

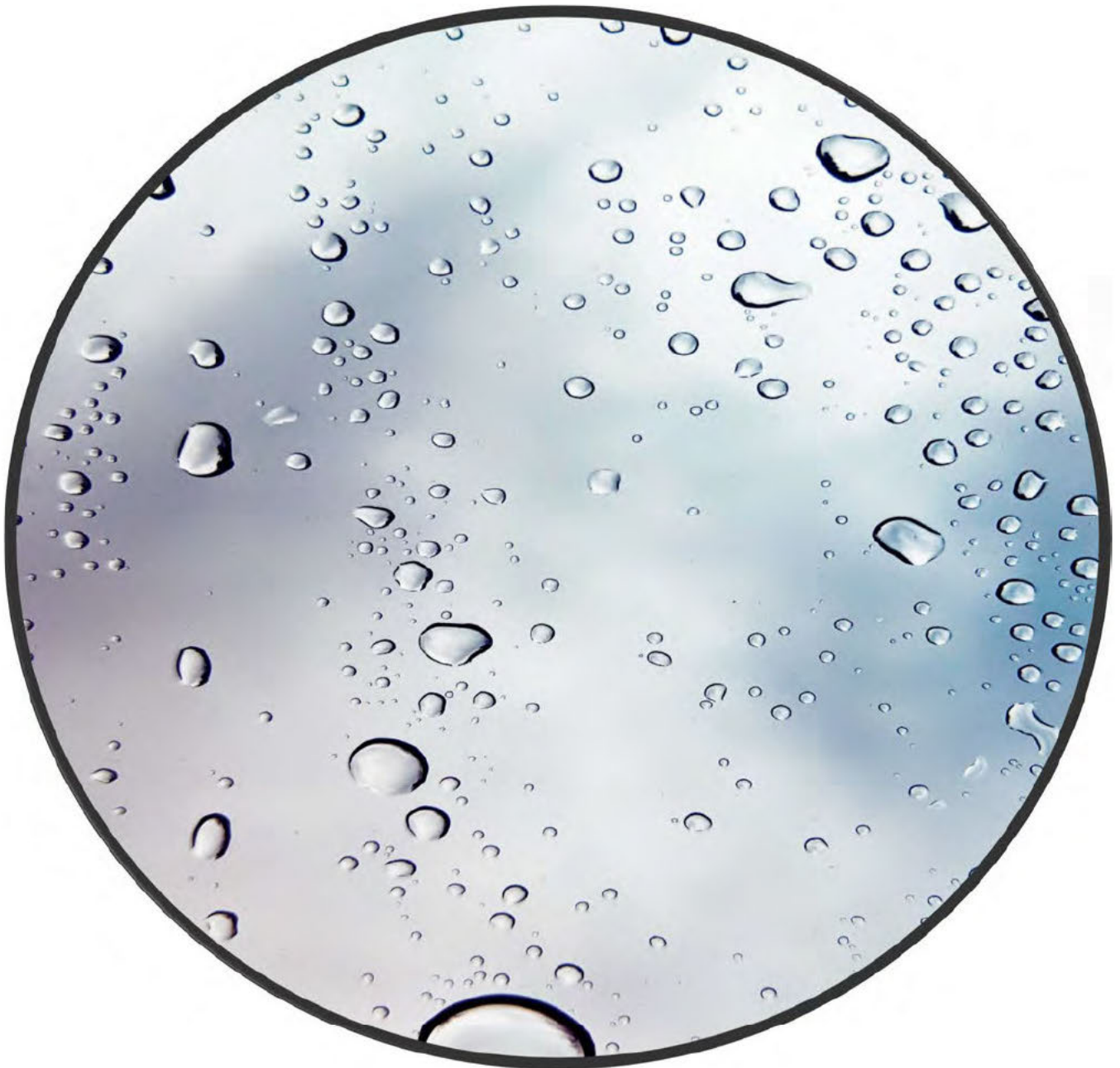


INFRASTRUCTURE DESIGN LTD
EST 2000

DRAINAGE STRATEGY REPORT, INCLUDING WASTEWATER STRATEGY

FORMER FRIENDS SCHOOL FIELDS, MOUNT PLEASANT
ROAD, SAFFRON WALDEN, ESSEX
ON BEHALF OF CHASE NEW HOMES LIMITED

APRIL 2025
IDL/1162/DS/02



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DRAINAGE STRATEGY REPORT, INCLUDING WASTEWATER STRATEGY

IDL/1162/DS/02

REPORT ISSUE

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P01	23/04/2025	Preliminary Issue

PREPARED BY

Infrastructure Engineer April 2025

REVIEWED BY

Director April 2025

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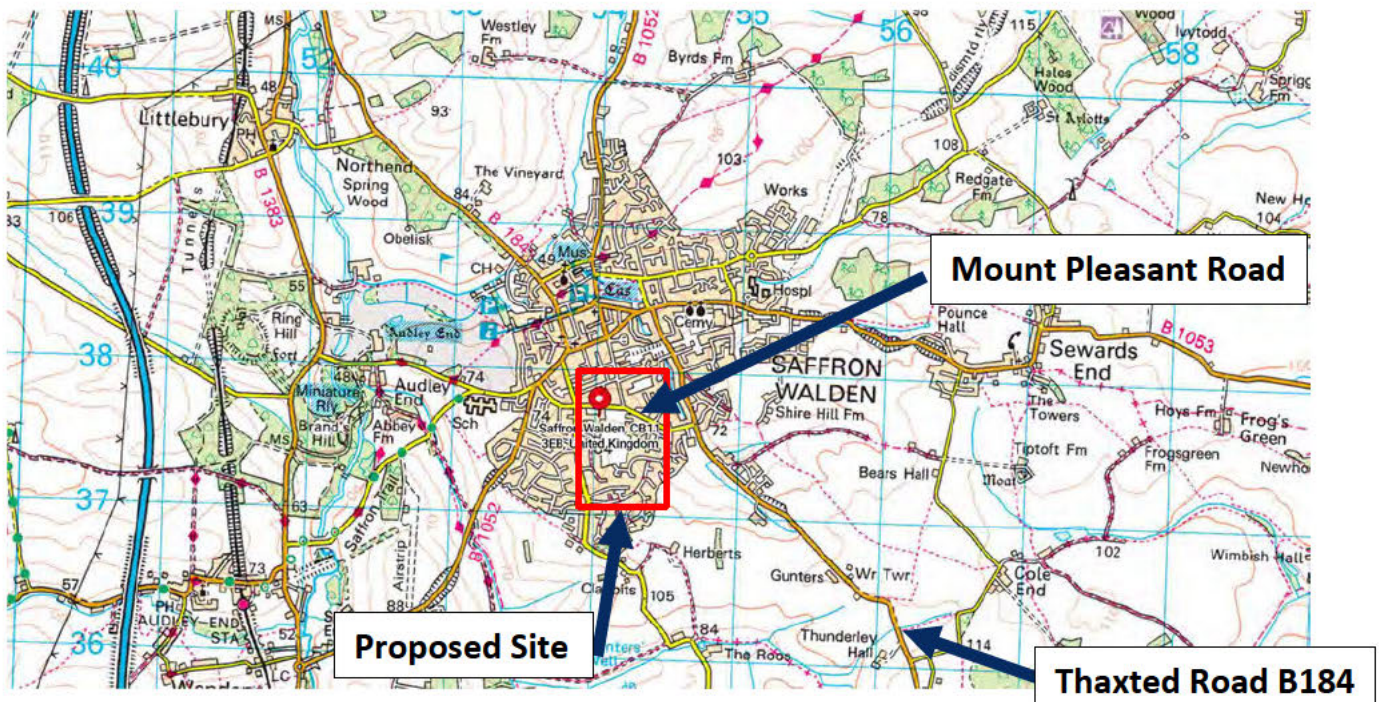
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1 INTRODUCTION

- 1.1 Chase New Homes Limited has appointed Infrastructure Design Ltd (IDL) to prepare this Drainage Strategy Summary Report to support their planning application for their proposed residential development site.
- 1.2 This report has been prepared in accordance with both national and local planning policy and takes guidance from CIRIA 753, The SuDS Manual and The Building Regulations, Approved Document Part H.
- 1.3 The site is situated off Mount Pleasant Road, Saffron Walden, in the Uttlesford District. The National Grid Reference for the site is TL 54136 37688.

Figure 1 – Site Location Plan



1.4 Reference Documents:-

- Card Geotechnics Limited Soakaway Test results.
- Anglian Water Utilities Report
- Proposed site layout Plan from Coles Architects.
- Datum Surveys Services Ltd Topographical Survey (Sheets 1 and 2)
- Amazi Flood Risk Assessment report dated 22nd April 2025.
- Sports Turf Consulting report dated 9th April

- 1.5 The site is an open playing field classified as greenfield open space, covering approximately 6.96 ha. The levels range from approximately 92.59m AOD at the site's eastern boundary to 85m AOD at the northwestern boundary lowest point near Mount Pleasant Road. On the west of the playing field is a former school site, which is currently under development to provide 96 residential units.
- 1.6 The proposed development of the playing field site will comprise 75 new dwellings (houses and apartments), a new sports facility (comprising marked out football and cricket pitches and a new clubhouse), access roads, shared and private drives, POS and communal landscaping.

The proposed main access to the development site will be from the former Walden School Access Road to the west and will remain private (constructed to standards acceptable to Essex Highways).

- 1.7 There are no foul or surface water sewers located within the playing field site, however, adopted foul water sewers do exist to the north in Mount Pleasant Road, and to the southwest in The Avenue.

The former school site (located west of the playing field site) discharged to a number of soakaways, and infiltration techniques are being implemented as part of the redevelopment of this site.

Furthermore, the former school site discharges foul water drainage to both the adopted in Mount Pleasant Road and, in part, to a foul sewer in Avenue Road to the south.

Refer to Appendix B for the Anglian Water sewer record map and the Datum topographical survey plans.

- 1.8 BGS data shows the site is underlain with Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated), which suggests potential for soakaway drainage.
- 1.9 Card Geotechnics Limited carried out soakage testing in April 2024, fully in accordance with BRE Digest 365.
- 1.10 The test results indicated infiltration rates between 7.4×10^{-5} m/s and 4.5×10^{-6} m/s.
- 1.11 No groundwater was observed during the infiltration testing and is expected to exist at considerable depth within the chalk strata.

Figure 2–Summary of Soakaway test results

Trial Pit No:	Infiltration rate	Infiltration m/s	m/hr	Lowest results
SA01-1	8.2X10-5	8.20E-05	0.2952	
SA01-2	7.4X10-5	7.40E-05	0.2664	0.252
SA01-3	7.0X10-5	7.00E-05	0.252	
SA02-1	3.6X10-5	3.60E-05	0.1296	
SA02-2	7.0X10-5	3.10E-05	0.1116	
SA02-3	7.0X10-9	1.80E-05	0.0648	0.0648
SA03-1	7.6X10-6	7.60E-06	0.02736	
SA03-2	4.5X10-6	4.50E-06	0.0162	0.0162
SA03-3	5.7X10-6	5.70E-06	0.02052	

SA04-1	1.9X10-5	1.90E-05	0.0684	
SA04-2	6.5X10-6	6.50E-06	0.0234	0.0234
SA04-3	1.9X10-5	1.90E-05	0.0684	
SA05-1	4.3X10-5	4.30E-05	0.1548	
SA05-2	2.9X10-5	2.90E-05	0.1044	0.1044
SA05-3	1.3X10-4	1.30E-04	0.468	

- 1.12 The north part of the site is within groundwater source protection zone 3 (SPZ3), and the south part of the site is located within groundwater source protection zone 2 (SPZ2).
- 1.13 The site is located within flood zone 1 and is not considered to be at risk of surface water or groundwater flooding. Refer to the Amazi Flood Risk Assessment report dated 24th June 2024.

2 FOUL WATER DRAINAGE

- 2.1 The proposed residential development's north and central parts of the development will discharge foul drainage via gravity to the existing Anglian Water foul sewer manhole located on Mount Pleasant Road manhole reference 2701. The southern part of the development will discharge via gravity to the Anglian Water foul sewer manhole located in The Avenue manhole reference 9504 via a newly formed lateral provided within the former school site and terminating at the western boundary of the playing fields site. Foul water drainage from the new clubhouse will discharge via a private package pump station to join the western outfall.
- 2.2 Prior to commencing any onsite drainage works, the exact location and levels of the existing sewer manhole will be recorded, and consent pursuant to Section 106 of The Water Industry Act will be obtained from Anglian Water.
- 2.3 The drainage strategy layout is included in Appendix C.

3 SURFACE WATER DRAINAGE & SUDS

- 3.1 The total site area extends to approximately 6.96 hectares.
- 3.2 The total proposed impermeable area for the site is 1503m²(1.503 Ha) with a roof of 0.668Ha, including 10% of urban creep allowances on the roof area added to the overall site area and a porous pavement area of 0.835 Ha. The impermeable area layout is included in Appendix C.
- 3.3 A hierarchal approach has been taken to selecting SuDS for the surface water drainage system outfalls. In order of priority, the methods of surface water discharge considered are:
- i) via infiltration techniques

ii) to the nearest watercourse

iii) and to the nearest sewer.

- 3.4 As noted in sections 1.8-1.12 and with reference to Appendix A1, infiltration techniques are feasible options for discharging the proposed surface water runoff from the site.
- 3.5 Given the underlying chalk strata, the cellular soakaway systems are positioned at least 10m from the foundations of any existing or proposed structures.
- 3.6 Surface water from plot driveways, parking areas and access roads will discharge via porous paving into the ground (System A-full infiltration).
- 3.7 Any excess surface water runoff from the sports pitches generated during periods of heavy or prolonged rainfall, will be diverted via a land drain located alongside the western boundary of the sports pitches and discharging into the cellular soakaway.
- 3.8 To summarise, the following SuDs devices will be applied to the scheme;
Permeable paving - To access roads, car parking aisles and parking bays.
Cellular Soakaway (Crate Storage) - To accommodate the runoff from all storm events, including the peak 1 in 100 years, plus climate change storm events.
- 3.9 SDS cellular soakaway system has been used to store extreme storm events. The SDS cellular system has granular stone filtration between the pipe and the geolight storage units, which eliminates hydrocarbons or suspended solids.
- 3.10 The permeable paving system incorporating a geotextile-lined subbase will be used to form the new parking areas, communal parking/access roads, and drives. This will serve to improve water quality prior to discharge to the ground. A minimum permeable stone layer of 350mm is required where the sub-base is laid level.
- 3.11 The proposed sports pitches surface water runoff will be discharged to SA-06 cellular soakaway via a series of 80mm (lateral drains) and 150mm (main drain/carrier) perforated pipe/drain proposed underneath the sports pitches areas. Please note that sports pitches drainage pipes and the cellular storage system has been designed to take 1 in 100 year plus 40% climate change. Refer to Appendix D for sports pitches drainage calculation SA-06.
- 3.12 In all instances, there will be an absolute minimum of 1m of freeboard between the base of any infiltration device and the seasonally high groundwater level. (Note: Historically, groundwater levels in the chalk strata locally have been circa 45m+ BGL.)

- 3.13 Given the low risk of pollution that surface water runoff from residential roofs and trafficked areas (via permeable paving) poses to the underlying geology, the groundwater resource within the SPZ's (2 & 3) will remain protected from harm.
- 3.14 Appendix D provides the *Flow* software results summary for the 1 in 1, 1 in 30 (3.3%) (plus a 35% allowance for 'upper end' climate change) and 1 in 100 (1%) years (plus a 40% allowance for 'upper end' climate change) return period events for the cellular soakaway system.

4 ENCLOSURES

- 4.1 Appendix A1 includes the SuDS Hierarchy and Appendix A2 includes Simple Index Tools.
- 4.2 Appendix B includes a copy of the Topographical Site Survey and Infiltration test results.
- 4.3 Appendix C includes a copy of the Drainage Strategy Layouts.
- 4.4 Appendix D includes the Surface Water / SuDS calculations and simulation results.
- 4.5 Appendix E Management & Maintenance Regime.

APPENDIX A1 – SUDS HIERARCHY

Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Included in the scheme?	Comments
	Living roofs	✓	✓	✓	✓	The clubhouse roof has a proposal of green roof. This will promote biodiversity and help retain and purify surface water runoff in the system.
	Basins and ponds	✓	✓	✓		Given the site layout, topography, and requirement for sports facilities, this type of above-ground feature is not practicable for use on this development.
	Filter strips and swales	✓	✓	✓	✓	Filter strips will deal with excess runoff from the sports fields, however swales are not suited on this scheme.
	Infiltration devices	✓	✓	✓	✓	Cellular Soakaway systems are proposed for the scheme.
	Permeable surfaces and infiltration blanket	✓	✓		✓	Permeable paving is proposed to be used extensively across the site. This will assist in pollution reduction
	Tanked systems-Over size Pipes	✓	✓			Not required.
Least Sustainable						



APPENDIX A2– SIMPLE INDEX TOOLS

1. The steps set out in the tool should be applied for each inflow or "runoff area" (ie each impermeable surface area separately discharging to a SuDS component).
2. The supporting "Design Conditions" stated by the tool must be fully considered and implemented in all cases.
3. Relevant design examples are included in the SuDS Manual Appendix C.
4. Each of the steps below are part of the process set out in the flowchart on Sheet 5.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SUDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment

If the generic land use types suggested are not applicable, select "Other" and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

Parent Area Land Use Description		Hazard Level	Total Suspended Solids	Metals	Hydrocarbons	DESIGN CONDITIONS	
						1	2
Select land use type from the drop-down list (or "Other" if none applicable) → If the generic land use types in the drop-down list above are not applicable, select "Other" and enter a description of the land use of the parent area and agreed user-defined indices in this case:	Initial Driveway	Low	0.5	0.4	0.4		
Landuse Pollution Hazard Index		Low	0.5	0.4	0.4		

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select "None" for each of the 3 SuDS components and move to Step 25

This step should be applied to evaluate the water quality protection provided by proposed SUDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If the proposed component is a biologic and/or a proprietary treatment product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined' include should be selected and a description of the component and agreed user defined include should be entered in the rows below the drop down lists.

		Pollution Mitigation Index			DESIGN CONSIDERATIONS		
		TOTAL SUSPENDED SOLIDS	Metals	Hydrocarbons	1	2	3
Select BuDR Component 1 (i.e. the upstream BuDR component) from the drop-down list: None Select BuDR Component 2 (i.e. the second BuDR component in a series) from the drop-down list: None Select BuDR Component 3 (i.e. the third BuDR component in a series) from the drop-down list: None							
If the proposed BuDR components are nonpoint-source only and the general indices above are not considered appropriate, select "Tertiary treatment system" or "User defined BuDR" and enter component descriptions and agreed-upon defined indices in these rows:							
Assessments Surface Water Pollution Mitigation Index	0	0	0				

Note: If the total assigned mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at "0.00". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed level of risk or other risk assessment is required. All proposed and agreed-upon measures will be used.

Is the runoff now discharged to an infiltration component?

Yes ? [Go to Step 2B](#)
No ? [Go to Step 2C](#)

No 7 [Go to slide 20](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

³Groundwater protection describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

When the discharge is to surface waters and risk to groundwater need not be considered, select None

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indicator					
		Total Suspended Solids	Metals	Hydrocarbons			
Select type of groundwater protection from the drop down list: ↓ Previous pavement underlain by 300 mm minimum depth of soils with good consolidation/stress/strain potential If the proposed groundwater protection is backfill/primary/secondary and/or the geosilt indicates above are not considered appropriate, select "Watershed product" or "User Defined Indicator" and enter a description of the protection and agreed user defined indicator in this case:				1	2	3	4
	As designs must include a minimum of 1 m unstabilized depth of natural or artificial material below the left traffic surface and the right-hand Bely groundwater line. The underlying soils must provide good containment effectiveness as outlined in the recommendations in Section 2008 (a) and (b) (Soil Washing (2015) or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater	0.7	0.6	0.7			
	Groundwater Protection Pollution Mitigation Index	0.7	0.6	0.7			

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	0.7	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at $\sim 0.95^{\circ}$. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where this assessment is required, this outcome would need more detailed verification).

STEP 20 Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type.

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (in order and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor effluent performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more prescriptive approach may be required and this should be decided with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indicators (USEPA Regions)				T
Solids	Metals	Hydrocarbons		
Sufficient	Sufficient	Sufficient	References to land planning documents should also be made to identify any additional protections required for sites due to habitat conservation (see Chapter 7 for the <i>State</i> design process). The implications of developments on or within sites proximate to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies.	

SIMPLE INDEX APPROACH: TOOL



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- The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', select:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined index in the row below the drop down list.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Index		
		Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable)				
Roads (excluding low traffic roads, highly frequented busy approaches to industrial estates, trunk roads/motorways)	Medium	0.7	0.6	0.7
Landuse Pollution Hazard Index	Medium	0.7	0.6	0.7

DESIGN CONDITIONS	
1	2

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined index' should be selected and a description of the component and agreed user defined index should be entered in the row below the drop down list.

SuDS Component Description	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list)			
None			
Select SuDS Component 2 (i.e. the second SuDS component in a series from the drop down list)			
None			
Select SuDS Component 3 (i.e. the third SuDS component in a series from the drop down list)			
None			
Aggregated Surface Water Pollution Mitigation Index	0	0	0

DESIGN CONDITIONS		
1	2	3

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50*. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and data to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generally described by the suggested measures, then a description of the protection and agreed user defined index should be entered in the row below the drop down list.

Select type of groundwater protection from the drop down list	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Permeable pavement underlain by 200 mm minimum depth of soils with good water retention characteristics	0.7	0.6	0.7
Groundwater Protection Pollution Mitigation Index	0.7	0.6	0.7

DESIGN CONDITIONS			
1	2	3	4

All designs must include a minimum of 1 m estimated depth of soil or other material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be provided by geotextile components that trap all, or designed specifically to retain, sediment in a separate head tank, easily accessible for maintenance, such that the sediment will not be re-dispersed in subsequent events.

The permeable pavement must include a suitable filtration layer providing treatment and must include a geotextile at the base separating the foundation from the sub-grade. The underlying soils must provide good contaminant attenuation potential (eg as recommended in BS5900:30 and BS11300:1 Part 1). Where (2012) or other appropriate guidance, alternative depth and soil characteristics must provide equivalent protection to the underlying groundwater.

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

Combined Pollution Mitigation Indices for the Runoff Area	Combined Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
	0.7	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50*. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

STEP 2D Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unanticipated pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more prescriptive approach may be required and this should be checked with the environmental regulator or a site by site basis.

Sufficiency of Pollution Mitigation Index		
Total Suspended Solids	Metals	Hydrocarbons
Sufficient	Sufficient	Sufficient

DESIGN CONDITIONS

Reference to local planning documents should also be made to identify any additional protection required for sites due to landfill contamination (see Chapter 7 for SuDS design process). The implications of developments on or within areas proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies such as Natural England.

SIMPLE INDEX APPROACH: TOOL



Water should not be liable for any direct or indirect damage claims, loss, cost, expense or liability however arising out of the use or responsibility to use the tool, even when water has been informed of the possibility of the same. The user hereby indemnifies water from and against any damage claims, loss, expense or liability resulting from any action taken against water that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. Water does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

- The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down list.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Index			DESIGN CONDITIONS
		Total Suspended Solids	Metals	Hydrocarbons	
Select land use type from the drop down list (or 'Other' if none applicable)					1 2
Residential parking	Low	0.5	0.4	0.4	
Landuse Pollution Hazard Index	Low	0.5	0.4	0.4	

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined index' should be selected and a description of the component and agreed user defined indices should be entered in the row below the drop down list.

SuDS Component Description	Pollution Mitigation Index			DESIGN CONDITIONS
	Total Suspended Solids	Metals	Hydrocarbons	
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list)				1 2 3
None				
Select SuDS Component 2 (i.e. the second SuDS component in a series from the drop down list)				
None				
Select SuDS Component 3 (i.e. the third SuDS component in a series from the drop down list)				
None				
Aggregated Surface Water Pollution Mitigation Index	0	0	0	

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and this to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generally described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list.

Select type of groundwater protection from the drop down list	Pollution Mitigation Index			DESIGN CONDITIONS
	Total Suspended Solids	Metals	Hydrocarbons	
Permeable pavement underlain by 200 mm minimum depth of soils with good contamination attenuation potential	0.7	0.6	0.7	1 2 3 4
Groundwater Protection Pollution Mitigation Index	0.7	0.6	0.7	

All designs must include a minimum of 1 m estimated depth of soil or other material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be provided by a permeable component that traps all, or designed specifically to retain, sediment in a separate head tank, easily accessible for maintenance, such that the sediment will not be re-dispersed in subsequent events.

The permeable pavement must include a suitable filtration layer providing treatment and must include a geotextile at the base separating the foundation from the sub-grade. The underlying soils must provide good contaminant attenuation potential (eg as recommended in BS5830:04 and BS11300:1:2005) or other appropriate geotextile. Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater.

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	0.7	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

STEP 2D Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unanticipated pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator or a site by site basis.

	Total Suspended Solids	Metals	Hydrocarbons
Sufficiency of Pollution Mitigation Indices	Sufficient	Sufficient	Sufficient

Reference to local planning documents should also be made to identify any additional protection required for sites due to landfill contamination (see Chapter 7 for SuDS design process). The implications of developments on or within areas proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies such as Natural England.

SIMPLE INDEX APPROACH: TOOL



Water should not be liable for any direct or indirect damage claims, loss, cost, expense or liability however arising out of the use or in responsibility to use the tool, even when water has been informed of the possibility of the same. The user hereby indemnifies water from and against any damage claims, loss, expense or liability resulting from any action taken against water that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. Water does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

- The steps set out in the tool should be applied for each inflow or 'runoff' area (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down list.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Index		
		Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable)				
Residential roofing	Very low	0.2	0.2	0.05
Landuse Pollution Hazard Index		Very low	0.2	0.2
			0.05	

DESIGN CONDITIONS			
1	2	3	4

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically assessed for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined index' and enter component descriptions and agreed user defined indices in the row below the drop down list.

SuDS Component Description	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list)			
None			
Select SuDS Component 2 (i.e. the second SuDS component in a series from the drop down list)			
None			
Select SuDS Component 3 (i.e. the third SuDS component in a series from the drop down list)			
None			
Aggregated Surface Water Pollution Mitigation Index		0	0
			0

DESIGN CONDITIONS			
1	2	3	4

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.05. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically assessed for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and data to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generally described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list.

Select type of groundwater protection from the drop down list	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
300 mm minimum depth of soils with good contamination absorption potential	0.4	0.3	0.3
Groundwater Protection Pollution Mitigation Index		0.4	0.3
			0.3

DESIGN CONDITIONS			
1	2	3	4
All designs must include a minimum of 1 m of unsaturated depth of soil or other material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be provided by a system component that traps all, or designed specifically to retain and catch, a separate final base, easily accessible for maintenance, such that the soil/water will not be suspended in subsequent events.	The underlying soils must provide good contaminant attenuation potential (eg as recommended in British Standard BS 5945-1:2005 or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater.		

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

Combined Pollution Mitigation Indices for the Runoff Area	Combined Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
	0.4	0.3	0.3

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.05. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

STEP 2D Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator or a site by site basis.

Sufficiency of Pollution Mitigation Index		
Total Suspended Solids	Metals	Hydrocarbons
Sufficient	Sufficient	Sufficient

DESIGN CONDITIONS

Reference to local planning documents should also be made to identify any additional protection required for sites due to landfill contamination (see Chapter 7 for SuDS design process). The implications of developments on or within areas proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies such as Natural England.

SIMPLE INDEX APPROACH: TOOL



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- The steps set out in the tool should be applied for each inflow or 'runoff' area (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', select:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down list.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Index		
		Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable)				
Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:				
Landuse Pollution Hazard Index	Low	0.5	0.4	0.4

DESIGN CONDITIONS		
1	2	

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined index' should be selected and a description of the component and agreed user defined indices should be entered in the row below the drop down list.

SuDS Component Description	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list)			
None			
Select SuDS Component 2 (i.e. the second SuDS component in a series from the drop down list)			
None			
Select SuDS Component 3 (i.e. the third SuDS component in a series from the drop down list)			
None			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined index' and enter component descriptions and agreed user defined indices in this row:			
Aggregated Surface Water Pollution Mitigation Index	0	0	0

DESIGN CONDITIONS		
1	2	3

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50*. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically required for the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and data to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generally described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list.

Select type of groundwater protection from the drop down list	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Permeable pavement underlain by 200 mm minimum depth of soils with good contamination attenuation potential	0.7	0.6	0.7
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined index' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	0.7	0.6	0.7

DESIGN CONDITIONS			
1	2	3	4

All designs must include a minimum of 1 m estimated depth of subsoil or similar material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be provided by a permeable component that traps all, or designed specifically to retain, sediment in a separate head tank, easily accessible for maintenance, such that the sediment will not be re-dispersed in subsequent events.

The permeable pavement must include a suitable filtration layer providing treatment and must include a geotextile at the base separating the foundation from the sub-grade. The underlying soils must provide good contaminant attenuation potential (eg as recommended in BS5900:30 and BS11300:1000) or other appropriate geotextile, otherwise depth and soil characteristics must provide equivalent protection to the underlying groundwater.

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

Combined Pollution Mitigation Indices for the Runoff Area	Combined Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
	0.7	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50*. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

STEP 2D Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (e.g. over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unanticipated pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator or a site by site basis.

Sufficiency of Pollution Mitigation Index		
Total Suspended Solids	Metals	Hydrocarbons
Sufficient	Sufficient	Sufficient

DESIGN CONDITIONS

Reference to local planning documents should also be made to identify any additional protection required for sites due to landfill contamination (see Chapter 7 for SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies such as Natural England.

SIMPLE INDEX APPROACH: TOOL



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- The steps set out in the tool should be applied for each inflow or 'runoff' area (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL.

STEP 1 Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', select:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined index in the row below the drop down list.

Runoff Area Land Use Description	Hazard Level	Pollution Hazard Index		
		Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable)				
Non-residential parking with infrequent charge (e.g. schools, offices, < 200 traffic movements a day)	Low	0.5	0.4	0.4
Landuse Pollution Hazard Index: Low 0.5 0.4 0.4				

STEP 2A Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically assessed for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generally described by the suggested components, then 'Proprietary treatment system' or 'User defined index' should be selected and a description of the component and agreed user defined index should be entered in the row below the drop down list.

SuDS Component Description	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component from the drop down list)			
None			
Select SuDS Component 2 (i.e. the second SuDS component in a series from the drop down list)			
None			
Select SuDS Component 3 (i.e. the third SuDS component in a series from the drop down list)			
None			
Aggregated Surface Water Pollution Mitigation Index: 0 0 0			

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes? [Go to Step 2B](#)
No? [Go to Step 2C](#)

STEP 2B Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even when infiltration is not specifically assessed for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and data to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generally described by the suggested measures, then a description of the protection and agreed user defined index should be entered in the row below the drop down list.

Select type of groundwater protection from the drop down list	Pollution Mitigation Index		
	Total Suspended Solids	Metals	Hydrocarbons
Permeable pavement underlain by 200 mm minimum depth of soils with good permeability characteristics	0.7	0.6	0.7
Groundwater Protection Pollution Mitigation Index: 0.7 0.6 0.7			

Note: The permeable pavement must include a suitable filtration layer providing treatment and must include a geotextile at the base separating the foundation from the sub-grade. The underlying soils must provide good contaminant attenuation potential (eg as recommended in BS5900:2008:40 and BS11300:1:2005:2010) or other appropriate geotextile. Alternative depth and soil characteristics must provide equivalent protection to the underlying groundwater.

STEP 2C Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	0.7	0.6	0.7

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at <0.50. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note where this assessment is required, this outcome would need more detailed verification).

STEP 2D Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (e.g. over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unanticipated pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator or a site by site basis.

Sufficiency of Pollution Mitigation Indices		
Total Suspended Solids	Metals	Hydrocarbons
Sufficient	Sufficient	Sufficient

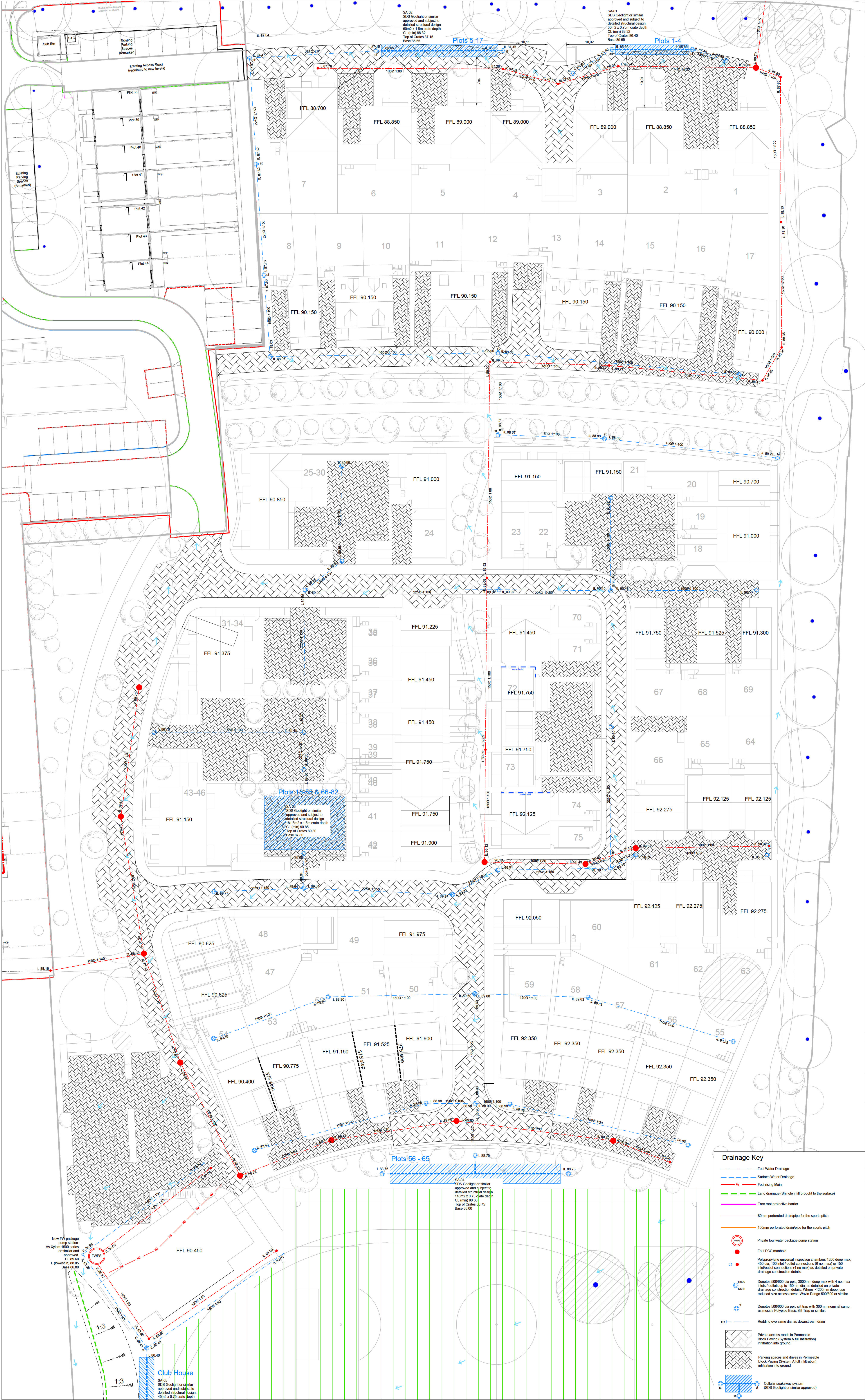
Reference to local planning documents should also be made to identify any additional protection required for sites due to landfill contamination (see Chapter 7 for SuDS design process). The implications of developments on or within areas proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered in consultation with relevant conservation bodies such as Natural England.



APPENDIX C – PROPOSED DRAINAGE STRATEGY LAYOUTS & DRAINAGE AREA PLANS

CONTRACT DOCUMENT

Notes



5	Site Plan and Drainage plan revised	23.04.25
4	Drainage plan revised according to client comments	11.04.25
3	Drainage plan revised to suit new site plan	08.04.25
2	Drainage plan revised to LLA comments	10.10.24
1	SA.2 & SA.5 soakaway corrected	
1	Preliminary Issue	20.05.24

Status: Preliminary Issue

Scale: 1:250@A0	Rev: 5	File Ref: 1229-07.dwg
Date: Jan 2024	Checked: RM	Approved: PT
Drawn: IDL		

Title: Drainage Layout Sheet 1 of 2

Project: Playing Fields Site, Safron Walden
Dwg No: IDL/1229/07/101
Date: 12/29/07/101
Rev: 5
File Ref: 1229-07-101.pdf
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iD LTD
INFRASTRUCTURE DESIGN LIMITED
working for

CHASE
NEW HOMES

Chase New Homes Limited
Jasmine House
8 Park Way
Welwyn Garden City
Hertfordshire, AL8 6HG
Tel: 01992 766558
Fax: 01992 715406

- Drainage Key**
- Foul Water Drainage
 - Surface Water Drainage
 - Foul Water Main
 - Land drainage (Shingle inlet brought to the surface)
 - Tree root protective barrier
 - 80mm perforated drainpipe for the sports pitch
 - 150mm perforated drainpipe for the sports pitch
 - Private foul water package pump station
 - Foul PCC manhole
 - Polypropylene universal inspection chambers: 1200 deep max, 450 dia, 100 inlet/outlet connections (8 no. max) or 150 inlet/outlet connections (4 no. max) as detailed on private drainage construction details.
 - Densites 500/600 dia pvc, 3000mm deep max with 4 no. max inlets/outlets up to 150mm dia, as detailed on private drainage construction details. Where >1200mm deep, use reduced size access cover. Waven Range 500/600 or similar.
 - Densites 500/600 dia pvc all trap with 300mm normal sump, as messes Polypropylene Silt Trap or similar.
 - Rodding eye same dia. as downstream drain
 - Private access roads in Permeable Block Paving (System A full infiltration) infiltration into ground
 - Parking spaces and drives in Permeable Block Paving (System A full infiltration) infiltration into ground
 - Cellular soakaway system (SDS Geolight or similar approved)

CONTRACT DOCUMENT

Notes

5	Site Plan and Drainage plan revised	23.04.25
4	Drainage plan revised according to client comments	11.04.25
3	Drainage plan revised to suit new site plan	08.04.25
2	Drainage plan revised to LFA comments	10.10.24
1	SA 2 & SA 5 soakaway corrected	
1	Preliminary Issue	20.06.24

Rev	Description	Date
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States: Preliminary Issue

Scale:	1:250@A0		
Date:	June 2024	Checked:	Approved:
Drawn:	IDL	BM	PT

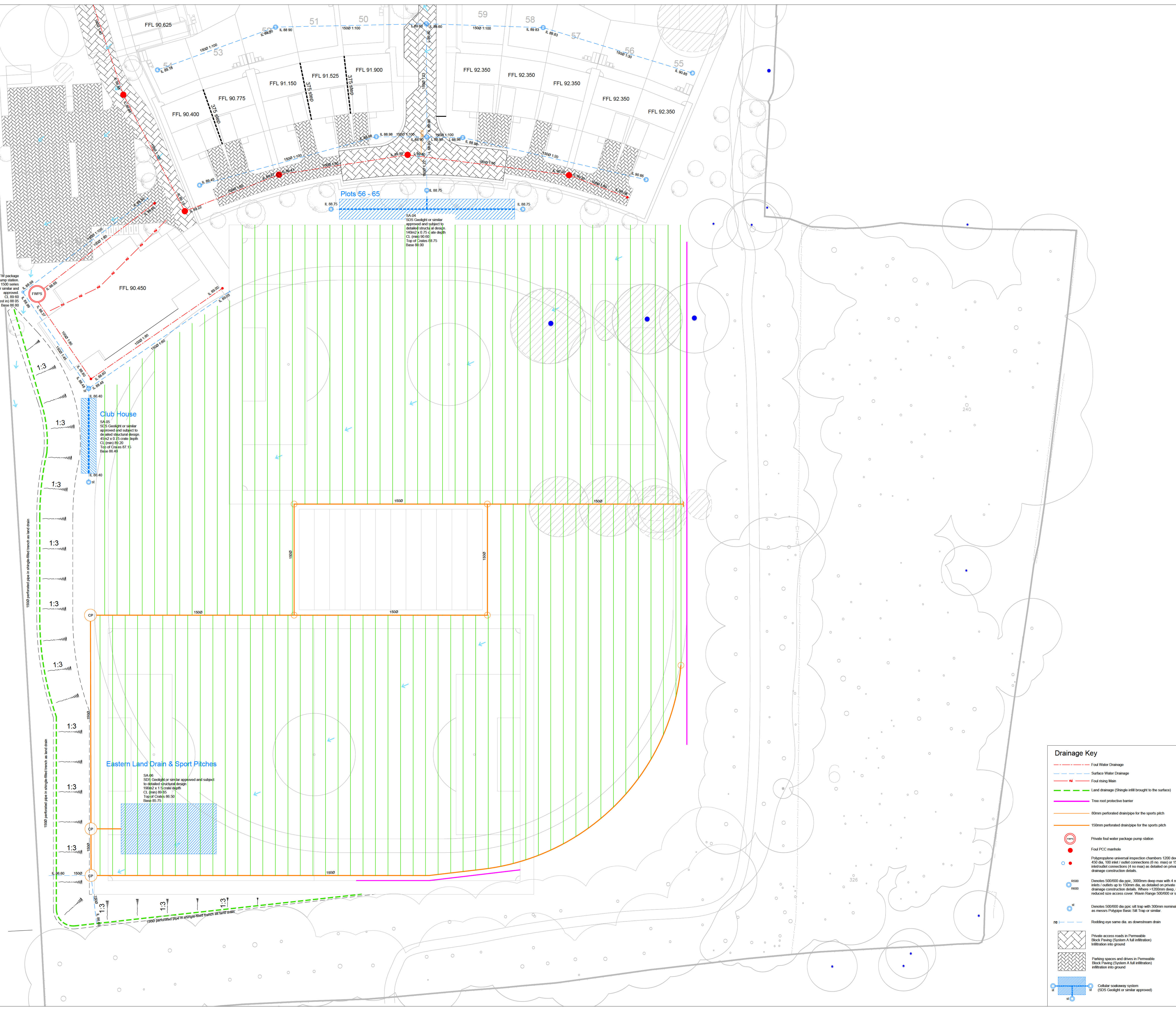
Title: Drainage Layout Sheet 2 of 2

Project: Playing Fields Site, Saffron Walden
ID/L/1229/07/104
33 The Point, Rockingham Road, Market Harborough, Leicestershire LE16 7QU
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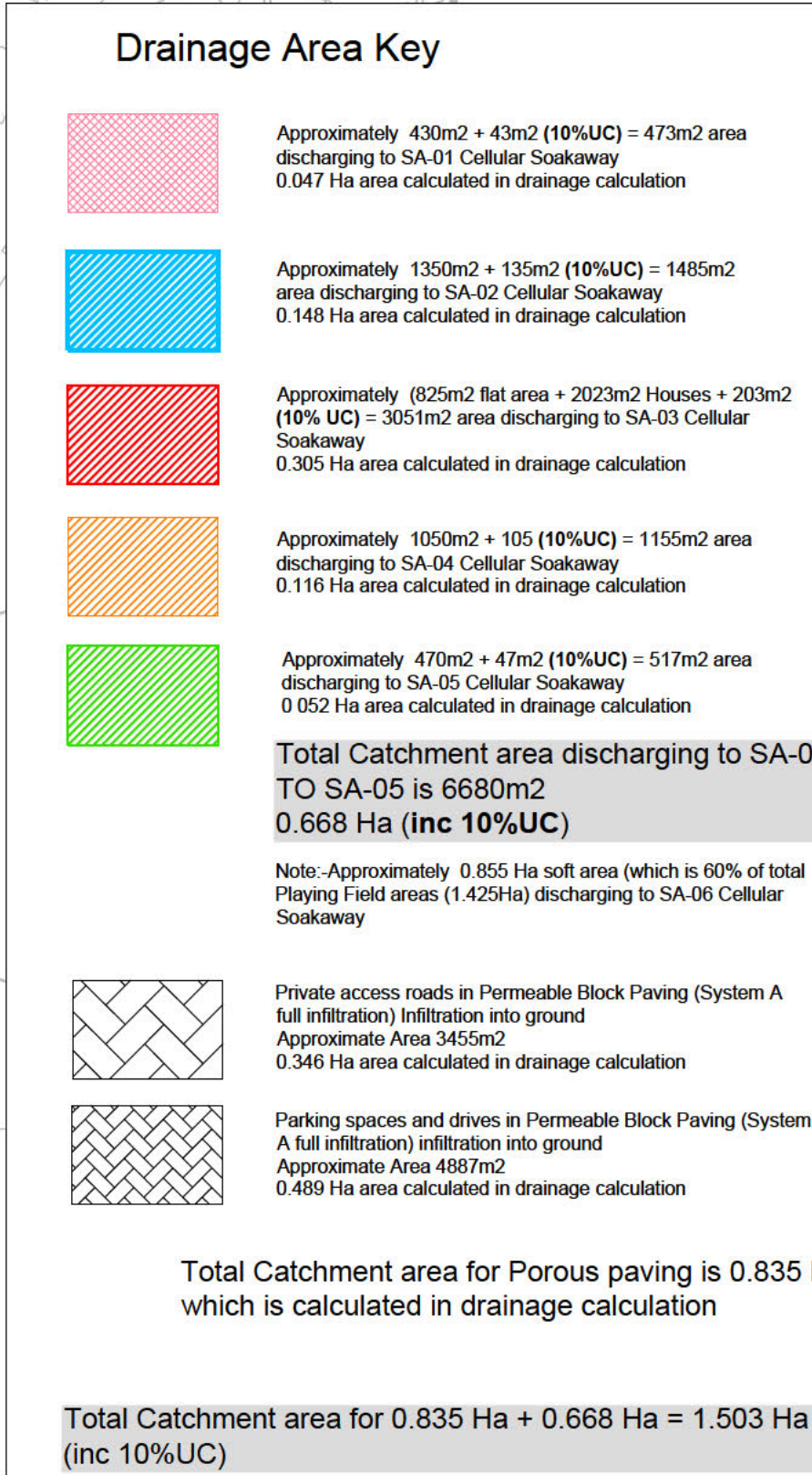
Chase New Homes Limited
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Hertfordshire, AL8 6HG
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Drainage Key

- Foul Water Drainage
- Surface Water Drainage
- Foul rising Main
- Land drainage (Shingle will be brought to the surface)
- Tree root protective barrier
- 150mm perforated drainpipe for the sports pitch
- 150mm perforated drainpipe for the sports pitch
- Private foul water package pump station
- Foul PCC manhole
- Polypropylene universal inspection chambers: 1200 deep max, 450 dia, 150 inlet / outlet connections (6 no max) or 150 inlet/outlet connections (4 no max) as detailed on private drainage construction details.
- Drainages 500/600 dia pvc, 3000mm deep max with 4 no max inlets / outlets up to 150mm dia, as detailed on private drainage construction details. Where >1500mm deep, use reduced size access cover. Woven Range 500/600 or similar.
- Drainages 500/600 dia pvc silt trap with 300mm nominal sump, as measured Polypropylene Basic Silt Trap or similar.
- Rodding eye same dia. as downstream drain
- Private access roads in Permeable Block Paving (System A full infiltration) infiltration into ground
- Parking spaces and drives in Permeable Block Paving (System A full infiltration) infiltration into ground
- Cellular soakaway system (SDS Geokight or similar approved)

Notes



6	Site Plan and Drainage plan revised	23.04.2017
5	Drainage plan revised according to client comments	11.04.2017
4	Drainage plan revised to suit new site plan	07.04.2017
3	Urban Creep Area clarified and urban creep area clearly shown with catchment areas	10.10.2016
2	Impermeable Area revised	18.09.2016
1	Preliminary Issue	20.06.2016

Preliminary Issue

Scale : 1:250@A0		
Date : Jun 2024	Checked:	Approved:
Drawn : IDL	BM	PT

Drainage Area Layout

Project :			
Playing Fields Site, Saffron Walden			
Org. No: IDL/1229/07/105	Rev:	File Ref:	1229-07-DAP d
	6	Plot Ref:	1229-07-105 p

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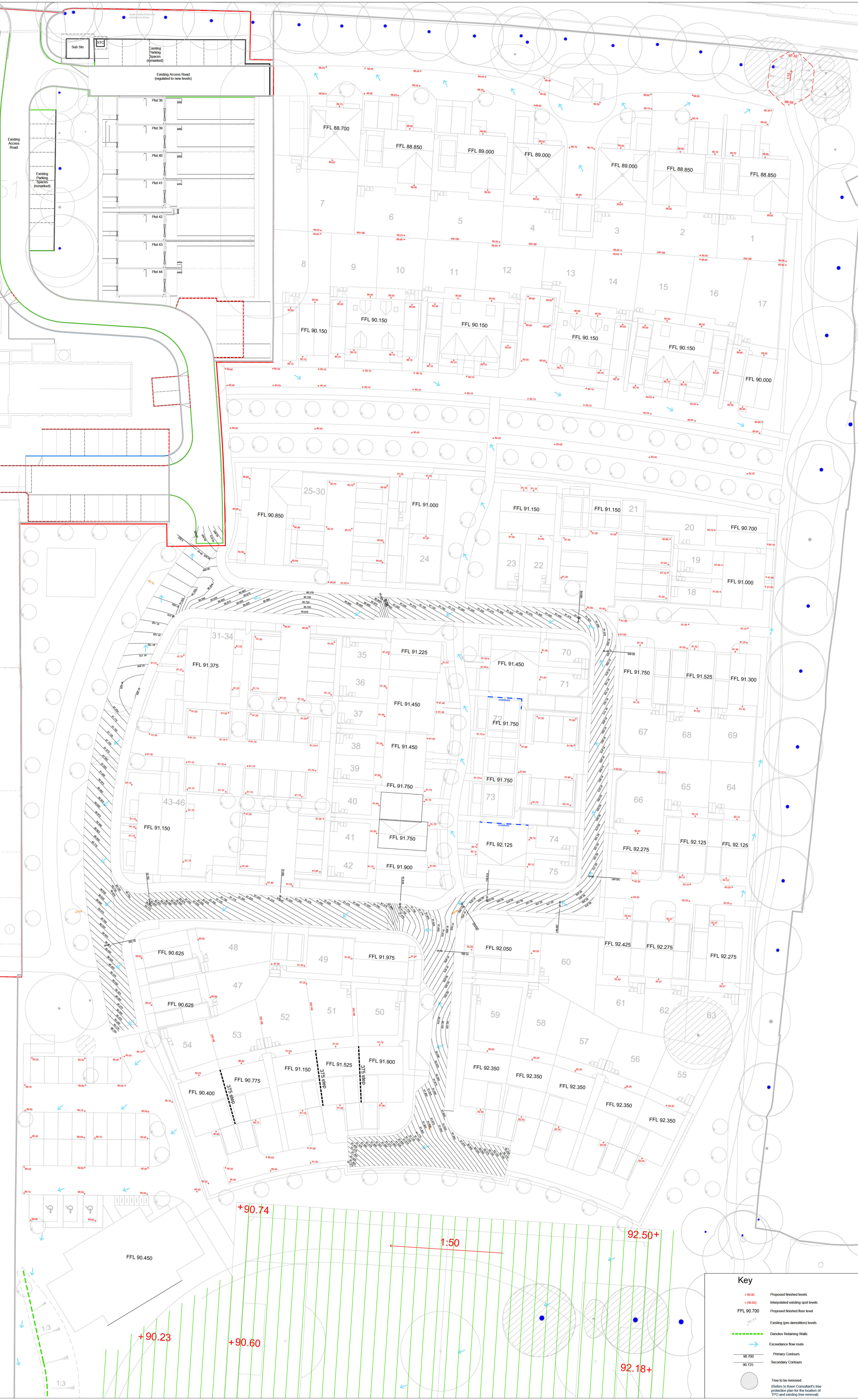
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Hertfordshire, AL8 6HG

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CONTRACT DOCUMENT

Notes

Refers to Keen Consultant's tree protection plan for the location of TPO and existing tree removal.



3	Site plan and levels revised	23 04 25
2	Site plan and levels revised	27 03 25
1	Preliminary Issue	20 06 24

Rev	Description	Date
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Status: Preliminary Issue

Scale: 1:250@A0	Checked: []	Approved: []
Date: Jan 2024	BM	PT
Drawn: IDL		

Title: Levels Layout Sheet 1 of 2

Project: Playing Fields Site, Safron Walden

Dwg No: IDL/1229/05/101	Rev: 3	File Ref: 1229-05.dwg
33 The Point Rockingham Road Market Harborough Leicestershire LE16 7QU Tel: 01858 411570 Fax: 01858 411571 Email: info@infrades.co.uk URL: [REDACTED]	Plot Ref: 1229-05-101.pdf	

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Key

- +90.00 Proposed finished levels
- +90.00 Interpolated existing spot levels
- FFL 90.700 Proposed finished floor level
- Existing (pre-demolition) levels
- Denotes Retaining Walls
- Exceedance flow route
- Primary Contours
- Secondary Contours
- Tree to be removed (Refers to Keen Consultant's tree protection plan for the location of TPO and existing tree removal)

CONTRACT DOCUMENT

Notes

3	Site plan and levels revised	23.04.25
2	Site plan and levels revised	27.03.25
1	Preliminary Issue	20.06.24

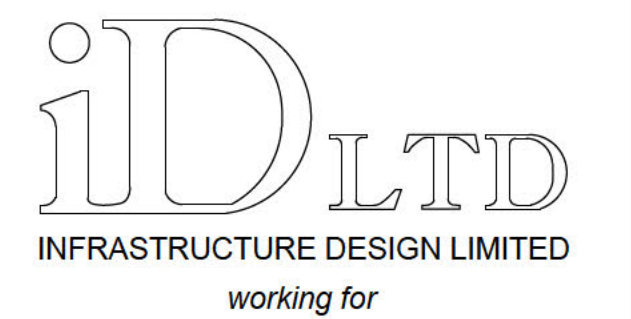
Rev	Description	Date
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States:
Preliminary Issue

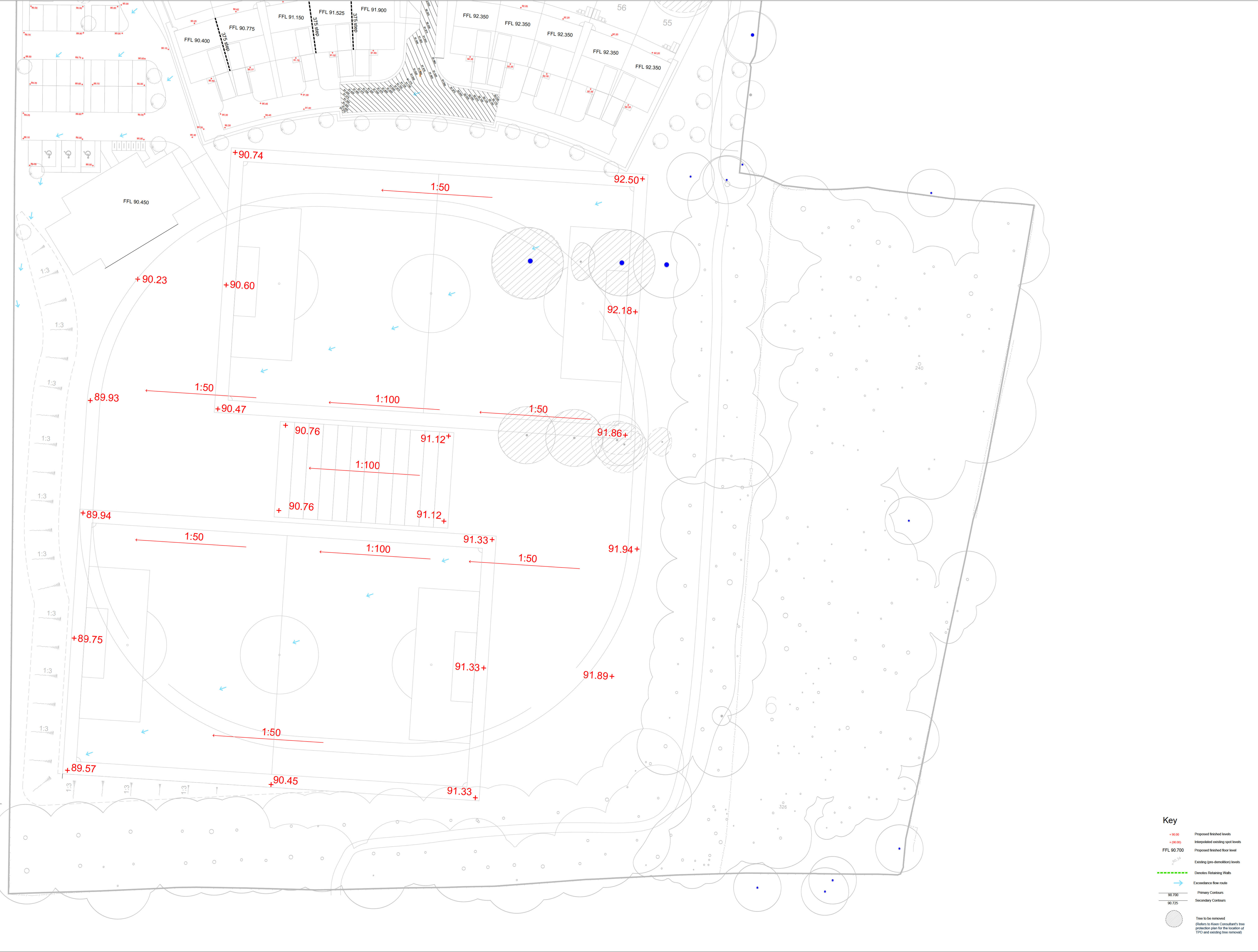
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Date:	Jan 2024	Checked:	Approved:
Drawn:	IDL	RM	PT

Title:
Levels Layout
Sheet 2 of 2

Project: Playing Fields Site, Saffron Walden			
Dwg No: IDL/1229/05/102	Rev: 3	File Ref: 1229-05.dwg	Plot Ref: 1229-05-102.pdf
33 The Point Rockingham Road Market Harborough Leicestershire LE16 7QU Tel: 01858 411570 Fax: 01858 411571 Email: info@infrades.co.uk URL: XXXXXXXXXX			



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Key

- +90.00 Proposed finished levels
- +90.00 Interpolated existing spot levels
- FFL 90.700 Proposed finished floor level
- +90.54 Existing (pre-demolition) levels
- Denotes Retaining Walls
- Exceedance flow route
- Primary Contours
- Secondary Contours
- Tree to be removed (Refers to Kern Consultant's tree protection plan for the location of TPO and existing tree removal)



APPENDIX D – SURFACE WATER DRAINAGE CALCULATION



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	0.2
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	0.6
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.8
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.047	Betterment (%)	0
SAAR (mm)	590	QBar	0.2
Soil Index	5	Q 1 year (l/s)	0.2
SPR	0.53	Q 30 year (l/s)	0.6
Region	6	Q 100 year (l/s)	0.8
Growth Factor 1 year	0.85		

Node SA1 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	85.650	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.25200	Invert Level (m)	85.650	Depth (m)	0.750
Side Inf Coefficient (m/hr)	0.25200	Time to half empty (mins)	128	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	2.000	Number Required	1
Porosity	0.95	Pit Length (m)	15.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	SA1	74	85.714	0.064	2.4	1.8231	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	SA1	Depth/Flow	0.0	0.0
120 minute summer	SA1	Infiltration	1.1	

Results for 2 year Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	SA1	80	85.766	0.116	3.7	3.2949	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	SA1	Depth/Flow	0.0	0.0
120 minute summer	SA1	Infiltration	1.2	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	SA1	90	86.027	0.377	9.0	10.7521	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	SA1	Depth/Flow	0.0	0.0
120 minute summer	SA1	Infiltration	1.5	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SA1	98	86.195	0.545	8.3	15.5233	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	SA1	Depth/Flow	0.0	0.0
120 minute winter	SA1	Infiltration	1.7	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SA1	96	86.148	0.498	7.7	14.1803	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	SA1	Depth/Flow	0.0	0.0
120 minute winter	SA1	Infiltration	1.6	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SA1	100	86.462	0.812	10.8	21.3893	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	SA1	Depth/Flow	0.0	0.0
120 minute winter	SA1	Infiltration	1.9	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	2.1
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	5.9
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	7.8
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.478	Betterment (%)	0
SAAR (mm)	590	QBar	2.5
Soil Index	5	Q 1 year (l/s)	2.1
SPR	0.53	Q 30 year (l/s)	5.9
Region	6	Q 100 year (l/s)	7.8
Growth Factor 1 year	0.85		

Node SA2 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	85.650	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.25200	Invert Level (m)	85.650	Depth (m)	1.500
Side Inf Coefficient (m/hr)	0.25200	Time to half empty (mins)	188	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	2.500	Number Required	1
Porosity	0.95	Pit Length (m)	24.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA2	116	85.779	0.129	6.3	7.3626	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA2	Depth/Flow	0.0	0.0
180 minute summer	SA2	Infiltration	2.3	

Results for 2 year Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA2	120	85.873	0.223	9.2	12.6928	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA2	Depth/Flow	0.0	0.0
180 minute summer	SA2	Infiltration	2.5	

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SA2	104	86.325	0.675	19.4	38.4840	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	SA2	Depth/Flow	0.0	0.0
120 minute winter	SA2	Infiltration	3.4	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA2	148	86.630	0.980	19.7	55.8548	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA2	Depth/Flow	0.0	0.0
180 minute winter	SA2	Infiltration	3.9	

Results for 100 year Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SA2	116	86.542	0.892	24.3	50.8431	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	SA2	Depth/Flow	0.0	0.0
120 minute winter	SA2	Infiltration	3.8	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA2	152	86.981	1.331	25.3	75.8424	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA2	Depth/Flow	0.0	0.0
180 minute winter	SA2	Infiltration	4.6	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	1.3
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	3.8
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	5.0
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.305	Betterment (%)	0
SAAR (mm)	590	QBar	1.6
Soil Index	5	Q 1 year (l/s)	1.3
SPR	0.53	Q 30 year (l/s)	3.8
Region	6	Q 100 year (l/s)	5.0
Growth Factor 1 year	0.85		

Node SA3 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	87.800	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA3 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.06480	Invert Level (m)	87.800	Depth (m)	1.500
Side Inf Coefficient (m/hr)	0.06480	Time to half empty (mins)	896	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	11.000	Number Required	1
Porosity	0.95	Pit Length (m)	16.500		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SA3	248	87.969	0.169	9.2	29.1712	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute summer	SA3	Depth/Flow	0.0	0.0
360 minute summer	SA3	Infiltration	1.7	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SA3	272	88.059	0.259	12.9	44.6544	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute summer	SA3	Depth/Flow	0.0	0.0
360 minute summer	SA3	Infiltration	1.8	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	SA3	352	88.483	0.683	17.8	117.7580	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	SA3	Depth/Flow	0.0	0.0
360 minute winter	SA3	Infiltration	2.0	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	SA3	352	88.777	0.977	24.1	168.4978	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	SA3	Depth/Flow	0.0	0.0
360 minute winter	SA3	Infiltration	2.1	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	SA3	352	88.679	0.879	22.0	151.6296	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	SA3	Depth/Flow	0.0	0.0
360 minute winter	SA3	Infiltration	2.1	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.03%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	SA3	472	89.099	1.299	24.1	223.9179	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	SA3	Depth/Flow	0.0	0.0
480 minute winter	SA3	Infiltration	2.3	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	0.5
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	1.4
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	1.9
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.116	Betterment (%)	0
SAAR (mm)	590	QBar	0.6
Soil Index	5	Q 1 year (l/s)	0.5
SPR	0.53	Q 30 year (l/s)	1.4
Region	6	Q 100 year (l/s)	1.9
Growth Factor 1 year	0.85		

Node SA4 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	88.000	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA4 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.10440	Invert Level (m)	88.000	Depth (m)	0.750
Side Inf Coefficient (m/hr)	0.10440	Time to half empty (mins)	228	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	4.000	Number Required	1
Porosity	0.95	Pit Length (m)	35.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA4	112	88.052	0.052	5.0	6.8786	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA4	Depth/Flow	0.0	0.0
180 minute summer	SA4	Infiltration	2.1	

Results for 2 year Critical Storm Duration. Lowest mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA4	120	88.083	0.083	7.2	10.9955	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA4	Depth/Flow	0.0	0.0
180 minute summer	SA4	Infiltration	2.1	

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA4	140	88.241	0.241	16.6	32.0679	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA4	Depth/Flow	0.0	0.0
180 minute summer	SA4	Infiltration	2.3	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA4	172	88.353	0.353	15.4	46.9457	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA4	Depth/Flow	0.0	0.0
180 minute winter	SA4	Infiltration	2.4	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA4	176	88.486	0.486	19.9	64.6004	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA4	Depth/Flow	0.0	0.0
180 minute winter	SA4	Infiltration	2.6	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	0.2
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	0.6
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.9
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.052	Betterment (%)	0
SAAR (mm)	590	QBar	0.3
Soil Index	5	Q 1 year (l/s)	0.2
SPR	0.53	Q 30 year (l/s)	0.6
Region	6	Q 100 year (l/s)	0.9
Growth Factor 1 year	0.85		

Node SA5 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	86.400	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA5 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.10440	Invert Level (m)	86.400	Depth (m)	0.750
Side Inf Coefficient (m/hr)	0.10440	Time to half empty (mins)	280	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.000	Number Required	1
Porosity	0.95	Pit Length (m)	15.000		



Results for 1 year Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	SA5	152	86.479	0.079	2.0	3.3843	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	SA5	Depth/Flow	0.0	0.0
240 minute summer	SA5	Infiltration	0.7	

Results for 2 year Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	SA5	160	86.527	0.127	2.8	5.4180	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute summer	SA5	Depth/Flow	0.0	0.0
240 minute summer	SA5	Infiltration	0.7	

Results for 30 year Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA5	172	86.763	0.363	5.1	15.5034	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA5	Depth/Flow	0.0	0.0
180 minute winter	SA5	Infiltration	0.8	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA5	176	86.926	0.526	6.9	22.4934	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA5	Depth/Flow	0.0	0.0
180 minute winter	SA5	Infiltration	0.9	

Results for 100 year Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SA5	176	86.875	0.475	6.4	20.2986	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	SA5	Depth/Flow	0.0	0.0
180 minute winter	SA5	Infiltration	0.9	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	SA5	232	87.109	0.709	7.2	30.3093	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	SA5	Depth/Flow	0.0	0.0
240 minute winter	SA5	Infiltration	1.0	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	6.5
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	18.5
Summer CV	0.950	Additional Storage (m³/ha)	20.0	100 year (l/s)	24.6
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Detailed	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	1.500	Betterment (%)	0
SAAR (mm)	590	QBar	7.7
Soil Index	5	Q 1 year (l/s)	6.5
SPR	0.53	Q 30 year (l/s)	18.5
Region	6	Q 100 year (l/s)	24.6
Growth Factor 1 year	0.85		

Node SA6 Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	85.750	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.000	2.500	0.000

Node SA6 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.10440	Invert Level (m)	85.750	Depth (m)	1.500
Side Inf Coefficient (m/hr)	0.10440	Time to half empty (mins)	776	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	10.000	Number Required	1
Porosity	0.95	Pit Length (m)	19.000		

Node SA6 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.10440	Invert Level (m)	89.000	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.10440	Time to half empty (mins)	40	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	0.250	Number Required	1
Porosity	0.33	Pit Length (m)	390.000		

Node SA6 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.10440	Invert Level (m)	89.000	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.10440	Time to half empty (mins)	40	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	0.150	Number Required	1
Porosity	0.33	Pit Length (m)	5337.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SA6	288	86.242	0.492	25.9	90.9824	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute summer	SA6	Depth/Flow	0.0	0.0
360 minute summer	SA6	Infiltration	3.2	
360 minute summer	SA6	Infiltration	0.0	
360 minute summer	SA6	Infiltration	0.0	

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	SA6	344	86.516	0.766	23.5	141.6213	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	SA6	Depth/Flow	0.0	0.0
360 minute winter	SA6	Infiltration	3.4	
360 minute winter	SA6	Infiltration	0.0	
360 minute winter	SA6	Infiltration	0.0	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	SA6	176	89.042	3.292	68.5	297.9203	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	SA6	Depth/Flow	0.0	0.0
240 minute winter	SA6	Infiltration	4.0	
240 minute winter	SA6	Infiltration	1.7	
240 minute winter	SA6	Infiltration	16.3	

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	SA6	156	89.139	3.389	127.5	327.1748	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute summer	SA6	Depth/Flow	0.0	0.0
240 minute summer	SA6	Infiltration	4.0	
240 minute summer	SA6	Infiltration	3.0	
240 minute summer	SA6	Infiltration	33.2	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.67%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	SA6	116	89.389	3.639	212.7	402.1838	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	SA6	Depth/Flow	0.0	0.0
180 minute summer	SA6	Infiltration	4.0	
180 minute summer	SA6	Infiltration	5.8	
180 minute summer	SA6	Infiltration	71.8	



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
PP	0.835	84.000	554102.536	237747.849	0.350

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	1 year (l/s)	1.5
Rainfall Events	Singular	Drain Down Time (mins)	10080	30 year (l/s)	4.3
Summer CV	0.950	Additional Storage (m³/ha)	0.0	100 year (l/s)	5.8
Winter CV	0.950	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	35	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	0.353	Betterment (%)	0
SAAR (mm)	590	QBar	1.8
Soil Index	5	Q 1 year (l/s)	1.5
SPR	0.53	Q 30 year (l/s)	4.3
Region	6	Q 100 year (l/s)	5.8
Growth Factor 1 year	0.85		

Node PP Online Depth/Flow Control

Flap Valve	x	Invert Level (m)	83.650	Design Flow (l/s)	0.1
Replaces Downstream Link	✓	Design Depth (m)	2.500		
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)		
0.001	0.000	2.500	0.000		

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	83.650	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.03600	Time to half empty (mins)	92	Depth (m)	0.350
Safety Factor	2.0	Width (m)	83.500	Inf Depth (m)	
Porosity	0.33	Length (m)	100.000		

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	76	83.711	0.061	65.0	51.7540	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	PP	Depth/Flow	0.0	0.0
120 minute summer	PP	Infiltration	25.6	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	82	83.759	0.109	159.2	163.0216	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	PP	Depth/Flow	0.0	0.0
120 minute summer	PP	Infiltration	41.9	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	86	83.789	0.139	214.9	244.3928	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	PP	Depth/Flow	0.0	0.0
120 minute summer	PP	Infiltration	41.9	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	84	83.780	0.130	199.2	220.7063	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	PP	Depth/Flow	0.0	0.0
120 minute summer	PP	Infiltration	41.9	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.04%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	92	83.825	0.175	278.9	345.5663	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	PP	Depth/Flow	0.0	0.0
120 minute summer	PP	Infiltration	42.0	

APPENDIX E – MANAGEMENT & MAINTENANCE REGIME

The Management Company

The responsibility for maintenance of all elements of the development remain with Chase New Homes until handed over to the Management Company.

Handover of external works to the Management Company coincides with completion of the final residential unit.

The Management Company employs a specialist Managing Agent to manage the development which includes all aspects of maintenance.

The Management Company is registered No. 'tbc' was incorporated in 'tbc' and its directors are currently made up of Chase New Homes representatives plus an appointment from the Managing Agent.

The Managing Agents are 'tbc' who have over 'tbc' years' experience in the industry.

At handover the Management Company and Managing Agent receive as built information together with operating and maintenance manuals which detail all maintenance protocols.

Approximately 1 year following completion of the final unit the residents will be invited to elect members to become directors of the Management Company, the Chase New Homes appointed directors at that time resign from the Management Company to be replaced by the elected representatives of the residents.

To ensure continuity and a full understanding of the development and the operation and maintenance of its various components the representative of the Managing Agent remains as a director of the Management Company and the appointment of the Managing Agents is fixed for a minimum period of two years following the date of resignation of the last Chase New Homes director.

After that two year period the Management Company have the right to re-tender the Managing Agent services but it is very rare that a change is made as our original appointments provide an excellent service.

Within the first two years from the final unit completion on the development the residents have two ways in which they can report any defects and problems which would include flooding and that is either to our Aftersales department or to the Managing Agents, the residents are issued with telephone numbers for both which include out of hours emergency response.

After two years our Aftersales contacts are normally replaced by members of the Management Company. The residents therefore have the ability to contact them or the Managing Agents which then remains through the life of the development.

Onsite Surface Water Drainage System (generally)

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the surface water drainage system;

Every 6 months: Remove silt build up from *all* catchpits and road gullies.

Annually: elect approx. 20% of the development's surface water inspection chambers (situated in accessible non-private areas) and inspect for blockages / silt build up. Remove silt and debris. Rotate on a 5 yearly cycle to cover all such chambers over this period.

Every 2-5 years (depending on outcome of aforementioned inspections)

Commission a CCTV survey and report on condition of the surface water piped drainage system upstream of the soakaways to check for structural integrity and hydraulic fluidity. Carry out promptly any remedial work as advised by CCTV company.

Permeable Paving

External parking areas and access roads are to be constructed in permeable block paving in order to;

- a) Delay the surface water runoff from these areas, and
- b) Enhance the quality of the rainwater prior to discharge into the ground.

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the pervious pavement;

Quarterly

- i) Inspect the pervious pavement for signs of ponding and ensure there is no migration of soils from adjacent landscaped areas or other deleterious material that may prematurely clog up the jointing stone situated in the gaps between the blocks. Ideally this type of inspection should be undertaken immediately following a heavy rainfall event.
- ii) Commission vacuum sweeping and brushing of the pervious pavement to ensure joints are kept free of silt. Minimum 3 sweeping per year, thus;
 - a) End of Winter (April) – to collect winter debris
 - b) Mid-Summer (July/August) – to collect dust, flower and grass-type deposits.
 - c) After Autumn leaf fall (November)

The company commissioned to carry out this work should ensure that their vacuum equipment is adjusted accordingly to avoid the removal of jointing material.

Any lost material should be replaced promptly to avoid the blocks from being dislodged.

Last Resort Remedial Action

- i) Should a portion of the pervious pavement become substantially impervious due to excessive siltation, the following procedure should be followed;
 - a) Lift block paving and laying course
 - b) Break out underlying bitmac base layer and replace with similar compacted depth of course aggregate subbase material to BS EN 13242:2002 Type 4/20, wrapped in geotextile as Terram 1000 or similar.
 - c) Renew laying course, replace blocks and renew jointing material

NB. Material removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and as such may need to be disposed of as 'controlled waste'. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Renew laying course, replace blocks and renew jointing material. NB. Material removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and as such may need to be disposed of as 'controlled waste'. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Cellular Soakaway Storage

The principle means of surface water attenuation/disposal from the development is by way of cellular soakaways storage.

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the surface water drainage system;

Inspections to identify any areas not operating correctly, pollution, blocked inlets or outlets, standing water etc.

Collect and remove from site all extraneous rubbish that is detrimental to the operation or detracts from the appearance of the site, including paper, bottles, cans and similar debris.