O K
10080 min Winter	9.341	0.141	0.0	0.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	30		
60 min Winter	61.531	0.0	60		
120 min Winter	36.920	0.0	114		
180 min Winter	27.160	0.0	142		
240 min Winter	21.763	0.0	180		
360 min Winter	15.835	0.0	256		
480 min Winter	12.539	0.0	328		
600 min Winter	10.433	0.0	402		
720 min Winter	8.964	0.0	470		
960 min Winter	7.046	0.0	606		
1440 min Winter	4.991	0.0	866		
2160 min Winter	3.510	0.0	1256		
2880 min Winter	2.731	0.0	1640		
4320 min Winter	1.912	0.0	2376		
5760 min Winter	1.496	0.0	3112		
7200 min Winter	1.260	0.0	3816		
8640 min Winter	1.110	0.0	4576		
10080 min Winter	1.010	0.0	5248		
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>2.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.22244</td> <td>Trench Length (m)</td> <td>2.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.200</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	2.0	Infiltration Coefficient Side (m/hr)	0.22244	Trench Length (m)	2.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.200	Cap Infiltration Depth (m)	0.000
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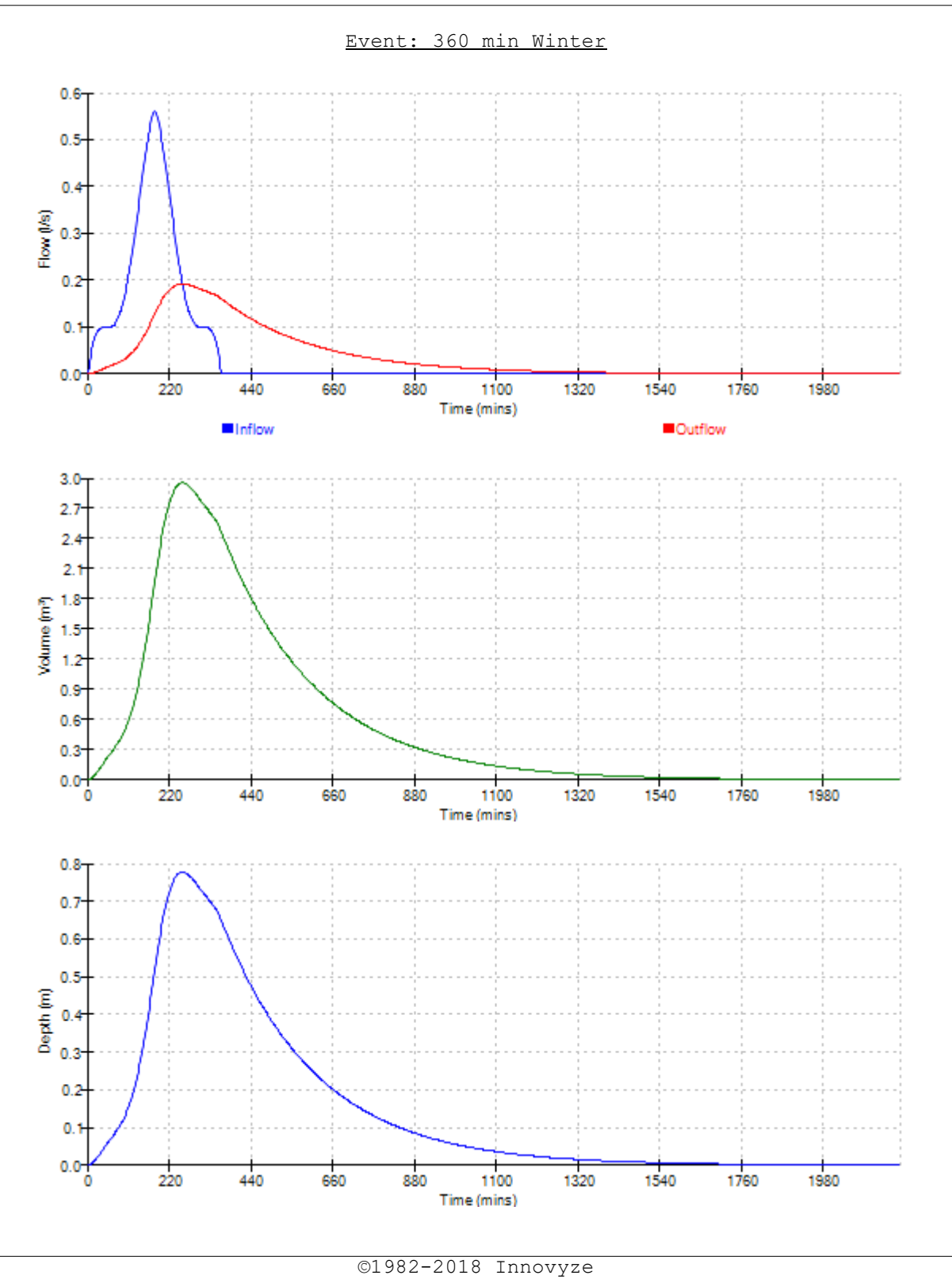
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685	
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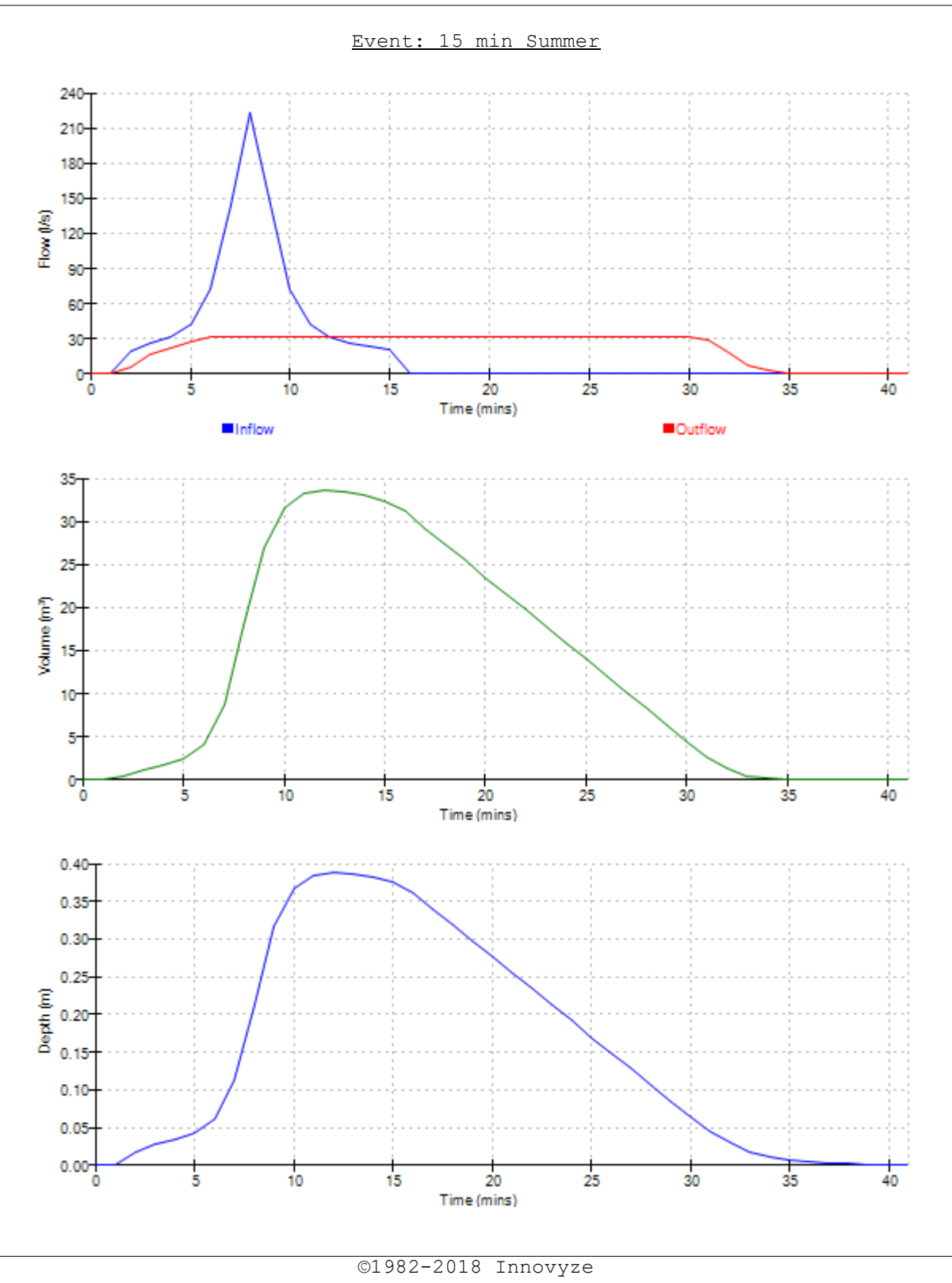
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Summer</td><td>12.539</td><td>0.0</td><td>244</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>304</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>356</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>478</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>710</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1068</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1440</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2200</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>2800</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3592</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4368</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>4992</td></tr><tr><td>15 min Winter</td><td>143.930</td><td>0.0</td><td>13</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max 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Eden Court		w10685 - CS1			
Lon Parcwr Business Park		Holt Road			
Denbighshire LL15 1NJ		Rossett			
Date 31/05/2018		Designed by HW			
File w10685-CS1.SRCX		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.977	0.477	31.8	41.6	Flood Risk
60 min Winter	9.908	0.408	31.8	35.4	Flood Risk
120 min Winter	9.693	0.193	31.8	16.0	O K
180 min Winter	9.560	0.060	31.8	4.1	O K
240 min Winter	9.542	0.042	26.8	2.5	O K
360 min Winter	9.531	0.031	19.9	1.4	O K
480 min Winter	9.527	0.027	15.7	1.1	O K
600 min Winter	9.525	0.025	13.0	0.9	O K
720 min Winter	9.523	0.023	11.4	0.8	O K
960 min Winter	9.521	0.021	9.1	0.6	O K
1440 min Winter	9.517	0.017	6.3	0.5	O K
2160 min Winter	9.515	0.015	4.6	0.3	O K
2880 min Winter	9.513	0.013	3.4	0.3	O K
4320 min Winter	9.511	0.011	2.4	0.2	O K
5760 min Winter	9.510	0.010	2.0	0.2	O K
7200 min Winter	9.509	0.009	1.6	0.1	O K
8640 min Winter	9.508	0.008	1.4	0.1	O K
10080 min Winter	9.508	0.008	1.4	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	23		
60 min Winter	61.531	0.0	42		
120 min Winter	36.920	0.0	74		
180 min Winter	27.160	0.0	98		
240 min Winter	21.763	0.0	124		
360 min Winter	15.835	0.0	182		
480 min Winter	12.539	0.0	246		
600 min Winter	10.433	0.0	294		
720 min Winter	8.964	0.0	356		
960 min Winter	7.046	0.0	482		
1440 min Winter	4.991	0.0	716		
2160 min Winter	3.510	0.0	1072		
2880 min Winter	2.731	0.0	1464		
4320 min Winter	1.912	0.0	2192		
5760 min Winter	1.496	0.0	2608		
7200 min Winter	1.260	0.0	3560		
8640 min Winter	1.110	0.0	4400		
10080 min Winter	1.010	0.0	4936		
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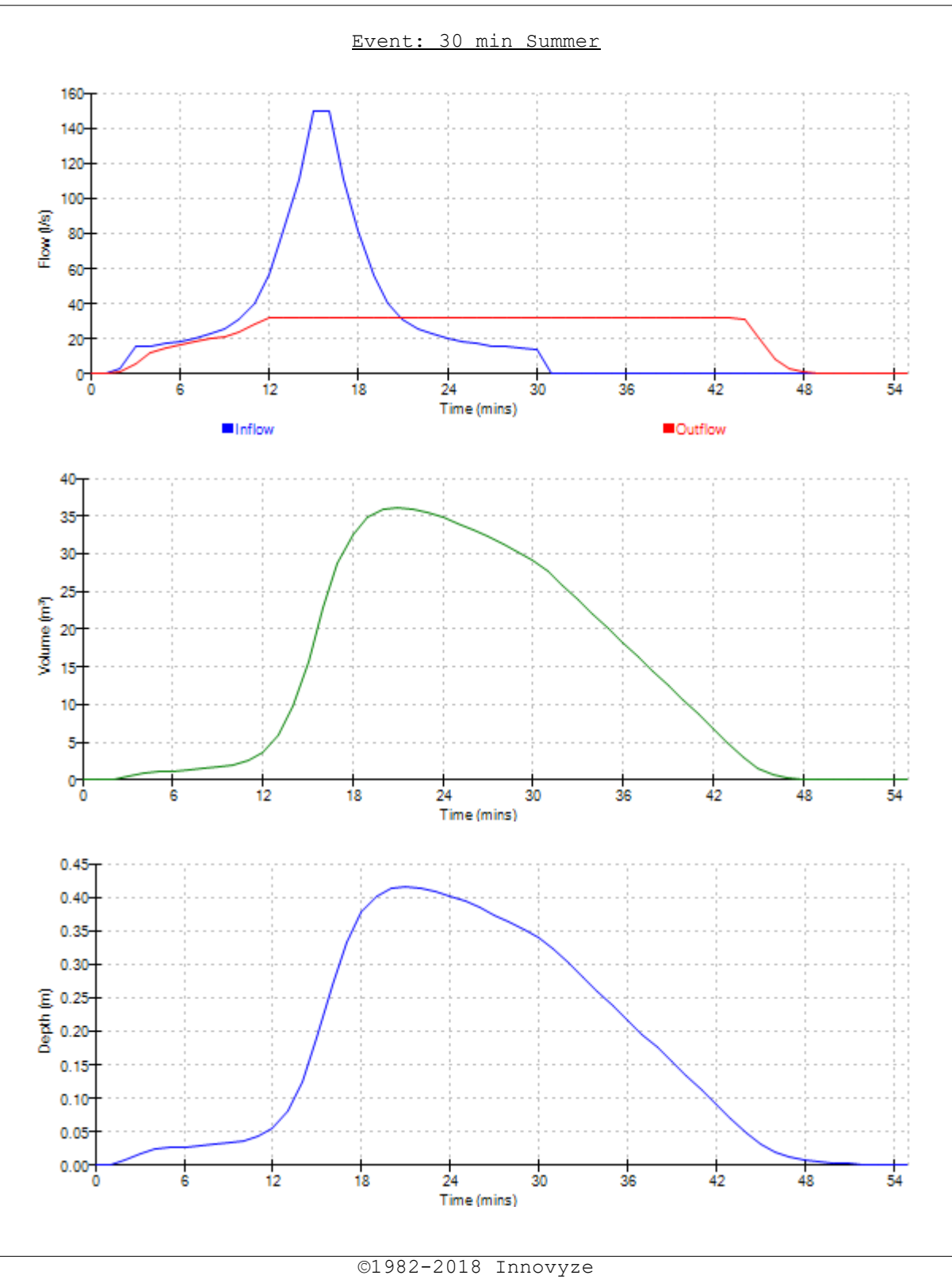
Waterco Ltd		Page 3																																	
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<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.76245</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>30.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>83.3</td> <td>Slope (1:X)</td> <td>1000.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.500</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.76245	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	30.0	Max Percolation (l/s)	83.3	Slope (1:X)	1000.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	9.500	Membrane Depth (m)	0
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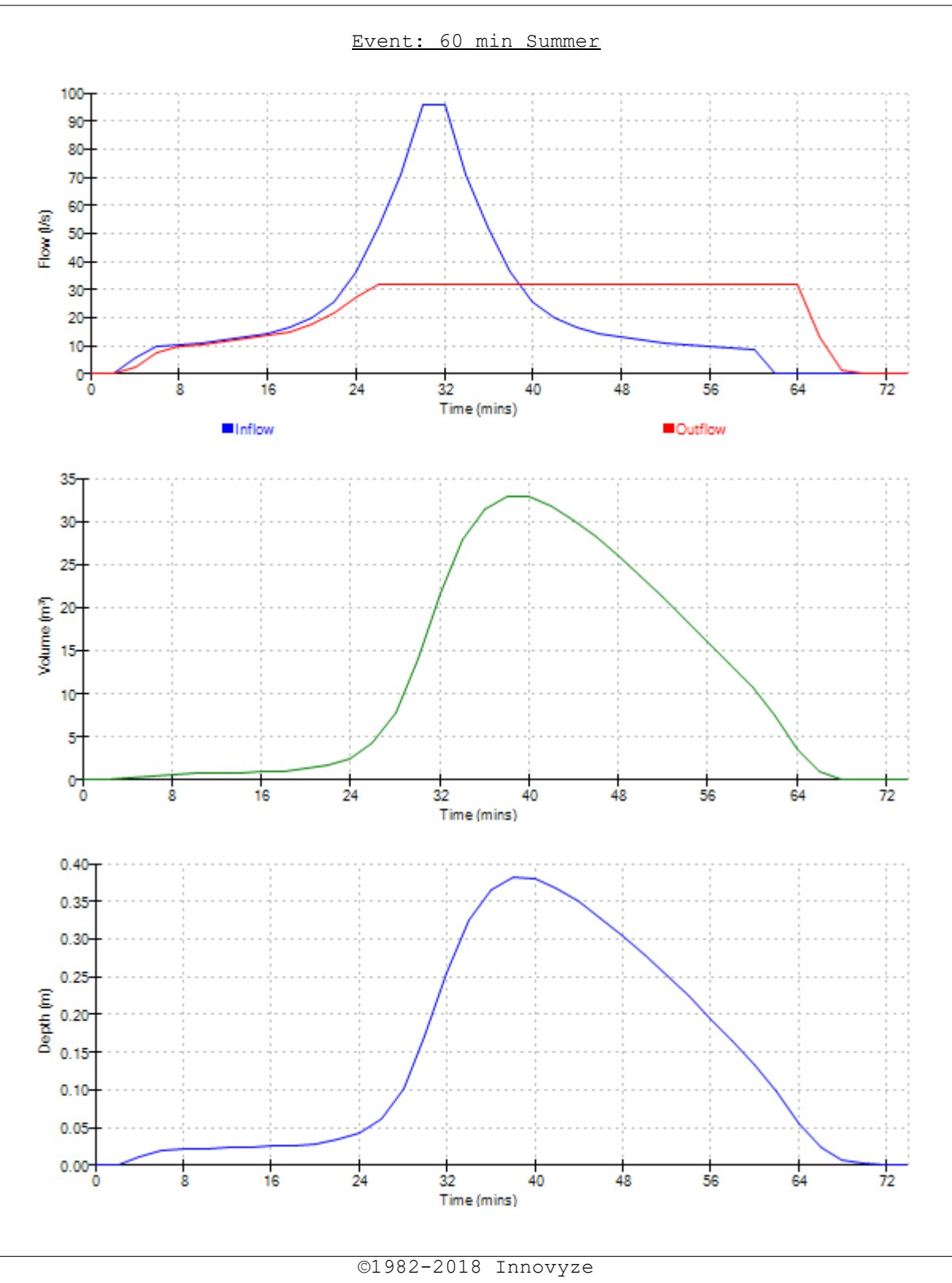
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS2 Holt Road Rossett	
Date 31/05/2018 File W10685-CS2.SRCX	Designed by HW Checked by AW	
XP Solutions	Source Control 2018.1	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 6 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.898	0.298	34.7	17.3	Flood Risk
30 min Summer	9.890	0.290	34.7	16.8	Flood Risk
60 min Summer	9.811	0.211	34.7	12.0	Flood Risk
120 min Summer	9.674	0.074	34.7	3.8	0 K
180 min Summer	9.644	0.044	30.4	2.0	0 K
240 min Summer	9.635	0.035	24.5	1.5	0 K
360 min Summer	9.626	0.026	17.9	1.0	0 K
480 min Summer	9.621	0.021	14.4	0.6	0 K
600 min Summer	9.619	0.019	12.2	0.5	0 K
720 min Summer	9.617	0.017	10.3	0.5	0 K
960 min Summer	9.615	0.015	8.1	0.4	0 K
1440 min Summer	9.613	0.013	6.1	0.3	0 K
2160 min Summer	9.611	0.011	4.4	0.2	0 K
2880 min Summer	9.610	0.010	3.3	0.2	0 K
4320 min Summer	9.608	0.008	2.4	0.1	0 K
5760 min Summer	9.607	0.007	1.8	0.1	0 K
7200 min Summer	9.607	0.007	1.8	0.1	0 K
8640 min Summer	9.607	0.007	1.6	0.1	0 K
10080 min Summer	9.606	0.006	1.4	0.1	0 K
15 min Winter	9.938	0.338	34.7	19.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	143.930	0.0	11
30 min Summer	96.151	0.0	19
60 min Summer	61.531	0.0	36
120 min Summer	36.920	0.0	64
180 min Summer	27.160	0.0	92
240 min Summer	21.763	0.0	122
360 min Summer	15.835	0.0	184
480 min Summer	12.539	0.0	244
600 min Summer	10.433	0.0	306
720 min Summer	8.964	0.0	362
960 min Summer	7.046	0.0	474
1440 min Summer	4.991	0.0	732
2160 min Summer	3.510	0.0	1084
2880 min Summer	2.731	0.0	1452
4320 min Summer	1.912	0.0	2128
5760 min Summer	1.496	0.0	2888
7200 min Summer	1.260	0.0	3592
8640 min Summer	1.110	0.0	4264
10080 min Summer	1.010	0.0	4984
15 min Winter	143.930	0.0	12

Waterco Ltd		Page 2
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS2 Holt Road Rossett	
Date 31/05/2018 File W10685-CS2.SRCX	Designed by HW Checked by AW	
XP Solutions		Source Control 2018.1

Summary of Results for 100 year Return Period (+30%)

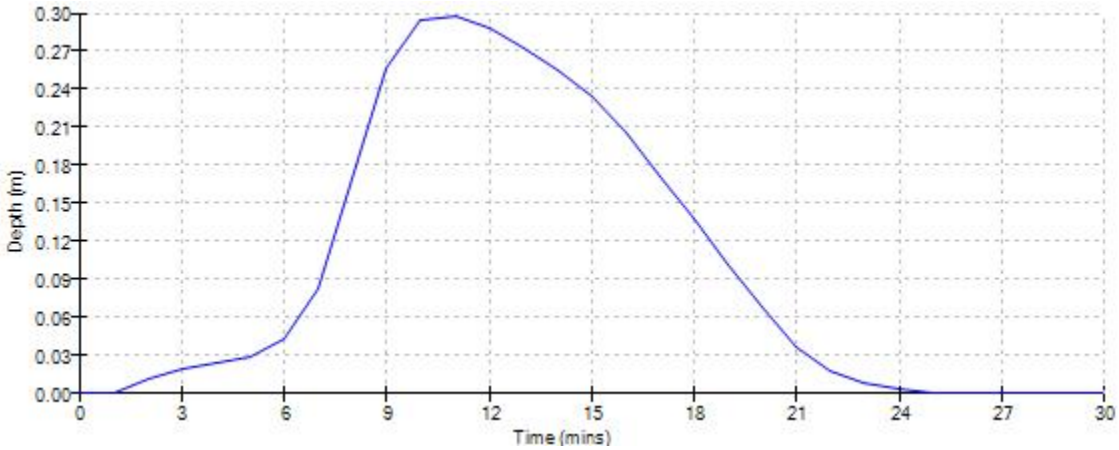
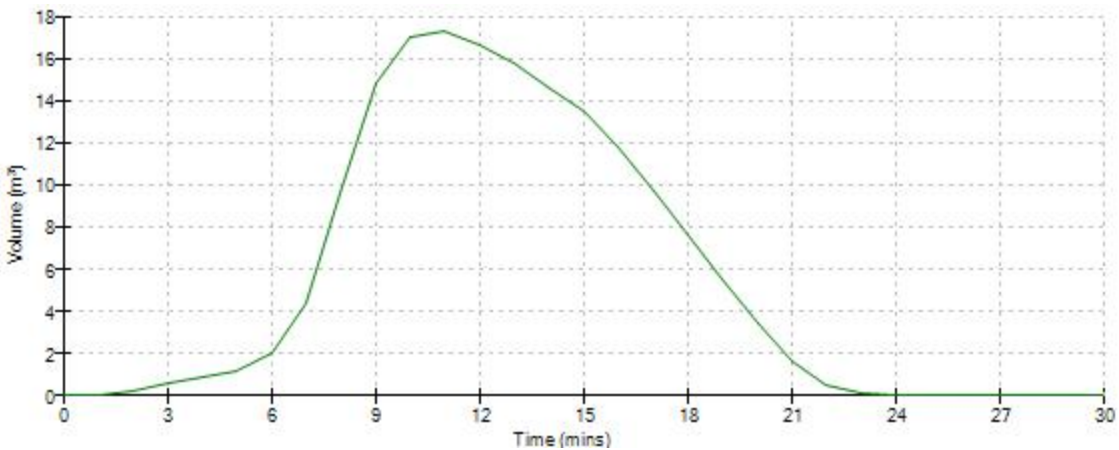
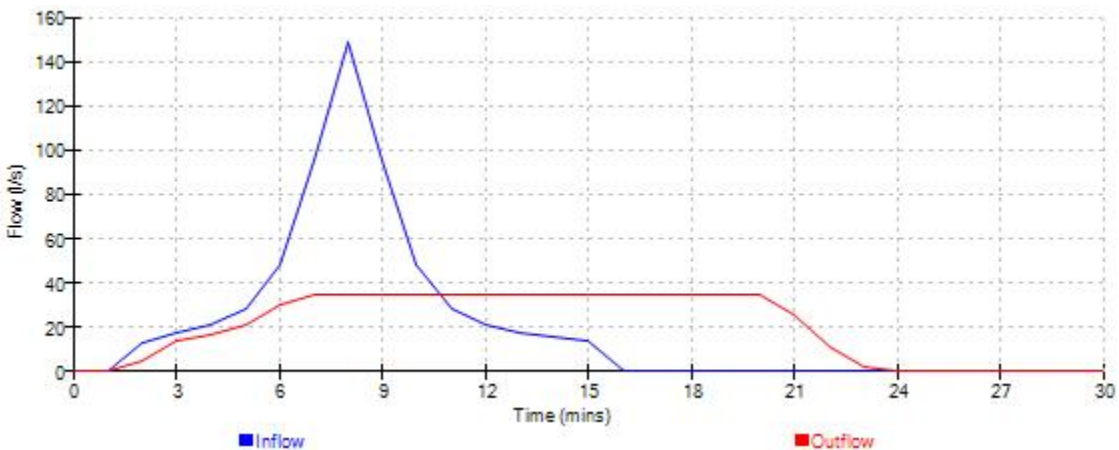
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.907	0.307	34.7	17.8	Flood Risk
60 min Winter	9.770	0.170	34.7	9.6	Flood Risk
120 min Winter	9.644	0.044	30.4	2.0	0 K
180 min Winter	9.632	0.032	22.4	1.3	0 K
240 min Winter	9.626	0.026	17.9	1.0	0 K
360 min Winter	9.620	0.020	13.6	0.6	0 K
480 min Winter	9.617	0.017	10.3	0.4	0 K
600 min Winter	9.616	0.016	8.6	0.4	0 K
720 min Winter	9.615	0.015	7.6	0.3	0 K
960 min Winter	9.613	0.013	6.1	0.3	0 K
1440 min Winter	9.611	0.011	4.4	0.2	0 K
2160 min Winter	9.609	0.009	3.0	0.1	0 K
2880 min Winter	9.608	0.008	2.4	0.1	0 K
4320 min Winter	9.607	0.007	1.8	0.1	0 K
5760 min Winter	9.607	0.007	1.6	0.1	0 K
7200 min Winter	9.606	0.006	1.4	0.1	0 K
8640 min Winter	9.606	0.006	1.1	0.1	0 K
10080 min Winter	9.605	0.005	1.0	0.1	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	96.151	0.0	21
60 min Winter	61.531	0.0	38
120 min Winter	36.920	0.0	62
180 min Winter	27.160	0.0	92
240 min Winter	21.763	0.0	122
360 min Winter	15.835	0.0	180
480 min Winter	12.539	0.0	234
600 min Winter	10.433	0.0	296
720 min Winter	8.964	0.0	360
960 min Winter	7.046	0.0	456
1440 min Winter	4.991	0.0	718
2160 min Winter	3.510	0.0	1076
2880 min Winter	2.731	0.0	1444
4320 min Winter	1.912	0.0	2076
5760 min Winter	1.496	0.0	2808
7200 min Winter	1.260	0.0	3752
8640 min Winter	1.110	0.0	4720
10080 min Winter	1.010	0.0	5080

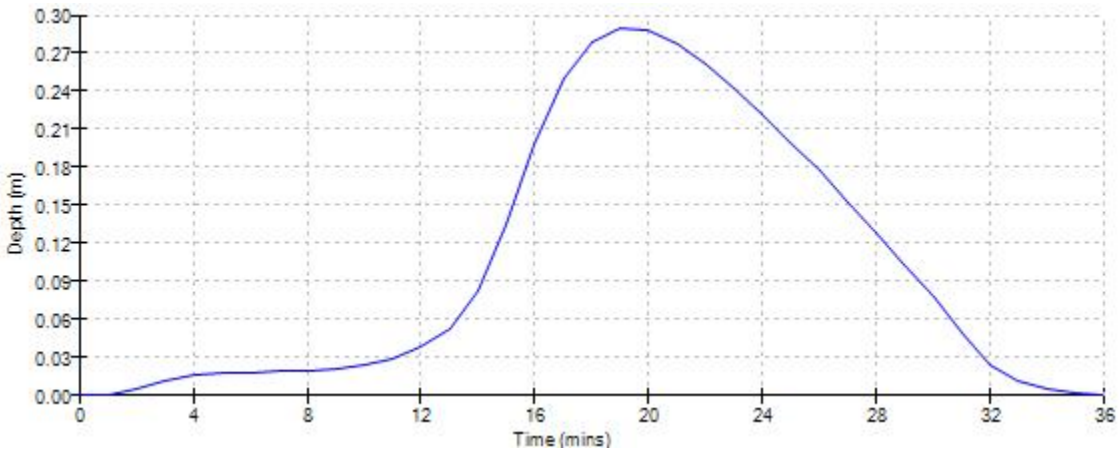
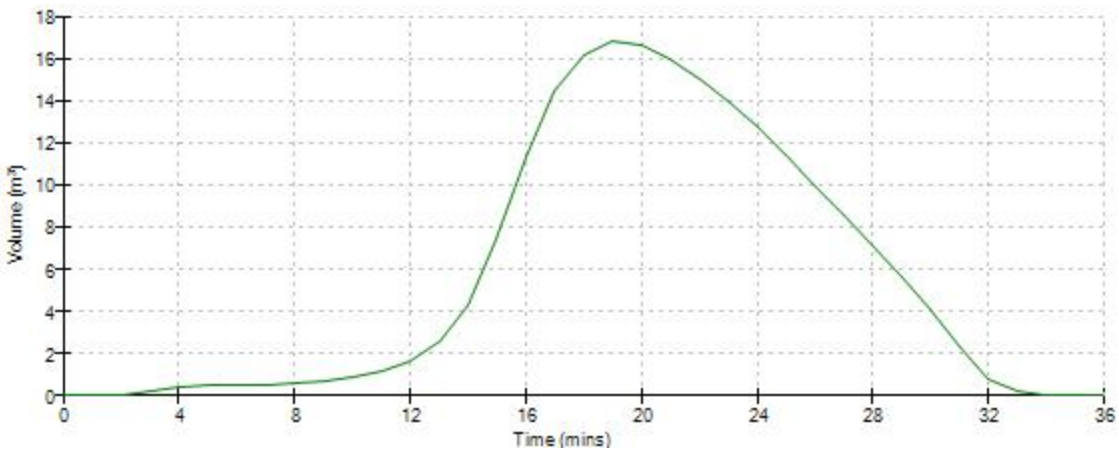
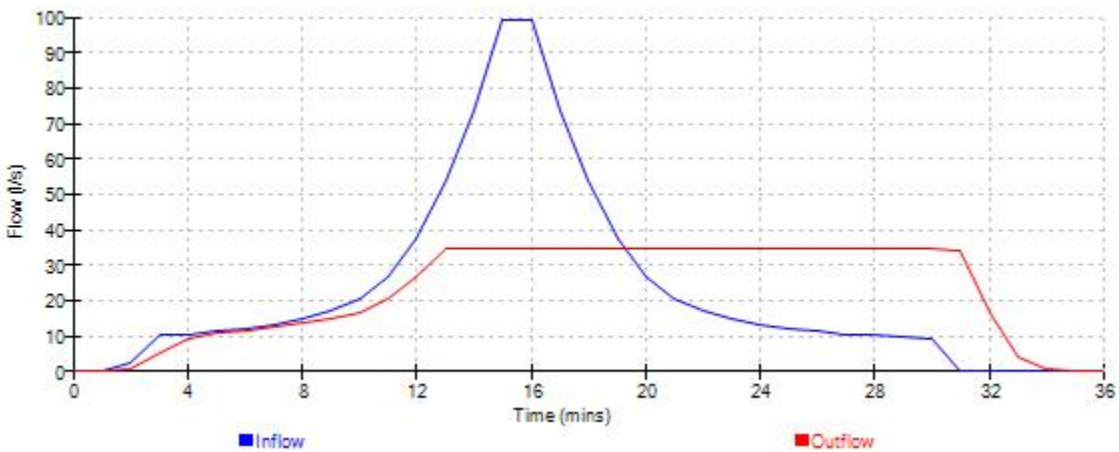
Waterco Ltd		Page 3																																	
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS2 Holt Road Rossett																																		
Date 31/05/2018 File W10685-CS2.SRCX	Designed by HW Checked by AW																																		
XP Solutions																																			
Source Control 2018.1																																			
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Site Location</td> <td>GB 337309 357277</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Data Type</td> <td>Point</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.140 <table> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> <tr> <td>0</td> <td>1</td> <td>0.140</td> </tr> </table>			Rainfall Model	FEH	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	FEH Rainfall Version	2013	Cv (Winter)	0.840	Site Location	GB 337309 357277	Shortest Storm (mins)	15	Data Type	Point	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)		Area	From:	To:	(ha)	0	1	0.140
Rainfall Model	FEH	Winter Storms	Yes																																
Return Period (years)	100	Cv (Summer)	0.750																																
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Summer Storms	Yes	Climate Change %	+30																																
Time (mins)		Area																																	
From:	To:	(ha)																																	
0	1	0.140																																	
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Waterco Ltd		Page 4																								
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS2 Holt Road Rossett																									
Date 31/05/2018 File W10685-CS2.SRCX	Designed by HW Checked by AW																									
XP Solutions																										
Source Control 2018.1																										
<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>1.25062</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>55.6</td> <td>Slope (1:X)</td> <td>1000.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.600</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	1.25062	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	20.0	Max Percolation (l/s)	55.6	Slope (1:X)	1000.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	9.600	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	1.25062	Width (m)	10.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	20.0																							
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Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	9.600	Membrane Depth (m)	0																							
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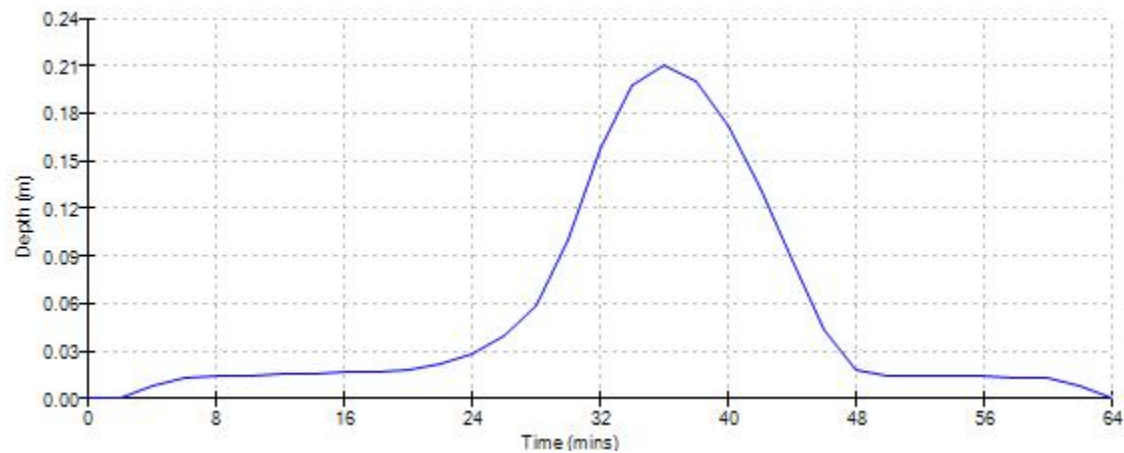
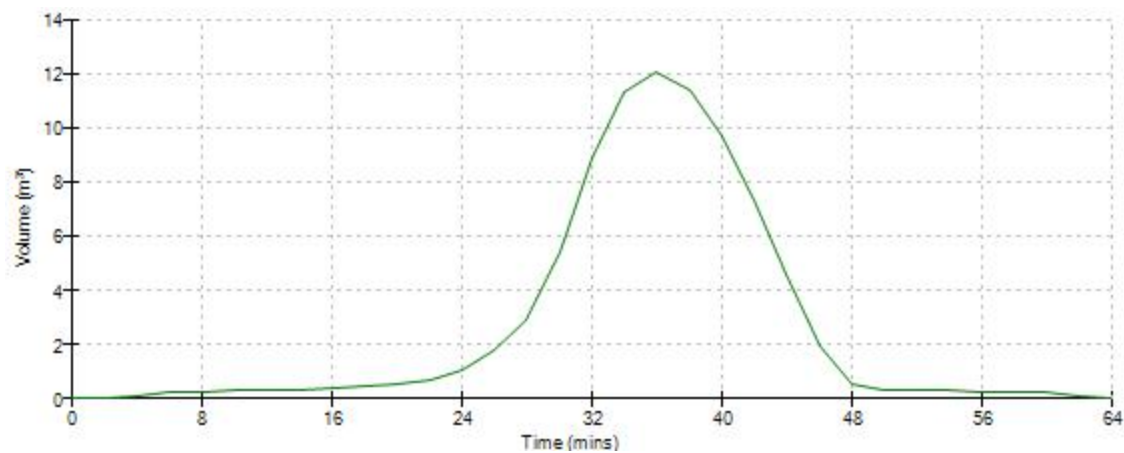
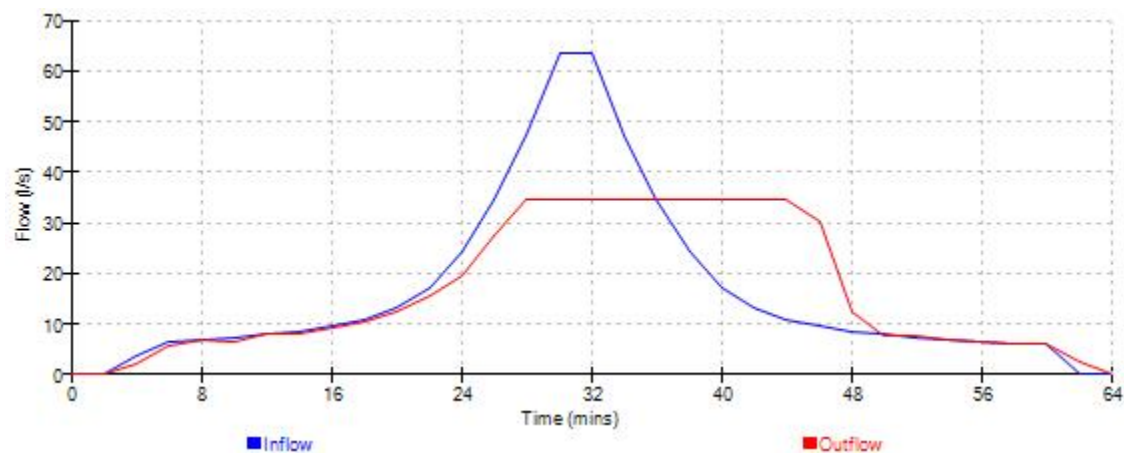
Event: 15 min Summer



Event: 30 min Summer

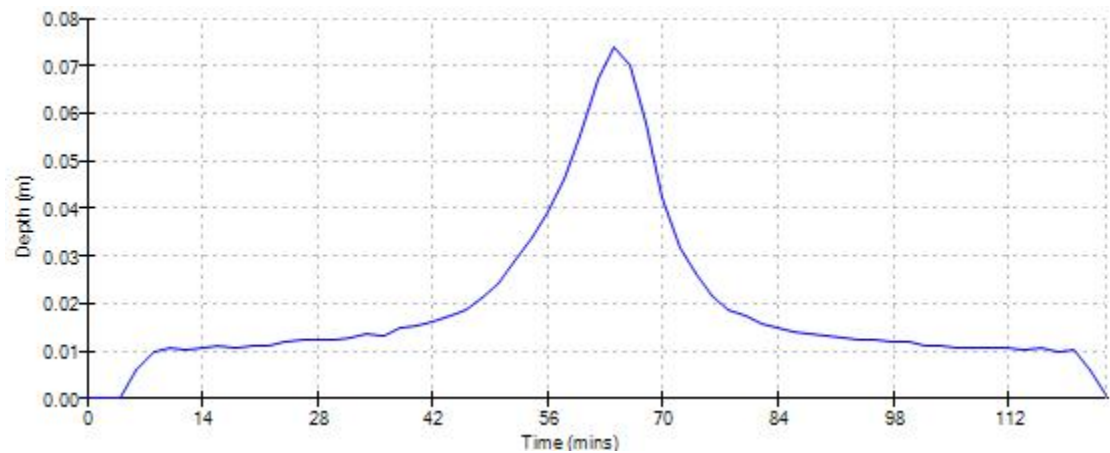
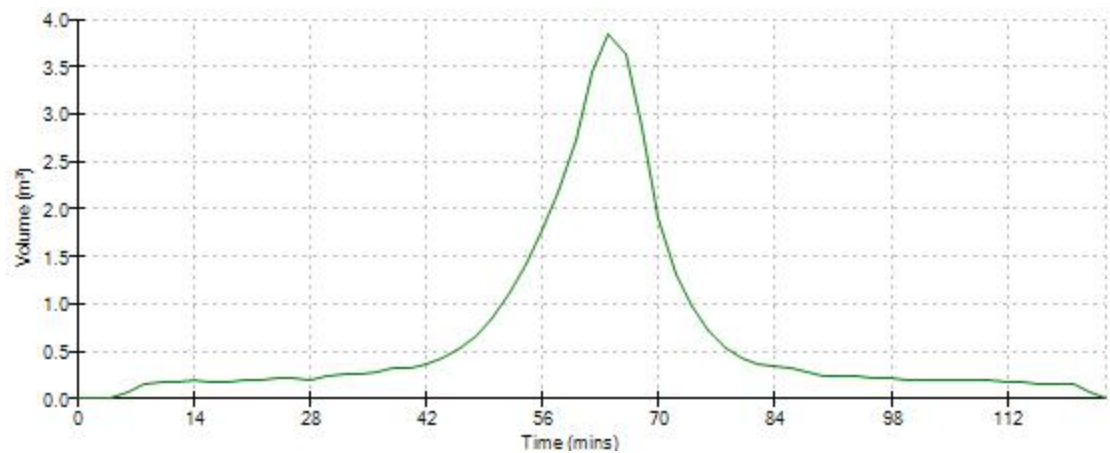
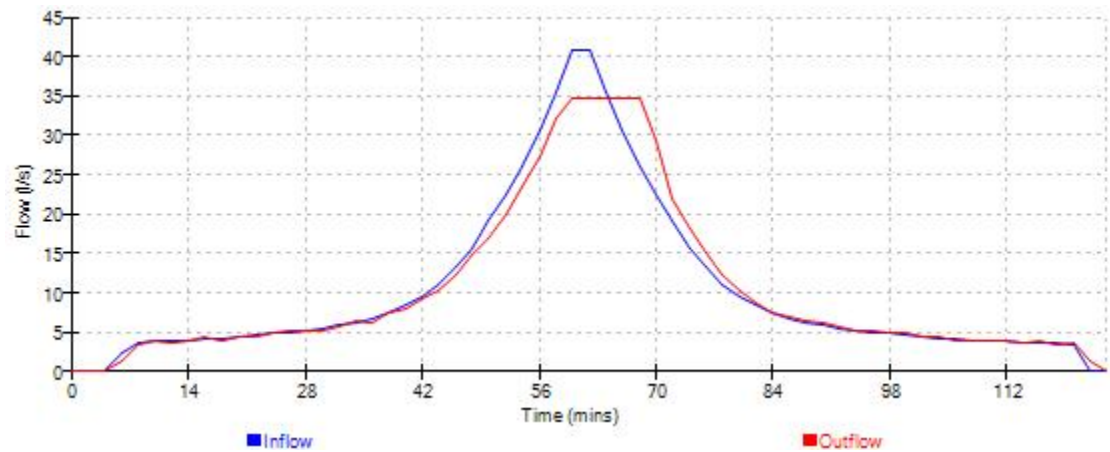


Event: 60 min Summer



Waterco Ltd		Page 8
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS2	
	Holt Road Rossett	
Date 31/05/2018	Designed by HW	
File W10685-CS2.SRCX	Checked by AW	
XP Solutions	Source Control 2018.1	

Event: 120 min Summer



Waterco Ltd		Page 1
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS3 Holt Road Rossett	
Date 31/05/2018 File W10685-CS3.SRCX	Designed by HW Checked by AW	
XP Solutions		Source Control 2018.1

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 35 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	9.798	0.298	7.7	21.4	Flood Risk
30 min Summer	9.849	0.349	7.7	25.2	Flood Risk
60 min Summer	9.867	0.367	7.7	26.6	Flood Risk
120 min Summer	9.827	0.327	7.7	23.6	Flood Risk
180 min Summer	9.780	0.280	7.7	20.1	Flood Risk
240 min Summer	9.734	0.234	7.7	16.6	Flood Risk
360 min Summer	9.654	0.154	7.7	10.6	0 K
480 min Summer	9.596	0.096	7.7	6.3	0 K
600 min Summer	9.561	0.061	7.7	3.6	0 K
720 min Summer	9.548	0.048	7.4	2.7	0 K
960 min Summer	9.538	0.038	5.9	1.9	0 K
1440 min Summer	9.527	0.027	4.2	1.1	0 K
2160 min Summer	9.522	0.022	3.1	0.7	0 K
2880 min Summer	9.520	0.020	2.4	0.6	0 K
4320 min Summer	9.516	0.016	1.6	0.4	0 K
5760 min Summer	9.515	0.015	1.3	0.3	0 K
7200 min Summer	9.513	0.013	1.1	0.3	0 K
8640 min Summer	9.513	0.013	1.0	0.2	0 K
10080 min Summer	9.512	0.012	0.9	0.2	0 K
15 min Winter	9.841	0.341	7.7	24.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	143.930	0.0	15
30 min Summer	96.151	0.0	27
60 min Summer	61.531	0.0	44
120 min Summer	36.920	0.0	78
180 min Summer	27.160	0.0	112
240 min Summer	21.763	0.0	144
360 min Summer	15.835	0.0	204
480 min Summer	12.539	0.0	260
600 min Summer	10.433	0.0	314
720 min Summer	8.964	0.0	368
960 min Summer	7.046	0.0	490
1440 min Summer	4.991	0.0	734
2160 min Summer	3.510	0.0	1096
2880 min Summer	2.731	0.0	1468
4320 min Summer	1.912	0.0	2192
5760 min Summer	1.496	0.0	2888
7200 min Summer	1.260	0.0	3560
8640 min Summer	1.110	0.0	4344
10080 min Summer	1.010	0.0	5024
15 min Winter	143.930	0.0	15

Waterco Ltd		Page 2
Eden Court	w10685 - CS3	
Lon Parcwr Business Park	Holt Road	
Denbighshire LL15 1NJ	Rossett	
Date 31/05/2018	Designed by HW	
File W10685-CS3.SRCX	Checked by AW	
XP Solutions	Source Control 2018.1	

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.907	0.407	7.7	29.6	Flood Risk
60 min Winter	9.926	0.426	7.7	31.0	Flood Risk
120 min Winter	9.864	0.364	7.7	26.3	Flood Risk
180 min Winter	9.789	0.289	7.7	20.7	Flood Risk
240 min Winter	9.718	0.218	7.7	15.4	Flood Risk
360 min Winter	9.603	0.103	7.7	6.8	0 K
480 min Winter	9.549	0.049	7.6	2.7	0 K
600 min Winter	9.541	0.041	6.4	2.1	0 K
720 min Winter	9.535	0.035	5.4	1.7	0 K
960 min Winter	9.528	0.028	4.3	1.2	0 K
1440 min Winter	9.522	0.022	3.1	0.7	0 K
2160 min Winter	9.519	0.019	2.2	0.5	0 K
2880 min Winter	9.517	0.017	1.7	0.4	0 K
4320 min Winter	9.514	0.014	1.2	0.3	0 K
5760 min Winter	9.512	0.012	0.9	0.2	0 K
7200 min Winter	9.511	0.011	0.8	0.2	0 K
8640 min Winter	9.511	0.011	0.7	0.2	0 K
10080 min Winter	9.510	0.010	0.6	0.2	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	96.151	0.0	29
60 min Winter	61.531	0.0	48
120 min Winter	36.920	0.0	86
180 min Winter	27.160	0.0	122
240 min Winter	21.763	0.0	154
360 min Winter	15.835	0.0	210
480 min Winter	12.539	0.0	246
600 min Winter	10.433	0.0	306
720 min Winter	8.964	0.0	368
960 min Winter	7.046	0.0	490
1440 min Winter	4.991	0.0	708
2160 min Winter	3.510	0.0	1084
2880 min Winter	2.731	0.0	1472
4320 min Winter	1.912	0.0	2196
5760 min Winter	1.496	0.0	2928
7200 min Winter	1.260	0.0	3536
8640 min Winter	1.110	0.0	4112
10080 min Winter	1.010	0.0	5264

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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS3 Holt Road Rossett	
Date 31/05/2018 File W10685-CS3.SRCX	Designed by HW Checked by AW	
XP Solutions Source Control 2018.1		

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 337309 357277	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

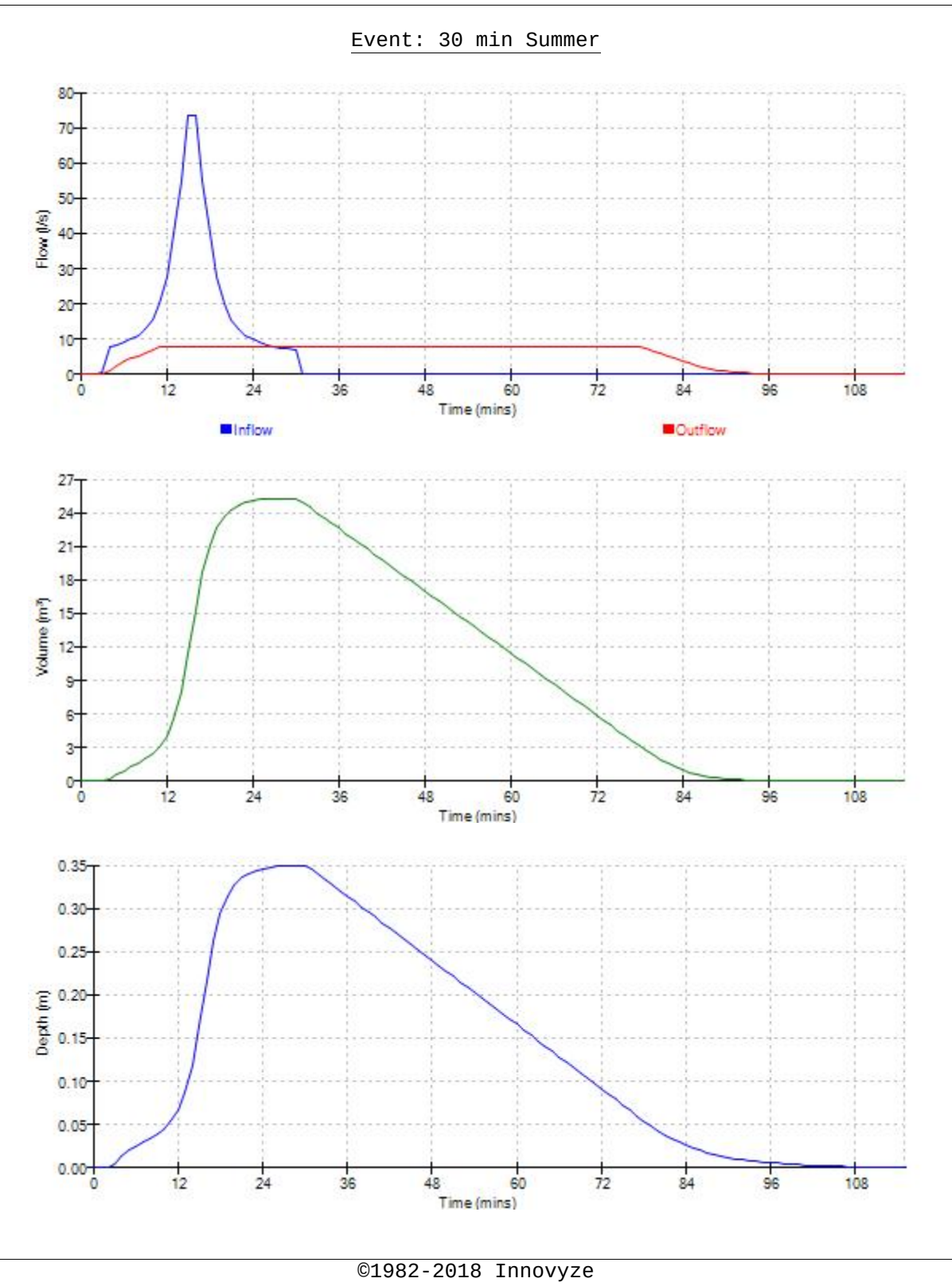
Total Area (ha) 0.104

Time (mins)		Area
From:	To:	(ha)
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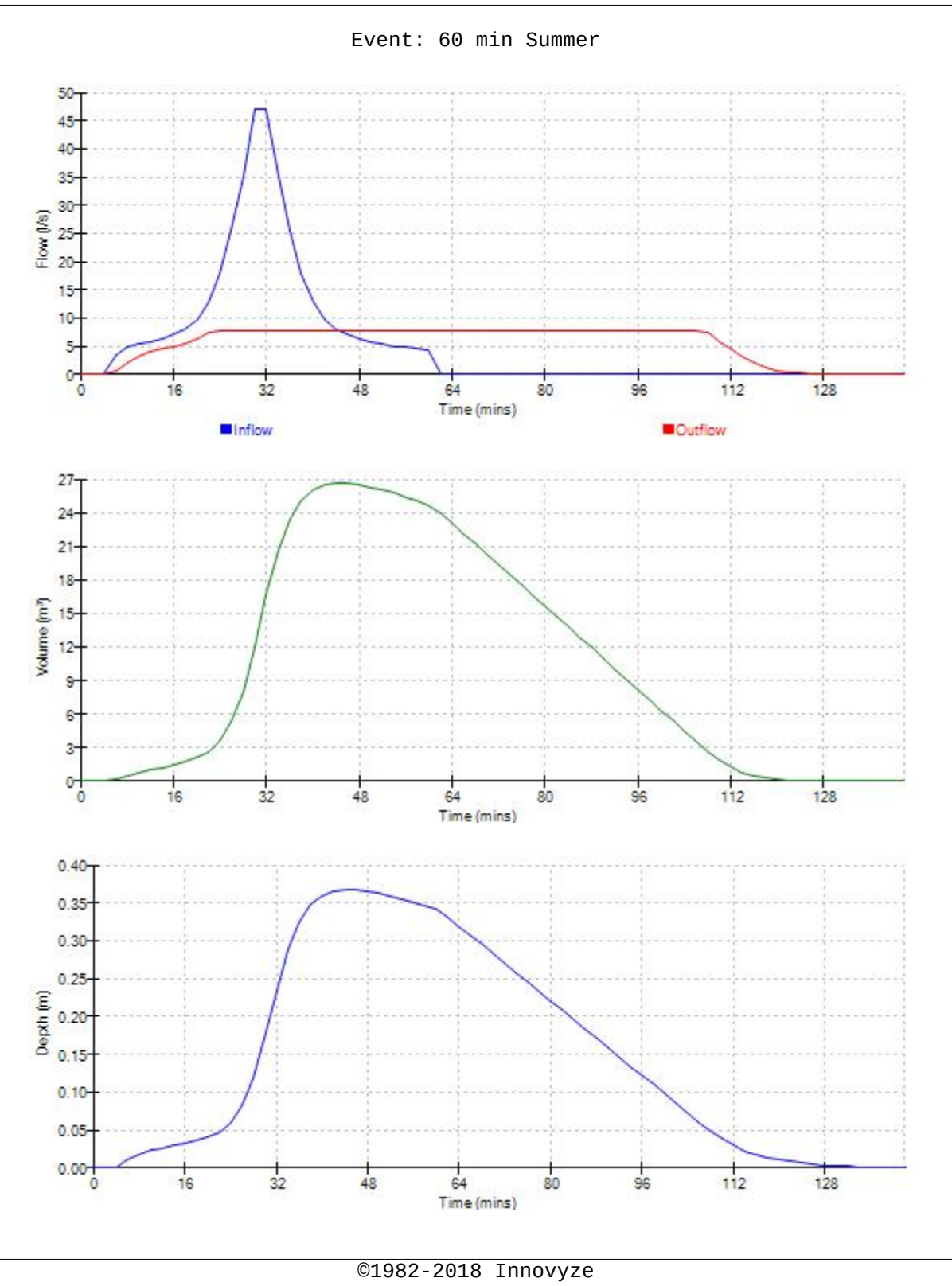
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS3 Holt Road Rossett																									
Date 31/05/2018 File W10685-CS3.SRCX	Designed by HW Checked by AW																									
XP Solutions	Source Control 2018.1																									
Model Details Storage is Online Cover Level (m) 10.000 Porous Car Park Structure <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.22244</td><td>Width (m)</td><td>10.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>25.0</td></tr><tr><td>Max Percolation (l/s)</td><td>69.4</td><td>Slope (1:X)</td><td>1000.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>9.500</td><td>Membrane Depth (m)</td><td>0</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.22244	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	25.0	Max Percolation (l/s)	69.4	Slope (1:X)	1000.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	9.500	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.22244	Width (m)	10.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	25.0																							
Max Percolation (l/s)	69.4	Slope (1:X)	1000.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	9.500	Membrane Depth (m)	0																							
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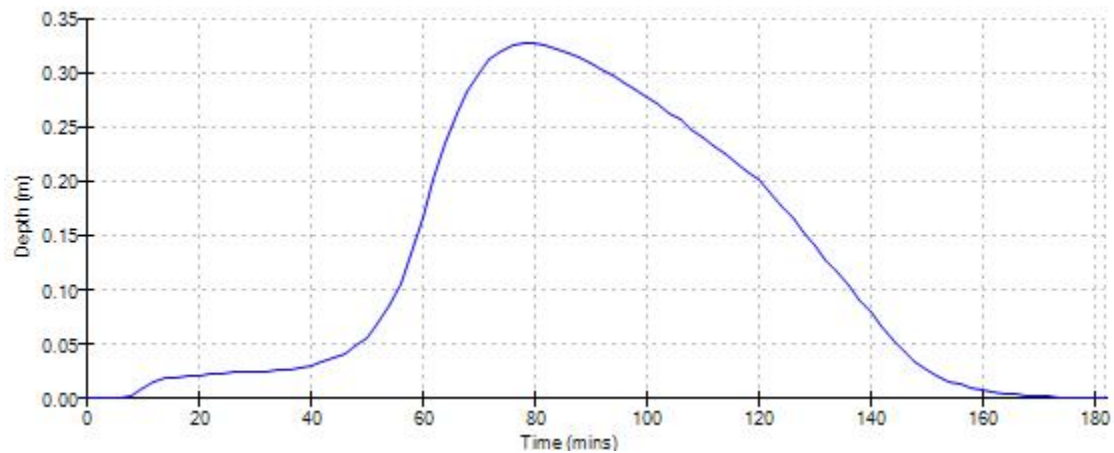
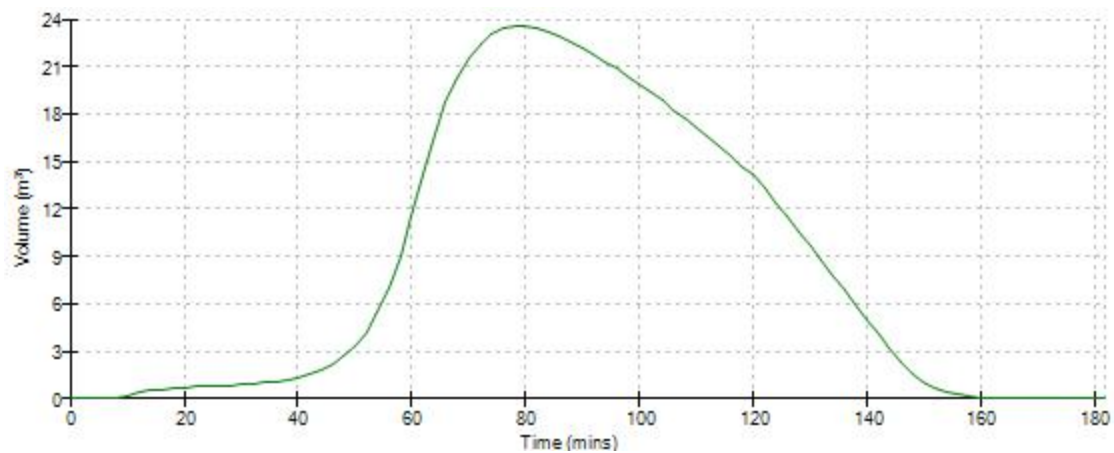
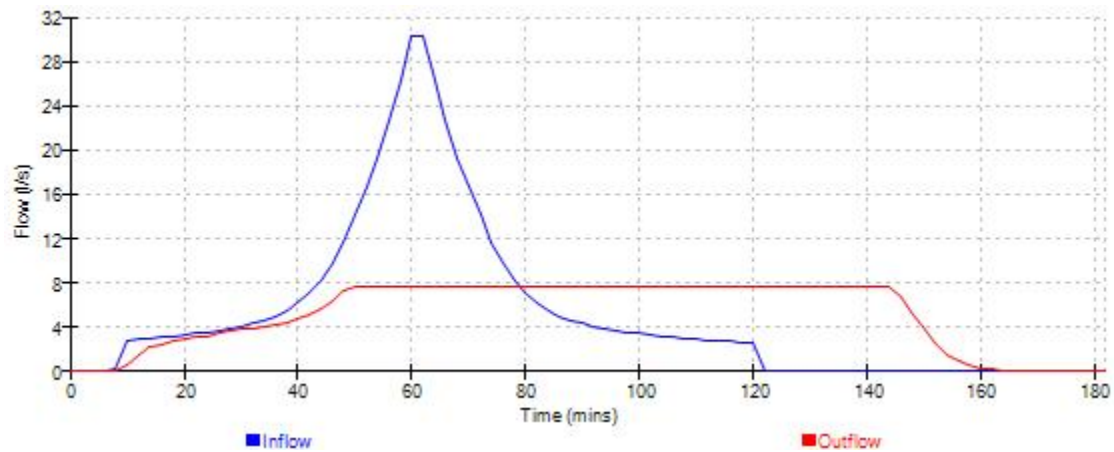
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS3	
	Holt Road Rossett	
Date 31/05/2018	Designed by HW	
File W10685-CS3.SRCX	Checked by AW	
XP Solutions	Source Control 2018.1	



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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS3	
	Holt Road Rossett	
Date 31/05/2018	Designed by HW	
File W10685-CS3.SRCX	Checked by AW	
XP Solutions	Source Control 2018.1	



Event: 120 min Summer



Waterco Ltd				Page 1																																																																																																																																																																																																																			
Eden Court		w10685 - CS4																																																																																																																																																																																																																					
Lon Parcwr Business Park		Holt Road																																																																																																																																																																																																																					
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Date 05/06/2018		Designed by HW																																																																																																																																																																																																																					
File W10685-CS4.SRCX		Checked by AW																																																																																																																																																																																																																					
XP Solutions		Source Control 2018.1																																																																																																																																																																																																																					
<u>Summary of Results for 100 year Return Period (+30%)</u> Half Drain Time : 374 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>9.639</td><td>0.239</td><td>1.9</td><td>63.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>9.710</td><td>0.310</td><td>2.5</td><td>84.2</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>9.783</td><td>0.383</td><td>3.1</td><td>104.8</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>9.834</td><td>0.434</td><td>3.5</td><td>119.4</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>9.854</td><td>0.454</td><td>3.7</td><td>125.1</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>9.861</td><td>0.461</td><td>3.8</td><td>127.0</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>9.866</td><td>0.466</td><td>3.8</td><td>128.5</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>9.864</td><td>0.464</td><td>3.8</td><td>128.1</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.860</td><td>0.460</td><td>3.8</td><td>126.8</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.854</td><td>0.454</td><td>3.7</td><td>125.1</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.840</td><td>0.440</td><td>3.6</td><td>121.1</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.809</td><td>0.409</td><td>3.3</td><td>112.3</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>9.766</td><td>0.366</td><td>3.0</td><td>100.0</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>9.731</td><td>0.331</td><td>2.7</td><td>90.1</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>9.679</td><td>0.279</td><td>2.2</td><td>75.3</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.645</td><td>0.245</td><td>1.9</td><td>65.5</td><td>O K</td></tr><tr><td>7200 min 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Summer</td><td>15.835</td><td>0.0</td><td>282</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>344</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>410</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>482</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>616</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>892</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1296</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1672</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2424</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3176</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>3896</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>4664</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5352</td></tr><tr><td>15 min 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Summer	9.598	0.198	1.5	52.1	O K	15 min Winter	9.666	0.266	2.1	71.5	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	143.930	0.0	16	30 min Summer	96.151	0.0	31	60 min Summer	61.531	0.0	62	120 min Summer	36.920	0.0	120	180 min Summer	27.160	0.0	180	240 min Summer	21.763	0.0	228	360 min Summer	15.835	0.0	282	480 min Summer	12.539	0.0	344	600 min Summer	10.433	0.0	410	720 min Summer	8.964	0.0	482	960 min Summer	7.046	0.0	616	1440 min Summer	4.991	0.0	892	2160 min Summer	3.510	0.0	1296	2880 min Summer	2.731	0.0	1672	4320 min Summer	1.912	0.0	2424	5760 min Summer	1.496	0.0	3176	7200 min Summer	1.260	0.0	3896	8640 min Summer	1.110	0.0	4664	10080 min Summer	1.010	0.0	5352	15 min Winter	143.930	0.0	16
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Eden Court		w10685 - CS4			
Lon Parcwr Business Park		Holt Road			
Denbighshire LL15 1NJ		Rossett			
Date 05/06/2018		Designed by HW			
File W10685-CS4.SRCX		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.746	0.346	2.8	94.3	Flood Risk
60 min Winter	9.827	0.427	3.5	117.5	Flood Risk
120 min Winter	9.886	0.486	4.0	134.2	Flood Risk
180 min Winter	9.909	0.509	4.2	140.9	Flood Risk
240 min Winter	9.919	0.519	4.3	143.5	Flood Risk
360 min Winter	9.920	0.520	4.3	144.0	Flood Risk
480 min Winter	9.916	0.516	4.2	142.9	Flood Risk
600 min Winter	9.908	0.508	4.2	140.5	Flood Risk
720 min Winter	9.898	0.498	4.1	137.6	Flood Risk
960 min Winter	9.875	0.475	3.9	131.2	Flood Risk
1440 min Winter	9.830	0.430	3.5	118.3	Flood Risk
2160 min Winter	9.772	0.372	3.0	101.8	Flood Risk
2880 min Winter	9.728	0.328	2.6	89.1	Flood Risk
4320 min Winter	9.665	0.265	2.1	71.1	O K
5760 min Winter	9.625	0.225	1.8	59.7	O K
7200 min Winter	9.599	0.199	1.6	52.5	O K
8640 min Winter	9.582	0.182	1.4	47.6	O K
10080 min Winter	9.570	0.170	1.3	44.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	31		
60 min Winter	61.531	0.0	60		
120 min Winter	36.920	0.0	118		
180 min Winter	27.160	0.0	174		
240 min Winter	21.763	0.0	228		
360 min Winter	15.835	0.0	288		
480 min Winter	12.539	0.0	364		
600 min Winter	10.433	0.0	440		
720 min Winter	8.964	0.0	514		
960 min Winter	7.046	0.0	664		
1440 min Winter	4.991	0.0	950		
2160 min Winter	3.510	0.0	1364		
2880 min Winter	2.731	0.0	1760		
4320 min Winter	1.912	0.0	2512		
5760 min Winter	1.496	0.0	3288		
7200 min Winter	1.260	0.0	4032		
8640 min Winter	1.110	0.0	4760		
10080 min Winter	1.010	0.0	5456		
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Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	w10685 - CS4 Holt Road Rossett	
Date 05/06/2018 File W10685-CS4.SRCX	Designed by HW Checked by AW	
XP Solutions Source Control 2018.1		

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 337309 357277	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

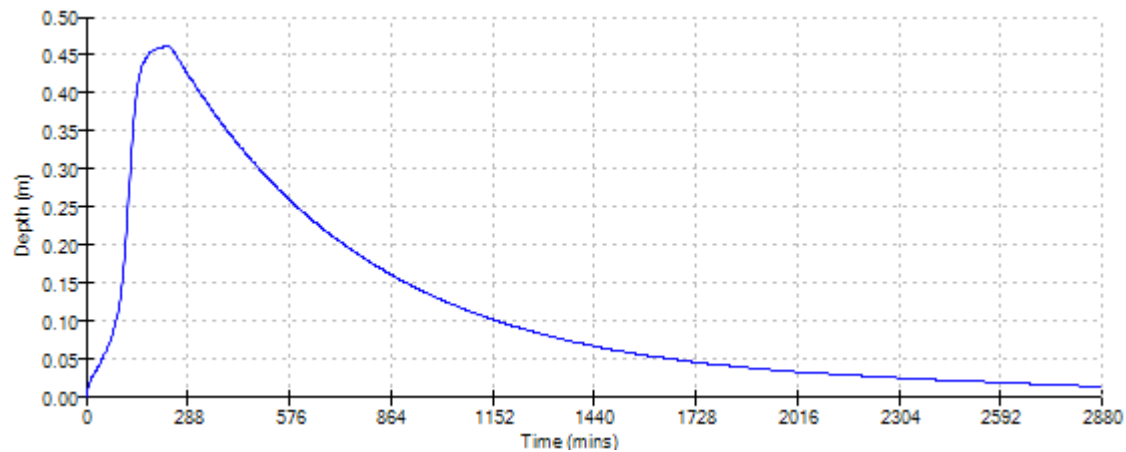
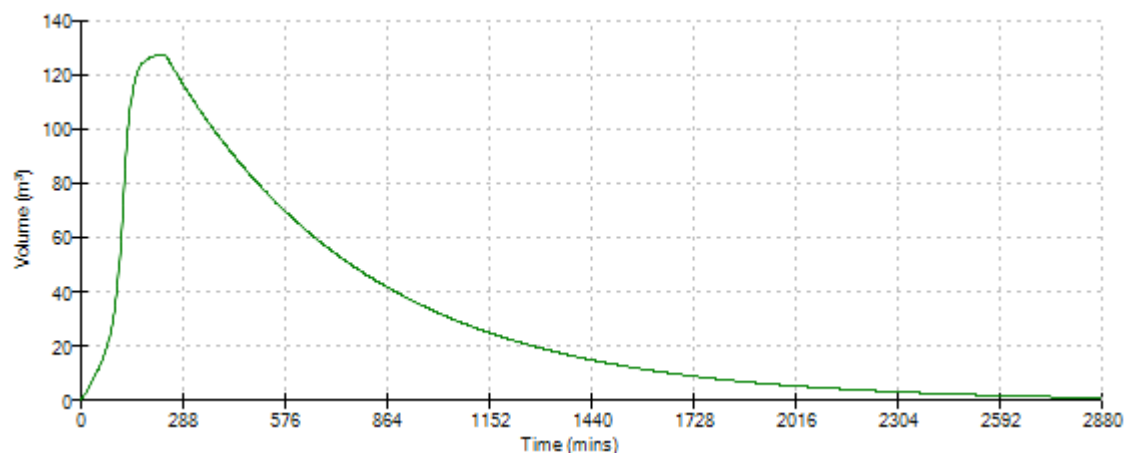
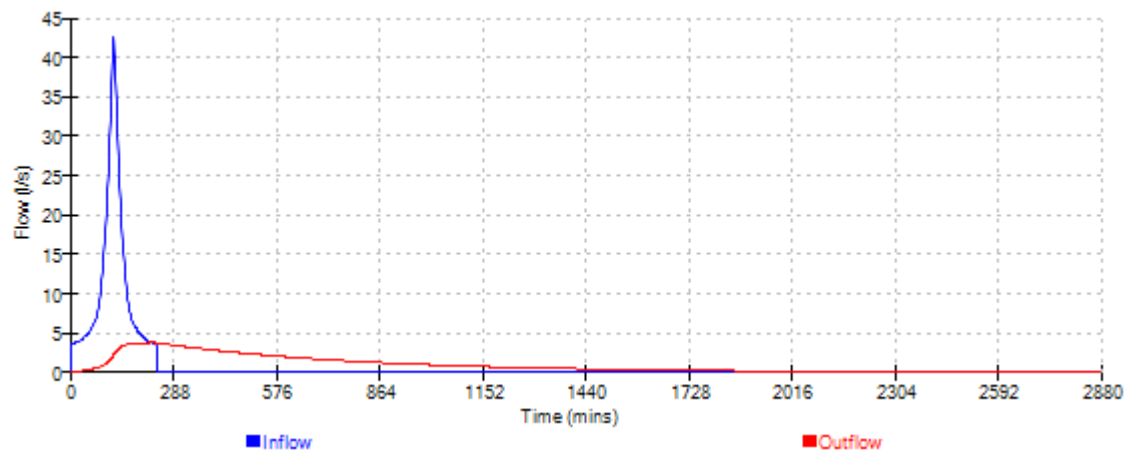
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Time (mins)	Area
From:	To: (ha)
0	1 0.240

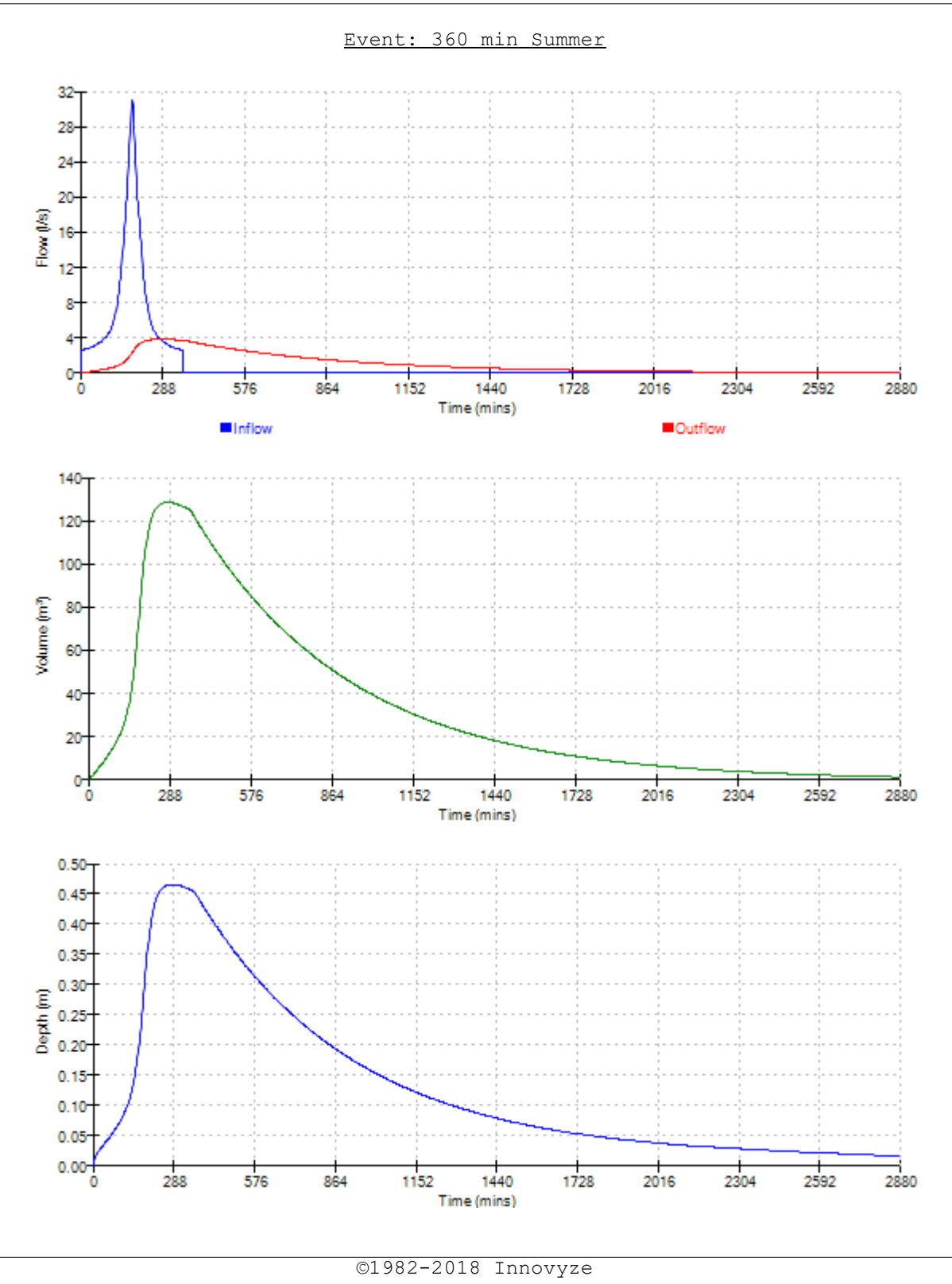
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XP Solutions																						
Source Control 2018.1																						
<u>Model Details</u> Storage is Online Cover Level (m) 10.000 <u>Trench Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Trench Width (m)</td> <td>10.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.76245</td> <td>Trench Length (m)</td> <td>30.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>1000.0</td> </tr> <tr> <td>Porosity</td> <td>0.95</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>9.400</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	10.0	Infiltration Coefficient Side (m/hr)	0.76245	Trench Length (m)	30.0	Safety Factor	2.0	Slope (1:X)	1000.0	Porosity	0.95	Cap Volume Depth (m)	0.000	Invert Level (m)	9.400	Cap Infiltration Depth (m)	0.000
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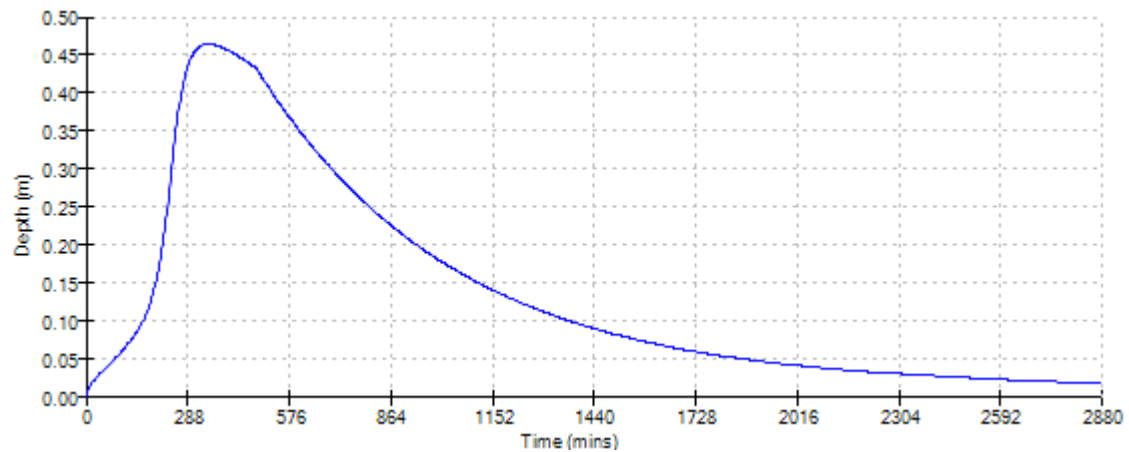
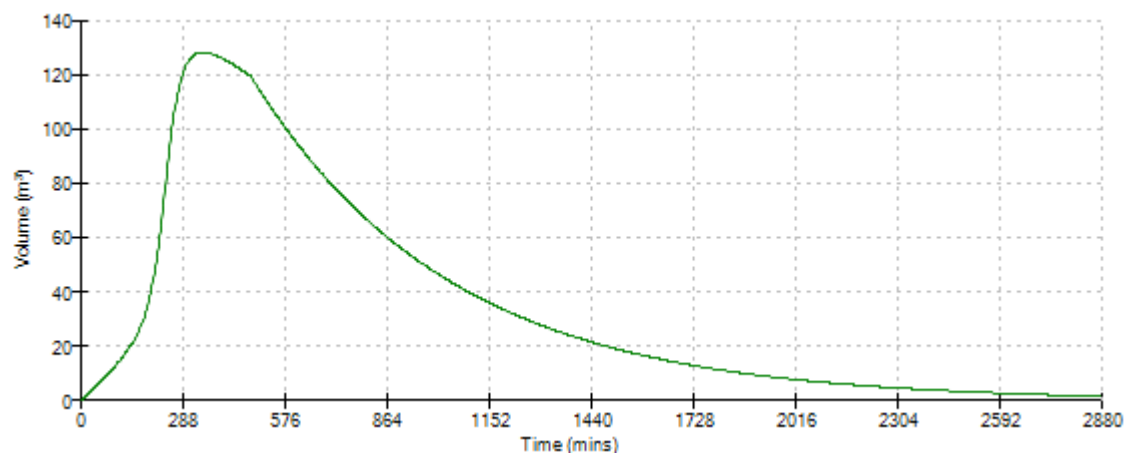
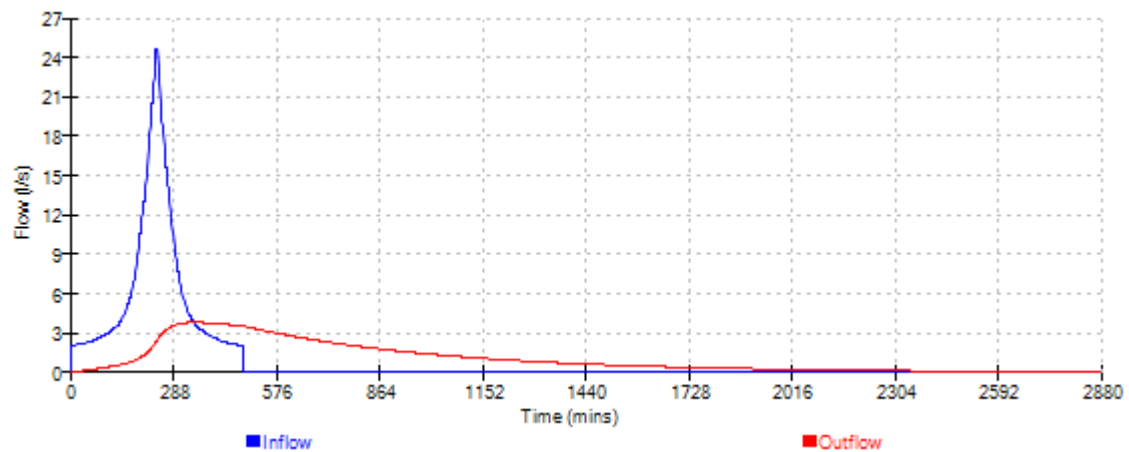
Event: 240 min Summer



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Eden Court	w10685 - CS4	
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Denbighshire LL15 1NJ	Rossett	
Date 05/06/2018	Designed by HW	
File W10685-CS4.SRCX	Checked by AW	
XP Solutions	Source Control 2018.1	



Event: 480 min Summer



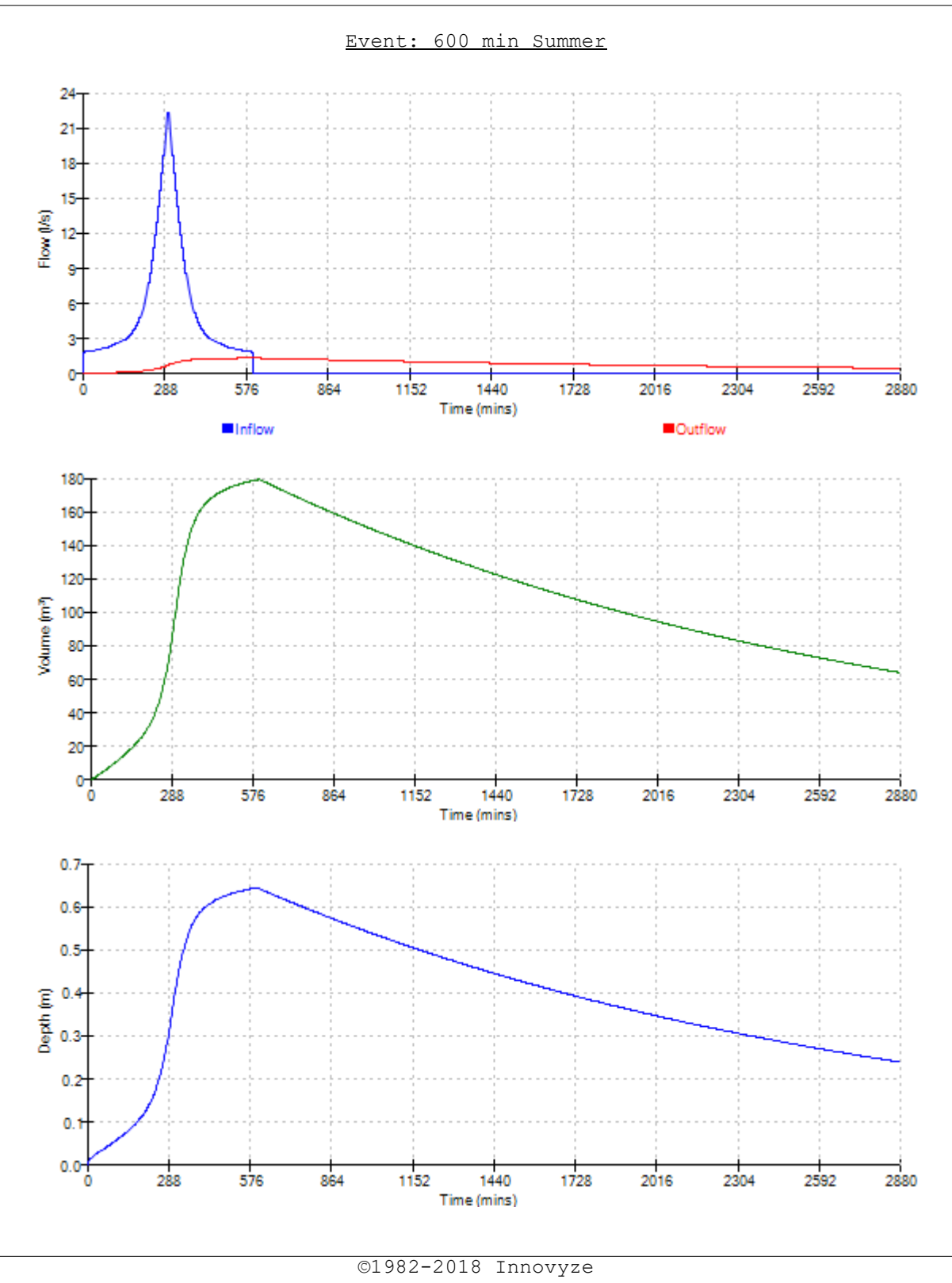
Waterco Ltd			Page 1																																																																																																																																																																																																																			
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Summer</td><td>9.836</td><td>0.636</td><td>1.3</td><td>176.9</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>9.844</td><td>0.644</td><td>1.4</td><td>179.2</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>9.846</td><td>0.646</td><td>1.4</td><td>179.9</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>9.843</td><td>0.643</td><td>1.3</td><td>179.1</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>9.834</td><td>0.634</td><td>1.3</td><td>176.3</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>9.816</td><td>0.616</td><td>1.3</td><td>171.2</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>9.797</td><td>0.597</td><td>1.2</td><td>165.8</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>9.759</td><td>0.559</td><td>1.2</td><td>155.0</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>9.728</td><td>0.528</td><td>1.1</td><td>146.1</td><td>Flood Risk</td></tr><tr><td>7200 min 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Summer</td><td>15.835</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>12.539</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>10.433</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>8.964</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>7.046</td><td>0.0</td><td>896</td></tr><tr><td>1440 min Summer</td><td>4.991</td><td>0.0</td><td>1124</td></tr><tr><td>2160 min Summer</td><td>3.510</td><td>0.0</td><td>1512</td></tr><tr><td>2880 min Summer</td><td>2.731</td><td>0.0</td><td>1928</td></tr><tr><td>4320 min Summer</td><td>1.912</td><td>0.0</td><td>2728</td></tr><tr><td>5760 min Summer</td><td>1.496</td><td>0.0</td><td>3568</td></tr><tr><td>7200 min Summer</td><td>1.260</td><td>0.0</td><td>4328</td></tr><tr><td>8640 min Summer</td><td>1.110</td><td>0.0</td><td>5112</td></tr><tr><td>10080 min Summer</td><td>1.010</td><td>0.0</td><td>5944</td></tr><tr><td>15 min 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Lon Parcwr Business Park		Holt Road, Rossett			
Denbighshire LL15 1NJ		1 in 100 plus 30% CC			
Date 05/06/2018		Designed by HW			
File W10685-CS5.SRCX		Checked by AW			
XP Solutions		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	9.584	0.384	0.8	105.1	O K
60 min Winter	9.684	0.484	1.0	133.5	O K
120 min Winter	9.770	0.570	1.2	158.1	Flood Risk
180 min Winter	9.819	0.619	1.3	172.2	Flood Risk
240 min Winter	9.852	0.652	1.4	181.6	Flood Risk
360 min Winter	9.893	0.693	1.5	193.1	Flood Risk
480 min Winter	9.912	0.712	1.5	198.7	Flood Risk
600 min Winter	9.922	0.722	1.5	201.5	Flood Risk
720 min Winter	9.926	0.726	1.5	202.7	Flood Risk
960 min Winter	9.925	0.725	1.5	202.4	Flood Risk
1440 min Winter	9.909	0.709	1.5	197.7	Flood Risk
2160 min Winter	9.883	0.683	1.4	190.3	Flood Risk
2880 min Winter	9.855	0.655	1.4	182.3	Flood Risk
4320 min Winter	9.799	0.599	1.3	166.5	Flood Risk
5760 min Winter	9.755	0.555	1.2	153.8	Flood Risk
7200 min Winter	9.725	0.525	1.1	145.5	Flood Risk
8640 min Winter	9.705	0.505	1.1	139.5	Flood Risk
10080 min Winter	9.690	0.490	1.0	135.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	96.151	0.0	31		
60 min Winter	61.531	0.0	62		
120 min Winter	36.920	0.0	120		
180 min Winter	27.160	0.0	180		
240 min Winter	21.763	0.0	238		
360 min Winter	15.835	0.0	354		
480 min Winter	12.539	0.0	470		
600 min Winter	10.433	0.0	584		
720 min Winter	8.964	0.0	694		
960 min Winter	7.046	0.0	912		
1440 min Winter	4.991	0.0	1140		
2160 min Winter	3.510	0.0	1600		
2880 min Winter	2.731	0.0	2048		
4320 min Winter	1.912	0.0	2940		
5760 min Winter	1.496	0.0	3800		
7200 min Winter	1.260	0.0	4616		
8640 min Winter	1.110	0.0	5448		
10080 min Winter	1.010	0.0	6248		
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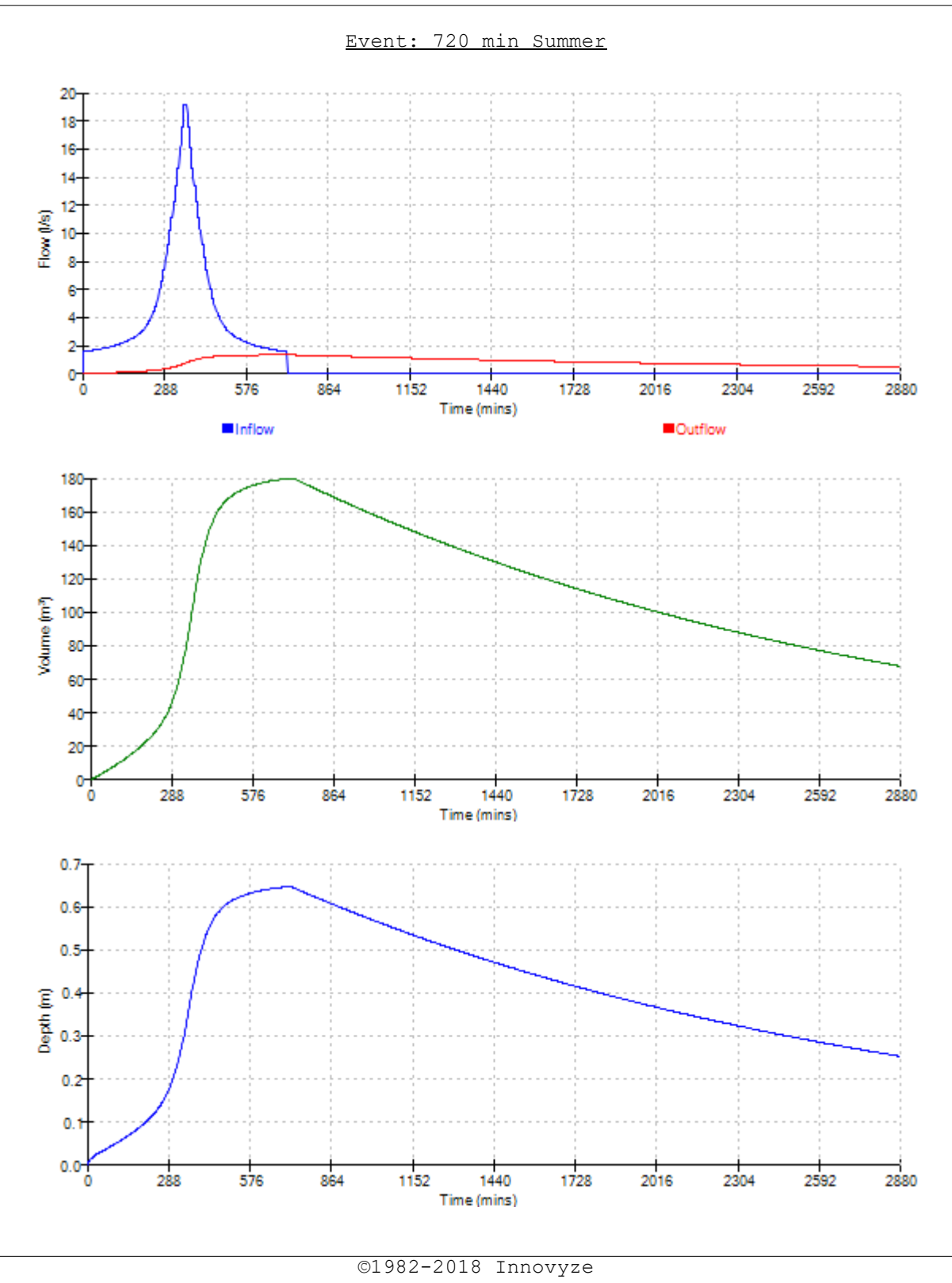
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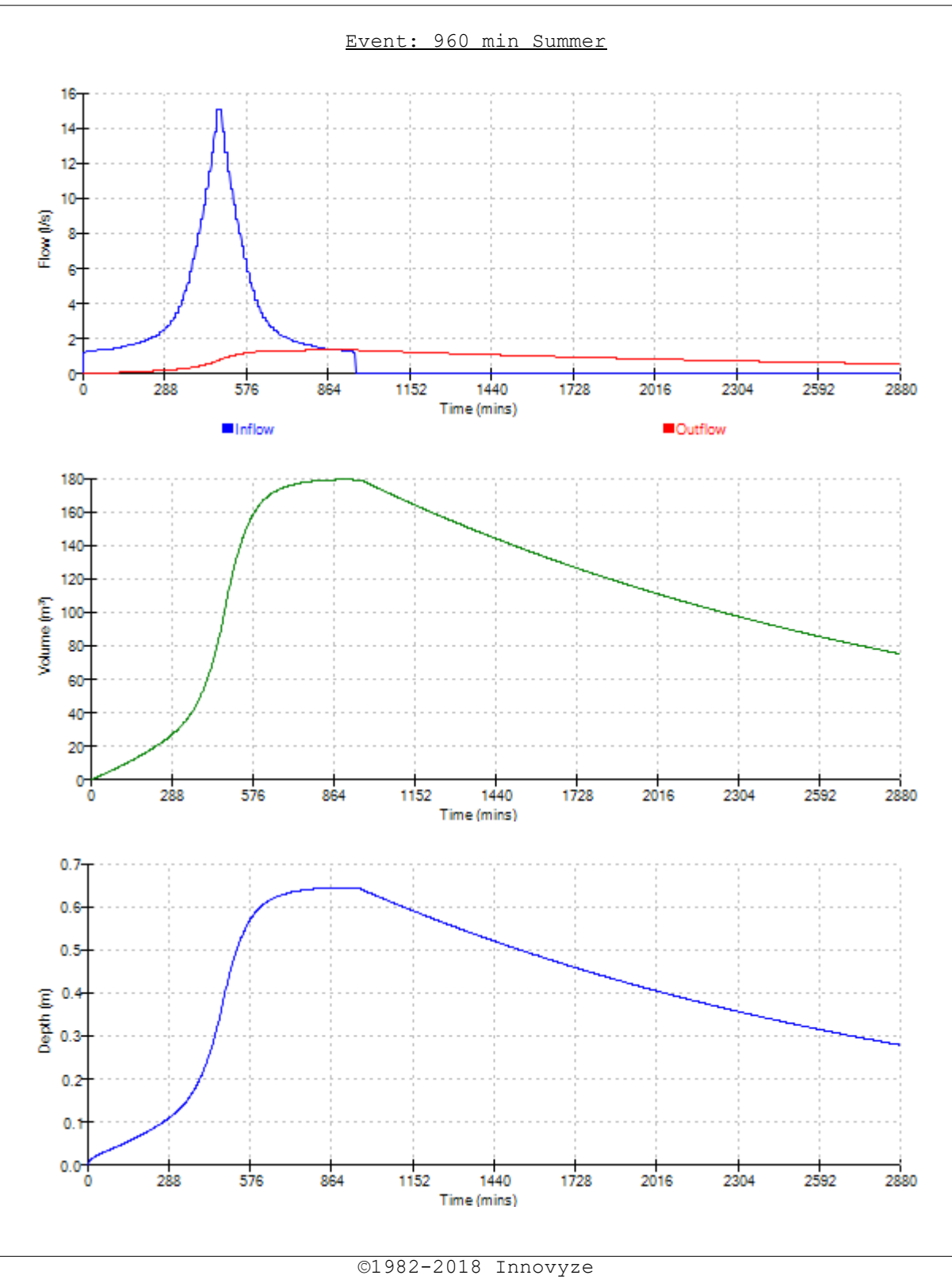
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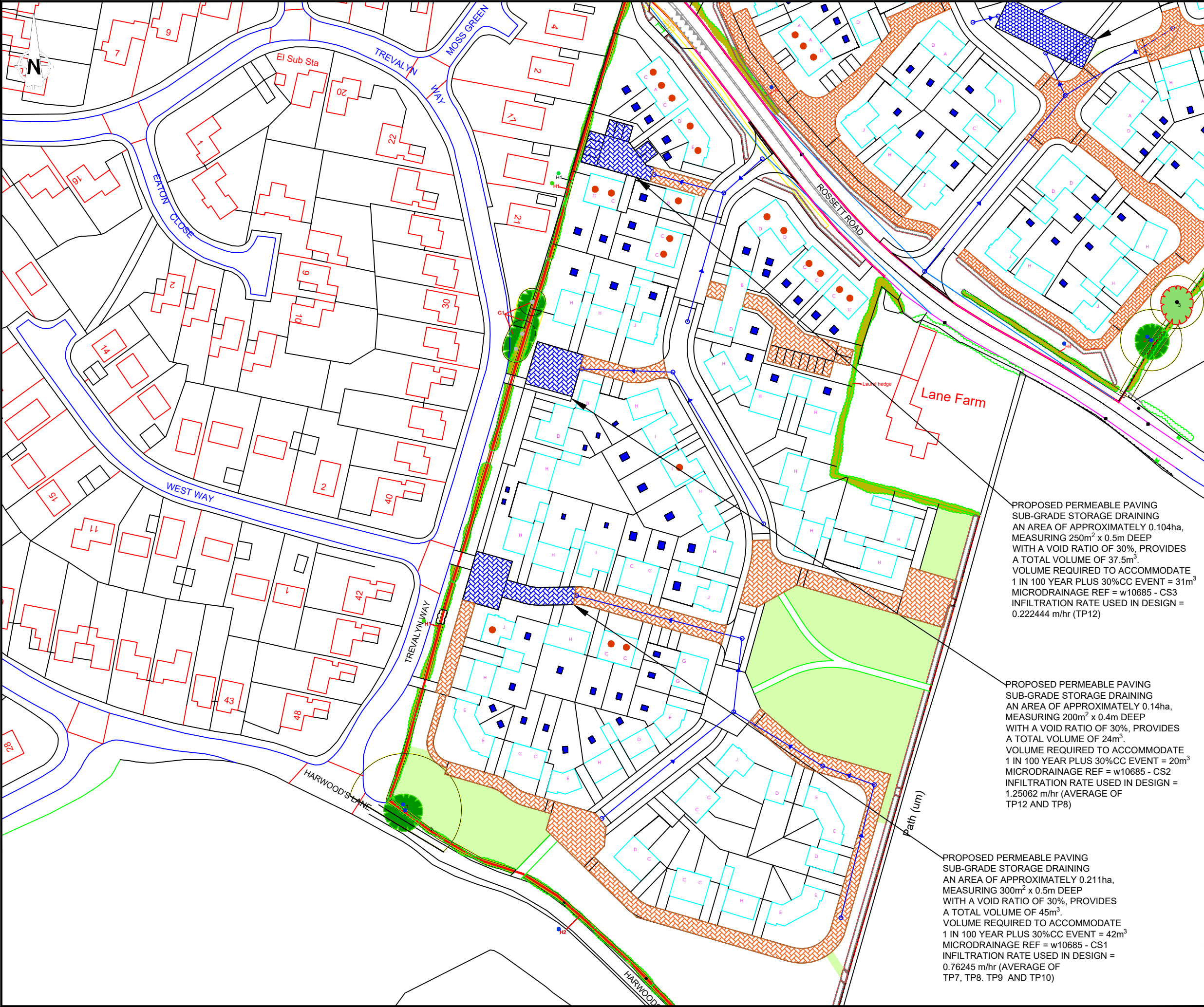
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XP Solutions	Source Control 2018.1	



Appendix J – Concept Drainage Sketch



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
- THIS DRAWING PROVIDES A CONCEPT ONLY AND IS NOT INTENDED FOR DETAILED DESIGN

KEY

- PROPOSED PERMEABLE PAVING SUB-GRADE STORAGE
- PROPOSED PERMEABLE PAVING
- PROPOSED PRIVATE SOAKAWAY
- PROPOSED INSPECTION CHAMBER
- PROPOSED SURFACE WATER SEWER

SITE LOCATION

GRID REFERENCE: 337283, 357183

SITE ADDRESS: Holt Road (B5102), Rossett, Wrexham, LL12 0ED

1	06-06-2018	-	HW	AW	VG
REV.	DATE	DESCRIPTION	DSGND	CHKD	APPD

CLIENT

BELLIS BROTHERS LTD

PRINCIPAL DESIGNER

Waterco Ltd., Eden Court,
Lon Parcwr Business Park, Ruthin LL15 1NJ

tel (+44) 1824 702220
www.waterco.co.uk

SCHEME

HOLT ROAD, ROSSETT - SOUTHERN
LAND PARCEL

TITLE

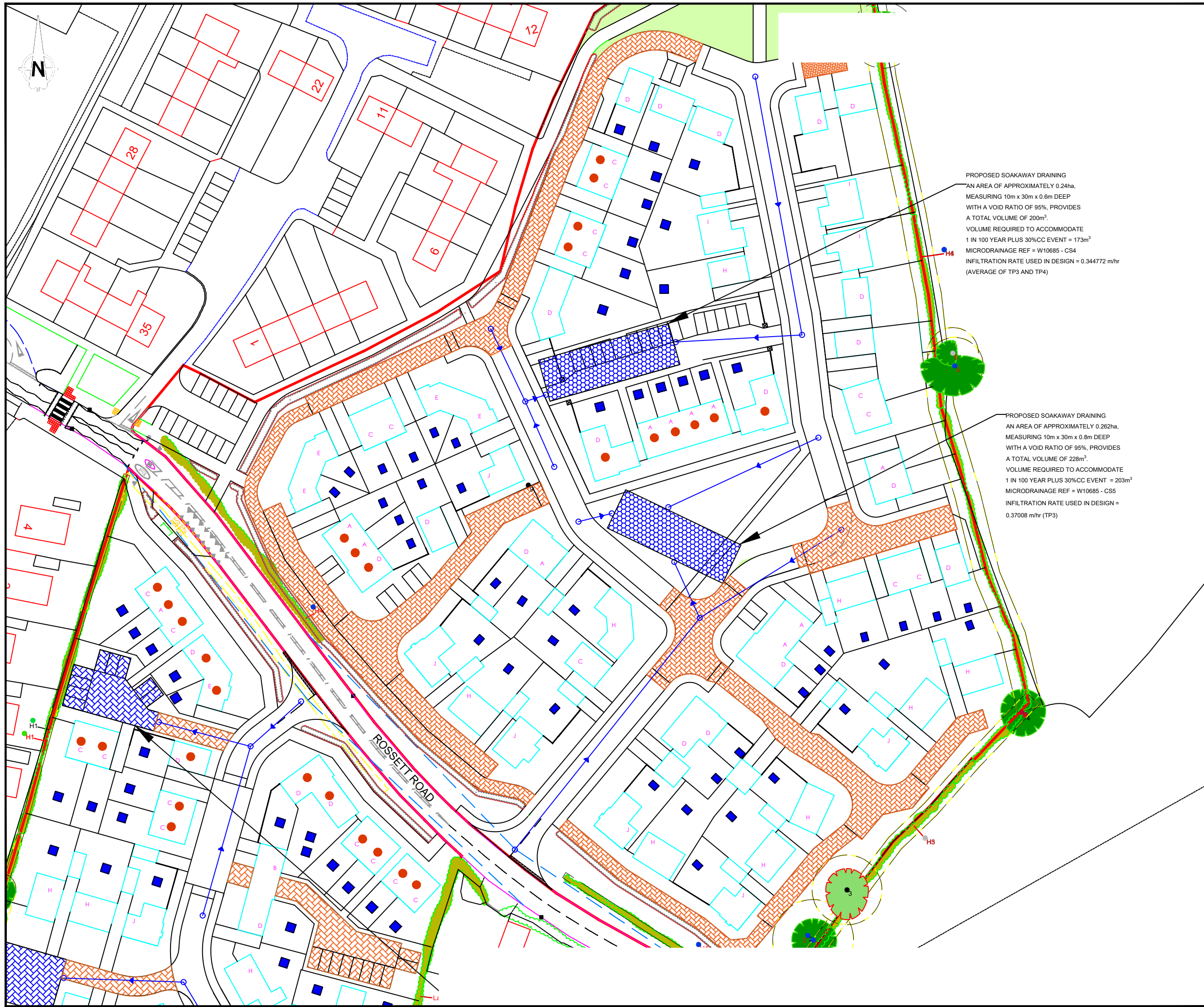
CONCEPT DRAINAGE SKETCH

STATUS

PRELIMINARY

DESIGNED HW	CHECKED AW	APPROVED VG	SCALE / SHEET SIZE NTS
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DRAWING NO.	REV
w10685	1



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
- THIS DRAWING PROVIDES A CONCEPT ONLY AND IS NOT INTENDED FOR DETAILED DESIGN.

KEY

- PROPOSED COMMUNAL SOAKAWAY
- PROPOSED PERMEABLE PAVING
- PROPOSED PRIVATE SOAKAWAY
- SURFACE WATER INSPECTION CHAMBER
- PROPOSED SURFACE WATER SEWER

SITE LOCATION
GRID REFERENCE: 337350, 357371
SITE ADDRESS: Holt Road (B5102), Rossett, Wrexham, LL12 0ED.

1	06-06-2018	-	HW	AW	VG
REV.	DATE	DESCRIPTION	DSGND	CHK'D	APP'D

CLIENT

BELLIS BROTHERS LTD

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SCHEME

**HOLT ROAD, ROSSETT - NORTHERN
LAND PARCEL**

TITLE

CONCEPT DRAINAGE SKETCH

STATUS

PRELIMINARY

DESIGNED HW	CHECKED AW	APPROVED VG	SCALE / SHEET SIZE NTS
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DRAWING NO. W10685	REV 1
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Appendix K – Maintenance Schedules

Operation and Maintenance Requirements for Soakaways

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor inspection tube or chamber and inside of concrete manhole rings.	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs.	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation.	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Ref. Table 13.1, CIRIA C753 'The SuDS Manual

The maintenance requirements detailed above are to be undertaken by the site owner.

Name:

Position:

Date:

**Signed on behalf
Of site owner**

Operation and Maintenance Requirements for Permeable Paving

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Ref. Table 20.15, CIRIA C753 'The SuDS Manual

The maintenance requirements detailed above are to be undertaken by the site owner.

Name:

Position:

Date:

**Signed on behalf
Of the site owner**