



Civil Engineers & Transport Planners

Plummerden House

Flood Risk Assessment & Drainage Strategy

May 2025

241875-FRA_DS-LB-RS-01

Rev A



Civil Engineers & Transport Planners

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CONTENTS

1	INTRODUCTION	1
1.1	Scope.....	1
2	SITE CONDITIONS	2
2.1	Site Location.....	2
2.2	Site Proposal	2
2.3	Site Geology	3
3	SOURCES OF FLOODING	4
3.1	Fluvial/Tidal Flooding	4
3.2	Surface Water Flooding	5
3.3	Groundwater Flooding.....	6
4	MODELLED FLOOD LEVELS AND CLIMATE CHANGE	7
4.1	Modelled Flood Levels	7
4.2	Climate Change Allowances	7
4.3	Impact of Development on Fluvial Flooding	7
4.4	Impact of Development on Flood Storage.....	7
4.5	Safe Access from the Development	7
5	SEQUENTIAL TEST AND EXCEPTION TEST	8
5.1	Sequential Test.....	8
5.2	Exception Test.....	8
6	EXISTING AND PROPOSED DRAINAGE.....	9
6.1	Existing Drainage.....	9
6.2	Proposed Foul Water Drainage.....	9
6.3	Proposed Surface Water Drainage.....	10
7	SURFACE WATER/ SUDS MAINTENANCE AND TREATMENT	13
7.1	SuDS Maintenance	13
8	SUMMARY AND CONCLUSION	17

TABLES

TABLE 5.1 – FLOOD RISK VULNERABILITY AND FLOOD ZONE ‘COMPATIBILITY’	8
TABLE 6.1 – PROPOSED RUNOFF VOLUMES (7 DAY EVENT)	11
TABLE 7.1 – PIPE AND MANHOLE MAINTENANCE SCHEDULE	14
TABLE 7.2 – POND AND WETLAND MAINTENANCE SCHEDULE	16

FIGURES

FIGURE 2.1 – SITE LOCATION.....	2
FIGURE 3.1 – FLOOD ZONE MAPPING	5
FIGURE 3.2 – SURFACE WATER FLOODING MAP (1 IN 100)	6
FIGURE 6.1 – SUSTAINABLE DRAINAGE HIERARCHY	11

APPENDICES

APPENDIX A	
Site Masterplan	
APPENDIX B	
Percolation Testing	
APPENDIX C	
Southern Water Sewer Records	
APPENDIX D	
241875-DS-01 – Proposed Drainage Strategy	
APPENDIX E	
MicroDrainage Calculations	

1 INTRODUCTION

1.1 Scope

1.1.1 Lanmor Consulting Ltd has been appointed to prepare a Flood Risk Assessment for the proposed equestrian development at Plummerden House, Park Lane, Lindfield, Haywards Heath, RH16 2QS.

1.1.2 This report describes the existing site conditions, development proposals and implications of flooding on the site as described in the governments guidance document; National Planning Policy Framework (NPPF) and its technical guidance. This report will consider the following:

- Development Proposals
- Sources of flooding and flood defences
- Flooding extents, depth and climate change predictions
- Impact of flooding on the development
- Dangers presented by flooding

1.1.3 This report has been prepared in accordance with the requirements of the governments National Planning Policy Framework (NPPF) and its planning practice guidance and will demonstrate that the proposed development will be safe and will not increase the risk of flooding in the surrounding area.

2 SITE CONDITIONS

2.1 Site Location

2.1.1 The site is located in Lindfield, a village to the north of the town of Haywards Heath in West Sussex. The site is located within a rural area, comprised of mostly farms and detached residential properties, north of Lindfield Golf Club. The nearest source of fluvial flooding is the River Ouse, which at its closest point lies approximately 740m south west of the site.

2.1.2 Figure 2.1 below shows the location of the application site.

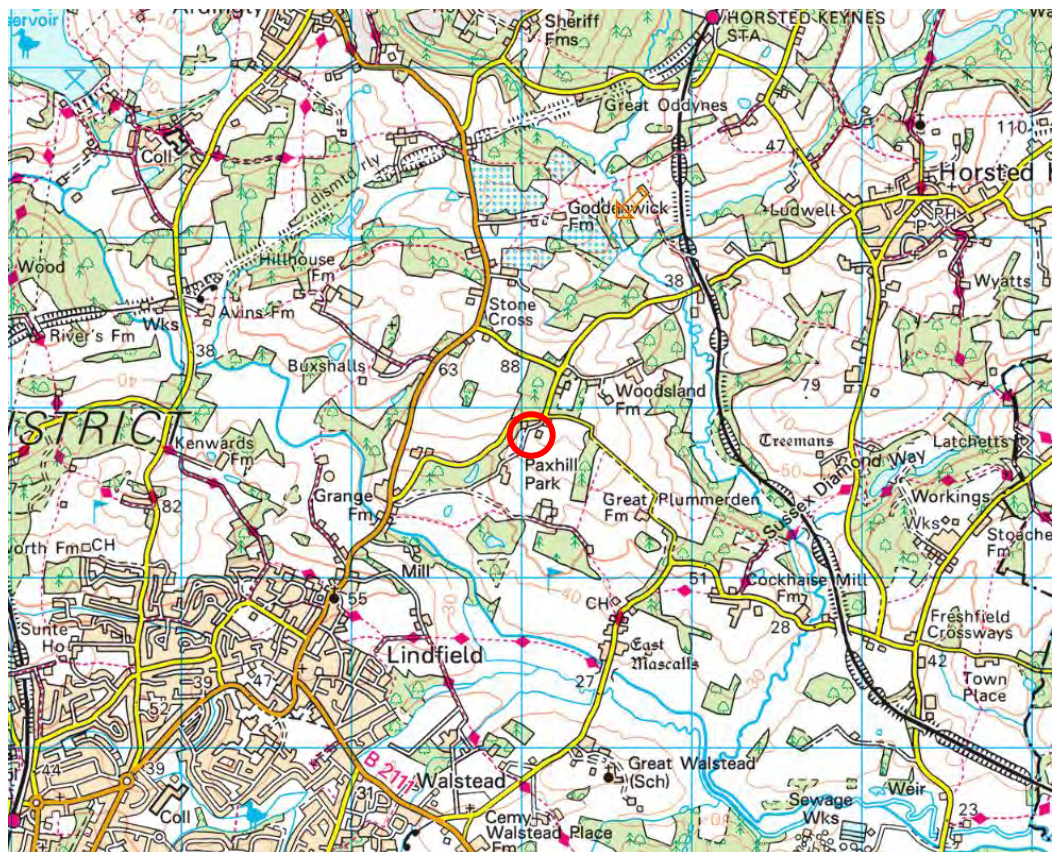


Figure 2.1 – Site Location

2.2 Site Proposal

2.2.1 The application seeks approval for the construction of an American Barn, Horse Walker and Outdoor Arena, as well as Indoor Arena, Ancillary Building, Pole Barn and Pump track. A site masterplan is included in Appendix A.

2.3 Site Geology

- 2.3.1 The British Geological Survey (BGS), mapping indicates the underlying bedrock at the application site to be Lower Grinstead Clay – Mudstone. This sedimentary bedrock was formed between 139.4 and 133.9 million years ago during the Cretaceous period. No information is available for superficial deposits at this site.
- 2.3.2 Site investigations to the north-east of the site found the ground conditions to be CLAY (Tunbridge Wells Sand Formation) from shallow depths of around 0.4m bgl. Ingress of groundwater was observed in some of the trial pits.

3 SOURCES OF FLOODING

3.1 Fluvial/Tidal Flooding

3.1.1 Flood mapping has been provided by the Environment Agency (EA) for the site and surrounding area. The mapping indicates the site to be within Flood Zone 1. This means it has a low probability of flooding from rivers and the sea.

3.1.2 The NPPF and PPG define the Flood Zones as follows:

- Zone 1: 'Low Probability' – This zone comprises land assessed as having a less than a 1 in 1000 annual probability of river or sea flooding (<0.1%) in any year.
- Zone 2: 'Medium Probability' – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year.
- Zone 3a: 'High Probability' – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Zone 3b: 'The Functional Floodplain' – This zone comprises land where water must flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.)

3.1.3 The EA mapping shows the site to be within Flood Zone 1. For Zone 1, there is a probability of less than 0.1% from river flooding. Figure 3.1 below shows the site's position in relation to the fluvial flood zones.



Figure 3.1 – Flood Zone Mapping

3.1.4 The unshaded area on the map above shows land in Flood Zone 1, it is clear that the site falls within this area, a significant distance from Zones 2 & 3. Therefore, the site has a flood probability of less than 0.1%.

3.2 Surface Water Flooding

3.2.1 The surface water flood mapping provided by the EA is considered to be the best available source of national information of surface water flooding. It is a starting point for understanding patterns and probability of surface water flooding. The EA accept that the mapping has limitations and state that *“these maps cannot definitely show that an area of land or property is, or is not, at risk of flooding, and the maps are not suitable for use at an individual property level.”*

3.2.2 The surface water flood risk map on the government website shows the estimated extent and depths of flooding for different return periods. Figure 3.2 below shows the extent and depths of surface water flooding from an event with a probability of 1.0%.

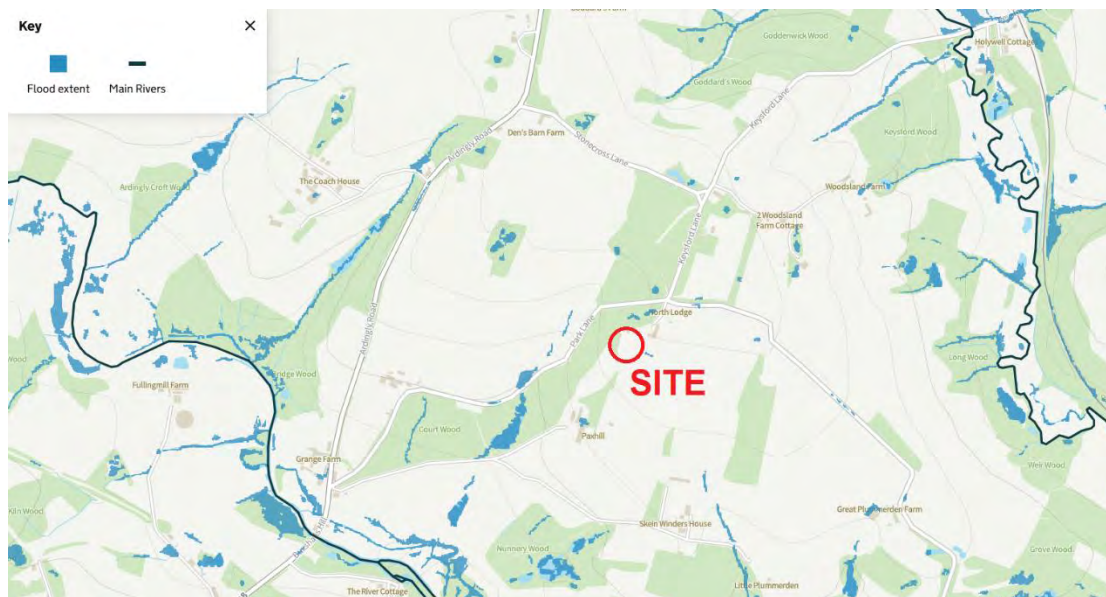


Figure 3.2 – Surface Water Flooding Map (1 in 100)

3.2.3 The mapping above shows the site will not be subject to surface water flooding with a probability of 1.0%. The site has therefore been identified as being at very low risk of surface water flooding.

3.3 Groundwater Flooding

3.3.1 The government's EA website states that flooding from groundwater is unlikely in this area.

4 MODELLED FLOOD LEVELS AND CLIMATE CHANGE

4.1 Modelled Flood Levels

- 4.1.1 The EA were unable to provide modelled flood levels for the site as it is some distance from the nearest source of fluvial flooding as shown in Figure 3.2. The site is considered to have a 1 in 1000 year or less probability of flooding.

4.2 Climate Change Allowances

- 4.2.1 New climate change allowances have been published by the EA; these allowances should be applied when assessing the flood risk for new developments. The allowance to be used is based on the management catchment area, site vulnerability and life expectancy.
- 4.2.2 The site is not at risk of fluvial flooding with a probability of 0.1% or greater so under the PPG guidance no allowance for climate change needs to be considered.

4.3 Impact of Development on Fluvial Flooding

- 4.3.1 The proposed development includes a number of barns for equestrian use. The EA flood maps show the area of the site is located in Flood Zone 1 and therefore the proposed development will not have any impact on the flow of flood waters for an event with a probability of 1.0% including allowances for climate change.

4.4 Impact of Development on Flood Storage

- 4.4.1 Given the area of the site where development is to take place has a probability of flooding of less than 0.1% it will not result in the loss of flood storage volumes across the site for the 1% AEP event including climate change.

4.5 Safe Access from the Development

- 4.5.1 The site is in a low flood risk area Flood Zone 1, having less than 0.1% probability of flooding, the general area around the site is also in Flood Zone 1, so a safe and dry access can be provided to and from the site at all times during extreme flood conditions.

5 SEQUENTIAL TEST AND EXCEPTION TEST

5.1 Sequential Test

5.1.1 The proposed use is classified as 'Less Vulnerable' according to the National Planning Policy Framework (NPPF). The aim of a sequential test is to demonstrate that the development is allocated to low risk flood areas.

5.1.2 Since the proposed development is within Flood Zone 1 and is at low risk for all other sources of flooding, the development meets the requirements of the sequential test to allocate vulnerable development to low risk flood areas.

5.1.3 Table 5.1 below of the NPPF below shows that this type of development within Flood Zone 1 is considered appropriate.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

Table 5.1 – Flood Risk Vulnerability and Flood Zone 'Compatibility'

5.2 Exception Test

5.2.1 The proposed development is within a very low flood risk area and therefore as set out in Table 5.1 the exception test is not required.

6 EXISTING AND PROPOSED DRAINAGE

6.1 Existing Drainage

- 6.1.1 The topographical survey of the site has found limited existing drainage features present in the area of the proposed works. There is 1 inspection chamber located adjacent to the stables, but it is unclear what this chamber serves and where it discharges to.

6.2 Proposed Foul Water Drainage

- 6.2.1 Foul wastewater from the Ancillary Building, American Barn and Indoor Arena will be collected in a below ground drainage network. There are no public sewers in the local area that could be connected to, and the infiltration testing has shown that the ground conditions are not suitable for a drainage field. Therefore, the wastewater will be collected in a cesspool before removal from site by tanker.

- 6.2.2 The size of the cesspool has been calculated based on the anticipated usage of each building as set out below. As the development is for equestrian use, not residential, users will only be onsite using the facilities for part of the day, and the size of the cesspool has been estimated accordingly.

Ancillary Building

- Office – 1 person 2 hours/day
- Gym – 2 people 1 hour/day
- Workshop – 1 person 1/week

American Barn

- 20 washes/week, 20 litres each = 80 litres/day
- WC – 4 people/day

Indoor Arena (Viewing Room)

- 4 people 4 times/week

- 6.2.3 The above roughly equates to 7 people on site full time (6 people plus 1 for the wash down) which therefore requires 52,000 litres storage within the cesspool. The level of wastewater within the cesspool will be monitored and emptying schedules adjusted as necessary if loads are higher than anticipated.

- 6.2.4 A single cesspool will serve the 3 buildings and has been located downstream of the buildings, but close enough to allowing servicing vehicles access. The location and size of the cesspool has been shown on drawing 241875-DS-01 included in Appendix D.

6.3 Proposed Surface Water Drainage

- 6.3.1 The Sustainable Drainage Systems (SuDS) hierarchy has been used to set the drainage strategy for the development. The proposed buildings will incorporate pitched roofs, and therefore the use of blue or green roofs is not viable.
- 6.3.2 Rainwater harvesting is proposed as a means of reusing surface water runoff on the site, reducing the volume of discharge. A tank will be constructed under the indoor arena to store runoff from the roof which will then be pumped out for reuse in the indoor/outdoor arenas and orchard. Whilst this tank will reduce the volume of discharge from the buildings it cannot be relied upon for all runoff as it may not be empty at the start of the storm. Therefore, an overflow pipe and subsequent discharge point needs to be provided.
- 6.3.3 Next on the SuDS hierarchy is the use of infiltration techniques such as soakaways and infiltration basins. The geology records indicate the ground conditions to be Clay with a high groundwater table. Therefore, the use of infiltration devices will not be viable, and so this method has been discounted.
- 6.3.4 Next on the SuDS hierarchy is discharge to watercourse. The survey has noted a short ditch on the site, however upon further investigation this turned out to be an old road that has been abandoned and become overgrown. As this does not lead anywhere it cannot be used as a discharge point for runoff. Therefore, this option has also been discounted.
- 6.3.5 There are no other ditches or watercourses in the vicinity of the site that could be discharged to, and there are no public sewers in the area that could be connected to. Therefore, this assessment has found there are no suitable discharge points from the site for surface water runoff.

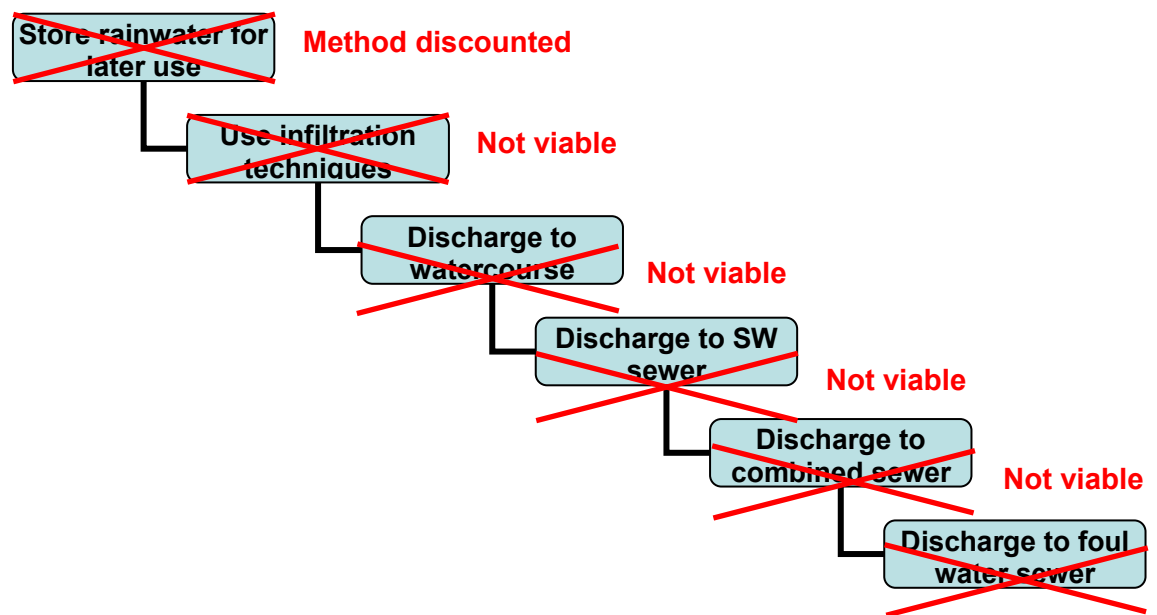


Figure 6.1 – Sustainable Drainage Hierarchy

6.3.6 Given the above, surface water runoff will be collected in a large pond to the south of the site, which has been sized at 1m deep with a base area of 400m² to provide 575m³ of storage before overtopping. Despite the ground conditions there will be some infiltration into the ground with evaporation also occurring.

6.3.7 Calculations have been completed to estimate the volume of runoff from the site to assist in sizing the large pond and rainwater harvesting tank. The volume of runoff is greater for longer storm events, and the volumes below are for the 7-day event.

Return Period	Volume of Runoff (m ³)	Depth of Water in Pond (m)	Pond Capacity	Total Capacity
1 in 1	146.2	0.322	26%	15%
1 in 30	247.9	0.511	43%	26%
1 in 30 +35%	334.7	0.655	58%	35%
1 in 100	294.8	0.590	51%	31%
1 in 100 +45% CC	427.4	0.797	75%	44%

Table 6.1 – Proposed Runoff Volumes (7 day event)

6.3.8 In the above table, the “Depth of Water in Pond” and “Pond Capacity” assumes the rainwater harvesting tank is full at the start of the storm and that all runoff overflows to the pond and so accounts for the worst-case scenario. The “Total Capacity” includes the storage available in the rainwater harvesting tank.

6.3.9 The above calculations show that there is ample storage within the system to store the runoff from all storm events, including allowances for climate change, without causing flooding on site or in the surrounding area. These volumes are for the longest storm event (7 days) so other durations will generate significantly less runoff. Therefore, the drainage system will be able to store the runoff from two consecutive storms for nearly all storm events.

6.3.10 Additional calculations have been completed to compare the average annual rainfall (AAR) captured with the anticipated water usage. The AAR for the site location is 805mm, which over the catchment area of 0.24ha gives 1,932 m³ of run off per year. The anticipated water usage for the various areas of the site have been tabled below.

Item	Volume of Water (m ³)
Outdoor Arena	356
Indoor Arena	182.5
Orchard	262.5
Total	801

6.3.11 The total anticipated water usage throughout the year is approximately 40% the total volume of runoff, leaving the remainder to drain to ground or evaporate. The above calculations have shown that the pond is suitably sized for the site and will not increase the risk of flooding.

6.3.12 An indicative drainage layout for the proposed development has been prepared and is included in Appendix D as drawing 241875-DS-01. MicroDrainage has been used to estimate runoff volumes to the pond and a copy of these calculations has been included in Appendix E.

7 SURFACE WATER/ SUDS MAINTENANCE AND TREATMENT

7.1 SuDS Maintenance

- 7.1.1 Regularly inspecting the surface water drainage network for blockages and clearing unwanted debris/silt from the system should improve the performance of the surface water network and decrease the need for future repairs.
- 7.1.2 The level and frequency of maintenance on site is dependent on the type of facility. The type of maintenance will fall into one of three categories: “regular maintenance”, “occasional maintenance” and “remedial maintenance”.
- 7.1.3 Regular maintenance of the drainage and SuDS features will include inspections, removal of litter/debris and sweeping of the surfaces. Occasional maintenance will include removal of sediment etc. and remedial maintenance may include structural repairs if required.
- 7.1.4 The drainage and SuDS elements after an initial inspection following construction should be inspected on a monthly basis for the first 12 months and after large storms, thereafter the following maintenance regime should be applied and adjusted if the 12-month monitoring process has identified any issues.
- 7.1.5 The freeholder of the property will be responsible for the maintenance and repair of the drainage and SuDS features onsite.
- 7.1.6 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained.

Pipes and Manholes

7.1.7 For drainage pipes and manholes, the following maintenance is required.

Manhole / Pipe Maintenance Schedule		
	Required Action	Typical Frequency
Regular maintenance	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
	Remove sediment from structures.	Annually or as required
Remedial Actions	Rod through poorly performing runs as initial remediation.	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Monitoring	Inspect/check all inlets, outlets, to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of pipe manholes for sediment build-up and remove if necessary	Every 5 years or as required

Table 7.1 – Pipe and Manhole Maintenance Schedule

Ponds and Wetlands

7.1.8 For ponds and wetlands, the following maintenance is required.

Ponds and Wetlands Maintenance Schedule		
	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public area	Monthly (During growing season)
	Cute the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as require)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May-October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal	Half Early
	Check any mechanical devices, e.g. penstocks	Half early
	Hand cut submerged and emergent aquatic plants (at minimum of 1.0m above pond and base; include max 25% of pond surface)	Annually

	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5, or as required
	Remove sediment and planting from one quadrant of the main body of ponds	Every 5 years, or as required
Remedial Actions	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g every 25-50 years
Monitoring	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate inlets outlets and overflows	As required

Table 7.2 – Pond and Wetland Maintenance Schedule

7.1.9 For specialist pieces of equipment, maintenance brochures will be provided by the manufacturers. These will set out the frequency of inspections and correct methods of cleaning etc. that should be followed. It is recommended that once installed the facility should be inspected monthly for the first three months and thereafter at six monthly intervals or as advised in the maintenance brochure.

7.1.10 The above information is only intended as guidance in standard maintenance practise for surface water drainage and SUDs features. The above measures should be reviewed regularly and modified to suit the site conditions.

8 SUMMARY AND CONCLUSION

- 8.1.1 This report has been prepared in support of the planning application at the site of Plummerden House, Park Lane, Lindfield, West Sussex, RH16 2QS. The application seeks approval for the construction of an American Barn, Horse Walker and Outdoor Arena, as well as Indoor Arena, Ancillary Building, Pole Barn and Pump track. A site masterplan is included in Appendix A.
- 8.1.2 This report has demonstrated that the site is at very low flood risk from all sources. The site is located in fluvial Flood Zone 1, with a risk of flooding of less than 1 in 1000 years (<0.1% AEP).
- 8.1.3 The surface water runoff will be collected in a rainwater harvesting tank for reuse on site, with an overflow to a large pond. Calculations have shown the tank and pond are of sufficient size to cater for runoff from all storm events, and so will not increase the risk of flooding on site or in the surrounding area.
- 8.1.4 This statement clearly demonstrates that the site is at low risk of flooding from all sources and suitable drainage can be provided for the development which will not result in an increased risk of flooding to the site or surrounding area. For the reasons outlined within this report, we see no reason to refuse planning permission for this development on the grounds of flood risk, or of there being insufficient capacity to cater for surface water runoff generated from the development.

APPENDIX A

Site Masterplan



Site Masterplan

Scale 1:500 (when printed at A1)

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Proposed Development

Plummerden House

Client	
Site	Park Lane, Lindfield West Sussex, RH16 2QS
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- All dimensions in millimeters. All dimensions and levels to be checked by contractor prior to commencing work.

- Assume drawings not to scale, use figured dimensions. Do not scale from drawings.

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Review		
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Stage		
Scale	1:200 (A1)	
Paper	A1	

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APPENDIX B

Percolation Testing



IN SITU PERCOLATION TEST REPORT

**PLUMMERDEN LODGE
LINDFIELD
WEST SUSSEX**

PROJECT REFERENCE: P16924

REPORT REFERENCE: R16496

Report Beneficiary: Mr G Levi c/o BLB Surveyors Ltd

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Report Section		Prepared By	Approved By
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Limitations

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TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	SITE CONTEXT	2
2.1	Site Location	2
2.2	Geological Setting	2
3.	SITE WORKS	3
4.	GROUND CONDITIONS	3
4.1	Stratigraphy	3
4.2	Stability	3
4.3	Groundwater Conditions	3
5.	IN SITU PERCOLATION TESTING	4

FIGURES AND APPENDICES

Figure 1	Site Location Plan
Figure 2	Site Plan
Explanatory Notes	
Exploratory Hole Records	

1. INTRODUCTION

Ashdown Site Investigation Ltd was requested to undertake in situ percolation testing to assist others in the design of a drainage field to serve a new sewage treatment plant at Plummerden Lodge, Lindfield, West Sussex.

The specific objectives of the works were to:

- a) Establish the expected geology and hydrogeology at the site;
- b) Investigate the shallow ground and groundwater conditions at the test locations; and
- c) Undertaken in situ percolation testing and provide calculated percolation values for the soils tested.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q14713, dated 15th November 2024. The instruction to proceed was received on behalf of the client, from H T Partnership.

2. SITE CONTEXT

2.1 Site Location

The site is located at Plummerden Lodge, Lindfield, West Sussex, and is centred on the approximate Ordnance Survey national grid reference 536211, 126874. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively.

2.2 Geological Setting

2.2.1 *Expected Geology and Aquifer Designation*

The stratigraphic succession that may be expected to underlie the site has been established by reference to British Geological Survey (BGS) mapping and the BGS Lexicon of Named Rock Units. The expected stratigraphy is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Bedrock	Cuckfield Stone Bed	Secondary A Aquifer
	Grinstead Clay Member	Unproductive Stratum

Both the Cuckfield Stone Bed and Grinstead Clay Member form part of the Tunbridge Wells Sand Formation which in turn forms part of the Wealden Group. The formation is of Valanginian age (133.9 to 139.4 million years old; Early Cretaceous). The Tunbridge Wells Sand Formation predominantly comprises repeating sequences of fine to medium grained sandstone, siltstone and silty sand with finely-bedded mudstones and thin limestones. In the western High Weald (between Haywards Heath and Tunbridge Wells) the formation can be divided into three, the informally named Lower and Upper Tunbridge Wells Sand and the intervening Grinstead Clay Member. The succession commences with rhythmically bedded sandstones, siltstones and mudstones of the lower part of the Lower Tunbridge Wells Sand which pass up into the massive sandstones of the Ardingly Sandstone Member. These are overlain by the finely bedded mudstones, mudstones and silty mudstones with subordinate clay ironstones and shelly limestones of the Grinstead Clay Member. This clay member is itself locally divided into upper and lower parts by the cross-bedded fine sandstone of the Cuckfield Stone Bed. Above the Grinstead Clay Member, the Upper Tunbridge Wells Sand comprises a generally more argillaceous rhythmic succession, including mudstones, siltstones and silty sandstones. Outside the western High Weald the Grinstead Clay Member is not recognisable and the succession is mapped as undivided Tunbridge Wells Sand Formation. The formation is recorded by the BGS to range in thickness up to 122m.

2.2.2 *Groundwater Source Protection Zones (SPZ)*

The Environment Agency defines SPZs as those areas where groundwater supplies are at risk from potentially polluting activities and accidental releases of pollutants. SPZs are primarily a policy tool used to control activities close to water supplies intended for human consumption.

The site does not lie within a SPZ.

3. SITE WORKS

The intrusive site works comprised the excavation of a series of hand dug trial pits to enable in-situ percolation testing¹ to be carried out in the proposed drainage field area. The intrusive work was carried out on 26th and 27th November 2024. The exploratory hole locations are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the appended exploratory hole records, together with explanatory notes to assist in their interpretation.

It is noted that initially it was proposed to excavate two trial pits, TP01 and TP02, to carry out in situ percolation testing. However, during the first two tests the water levels within the pits were noted to rise due to the ingress of water from the surrounding soils during the saturation test period. Further pits were therefore excavated, with trial pits TP03, TP05 and TP06 excavated to attempt further percolation testing and pits TP04 and TP07 dug to monitor the rise of the water ingress into the trial pits.

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 *Surface Covering*

Each of the exploratory holes was excavated through a surface cover of topsoil over subsoil, some 350mm to 400mm in thickness.

4.1.2 *Tunbridge Wells Sand Formation*

Underlying the topsoil/subsoil, the investigation progressed into undisturbed slightly sandy silty clay deposits which continued to the full depth of excavation.

It can be difficult to distinguish between the individual members and beds which form the Tunbridge Wells Sand Formation, and therefore, particularly given the shallow depth of the investigation, the natural soils have been denoted as being part of the Tunbridge Wells Sand Formation deposits for the purposes of this report.

4.2 Stability

Each of the shallow exploratory holes was recorded to remain stable during the course of excavation.

4.3 Groundwater Conditions

Ingress of water was noted at various depths within the shallow trial pits, in general noted to be filling the pits while they remained open.

¹ Conducted in general accordance with the requirements of BS6297:2007 + A1:2008, Code of practice for the design and installation of drainage fields for use in wastewater treatment.

5. IN SITU PERCOLATION TESTING

In-situ percolation testing² was carried out in trial pits TP01 to TP07. The trial pits were excavated to depths of between 0.40m and 0.80m below ground level and were 300mm by 300mm in plan to form the test cell.

For the saturation part of the test a 300mm cube test cell should be filled with water and left to completely seep away. However, during this part of the test, water levels within the majority of the pits were noted to be rising due to ingress of water into the pits. Trial pits TP04 and TP07 were not filled with water and were instead left to observe the groundwater ingress into the pits over the same period.

Table 2. Summary of Saturation Testing

Exploratory Hole	Trial Pit Test Depth (m bgl)	Water Filled to Depth (m bgl)	Water Depth at End of Saturation Period (m bgl)	Length of Saturation Period (mins)	Time Taken for Water to Fully Drain Was Less than 6 Hours
TP01	0.80	0.50	0.02	1430.00	No
TP02	0.80	0.50	0.00	1455.00	No
TP03	0.40	0.10	0.40	60	Yes
TP04	0.60	n/a - Observation of Ingress of Groundwater	Rose from base of pit to 0.09	1380.00	No
TP05	0.80	0.50	0.04	1295.00	No
TP06	0.40	0.10	0.00	1195.00	No
TP07	0.70	n/a - Observation of Ingress of Groundwater	Rose from base of pit to 0.00	1211.00	No

The guidance indicates that if during the saturation test period the water does not seep away in less than 6 hours the soils should be deemed as being unsuitable for drainage fields. The only test pit that fully drained in less than 6 hours was trial pit TP03. The remaining trial pits all filled with water and when left overnight filled to close to ground level.

Whilst it is possible that significant precipitation overnight may have exacerbated the rise in water levels in the pits, it is noted that during the first day of the works the weather was dry and water levels were still noted to be rising due to ingress of water from the surrounding soils.

² Conducted in general accordance with the requirements of BS6297:2007 + A1:2008, Code of practice for the design and installation of drainage fields for use in wastewater treatment.

Following the saturation stage in trial pit TP03, the pit was filled a further three times to enable the percolation Vp value to be calculated. The Vp is calculated by dividing the time in seconds for the water to fall between 75% and 25% of the initial test depth by the depth of water in millimetres between 75% and 25% of the initial test depth. Typically for a test that is filled with 300mm of water, the latter depth would be 150mm.

The calculated Vp figures derived from the tests are summarised in the following table.

Table 3. Calculated Vp Figures

Exploratory Hole	Time to reach 75% empty (secs)	Time to reach 25% empty (secs)	Time taken for water to fall between 75% and 25% (secs)	Total Depth of Water between 75% and 25% full (mm)	Vp
TP03 Test 1	310.5	1806	1495.5	150	10
TP03 Test 2	281.25	2070	1788.75	150	11.9
TP03 Test 3	202.5	1800	1597.5	150	10.7

The overall average Vp result for trial pit TP03 is indicated to be 10.9. However, it is noted that the testing carried out within this trial pit was conducted at a relatively shallow depth, with the pit kept shallow to minimise the ingress of any groundwater. The relatively high groundwater observed within the remaining pits should be taken into account by the designers.

The results from the percolation testing should be provided to engineers responsible for the design of the drainage system.

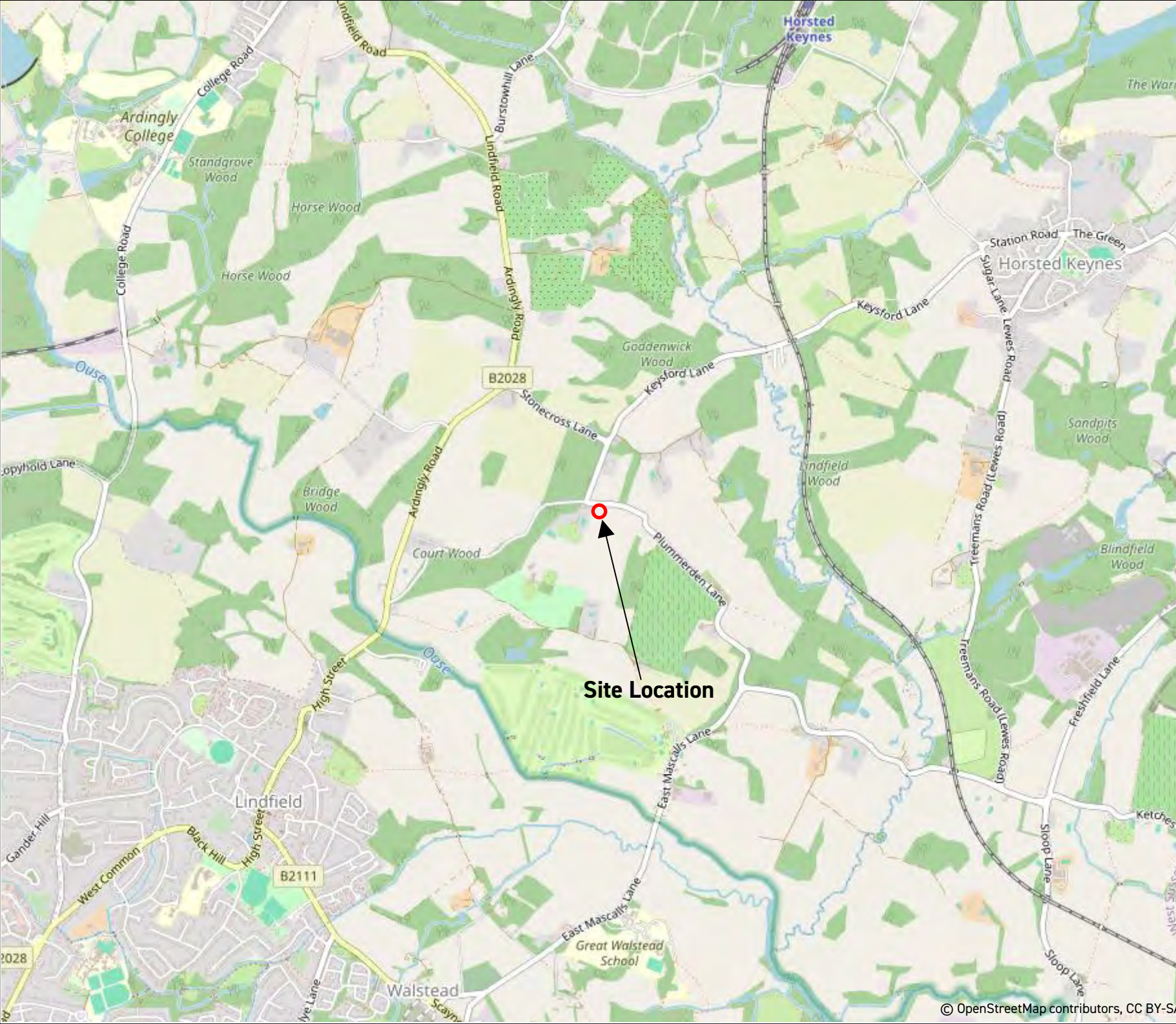
FIGURES AND APPENDICES

Figure 1 Site Location Plan

Figure 2 Site Plan

Explanatory Notes

Exploratory Hole Records



Head Office

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
contact@ashdownsi.co.uk

Site

Plummenden Lodge
Lindfield
West Sussex

Project Ref

P16924

Figure No

1

Drawing Title

Site Location Plan

Scale

Not To Scale

Park Lane

+

+

LODGE

TP03

TP04

TP06

TP07

TP01

TP05

TP02



Head Office

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
contact@ashdownsi.co.uk

Site

Plummerden Lodge
Lindfield
West Sussex

Project Ref.

P16924

Figure No.

2

Drawing Title

Site Plan

Scale

Not To Scale

PLUMMERDEN
HOUSE

EXPLANATORY NOTES

Symbols and abbreviations on Exploratory Hole Records

Samples

U	'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample
R	Root Sample
B	Bulk Disturbed Sample
W	Water Sample
ES	Environmental Suite (on older records may be referenced J T)

In Situ Testing

S	Standard penetration test (SPT): Using the split spoon sampler.
C	Standard Penetration Test (SPT): Using a solid cone instead of the sampler – conducted usually in coarse grained soils or weak rocks.
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP	Cable Percussion Borehole
RC	Rotary Cored Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

In Situ Strength Testing

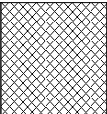
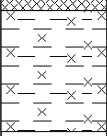
Standard penetration testing (SPT) carried out in accordance with BS EN ISO 22476-3:2005.

Continuous dynamic probe testing conducted using a super heavy DPSH-B (As defined by BS EN ISO 22476-2:2005) probing geometry. The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

Perth penetrometer tests carried out in accordance with Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes; no equivalent European or British Standard having been published to date.

Undrained shear strength determinations made in-situ using a Geonor hand shear vane or a hand penetrometer.

Testing to determine the in-situ California Bearing Ratio (CBR) of soils conducted at shallow depths using a hand-held Transport Research Laboratory (TRL) cone penetrometer.

ASHDOWN SITE INVESTIGATION E-mail: contact@ashdownsi.co.uk Web: www.ashdownsi.co.uk Tel: 01273 483119		Site Name: Plummerden Lodge, Lindfield, West Sussex Job Number: P16924 Start Date: 26/11/2024 End Date: 27/11/2024				Trial Pit Number: TP01 Sheet 1 of 1	
Samples and In Situ Testing						Stratum Description	
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth/ Reduced Level		
D	0.60				0.00	Topsoil over,	
					0.40	SUBSOIL: Grey brown and orange brown slightly sandy silty clay with rare gravel of subangular to subrounded fine to coarse ash-like material and organic matter.	
					0.80	Orange brown and grey brown mottled slightly sandy silty CLAY with occasional gravel of sandstone. (Tunbridge Wells Sand Formation)	
						End of trial pit at 0.80m	
Remarks							
Groundwater: Water ingress from shallow soils, recorded at 0.80m depth on completion of trial pit.						Excavation Method: HDP	
Stability: Trial pit stable on completion.						Pit Length: 0.30m	
Notes: n/a						Pit Width: 0.30m	
						Made By: TM	

Sheet 1 of 1

Remarks Groundwater: Water ingress from shallow soils, recorded at 0.79m depth on completion of trial pit. Stability: Trial pit stable on completion. Notes: n/a	Excavation Method: HDP
	Pit Length: 0.30m
	Pit Width: 0.30m
	Made By: TM

Site Name: Plummerden Lodge, Lindfield, West Sussex

Job Number: P16924

Start Date: 26/11/2024

End Date: 26/11/2024

Trial Pit Number: **TP03**

Sheet 1 of 1

Remarks Groundwater: Water ingress noted at base of pit on completion. Stability: Trial pit stable on completion. Notes: n/a	Excavation Method: HDP
	Pit Length: 0.30m
	Pit Width: 0.30m
	Made By: TM

**Job Number:** P16924

Start Date: 26/11/2024

End Date: 27/11/2024

Trial Pit Number: TP04

Sheet 1 of 1

Remarks Groundwater: Water ingress noted at base of pit on completion. Stability: Trial pit stable on completion. Notes: n/a	Excavation Method: HDP
	Pit Length: 0.30m
	Pit Width: 0.30m
	Made By: TM

Site Name: Plummerden Lodge, Lindfield, West Sussex

Job Number: P16924

Start Date: 26/11/2024

End Date: 27/11/2024

Trial Pit Number: **TP05**

Sheet 1 of 1

Remarks Groundwater: Water ingress from shallow soils, recorded at 0.63m depth on completion of trial pit. Stability: Trial pit stable on completion. Notes: n/a	Excavation Method: HDP
	Pit Length: 0.30m
	Pit Width: 0.30m
	Made By: TM

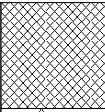
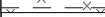
**Job Number:** P16924

Start Date: 26/11/2024

End Date: 27/11/2024

Trial Pit Number: TP06

Sheet 1 of 1

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil over, SUBSOIL: Grey brown and orange brown slightly sandy silty clay.
					0.35	Orange brown and grey brown mottled slightly sandy silty CLAY with occasional gravel of sandstone. (Tunbridge Wells Sand Formation)
					0.40	End of trial pit at 0.40m

Remarks	

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: HDP

Pit Length: 0.30m

Pit Width: 0.30m

Made By: TM

E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Plummerden Lodge, Lindfield, West Sussex

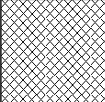
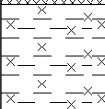
Job Number: P16924

Start Date: 26/11/2024

End Date: 27/11/2024

Trial Pit Number: TP07

Sheet 1 of 1

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil over, SUBSOIL: Grey brown and orange brown slightly sandy silty clay.
					0.35	Orange brown and grey brown mottled slightly sandy silty CLAY with occasional gravel of sandstone. (Tunbridge Wells Sand Formation)
					0.70	End of trial pit at 0.70m

Remarks

Groundwater: Water ingress recorded at 0.45m depth on completion of trial pit.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: HDP

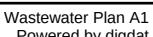
Pit Length: 0.30m

Pit Width: 0.30m

Made By: TM

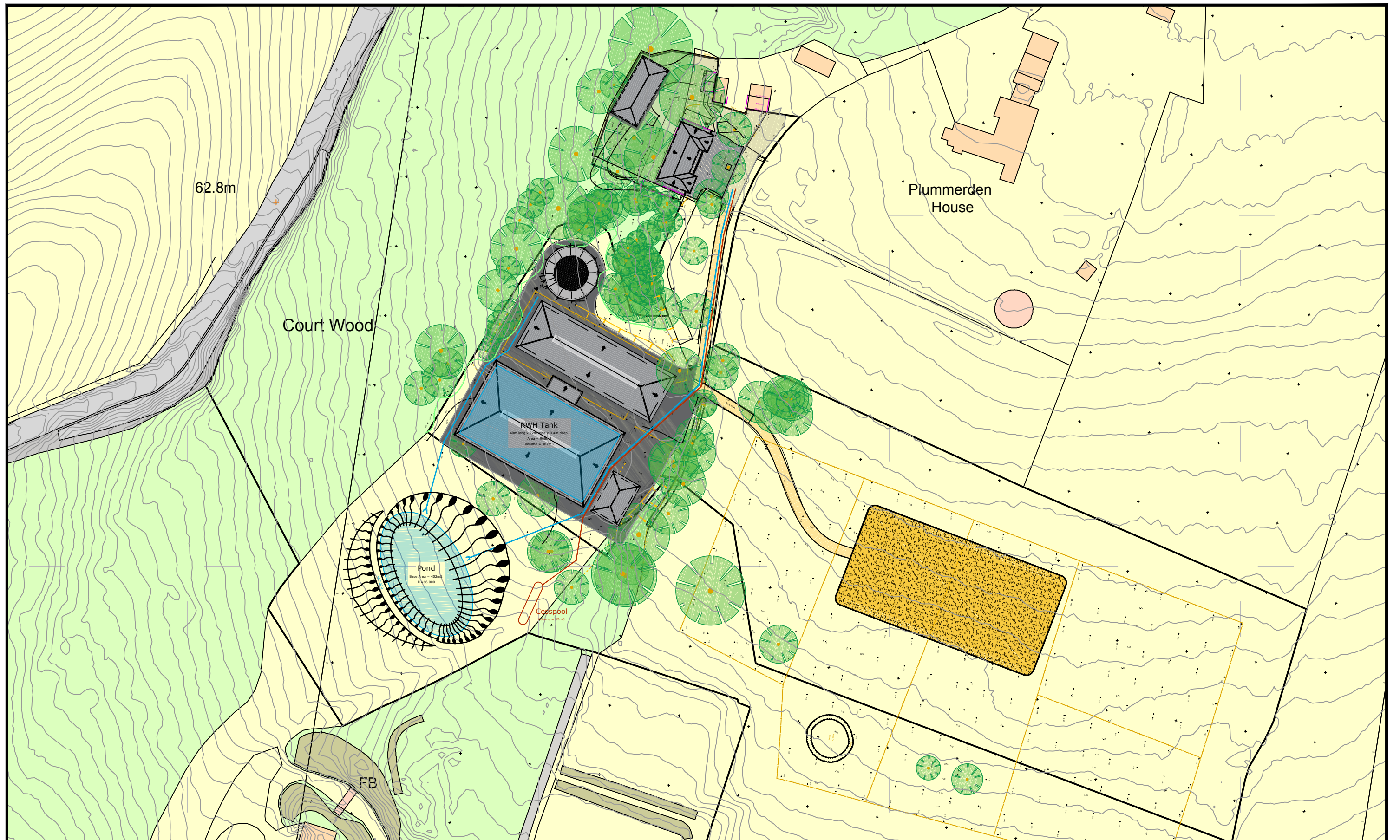
APPENDIX C

Southern Water Sewer Records



APPENDIX D

241875-DS-01 – Proposed Drainage Strategy



Plummerden House
Park Lane, Lindfield

Proposed Drainage Strategy

LANMOR Consulting
Civil Engineers & Transport Planning

Thorogood House, 34 Tolworth Close, Surbiton, Surrey, KT6 7EW

Telephone: 0208 339 7899 Fax: 0208 339 7898

E-mail: info@lanmor.co.uk

www.lanmor.co.uk

SCALE 1:1000

DRAWN BY RS

PRJ No. 241875

DWG No. 241875-DS-01 Rev B

APPENDIX E

MicroDrainage Calculations

Lanmor Consulting Ltd		Page 1
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 1 year Return Period

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
15 min Summer	66.032	0.032	13.0	O K
30 min Summer	66.043	0.043	17.5	O K
60 min Summer	66.056	0.056	23.0	O K
120 min Summer	66.072	0.072	29.8	O K
180 min Summer	66.083	0.083	34.5	O K
240 min Summer	66.091	0.091	38.1	O K
360 min Summer	66.104	0.104	43.6	O K
480 min Summer	66.114	0.114	47.9	O K
600 min Summer	66.122	0.122	51.6	O K
720 min Summer	66.130	0.130	54.8	O K
960 min Summer	66.142	0.142	60.3	O K
1440 min Summer	66.161	0.161	69.0	O K
2160 min Summer	66.183	0.183	78.9	O K
2880 min Summer	66.200	0.200	86.8	O K
4320 min Summer	66.227	0.227	99.5	O K
5760 min Summer	66.247	0.247	109.2	O K
7200 min Summer	66.264	0.264	117.2	O K
8640 min Summer	66.278	0.278	124.2	O K
10080 min Summer	66.291	0.291	130.5	O K
15 min Winter	66.036	0.036	14.6	O K
30 min Winter	66.048	0.048	19.6	O K
60 min Winter	66.063	0.063	25.8	O K
120 min Winter	66.080	0.080	33.3	O K
180 min Winter	66.093	0.093	38.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	28.988	0.0	19
30 min Summer	19.483	0.0	34
60 min Summer	12.800	0.0	64
120 min Summer	8.268	0.0	124
180 min Summer	6.381	0.0	184
240 min Summer	5.291	0.0	244
360 min Summer	4.033	0.0	364
480 min Summer	3.327	0.0	484
600 min Summer	2.866	0.0	604
720 min Summer	2.537	0.0	724
960 min Summer	2.094	0.0	964
1440 min Summer	1.597	0.0	1444
2160 min Summer	1.217	0.0	2164
2880 min Summer	1.005	0.0	2884
4320 min Summer	0.767	0.0	4324
5760 min Summer	0.632	0.0	5768
7200 min Summer	0.543	0.0	7208
8640 min Summer	0.479	0.0	8648
10080 min Summer	0.432	0.0	10088
15 min Winter	28.988	0.0	19
30 min Winter	19.483	0.0	34
60 min Winter	12.800	0.0	64
120 min Winter	8.268	0.0	124
180 min Winter	6.381	0.0	184

Lanmor Consulting Ltd		Page 2
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
240 min Winter	66.102	0.102	42.7	O K
360 min Winter	66.116	0.116	48.8	O K
480 min Winter	66.127	0.127	53.7	O K
600 min Winter	66.136	0.136	57.8	O K
720 min Winter	66.144	0.144	61.4	O K
960 min Winter	66.158	0.158	67.5	O K
1440 min Winter	66.180	0.180	77.3	O K
2160 min Winter	66.203	0.203	88.3	O K
2880 min Winter	66.222	0.222	97.2	O K
4320 min Winter	66.252	0.252	111.4	O K
5760 min Winter	66.274	0.274	122.3	O K
7200 min Winter	66.292	0.292	131.3	O K
8640 min Winter	66.308	0.308	139.1	O K
10080 min Winter	66.322	0.322	146.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	5.291	0.0	244
360 min Winter	4.033	0.0	364
480 min Winter	3.327	0.0	484
600 min Winter	2.866	0.0	604
720 min Winter	2.537	0.0	724
960 min Winter	2.094	0.0	964
1440 min Winter	1.597	0.0	1444
2160 min Winter	1.217	0.0	2164
2880 min Winter	1.005	0.0	2884
4320 min Winter	0.767	0.0	4324
5760 min Winter	0.632	0.0	5768
7200 min Winter	0.543	0.0	7208
8640 min Winter	0.479	0.0	8648
10080 min Winter	0.432	0.0	10088

Lanmor Consulting Ltd		Page 3
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions		Source Control 2015.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.327	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.240

Time (mins)		Area
From:	To:	(ha)
0	4	0.240

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Model Details

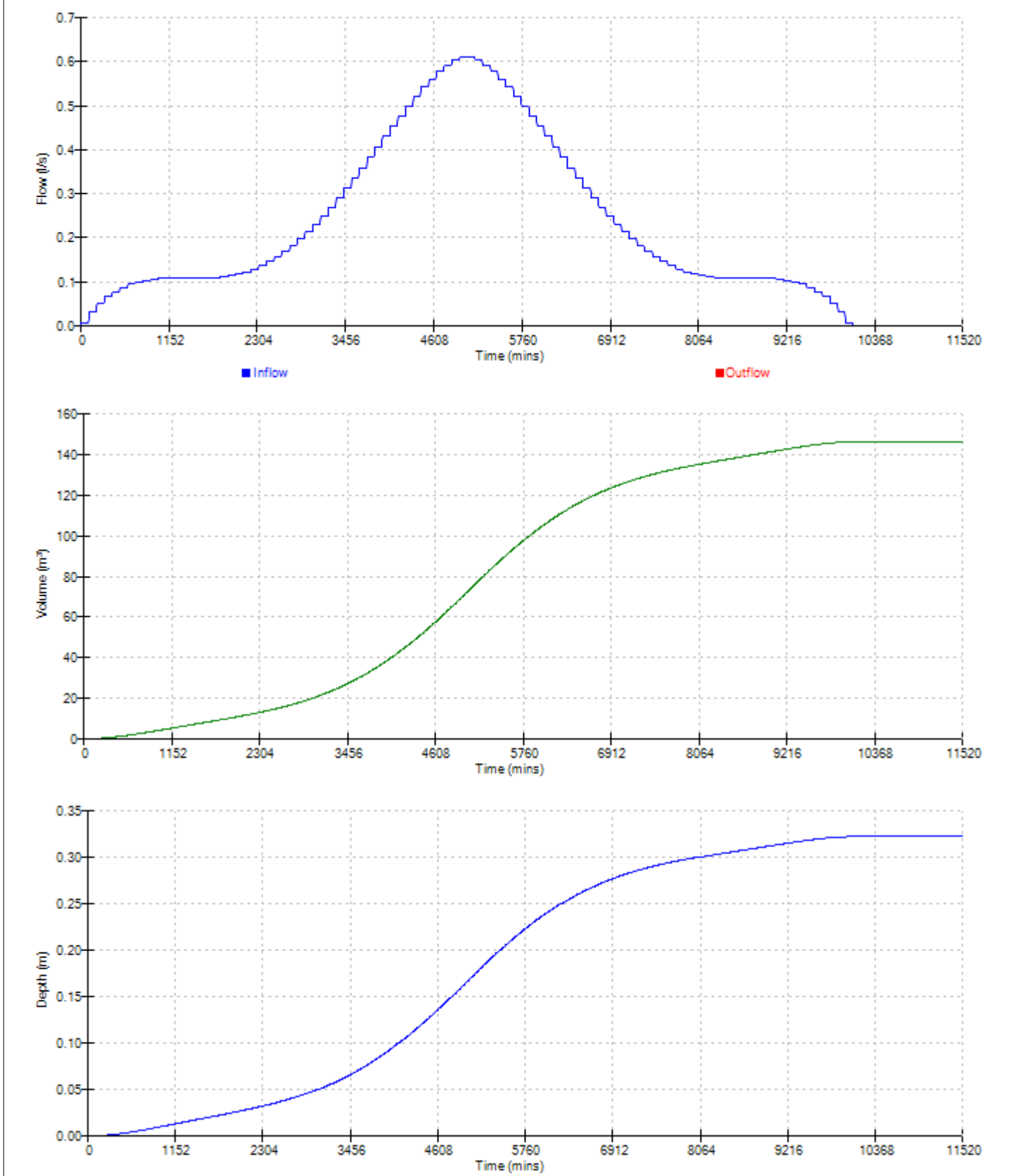
Storage is Online Cover Level (m) 67.000

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	402.1	0.300	499.6	0.600	606.2	0.900	721.9
0.100	433.6	0.400	534.2	0.700	643.8	1.000	762.4
0.200	466.1	0.500	569.7	0.800	682.3		

Event: 10080 min Winter



Lanmor Consulting Ltd		Page 1
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
15 min Summer	66.077	0.077	32.0	O K
30 min Summer	66.103	0.103	43.0	O K
60 min Summer	66.131	0.131	55.5	O K
120 min Summer	66.162	0.162	69.3	O K
180 min Summer	66.181	0.181	78.0	O K
240 min Summer	66.195	0.195	84.4	O K
360 min Summer	66.216	0.216	94.3	O K
480 min Summer	66.232	0.232	102.0	O K
600 min Summer	66.245	0.245	108.2	O K
720 min Summer	66.256	0.256	113.6	O K
960 min Summer	66.275	0.275	122.5	O K
1440 min Summer	66.302	0.302	136.0	O K
2160 min Summer	66.331	0.331	150.7	O K
2880 min Summer	66.353	0.353	162.0	O K
4320 min Summer	66.386	0.386	179.1	O K
5760 min Summer	66.411	0.411	192.4	O K
7200 min Summer	66.431	0.431	203.4	O K
8640 min Summer	66.448	0.448	213.0	O K
10080 min Summer	66.464	0.464	221.4	O K
15 min Winter	66.086	0.086	35.8	O K
30 min Winter	66.115	0.115	48.2	O K
60 min Winter	66.146	0.146	62.1	O K
120 min Winter	66.180	0.180	77.6	O K
180 min Winter	66.201	0.201	87.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	71.031	0.0	19
30 min Summer	47.794	0.0	34
60 min Summer	30.811	0.0	64
120 min Summer	19.253	0.0	124
180 min Summer	14.436	0.0	184
240 min Summer	11.721	0.0	244
360 min Summer	8.736	0.0	364
480 min Summer	7.081	0.0	484
600 min Summer	6.013	0.0	604
720 min Summer	5.258	0.0	724
960 min Summer	4.252	0.0	964
1440 min Summer	3.148	0.0	1444
2160 min Summer	2.326	0.0	2164
2880 min Summer	1.875	0.0	2884
4320 min Summer	1.382	0.0	4324
5760 min Summer	1.113	0.0	5768
7200 min Summer	0.942	0.0	7208
8640 min Summer	0.822	0.0	8648
10080 min Summer	0.732	0.0	10088
15 min Winter	71.031	0.0	19
30 min Winter	47.794	0.0	34
60 min Winter	30.811	0.0	64
120 min Winter	19.253	0.0	124
180 min Winter	14.436	0.0	184

Lanmor Consulting Ltd		Page 2
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
240 min Winter	66.217	0.217	94.5	O K
360 min Winter	66.240	0.240	105.7	O K
480 min Winter	66.258	0.258	114.2	O K
600 min Winter	66.272	0.272	121.2	O K
720 min Winter	66.284	0.284	127.2	O K
960 min Winter	66.304	0.304	137.2	O K
1440 min Winter	66.334	0.334	152.3	O K
2160 min Winter	66.366	0.366	168.8	O K
2880 min Winter	66.390	0.390	181.4	O K
4320 min Winter	66.426	0.426	200.6	O K
5760 min Winter	66.453	0.453	215.5	O K
7200 min Winter	66.475	0.475	227.9	O K
8640 min Winter	66.494	0.494	238.5	O K
10080 min Winter	66.511	0.511	247.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	11.721	0.0	244
360 min Winter	8.736	0.0	364
480 min Winter	7.081	0.0	484
600 min Winter	6.013	0.0	604
720 min Winter	5.258	0.0	724
960 min Winter	4.252	0.0	964
1440 min Winter	3.148	0.0	1444
2160 min Winter	2.326	0.0	2164
2880 min Winter	1.875	0.0	2884
4320 min Winter	1.382	0.0	4324
5760 min Winter	1.113	0.0	5768
7200 min Winter	0.942	0.0	7208
8640 min Winter	0.822	0.0	8648
10080 min Winter	0.732	0.0	10088

Lanmor Consulting Ltd		Page 3
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions		Source Control 2015.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.327	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.240

Time (mins)		Area
From:	To:	(ha)
0	4	0.240

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Model Details

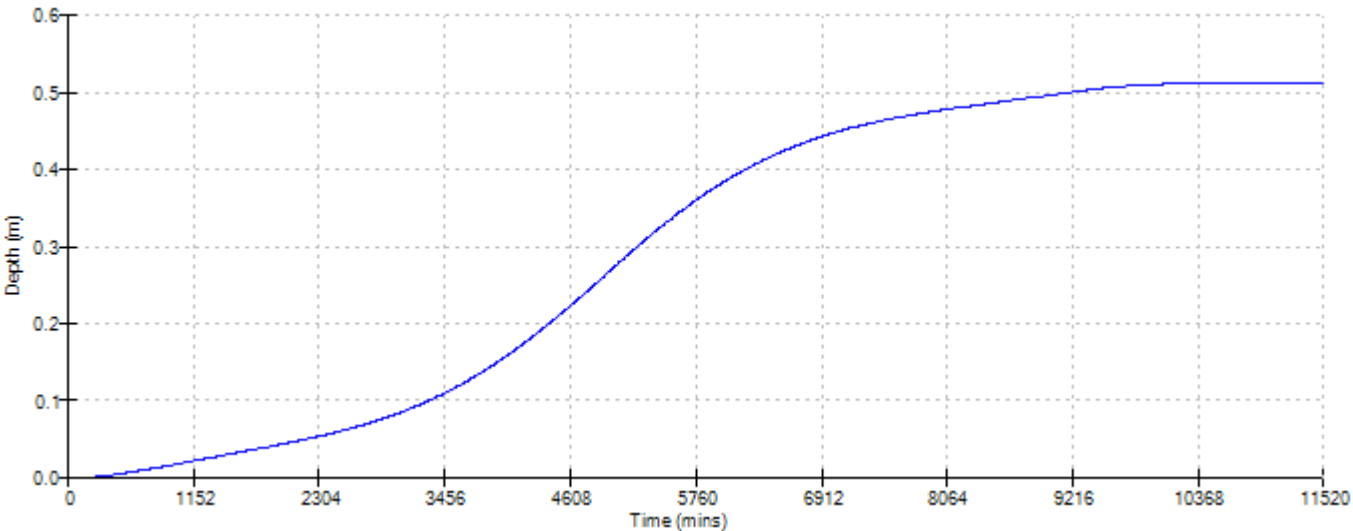
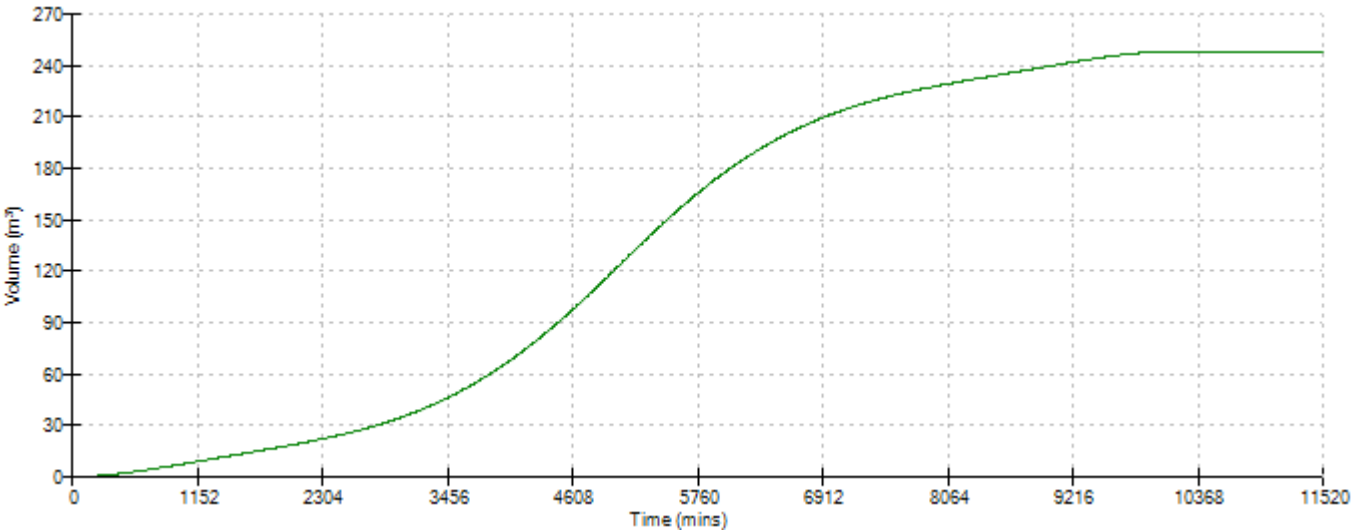
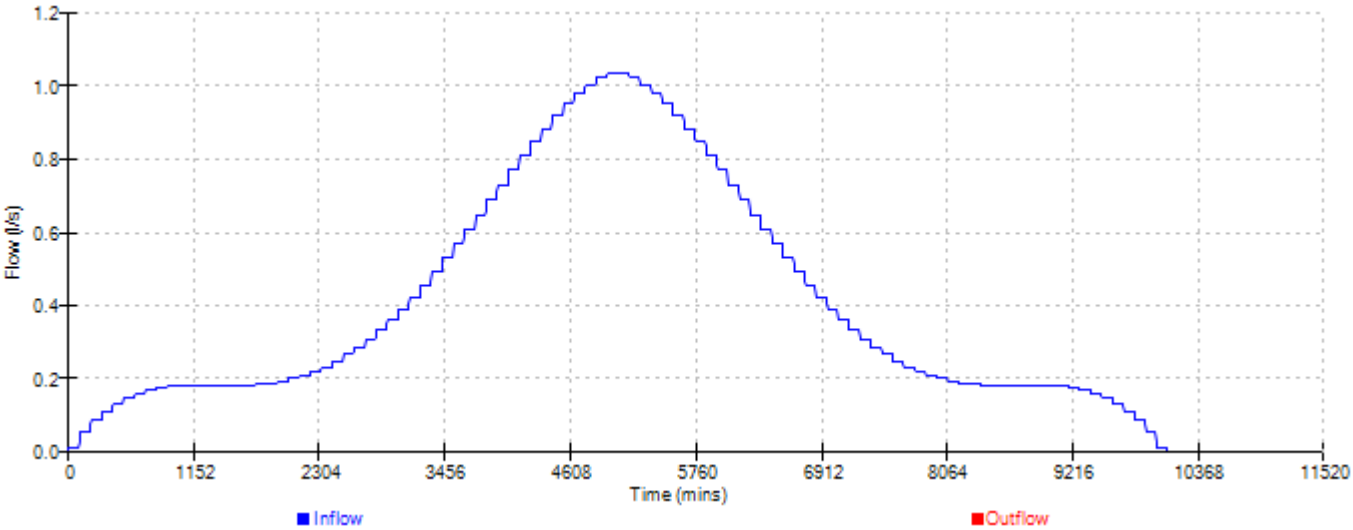
Storage is Online Cover Level (m) 67.000

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	402.1	0.300	499.6	0.600	606.2	0.900	721.9
0.100	433.6	0.400	534.2	0.700	643.8	1.000	762.4
0.200	466.1	0.500	569.7	0.800	682.3		

Event: 10080 min Winter



Lanmor Consulting Ltd		Page 1
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period (+35%)

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
15 min Summer	66.103	0.103	43.2	O K
30 min Summer	66.137	0.137	58.1	O K
60 min Summer	66.174	0.174	74.9	O K
120 min Summer	66.215	0.215	93.6	O K
180 min Summer	66.239	0.239	105.2	O K
240 min Summer	66.257	0.257	113.9	O K
360 min Summer	66.285	0.285	127.4	O K
480 min Summer	66.305	0.305	137.7	O K
600 min Summer	66.322	0.322	146.1	O K
720 min Summer	66.336	0.336	153.3	O K
960 min Summer	66.359	0.359	165.3	O K
1440 min Summer	66.394	0.394	183.6	O K
2160 min Summer	66.431	0.431	203.5	O K
2880 min Summer	66.459	0.459	218.7	O K
4320 min Summer	66.500	0.500	241.8	O K
5760 min Summer	66.531	0.531	259.7	O K
7200 min Summer	66.556	0.556	274.7	O K
8640 min Summer	66.578	0.578	287.5	O K
10080 min Summer	66.597	0.597	298.8	O K
15 min Winter	66.115	0.115	48.3	O K
30 min Winter	66.153	0.153	65.0	O K
60 min Winter	66.194	0.194	83.9	O K
120 min Winter	66.238	0.238	104.8	O K
180 min Winter	66.265	0.265	117.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	95.892	0.0	19
30 min Summer	64.522	0.0	34
60 min Summer	41.595	0.0	64
120 min Summer	25.992	0.0	124
180 min Summer	19.488	0.0	184
240 min Summer	15.823	0.0	244
360 min Summer	11.794	0.0	364
480 min Summer	9.560	0.0	484
600 min Summer	8.117	0.0	604
720 min Summer	7.098	0.0	724
960 min Summer	5.740	0.0	964
1440 min Summer	4.249	0.0	1444
2160 min Summer	3.140	0.0	2164
2880 min Summer	2.531	0.0	2884
4320 min Summer	1.866	0.0	4324
5760 min Summer	1.503	0.0	5768
7200 min Summer	1.272	0.0	7208
8640 min Summer	1.109	0.0	8648
10080 min Summer	0.988	0.0	10088
15 min Winter	95.892	0.0	19
30 min Winter	64.522	0.0	34
60 min Winter	41.595	0.0	64
120 min Winter	25.992	0.0	124
180 min Winter	19.488	0.0	184

Lanmor Consulting Ltd		Page 2
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 30 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
240 min Winter	66.285	0.285	127.6	O K
360 min Winter	66.315	0.315	142.7	O K
480 min Winter	66.338	0.338	154.2	O K
600 min Winter	66.356	0.356	163.6	O K
720 min Winter	66.372	0.372	171.7	O K
960 min Winter	66.397	0.397	185.2	O K
1440 min Winter	66.435	0.435	205.6	O K
2160 min Winter	66.475	0.475	227.9	O K
2880 min Winter	66.505	0.505	245.0	O K
4320 min Winter	66.550	0.550	270.8	O K
5760 min Winter	66.584	0.584	290.9	O K
7200 min Winter	66.611	0.611	307.6	O K
8640 min Winter	66.635	0.635	322.0	O K
10080 min Winter	66.655	0.655	334.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	15.823	0.0	244
360 min Winter	11.794	0.0	364
480 min Winter	9.560	0.0	484
600 min Winter	8.117	0.0	604
720 min Winter	7.098	0.0	724
960 min Winter	5.740	0.0	964
1440 min Winter	4.249	0.0	1444
2160 min Winter	3.140	0.0	2164
2880 min Winter	2.531	0.0	2884
4320 min Winter	1.866	0.0	4324
5760 min Winter	1.503	0.0	5768
7200 min Winter	1.272	0.0	7208
8640 min Winter	1.109	0.0	8648
10080 min Winter	0.988	0.0	10088

Lanmor Consulting Ltd		Page 3
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions		Source Control 2015.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.327	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.240

Time (mins)		Area
From:	To:	(ha)
0	4	0.240

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Model Details

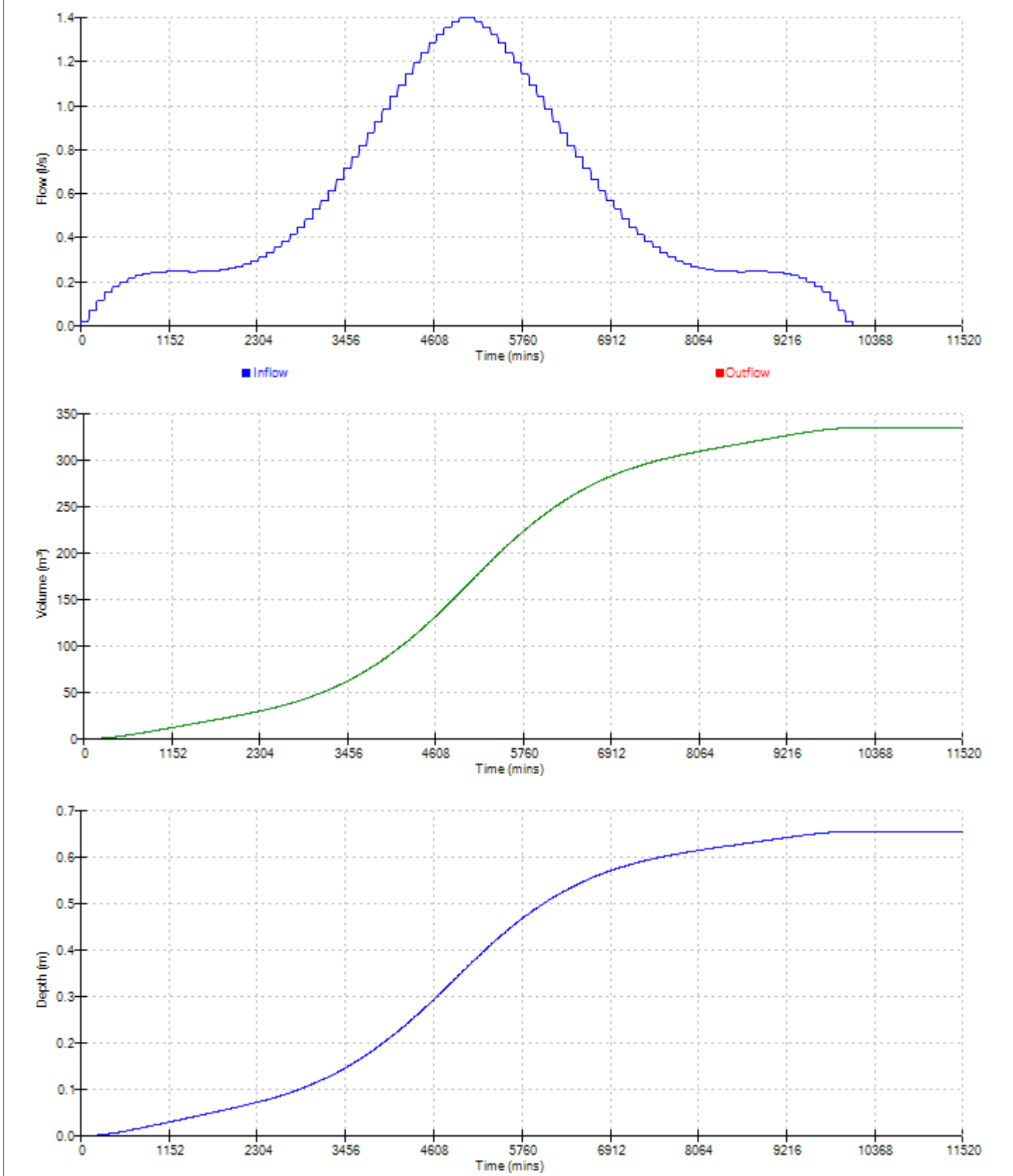
Storage is Online Cover Level (m) 67.000

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	402.1	0.300	499.6	0.600	606.2	0.900	721.9
0.100	433.6	0.400	534.2	0.700	643.8	1.000	762.4
0.200	466.1	0.500	569.7	0.800	682.3		

Event: 10080 min Winter



Lanmor Consulting Ltd		Page 1
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
15 min Summer	66.099	0.099	41.4	O K
30 min Summer	66.133	0.133	56.2	O K
60 min Summer	66.170	0.170	72.9	O K
120 min Summer	66.209	0.209	91.0	O K
180 min Summer	66.232	0.232	101.8	O K
240 min Summer	66.248	0.248	109.6	O K
360 min Summer	66.273	0.273	121.7	O K
480 min Summer	66.292	0.292	130.8	O K
600 min Summer	66.306	0.306	138.3	O K
720 min Summer	66.319	0.319	144.6	O K
960 min Summer	66.339	0.339	154.9	O K
1440 min Summer	66.369	0.369	170.4	O K
2160 min Summer	66.401	0.401	187.0	O K
2880 min Summer	66.424	0.424	199.4	O K
4320 min Summer	66.457	0.457	217.9	O K
5760 min Summer	66.483	0.483	232.2	O K
7200 min Summer	66.504	0.504	244.1	O K
8640 min Summer	66.522	0.522	254.2	O K
10080 min Summer	66.537	0.537	263.2	O K
15 min Winter	66.111	0.111	46.4	O K
30 min Winter	66.148	0.148	63.0	O K
60 min Winter	66.189	0.189	81.7	O K
120 min Winter	66.232	0.232	101.9	O K
180 min Winter	66.257	0.257	114.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	91.965	0.0	19
30 min Summer	62.496	0.0	34
60 min Summer	40.510	0.0	64
120 min Summer	25.280	0.0	124
180 min Summer	18.851	0.0	184
240 min Summer	15.223	0.0	244
360 min Summer	11.268	0.0	364
480 min Summer	9.086	0.0	484
600 min Summer	7.682	0.0	604
720 min Summer	6.693	0.0	724
960 min Summer	5.379	0.0	964
1440 min Summer	3.945	0.0	1444
2160 min Summer	2.885	0.0	2164
2880 min Summer	2.308	0.0	2884
4320 min Summer	1.681	0.0	4324
5760 min Summer	1.344	0.0	5768
7200 min Summer	1.130	0.0	7208
8640 min Summer	0.981	0.0	8648
10080 min Summer	0.870	0.0	10088
15 min Winter	91.965	0.0	19
30 min Winter	62.496	0.0	34
60 min Winter	40.510	0.0	64
120 min Winter	25.280	0.0	124
180 min Winter	18.851	0.0	184

Lanmor Consulting Ltd		Page 2
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m³)	Status
240 min Winter	66.275	0.275	122.8	O K
360 min Winter	66.303	0.303	136.3	O K
480 min Winter	66.323	0.323	146.5	O K
600 min Winter	66.339	0.339	154.9	O K
720 min Winter	66.353	0.353	161.9	O K
960 min Winter	66.375	0.375	173.5	O K
1440 min Winter	66.408	0.408	190.9	O K
2160 min Winter	66.442	0.442	209.4	O K
2880 min Winter	66.467	0.467	223.3	O K
4320 min Winter	66.504	0.504	244.1	O K
5760 min Winter	66.532	0.532	260.1	O K
7200 min Winter	66.554	0.554	273.4	O K
8640 min Winter	66.574	0.574	284.7	O K
10080 min Winter	66.590	0.590	294.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
240 min Winter	15.223	0.0	244
360 min Winter	11.268	0.0	364
480 min Winter	9.086	0.0	484
600 min Winter	7.682	0.0	604
720 min Winter	6.693	0.0	724
960 min Winter	5.379	0.0	964
1440 min Winter	3.945	0.0	1444
2160 min Winter	2.885	0.0	2164
2880 min Winter	2.308	0.0	2884
4320 min Winter	1.681	0.0	4324
5760 min Winter	1.344	0.0	5768
7200 min Winter	1.130	0.0	7208
8640 min Winter	0.981	0.0	8648
10080 min Winter	0.870	0.0	10088

Lanmor Consulting Ltd		Page 3
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.327	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.240

Time (mins)		Area
From:	To:	(ha)
0	4	0.240

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Model Details

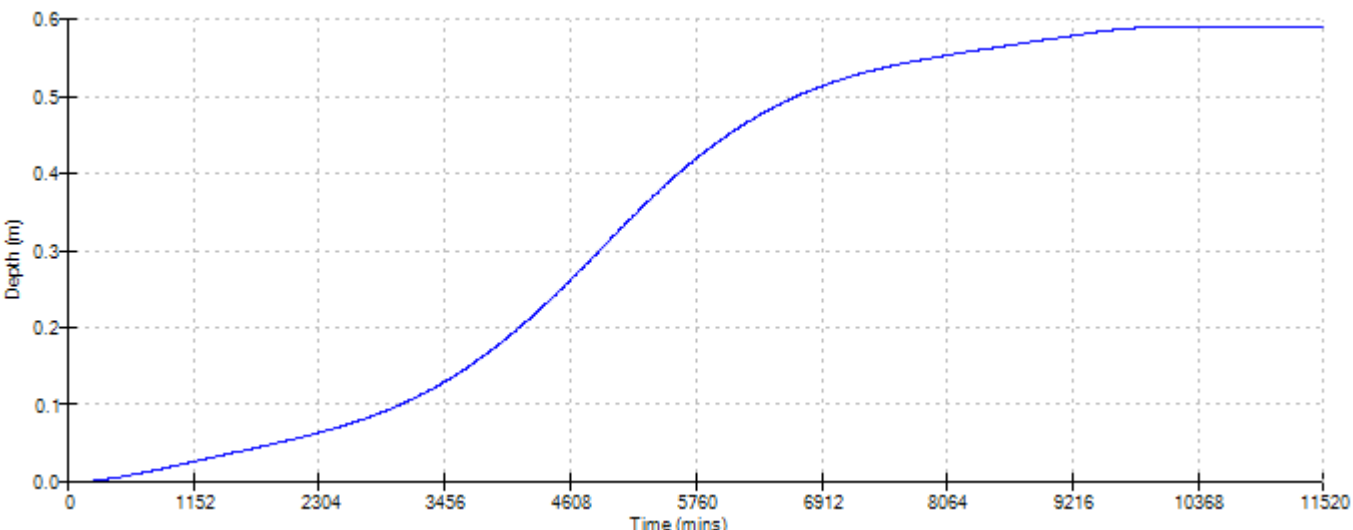
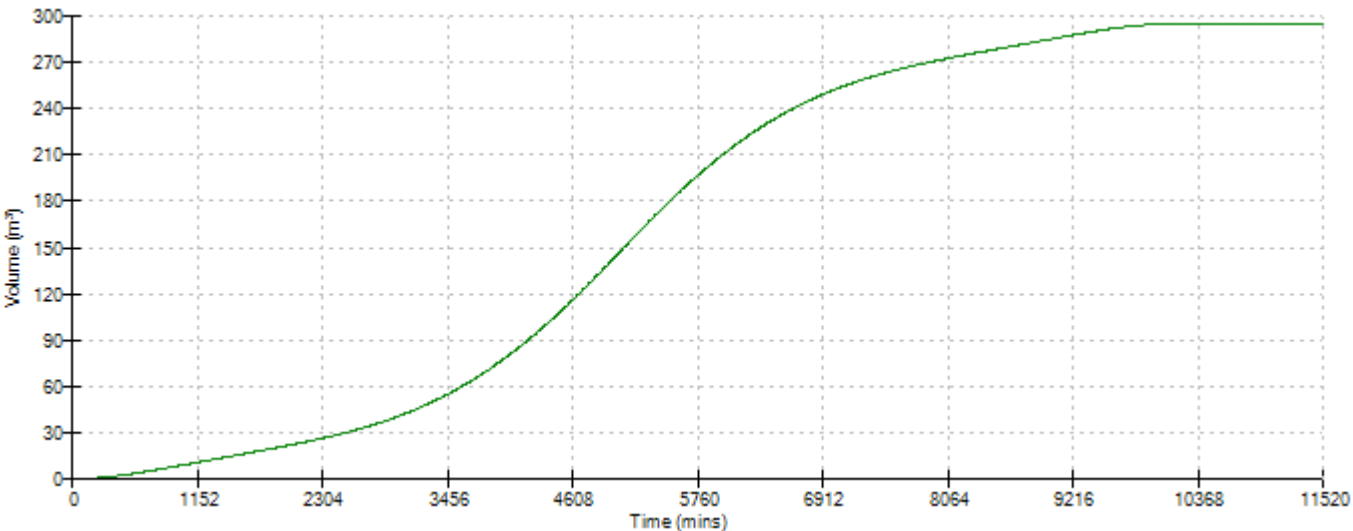
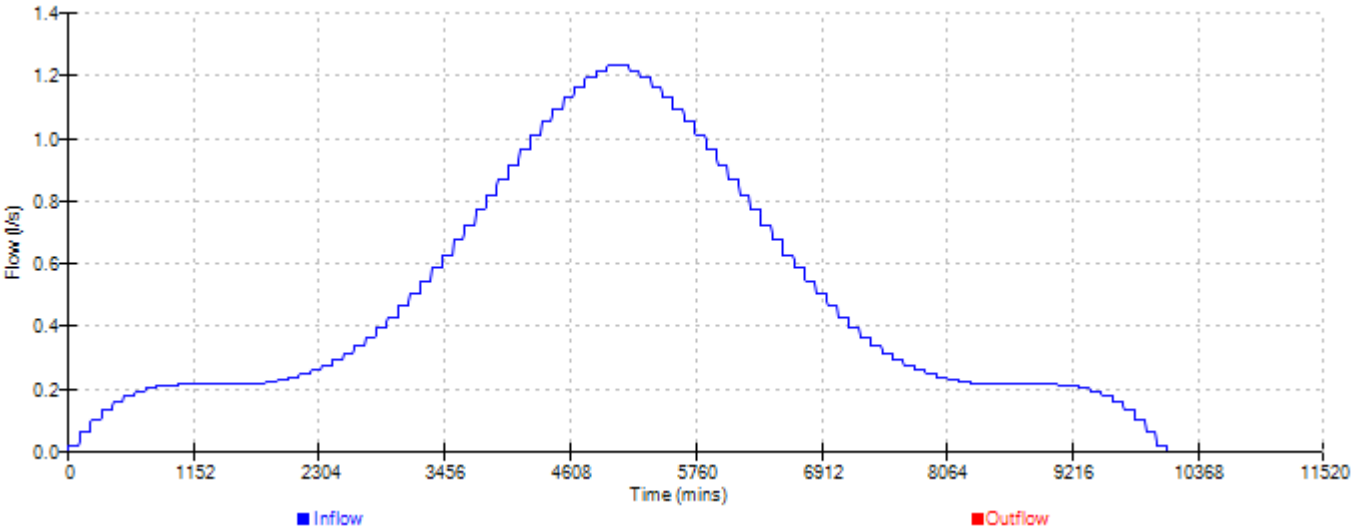
Storage is Online Cover Level (m) 67.000

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	402.1	0.300	499.6	0.600	606.2	0.900	721.9
0.100	433.6	0.400	534.2	0.700	643.8	1.000	762.4
0.200	466.1	0.500	569.7	0.800	682.3		

Event: 10080 min Winter



Lanmor Consulting Ltd		Page 1
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+45%)

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
15 min Summer	66.141	0.141	60.0	O K
30 min Summer	66.189	0.189	81.6	O K
60 min Summer	66.240	0.240	105.7	O K
120 min Summer	66.294	0.294	132.0	O K
180 min Summer	66.325	0.325	147.6	O K
240 min Summer	66.347	0.347	158.9	O K
360 min Summer	66.381	0.381	176.5	O K
480 min Summer	66.406	0.406	189.7	O K
600 min Summer	66.426	0.426	200.5	O K
720 min Summer	66.442	0.442	209.6	O K
960 min Summer	66.469	0.469	224.6	O K
1440 min Summer	66.509	0.509	247.1	O K
2160 min Summer	66.550	0.550	271.1	O K
2880 min Summer	66.581	0.581	289.1	O K
4320 min Summer	66.625	0.625	316.0	O K
5760 min Summer	66.658	0.658	336.7	O K
7200 min Summer	66.686	0.686	353.9	O K
8640 min Summer	66.708	0.708	368.6	Flood Risk
10080 min Summer	66.728	0.728	381.6	Flood Risk
15 min Winter	66.157	0.157	67.2	O K
30 min Winter	66.210	0.210	91.3	O K
60 min Winter	66.266	0.266	118.4	O K
120 min Winter	66.325	0.325	147.8	O K
180 min Winter	66.359	0.359	165.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	133.350	0.0	19
30 min Summer	90.619	0.0	34
60 min Summer	58.739	0.0	64
120 min Summer	36.656	0.0	124
180 min Summer	27.334	0.0	184
240 min Summer	22.073	0.0	244
360 min Summer	16.339	0.0	364
480 min Summer	13.175	0.0	484
600 min Summer	11.138	0.0	604
720 min Summer	9.704	0.0	724
960 min Summer	7.799	0.0	964
1440 min Summer	5.720	0.0	1444
2160 min Summer	4.184	0.0	2164
2880 min Summer	3.347	0.0	2884
4320 min Summer	2.438	0.0	4324
5760 min Summer	1.948	0.0	5768
7200 min Summer	1.638	0.0	7208
8640 min Summer	1.422	0.0	8648
10080 min Summer	1.262	0.0	10088
15 min Winter	133.350	0.0	19
30 min Winter	90.619	0.0	34
60 min Winter	58.739	0.0	64
120 min Winter	36.656	0.0	124
180 min Winter	27.334	0.0	184

Lanmor Consulting Ltd		Page 2
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Volume (m ³)	Status
240 min Winter	66.384	0.384	178.0	O K
360 min Winter	66.420	0.420	197.6	O K
480 min Winter	66.448	0.448	212.5	O K
600 min Winter	66.469	0.469	224.5	O K
720 min Winter	66.487	0.487	234.8	O K
960 min Winter	66.517	0.517	251.6	O K
1440 min Winter	66.560	0.560	276.7	O K
2160 min Winter	66.605	0.605	303.7	O K
2880 min Winter	66.638	0.638	323.8	O K
4320 min Winter	66.686	0.686	353.9	O K
5760 min Winter	66.722	0.722	377.1	Flood Risk
7200 min Winter	66.751	0.751	396.4	Flood Risk
8640 min Winter	66.776	0.776	412.9	Flood Risk
10080 min Winter	66.797	0.797	427.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
240 min Winter	22.073	0.0	244
360 min Winter	16.339	0.0	364
480 min Winter	13.175	0.0	484
600 min Winter	11.138	0.0	604
720 min Winter	9.704	0.0	724
960 min Winter	7.799	0.0	964
1440 min Winter	5.720	0.0	1444
2160 min Winter	4.184	0.0	2164
2880 min Winter	3.347	0.0	2884
4320 min Winter	2.438	0.0	4324
5760 min Winter	1.948	0.0	5768
7200 min Winter	1.638	0.0	7208
8640 min Winter	1.422	0.0	8648
10080 min Winter	1.262	0.0	10088

Lanmor Consulting Ltd		Page 3
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions		Source Control 2015.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.327	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.240

Time (mins)		Area
From:	To:	(ha)
0	4	0.240

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW	Plummerden House Park Lane Lindfield	
Date March 2025 File POND.SRCX	Designed by RS Checked by KBL	
XP Solutions		Source Control 2015.1

Model Details

Storage is Online Cover Level (m) 67.000

Tank or Pond Structure

Invert Level (m) 66.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	402.1	0.300	499.6	0.600	606.2	0.900	721.9
0.100	433.6	0.400	534.2	0.700	643.8	1.000	762.4
0.200	466.1	0.500	569.7	0.800	682.3		

Event: 10080 min Winter

