GeoSmart Information

SuDSmart Design

Sustainable Drainage Assessment

Site Address

107a Gardner Road
Portslade
BN41 1PN

Grid Reference

525177, 105205

Report Prepared for

Herbert James

Date

2024-02-26

Report Status

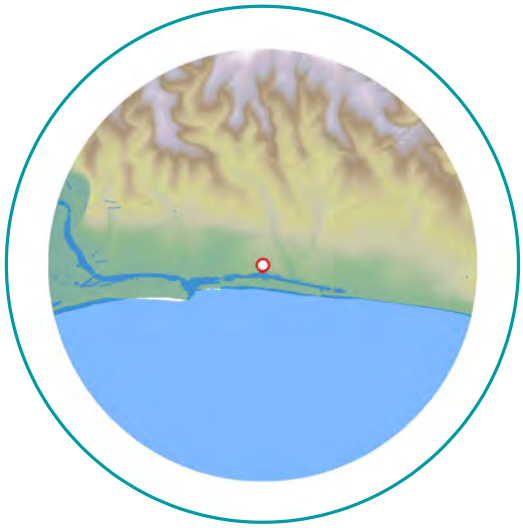
FINAL

Site Area

0.0141 ha

Report Reference

81077R1



Discharge to Sewer

SuDS features such as rainwater harvesting butts, permeable paving and a flow control are proposed to ensure runoff is managed on site. Surface water will be discharged to the nearby public surface water sewer at a controlled rate of 1 l/s, as close to greenfield runoff rates as possible without causing flood risk due to blockages.

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1 Executive summary

This report assesses the feasibility of a range of Sustainable Drainage Scheme (SuDS) options in support of the Site development process. A SuDS strategy is proposed to ensure surface water runoff can be managed effectively over the lifetime of the development.

SuDS suitability

Risk	Issue	Result
Discharge Location	What is the infiltration potential at the Site?	Low
	What is the potential to discharge to surface water features?	Low
	What is the potential to discharge to sewers?	High
	What is the potential to discharge to highway drains?	High
Flooding	What is the fluvial flood risk at the Site?	Very Low
	What is the pluvial flood risk at the Site?	Very Low
	What is the groundwater flood risk at the Site?	Low
Pollution	Is the groundwater a protected resource?	No
	Is the surface water feature a protected resource?	N/A

*while GeoSmart's SD50 mapping shows a Moderate potential for infiltration, spatial constraints mean that a 5m buffer between infiltration features and building foundations cannot be provided. The infiltration potential has therefore been downgraded to Low.

Summary of existing and proposed development

The Site is currently used within a residential capacity. At present there is a single building with car park and landscaped areas. Development proposals comprise the demolition of the existing garage building, with the construction of a new three-bedroom residential building along with new access, parking and landscaping.

Summary of discharge routes

According to GeoSmart's SD50 mapping the Site has moderate potential for infiltration, with permeable underlying River Terrace deposits but the potential for a shallow groundwater table.

Spatial constraints mean that a 5m buffer between building foundations and focused infiltration features cannot be provided as required by Building Regulation (2010). Focused infiltration features are therefore not considered to be feasible.

There are no known issues identified relating to Site contamination or the presence of a SPZ.

The Site is not located within 100 m of a surface water feature, due to the significant drainage pipework that would be required this is not considered a feasible option for discharging runoff.

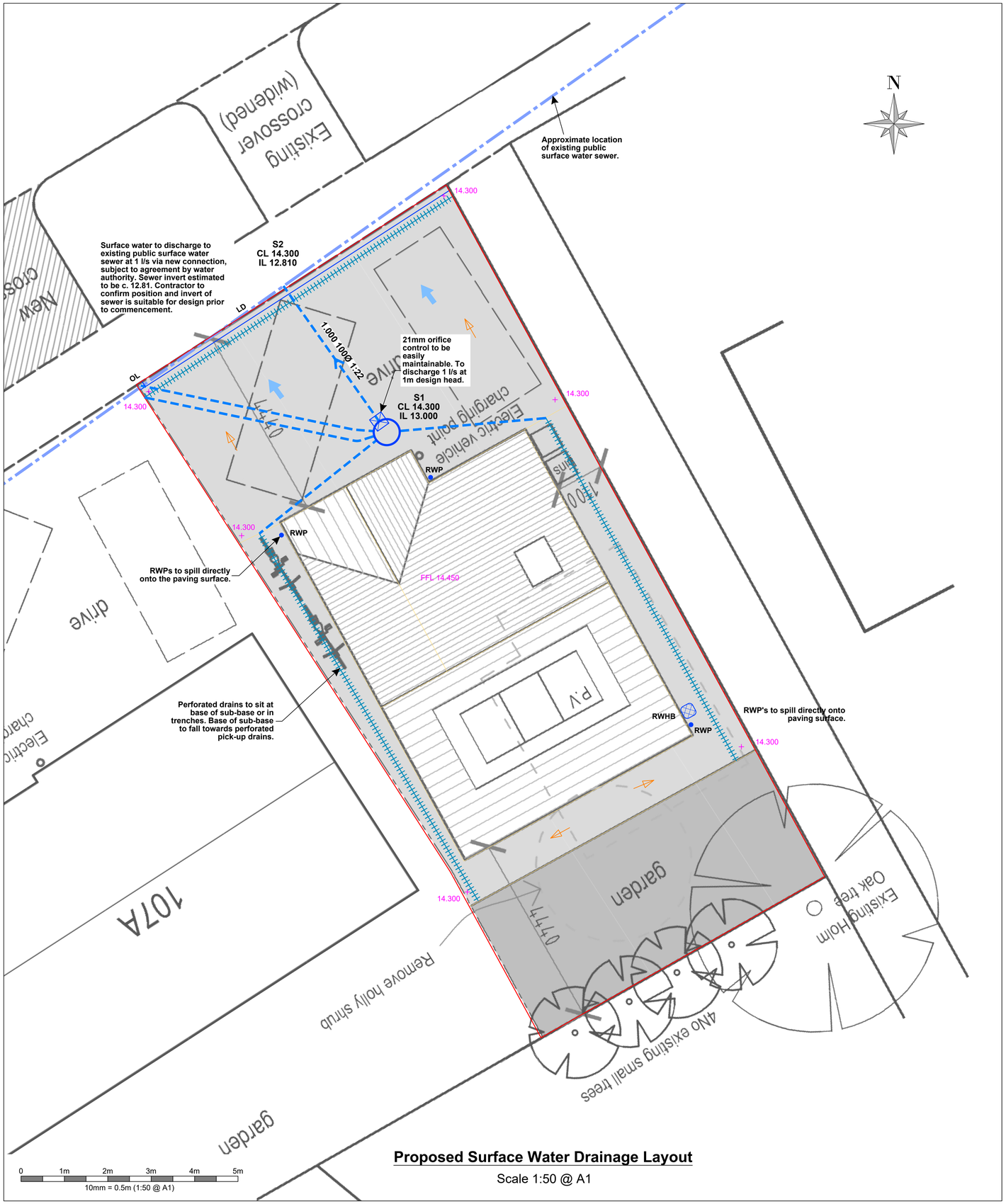
GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the Southern Water asset location plan there is a public surface water sewer, located adjacent to the north of the Site, therefore discharge to sewer is likely to be appropriate. As infiltration to ground and discharge to watercourse is not considered to be feasible, discharge to this surface water sewer is proposed.

Runoff rate and attenuation requirements

Discharging off-Site requires 3.6 m^3 of attenuation to be provided to ensure there is no flooding within the development in all storm events up to and including the 1 in 100 year including a 45% allowance for climate change. This volume is subject to the discharge rate being restricted to 1 l/s, as close to greenfield runoff rates as possible without causing flood risk due to blockages.

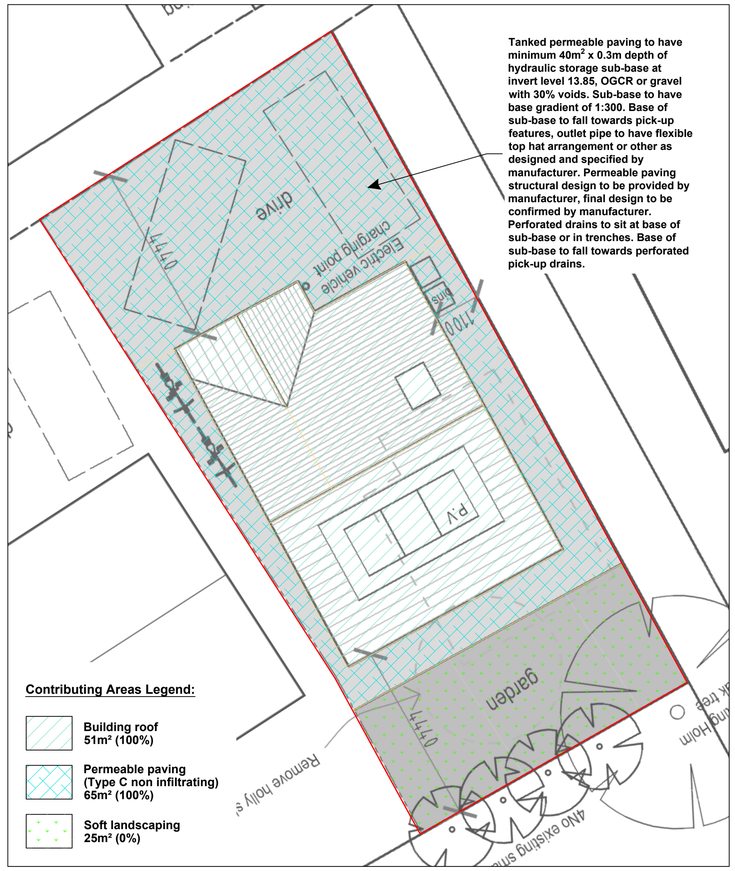
Recommendations / Next steps

The capacity of the public surface water sewer should be confirmed and permission to connect gained.



Proposed Surface Water Drainage Layout

Scale 1:50 @ A1



Contributing Areas

Scale 1:75 @ A1

Drainage Strategy:

- Drainage strategy consists of rain water harvesting butts, permeable paving and controlled discharge to an existing surface water sewer.
- Permeable paving will discharge via perforated pick up drains or top hat type outlets. Base of storage sub-base to fall towards pick up / discharge points, all as manufacturer design.
- Paving will be tanked to avoid interaction with groundwater table and building foundations.
- Surface water will discharge to nearby surface water sewer via new connection, subject to agreement by sewer authority and third party landowners.
- Discharge rate will be controlled by orifice control to 1 l/s, subject to approval.

Legend:

- RWP — Rain water pipe
- RWHB — Rain water harvesting butt
- Surface water drain
- Sub-base perforated pick-up drain
- LD OL — Linear drain with outlet
- S1 / CL 14.300 / IL 13.000 — Surface manhole with: Reference number, Cover level, Invert level
- Flow control at manhole
- Assumed falls
- Overland flow routes
- 14.300 — Assumed spot levels

Notes:

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6. Contractor to confirm locations of existing services prior to commencement on site and to arrange for any necessary diversions, lowering or protection works as required.
7. All specialist drainage components such as attenuation tanks, flow control and pumping stations to be designed and installed as per manufacturers requirements.
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16. Access chamber cover class A15 for garden and patio, B125 for driveway, C250 for lightly trafficked roads or small private carparks.
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19. Design should be reviewed in light of any additional information or on validation or otherwise of any assumptions.

Rev	Date	Detail	Drwn	Chkd
P01	26.02.24	Initial issue	DS	MG

Client: Sinnis Ltd

Project: 107A East Gardner Road, Southwick

Drawing Title: Proposed Surface Water Drainage Layout

GeoSmart Information
Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU

Drawn by:	Checked by:	Date:
DS	MG	Feb. 2024
Scale: 1:50, 1:75 @ A1		Status: Preliminary
Drawing No: 81077 100		Issue: P01



	Asset Type	Maintenance Schedule (and Frequency)	Party Responsible
	Permeable pavements	Regular maintenance: • Brushing and vacuuming (three time per year) • Trimming any roots and surrounding grass and weeds that may be causing blockages (annually or as required) Monitoring: • Initial inspection (monthly) • Inspect surface for poor performance or ponding (annually or after large storm events)	Privately owned and maintained by house owners.
	Underground drainage pipe network and manholes / catchpits	Regular maintenance: • Remove sediment and debris from pre-treatment devices and floor of inspection tube or chamber (annually) • Cleaning of gutters and any filters on downpipes (annually) • Trimming any roots that may be causing blockages (annually or as required) Monitoring: • Inspect silt traps and note rate of sediment accumulation (monthly in the first year and then annually)	
	Linear drainage channel Rain water pipe	Regular maintenance: • Remove sediment and debris from grating, channel and sump (monthly or as required) • Trimming any roots and surrounding grass blockages (as required) Monitoring: • Inspect inlets and outlets for blockages or silt accumulation (monthly or after a heavy storm)	
	Hydrobrake	Regular maintenance: • Remove silts from the Hydrobrake chamber sump (annually) • Remove any debris obstructing the inlet, outlet or control ensuring the emergency drain down mechanism if replaced correctly (annually) Monitoring: Inspect the hydrobrake control from the surface for signs of blockage or damage (as required) • Inspect the Hydrobrake chamber sump for build up of silt and the inlet and outlet for debris (annually) • Check the emergency drain down mechanism is in good working order (annually)	
	Rainwater harvesting water butt	Regular maintenance: • Clean tank, inlets, outlets, gutters, roof drain filters and withdrawal devices (annually or as required) • Empty water butt and clean interior, removing any sludge, algea or sediments (annually or as required) Monitoring: • Inspect tank for debris and sediment build up (annually and following poor performance) • Inspect inlets, outlets and overflow (annually and following poor performance)	

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Rev	Date	Detail	Drwn	Chkd
P01	26.02.24	Initial issue	DS	MG

Client:

Sinnis Ltd

Project:

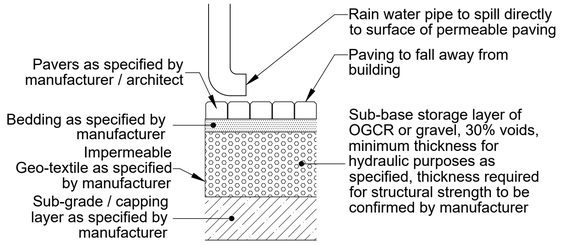
107A Gardner Road, Southwick

Drawing Title:

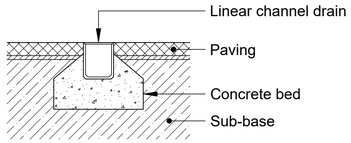
Management and Maintenance Plan

GeoSmart Information
Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU

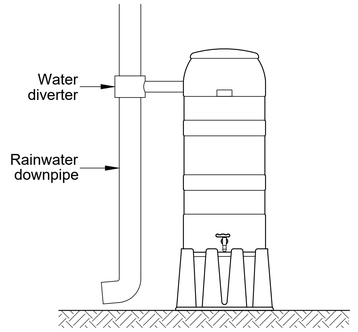
Drawn by:	Checked by:	Date:
DS	MG	Feb. 2024
Scale:		Status:
1:50, 1:75 @ A1		Preliminary
Drawing No:		Issue:
81077_101		P01



Typical Rain Water Pipe Direct Discharge to Permeable Paving Detail

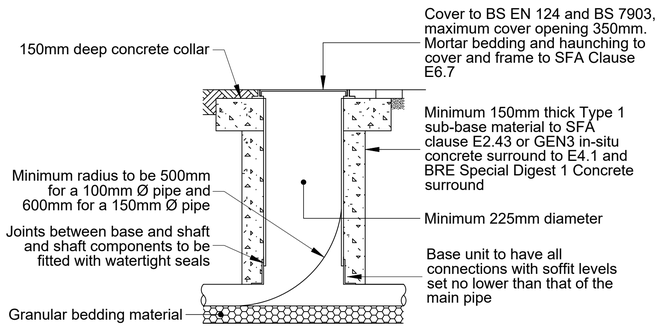


Typical linear drain

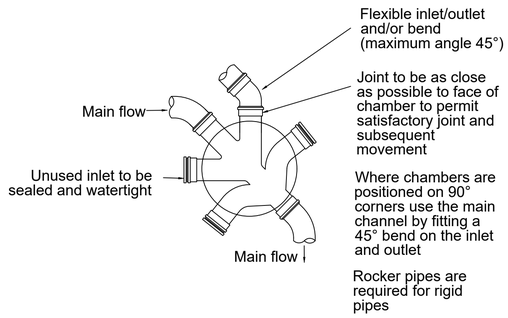


Typical Rain Water Harvest Butt

Typical control chamber
(Design to be specified by manufacturer)



Typical Inspection Chamber
(Driveways, paved areas)



Typical base layout of Type 3 chambers

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107A Gardner Road,
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Drawing Title:
Drainage Details

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Drawn by:	Checked by:	Date:
DS	MG	Feb. 2024
Scale: 1:20 @ A1		Status: Preliminary
Drawing No: 81077 102		Issue: P01

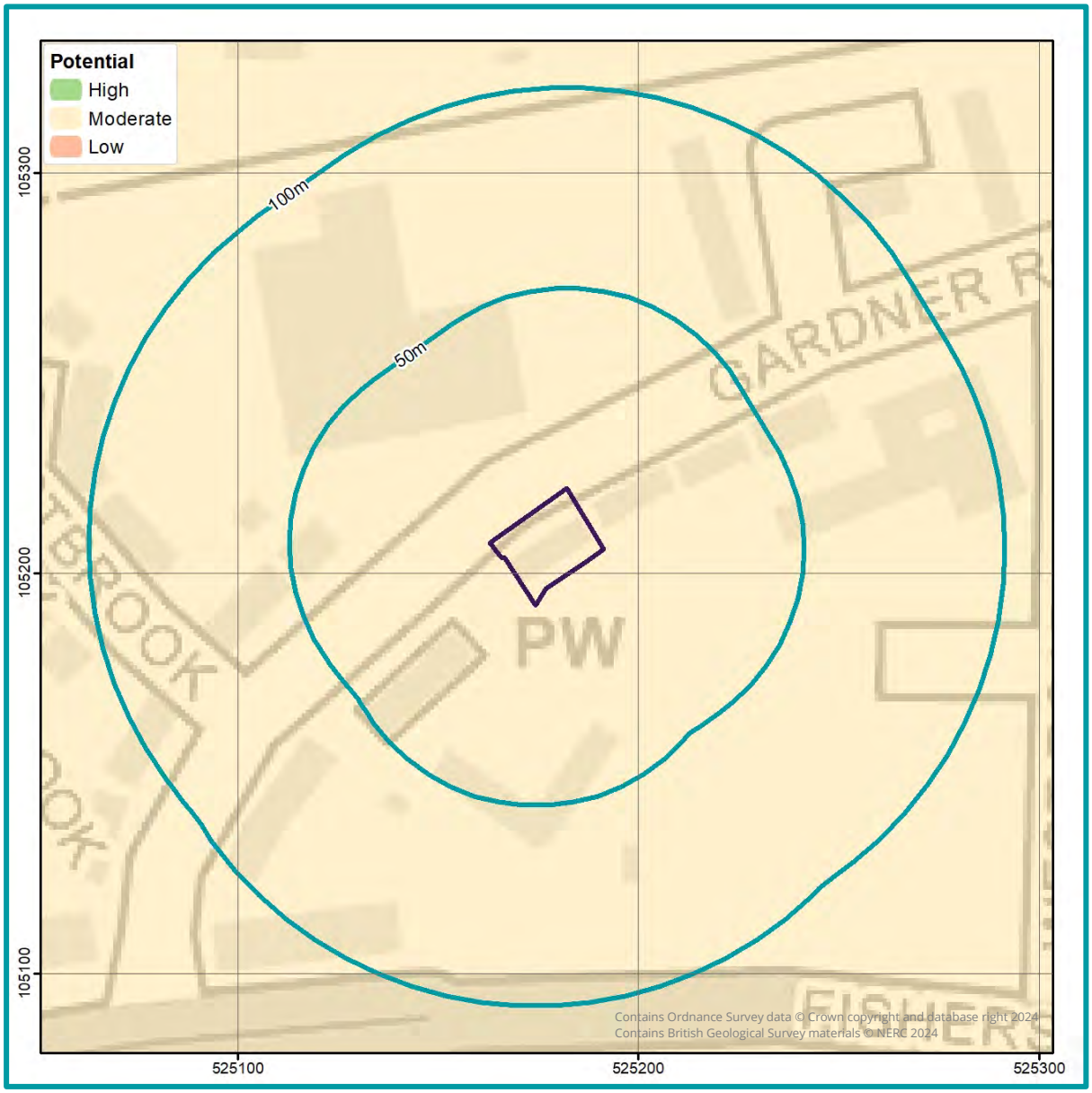
2 Site analysis

Site location

Figure 1. Aerial Imagery (Bluesky, 2024)



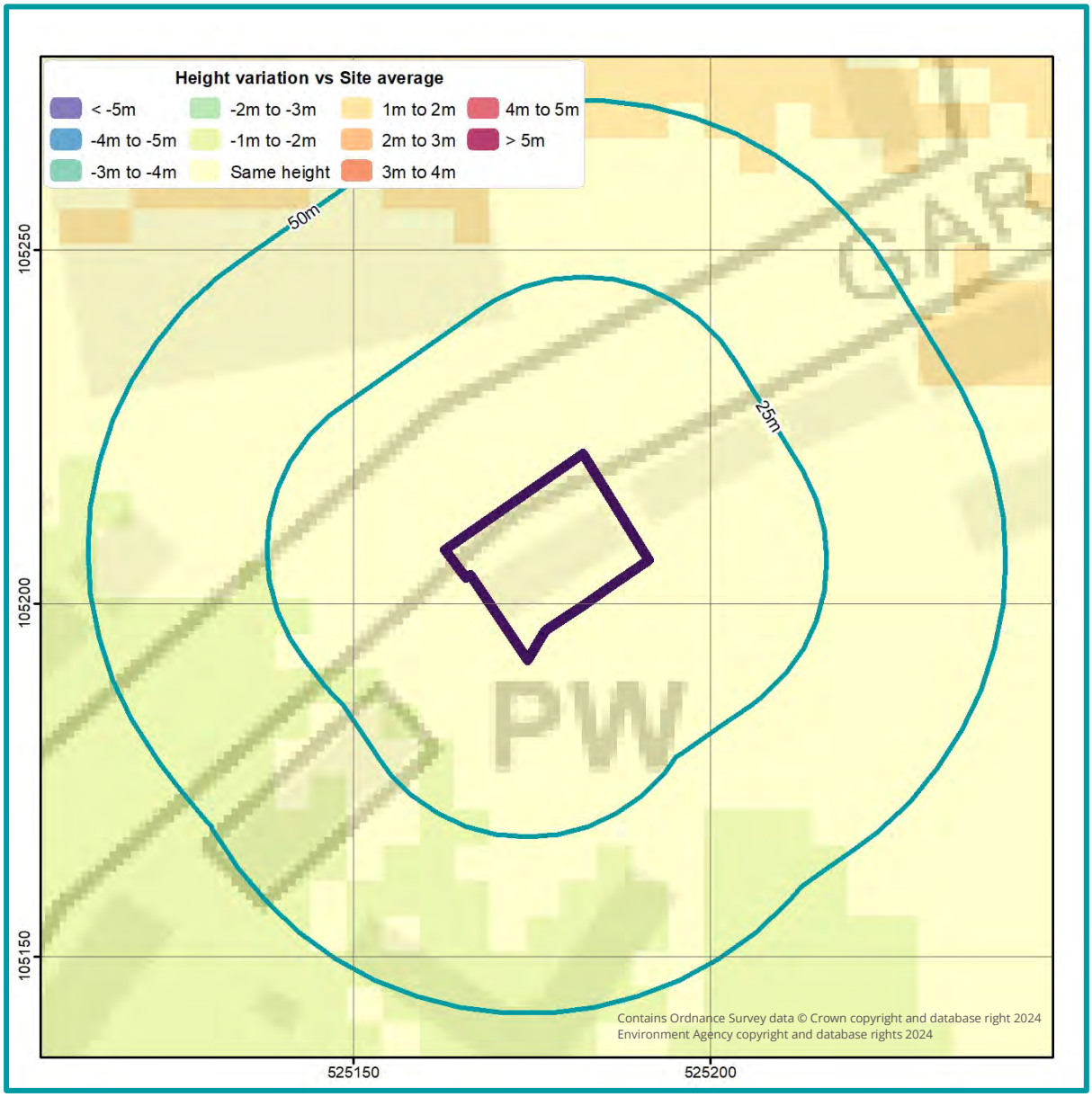
Figure 2. SuDS infiltration suitability (SD50) map (GeoSmart, 2024)



The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual Site drainage design and the planning of further Site investigation.

There is a Moderate potential for infiltration SuDS across the Site. It is likely that the underlying geology at the Site has high permeability but the potential for a shallow groundwater table and an infiltration SuDS scheme may be possible at the Site. However spatial constraints mean that a 5m buffer between infiltration features and building foundations cannot be provided.

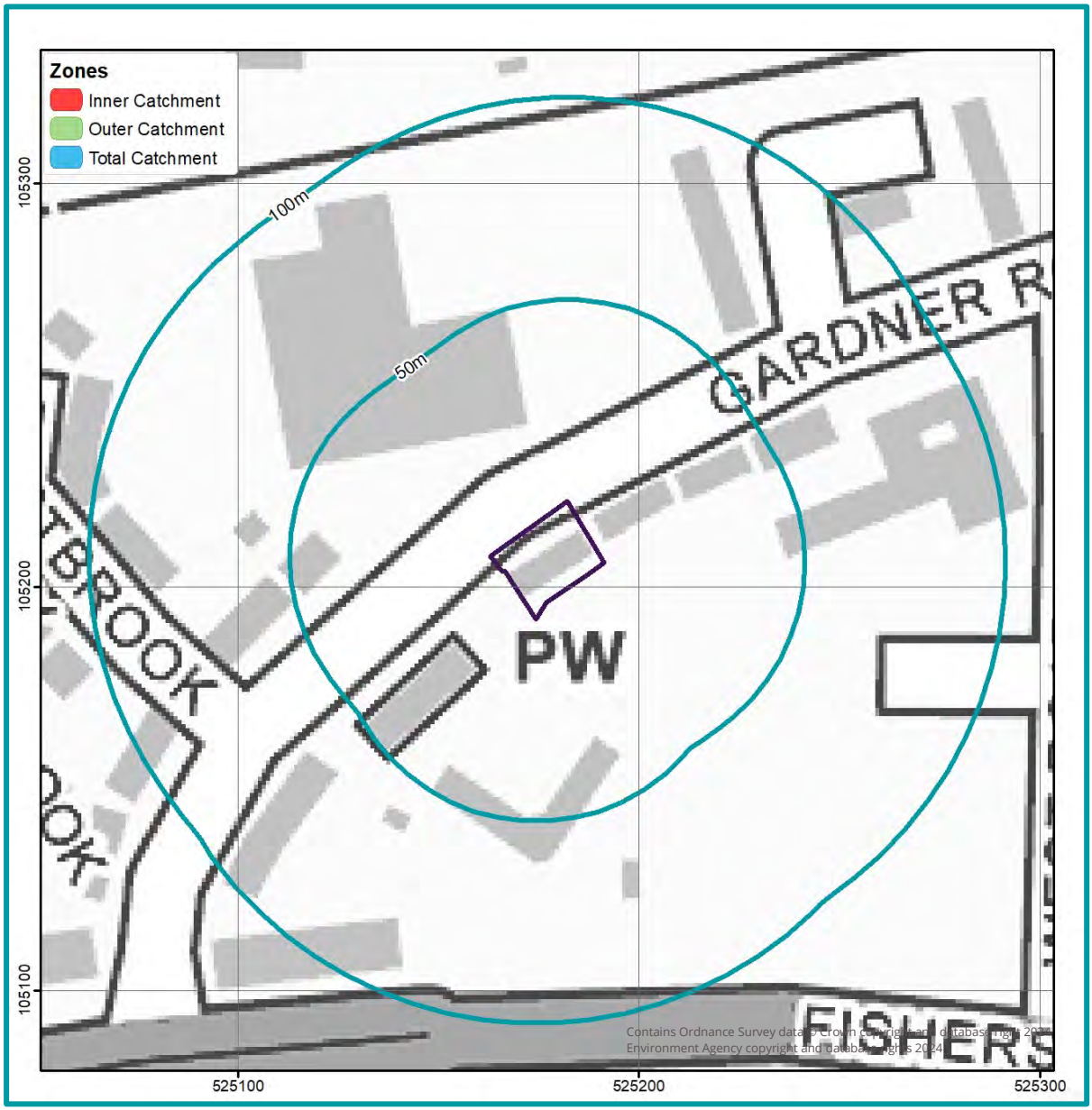
Figure 3. Site topography (GeoSmart, 2024)



An assessment of the topography at the Site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localized depressions. The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area. The mapping confirms the overall Site is generally level.

Further analysis could be undertaken by visiting the Site or by collecting additional topographic survey to provide further confirmation of ground levels.

Figure 4. Source protection zone map (EA, 2024)

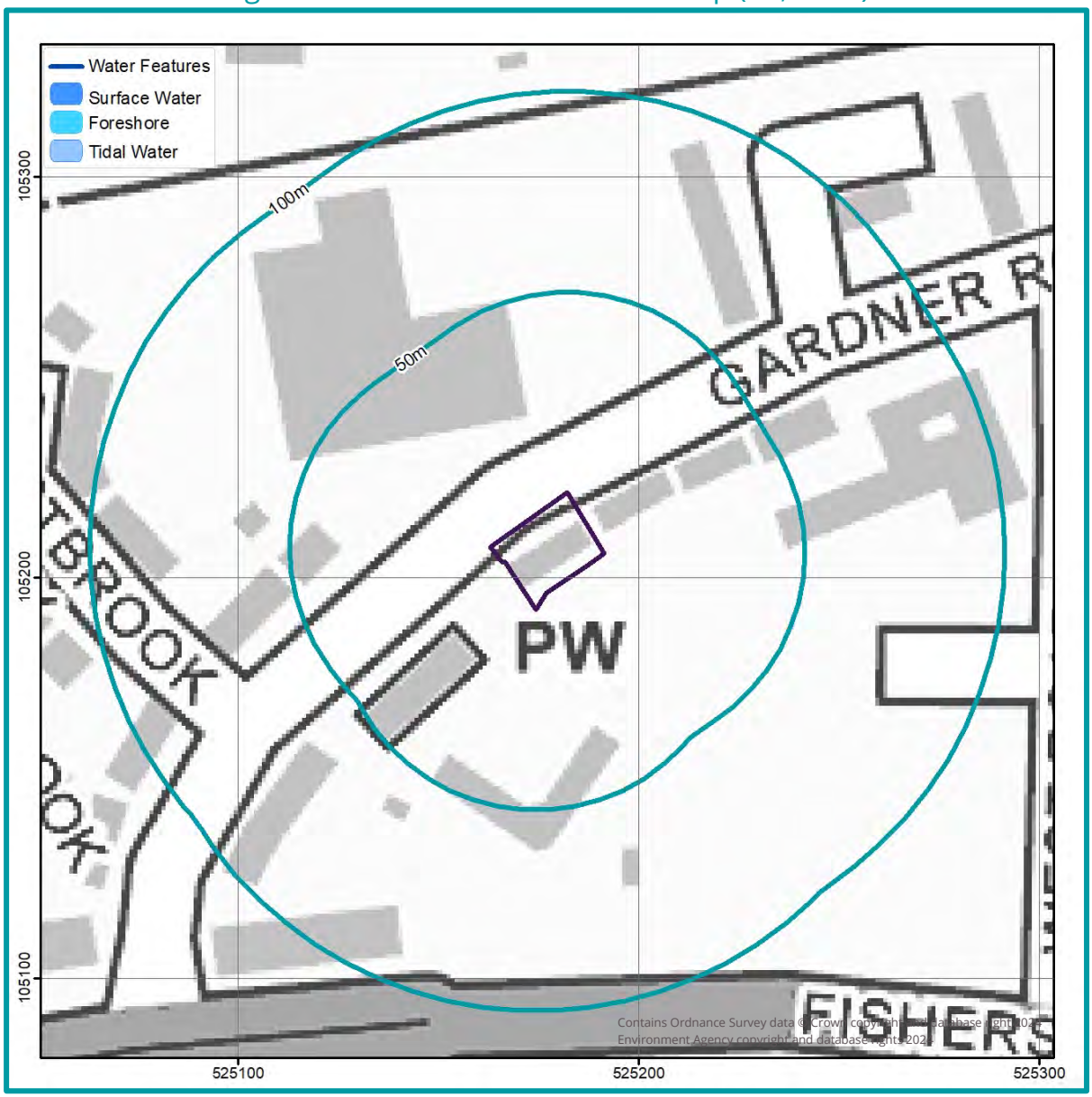


An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site is not located within an SPZ.

Infiltration, if possible, is likely to be acceptable providing risk screening identifies suitable mitigation measures, if required, to prevent an impact on water quality from the proposed or historical land use and contaminated land.

If further analysis is required, this would involve a review of Site specific contaminated land data. If hazards are identified, it is recommended that the Local Authority and the Environment Agency are contacted to confirm the susceptibility of any SPZs within the wider area.

Figure 5. Surface water features map (EA, 2024)

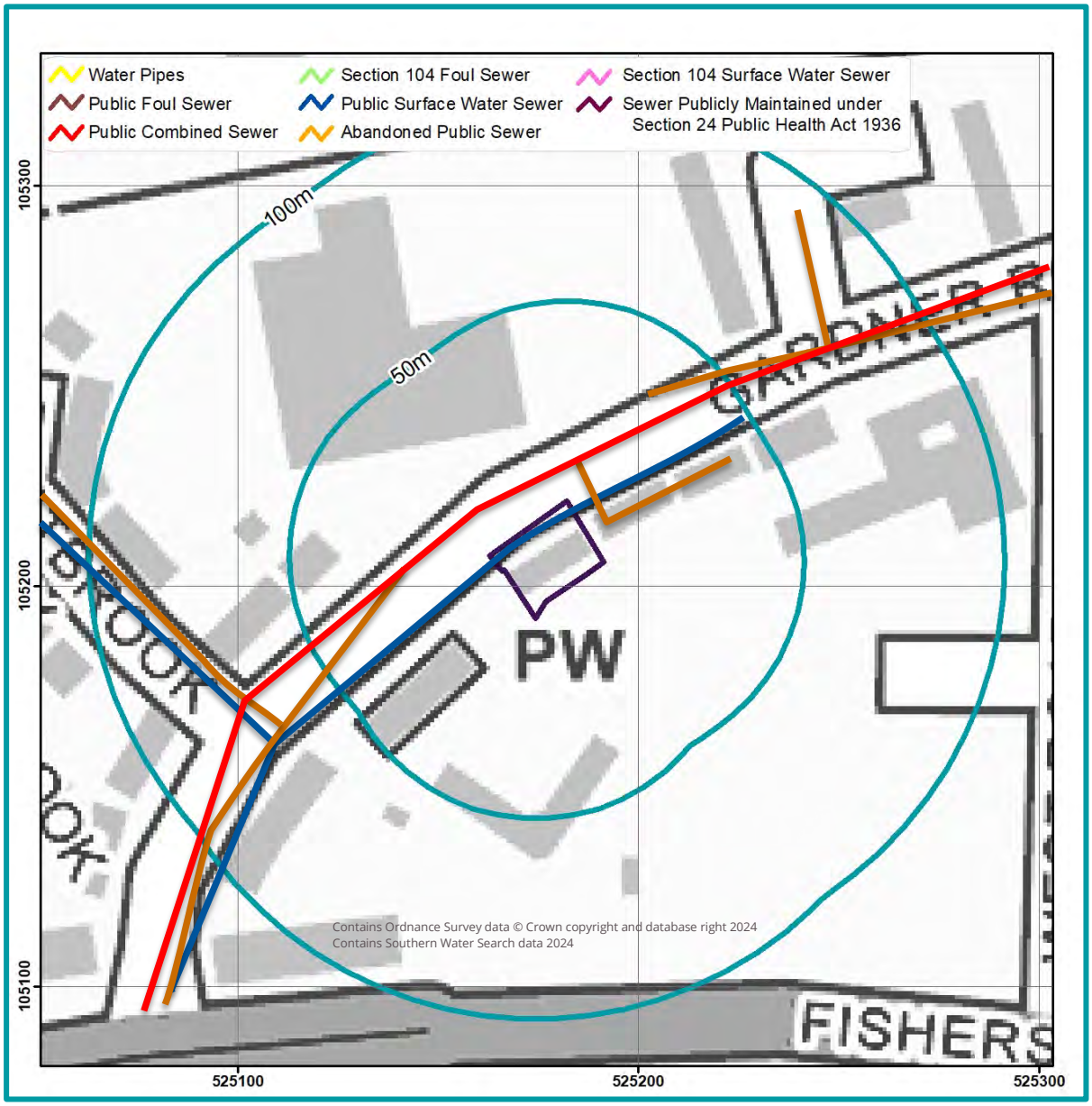


The mapping above confirms that there are no surface water feature within 100 m of the Site. Therefore, discharge to surface water is unlikely to be appropriate.

According to DEFRA's MagicMap, the Site is not within 250m of a SSSI or SPA.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency (EA) to confirm the presence, location and condition of any mapped or additional unmapped surface water features.

Figure 6. Sewer features map (OS & Southern Water, 2024)

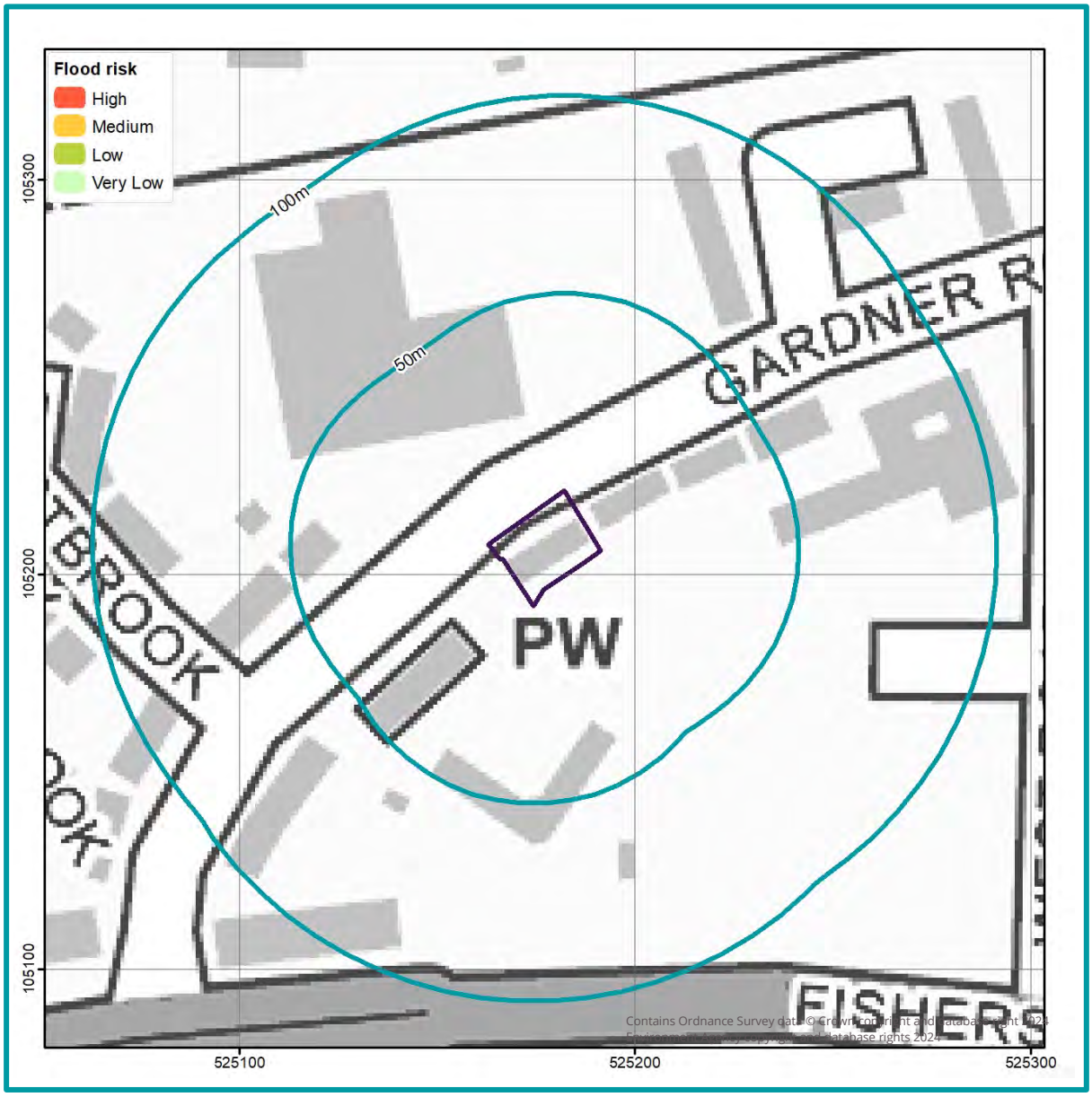


GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. There is a public surface water sewer, located adjacent to the north of the Site, therefore discharge to sewer is likely to be appropriate.

Further analysis of the connections and condition of the public surface water drainage system should be undertaken by carrying out a CCTV survey or by contacting the drainage provider or the Local Council to confirm the presence, location and condition of the sewer. Consultation with the drainage provider would also be required to determine that sufficient capacity is available to accept the proposed discharge, and to gain permission to connect if required.

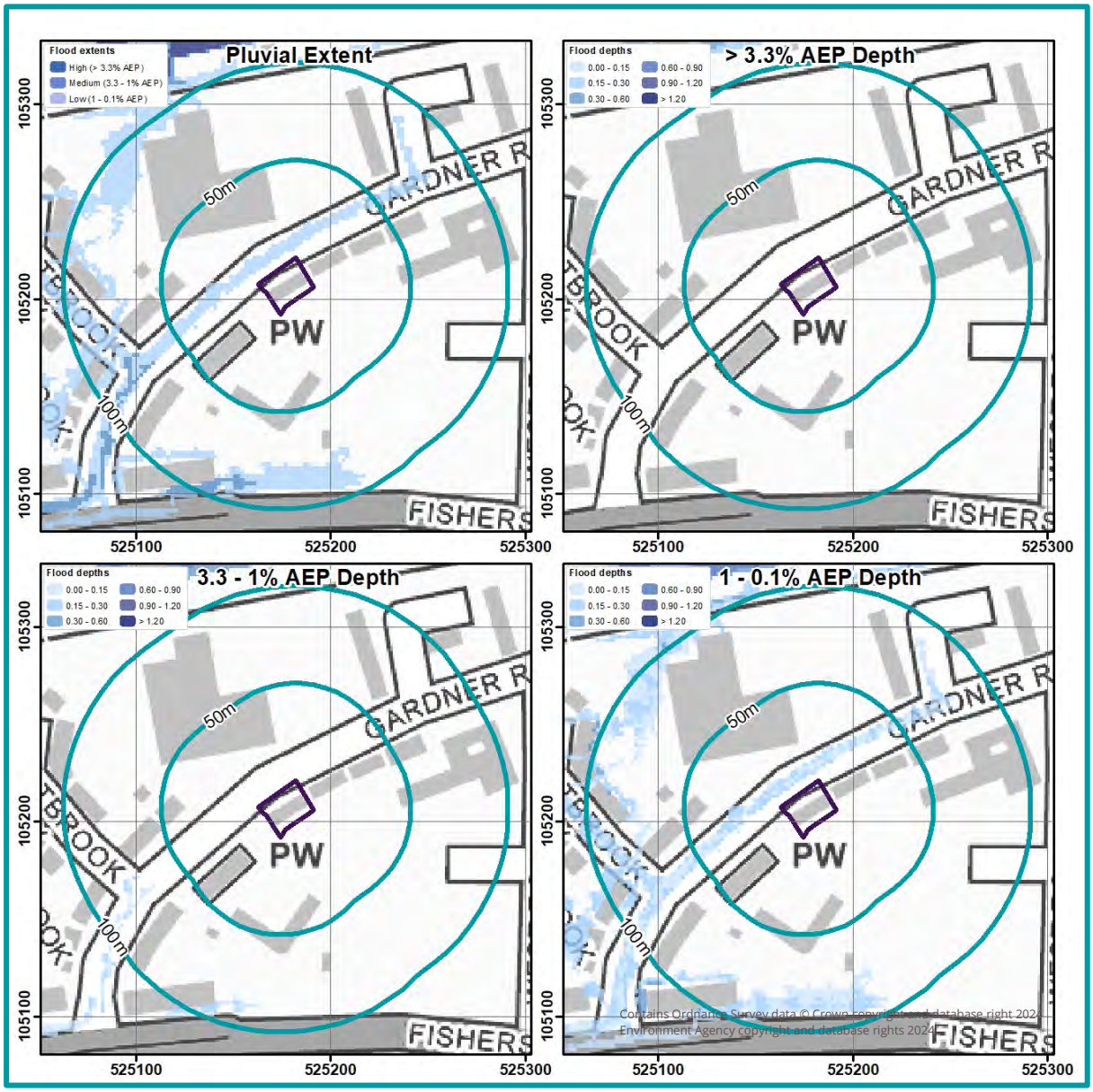
Where development is proposed above or within close proximity to the public sewer network, a build-over agreement or easement may be required with the relevant utility provider.

Figure 7. Risk of flooding from rivers & sea map (EA, 2024)



According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) map, the Site has a Very Low risk of flooding from fluvial or coastal flooding, with less than 0.1% annual probability of flooding, therefore the SuDs design is unlikely to be affected.

Figure 8. Risk of surface water flooding map (EA, 2024)

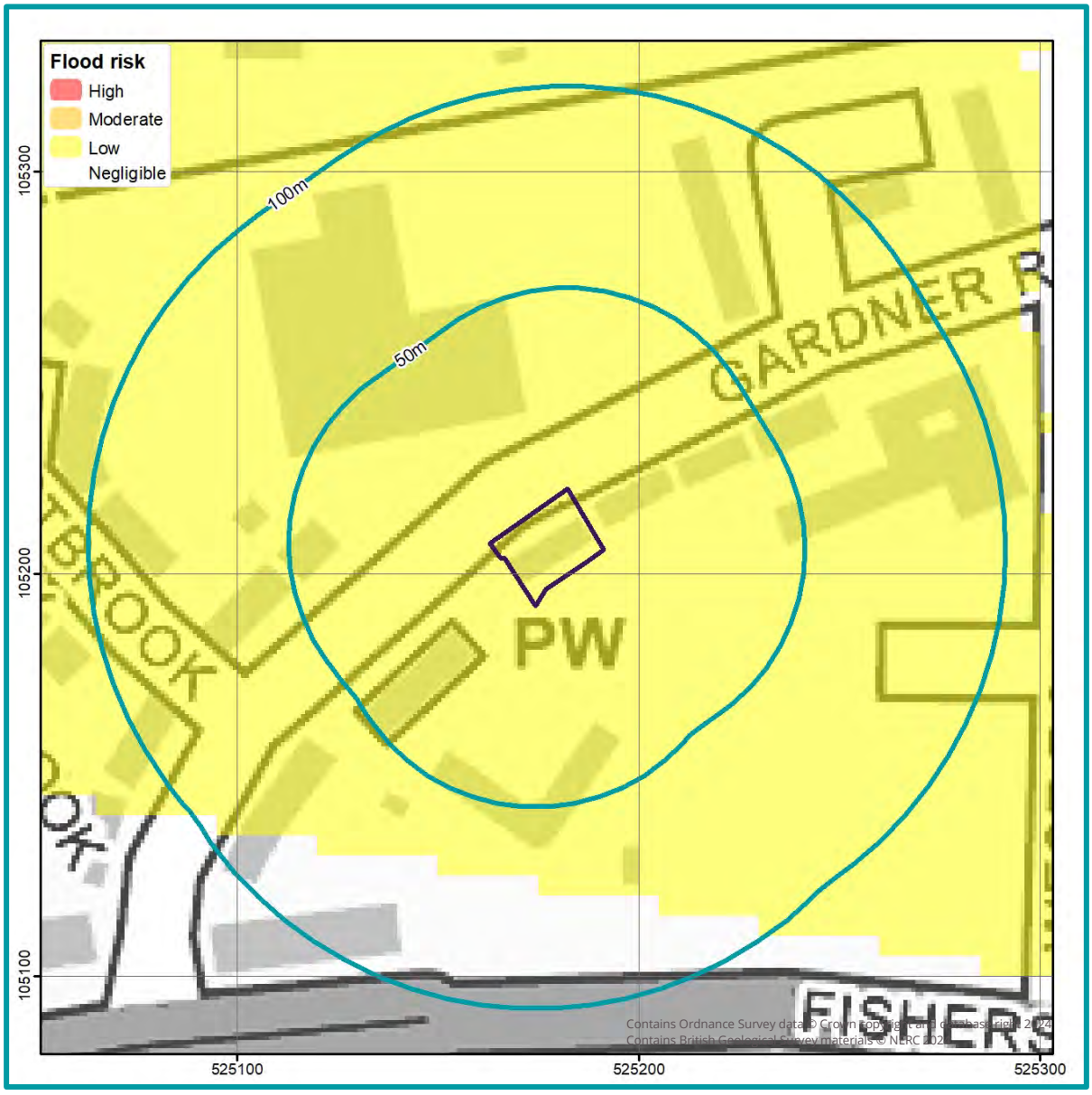


GeoSmart have undertaken an assessment of the risk of flooding from surface water (pluvial) sources within the vicinity of the Site using the EA's Risk of Flooding from Surface Water (RoFSW) mapping.

The above map shows the extent and depth of flooding during the >3.3% annual probability (AEP) (1 in 30 year – High risk), 3.3 – 1% AEP (1 in 100 year – Medium risk) and 1 – 0.1% AEP (1 in 1000 year – Low risk) events. This confirms that there are no areas of the Site which are modelled to be affected by surface water flooding.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency to confirm the pluvial flood risk, flood depths and velocities where applicable.

Figure 9. Groundwater flood risk (GW5) map (GeoSmart, 2024)



GeoSmart have undertaken an assessment of the risk of flooding from groundwater within the vicinity of the Site. GeoSmart's Groundwater Flood Risk Screening (GW5) map confirms the Site has a Low risk of groundwater flooding during a 1% annual probability (1 in 100 year) event.

The Low risk indicates the groundwater table may be particularly shallow in these areas and further investigation may be required.

3 Site context

Site information

The purpose of this report is to assess the potential for disposing of surface water through a Sustainable Drainage System (SuDS) for the site east of 107a, Gardner Road, Portslade (the Site). The Site is located to the east of Worthing on the south coast of England in a setting of commercial and residential land use. The land slopes to the west from 14.12 mAOD to 14.69 mAOD. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±150 mm. Site plans and drawings are provided in Appendix A.

Development

The Site is currently used within a residential capacity. At present there is a single building with car park and landscaped areas. Development proposals comprise the demolition of the existing garage building, with the construction of a new three-bedroom residential building along with new access, parking and landscaping.

Geology, permeability and thickness

British Geological Survey (BGS) national superficial and bedrock geology mapping confirms the geological formations underlying the Site and each formation may have a range of permeability.

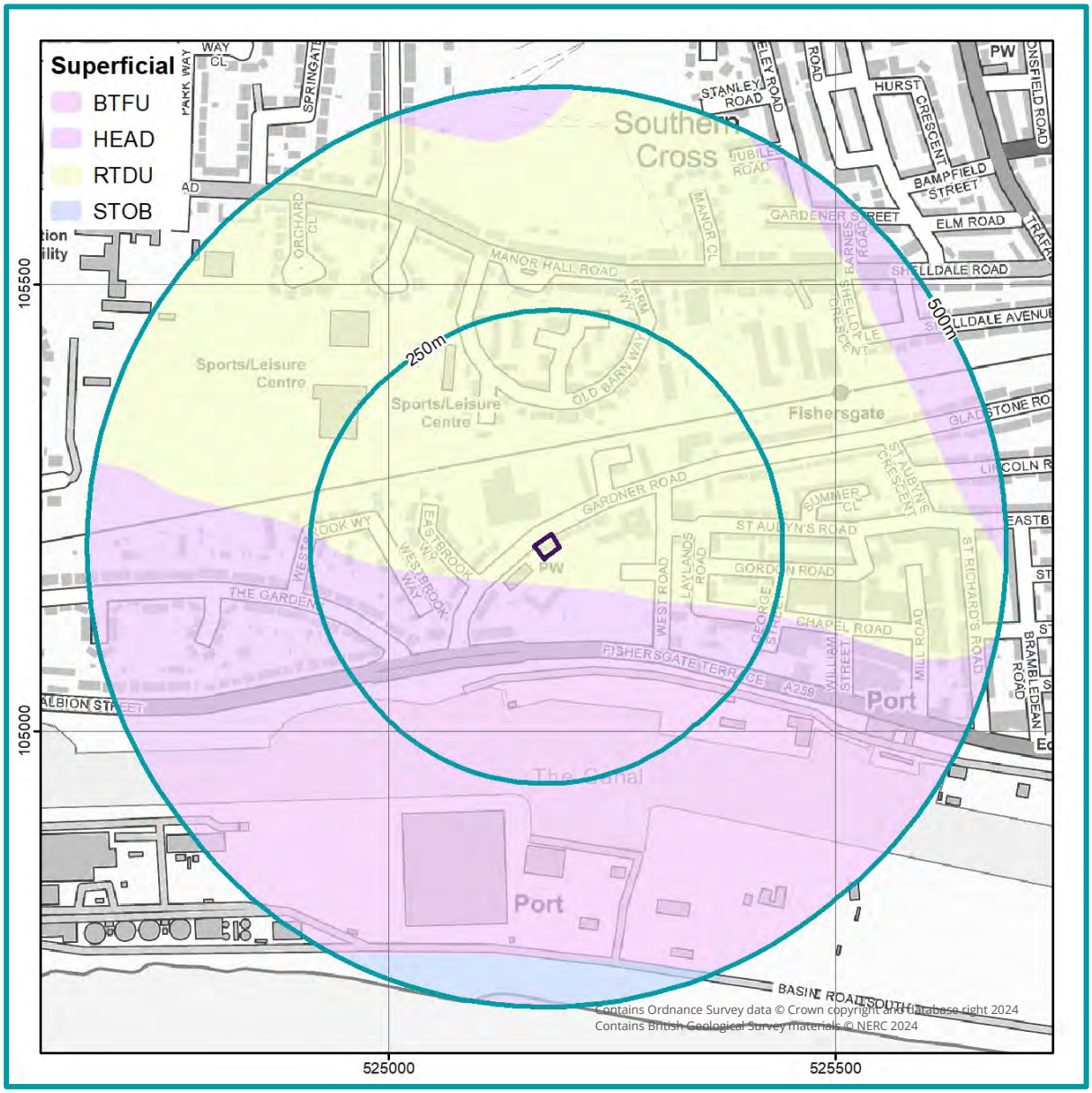
Table 1. Site Geology

Geology present on-Site		Potentially permeable?
Superficial geology (Figure 11)	River Terrace Deposits (undifferentiated) (sand, silt and clay) (RTDU)	✓
Bedrock geology (Figure 12)	Tarrant Chalk Member (Chalk) (TACH)	✓

The BGS website was used to extract ground information from the nearest borehole records, within the same geological formations, to the Site (ref: TQ20NE145). This borehole is located approximately 380m to the northeast..

The borehole records confirm the underlying geology compromises a pit to 2.13 m below ground level (bgl), coarse flint gravel and cobbles to 7.47 m bgl, Firm light-brown very silty (chalky) clay to 8.46 m bgl, brown silty sand to 12.49 m bgl underlain by Tarrant Chalk to a depth of between 14.32 m bgl, where the borehole ends.

Figure 10. Superficial Geology (BGS, 2024)



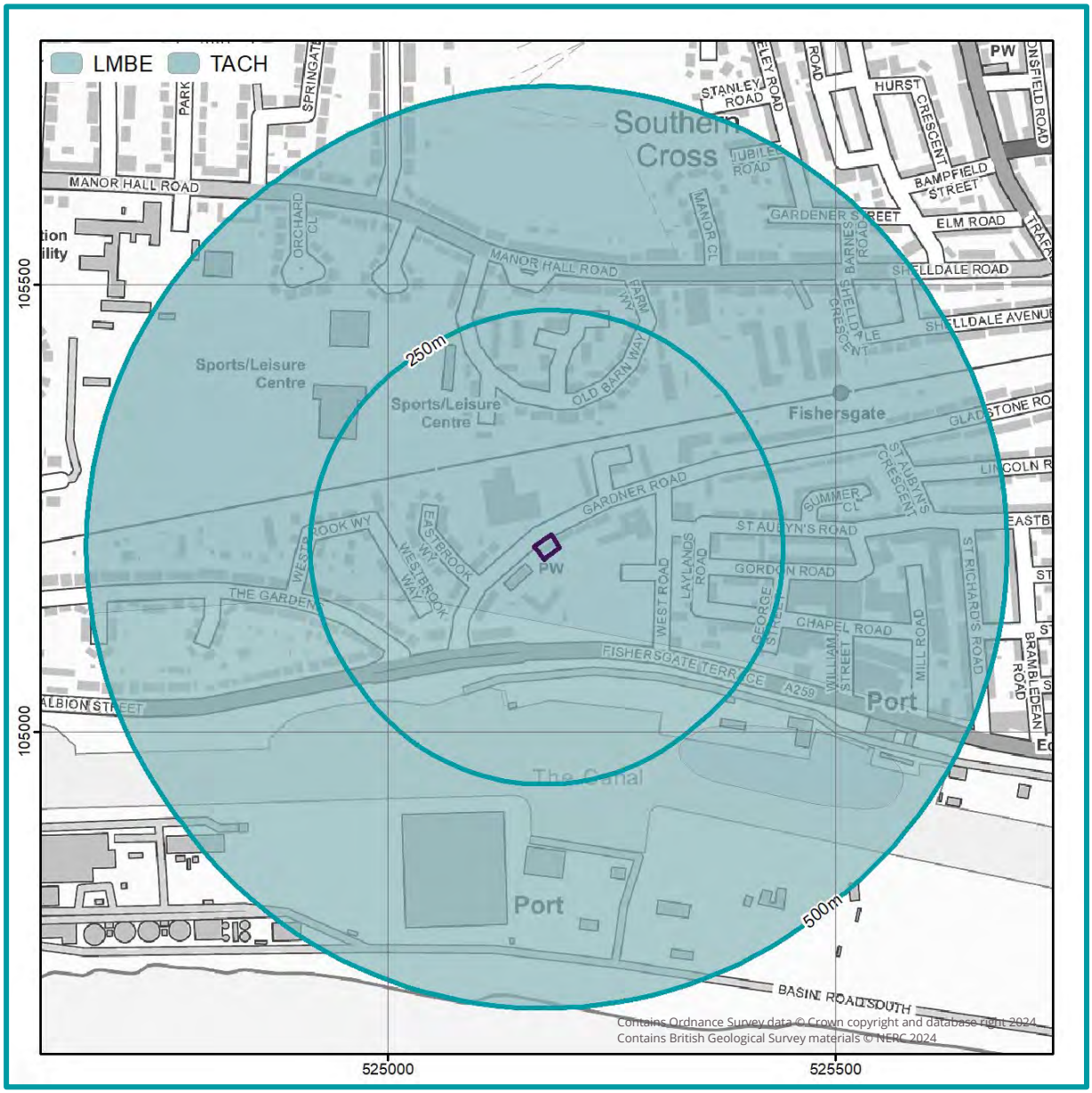
Depth to groundwater

The SuDS system should be designed to operate in periods of extreme groundwater levels.

According to borehole data and GeoSmart's Groundwater Flood Risk (GW5) map (figure 9), shallow groundwater is unlikely to be an issue at the Site. Relevant boreholes (ref: TQ20NE145) indicate groundwater was struck at the contact between the superficial and bedrock deposit at 12.49 m and the standing water level 11.27 m bgl within the permeable superficial deposits.

Spatial constraints mean that a 5m buffer between building foundations and focused infiltration features cannot be provided as required by Building Regulation (2010). Focused infiltration features are therefore not considered to be feasible.

Figure 11. Bedrock Geology (BGS, 2024)



Ground conditions

Infiltration SuDS features are not proposed at the Site, therefore a detailed investigation into the ground conditions is not required.

Water quality

The Site does not lie within an SPZ and infiltration features are not proposed therefore for the purposes of the sustainable drainage assessment further consideration of the historical land uses (and any associated contamination risks) is not considered necessary.

4 National & local policy context

National Guidance

CIRIA SuDS Manual (C753) (2015)

A development should utilise sustainable drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. Use infiltration techniques, such as porous surfaces in non-clay areas,
2. attenuate rainwater in ponds or open water features for gradual release,
3. attenuate rainwater by storing in tanks or sealed water features for gradual release,
4. discharge rainwater direct to a watercourse,
5. discharge rainwater to a surface water sewer / drain,
6. discharge rainwater to the combined sewer.

Defra - Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems (2015)

Peak Flow control

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

Volume control

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. The runoff volume must be discharged at a rate that does not adversely affect flood risk.

The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30 year rainfall event.

Ministry of Housing, Communities & Local Government – National Planning Practice Guidance: Flood risk assessments: climate change allowances (2022)

The Peak rainfall intensity allowances section provides advice on the increased rainfall effects on river levels and land and urban drainage systems. As of May 2022, the applicable climate change allowance is defined by specific Management Catchment for the 1 in 30 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event.

As the Site is located within the Adur and Ouse Management Catchment the following climate change allowances are applicable.

Table 2. Adur and Ouse Management Catchment peak rainfall allowances

Adur and Ouse Management Catchment	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	2050s	2070s	2050s	2070s
Central	20%	20%	20%	25%
Upper end	35%	40%	45%	45%

The drainage system should be designed to make sure there is no increase in the rate of runoff discharged from the Site for the upper end allowance.

Where on-Site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant flood hazard to people from on-Site flooding for the central allowance.

Sub-national Drainage Policy

West Sussex LLFA Policy for the Management of Surface Water (AECOM, 2018).

West Sussex County Council was made LLFA for West Sussex by the Flood and Water Management Act 2010 (the Act). As LLFA, West Sussex County Council has a strategic overview of 'local flooding.' Local flooding is defined by the Act as flooding which is caused by:

- Surface water; and/or
- Groundwater; and/or
- Ordinary Watercourses.

SuDS Policy 1: Discharge Hierarchy

Surface water must not be discharged into the foul sewer system. Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q1) by means of a controlled outflow.

SuDS Policy 2: Manage Flood Risk through Design

The drainage system must be designed to operate without any flooding occurring during any rainfall event up to (and including) the critical 1 in 30 year storm (3.33% AEP). The system must also be able to accommodate the rainfall generated by events of varying durations and intensities up to (and including) the critical, climate change adjusted 1 in 100 year storm (1% AEP) without any on-site property flooding and without exacerbating the off-site flood-risk. Sufficient steps are to be taken to ensure that any surface flows between the 1 in 30 and 1 in 100 year events are retained on site.

Attenuation storage volume provided by any drainage area should half empty within 24 hours so that it can receive runoff from subsequent storms.

SuDS Policy 3: Mimic Natural Flows and Drainage Flow Paths

Runoff rates should match Greenfield runoff rates, follow natural or existing drainage routes, utilise existing natural low-lying areas or conveyance pathways, and match infiltration rates and discharges as far as possible for all events up to and including the climate-change adjusted 1 in 100 year (1% AEP) design event.

Redevelopment on brownfield land has the potential to rectify or reduce flood risk. In all cases, including on brownfield sites, runoff should where possible be restricted to the greenfield 1 in 1 year runoff rate during all events up to and including the 1 in 100 year rainfall event with climate change. An alternative approach would be for discharge rates to be limited to a range of greenfield rates, based on the 1 in 1, 1 in 30 and 1 in 100 year storm events. However, the use of this method to restrict discharge rates requires the inclusion of on-line long-term storage, sized to take account of the increased post development volumes, discharging at no greater than 2l/s/ha.

SuDS Policy 7: Safeguard Water Quality

West Sussex LLFA expects developers to demonstrate that the first 5 mm of any rainfall event can be accommodated and disposed of on-site, rather than being discharged to any receiving watercourse or surface water sewer. This can frequently be achieved through the inclusion of sustainable drainage measures such as infiltration systems, rain gardens, bioretention systems, swales, and permeable pavement.

Local Policy

Adur Local Plan, Adur District Council 2017

Policy 35: Water Quality and Protection

Development will be permitted provided that: It does not have an unacceptable impact on the quality and potential yield of local water resources and the water environment; also

It protects and enhances groundwater, surface water features and controls aquatic pollution to help achieve the objectives of the Water Framework Directive; and

It has an adequate means of water supply (even in a drought), sufficient foul and surface water drainage and adequate sewage treatment capacity.

Development must be phased to take into account the timing of any water and/or wastewater infrastructure required which must be in place prior to the occupation of development.

A preliminary risk assessment will be required for any development where there is potential risk of contamination of controlled waters.

New development within Groundwater Source Protection Zones will only be permitted provided that it has no adverse impact on the quality of the groundwater source or a risk to its ability to maintain a public water supply.

Policy 36: Flood Risk and Sustainable Drainage

The Council will work with relevant bodies to ensure that flood risk in Adur is reduced. A site specific flood risk assessment must be submitted with planning applications for:

- Proposals of 1 hectare or greater in Flood Zone 1
- All development or changes of use to a more vulnerable use in Flood Zones 2 and 3
- All development or changes of use to a more vulnerable use, regardless of flood zone or size, where flood risk from other sources (surface water, sewer, groundwater) is identified by the Strategic Flood Risk Assessment.

The flood risk assessment will need to demonstrate that development:

- is appropriately flood resilient and resistant, includes safe access and escape routes where required, and that any residual risk can be safely managed;
- will be safe for its lifetime taking account of the vulnerability of its users;
- will not increase flood risk (including sewer flooding, surface water and groundwater flood risk) elsewhere; will, where possible, reduce flood risk overall; and
- will give priority to the use of sustainable drainage systems. The flood risk assessment will also need to demonstrate that, where possible, higher vulnerability uses have been located on parts of the site at the lowest probability of flooding.

New development within Adur must include some form of Sustainable Drainage System (SuDS) or other appropriate design measures in order to reduce the risks of surface water flooding and to mitigate the risk of pollution to groundwater sources. SuDS should be considered before other forms of disposal.

Substantial storage through SuDS will be required to achieve a reduction in runoff to levels below that experienced prior to development. On relevant sites, storage of runoff during the high part of the tidal cycle should be addressed. SuDS must be designed sensitively and must seek to enhance landscapes, increase biodiversity gains, and provide quality spaces.

For all developments, applicants will be required to demonstrate that acceptable management arrangements are in place and funded to ensure the ongoing maintenance of

SuDS into the future. Where it is not practical to provide SuDS on site, the development of strategic level SuDS may be considered appropriate. In these circumstances, contributions may be required through s106 undertakings/ CIL.

5 Storage, volume and peak flow rate

Suggested minimum and aspirational storage requirements for an infiltration or attenuation SuDS scheme for the development footprint are set out below, with more detail provided in subsequent sections. Storage volumes may be reduced (but not below the minimum level) if the design incorporates off-Site discharge.

Table 3. Storage requirements at the proposed development Site (Discharge runoff to surface water sewer)

Attenuation scenario		Attenuation required (m^3)	Explanation
Discharge runoff to surface water sewer	1 in 100 year including 45% CC	3.6	Attenuation required to ensure surface water runoff is attenuated in all storm events up to and including the 1 in 100 year event including a 45% allowance for climate change*.

*See Appendix B for associated runoff and discharge calculations. Discharge rates all restricted as close as possible to greenfield rates in their respective events.

Surface water runoff

An increase in impermeable area on-Site will result in greater rainfall runoff. Reduction in runoff will help mitigate flood risk both on and off-Site. Further information on the surface water runoff calculations is provided in Section 12 'Background Information'.

Guidance

The Non-Statutory Technical Guidance for SuDS (Defra, March 2015) states:

"Where reasonably practicable, for Greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the Greenfield runoff volume for the same event. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event."

Table 4. Change in impermeable area associated with the development

Total Site area	141 m^2
Impermeable area (and as a percentage of the total area of the proposed development footprint of 141 m^2)	
Pre-development	Post-development
60 m^2 (43%)	116 m^2 (82%)
Impermeable land use: building footprint and driveway Permeable land use: landscaped areas	New impermeable land use: 51 m^2 building footprint and 65 m^2 paving New permeable land use: landscaped areas

Guidance

"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event' and 'flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development"

(Defra, March 2015, non-statutory guidance).

Peak discharge rates

The table below presents peak discharge rates for a range of storm events used to assess the impact of the proposed development and select the maximum permitted discharge rate. Further information on the calculation and control of peak discharge rates is provided in Section 12 'Background Information'.

Table 5. Peak discharge rates associated with the development

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates[1] (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.00	N/A	N/A	N/A

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates[1] (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
6 hour 1 in 1 year	0.00	0.09	0.15	0.06
6 hour 1 in 10 year	0.00	0.14	0.24	0.10
6 hour 1 in 30 year	0.01	0.18	0.31	0.13
6 hour 1 in 100 year	0.01	0.22	0.39	0.17
6 hour 1 in 100 year + 20% CC	N/A	N/A	0.47	0.24
6 hour 1 in 100 year + 45% CC	N/A	N/A	0.56	0.34

[1] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

Relevant national, regional and local planning policy has been consulted in Section 4 to determine restrictions on runoff from previously developed and greenfield sites. In some cases, greenfield rates may be requested, but in practice it is difficult to restrict discharge rates at any one control point to less than 1 l/s, without increasing the risk of any potential blockages occurring in the drainage network.

Total discharge volumes

The table below presents discharge volumes for a range of storm events used to assess the impact of the proposed development and calculate the required storage volumes. Further information on the calculation of total discharge volumes is provided in Section 9 'Methodology and Limitations'.

Table 6. Total discharge volumes associated with the development

Rainfall event	Greenfield runoff volume (m^3)	Existing runoff volume[2] (m^3)	Potential runoff volume without attenuation (m^3)	Potential minus existing (m^3)
QBAR	0.42	N/A	N/A	N/A
6 hour 1 in 1 year	0.39	1.90	3.30	1.40
6 hour 1 in 10 year	0.64	3.00	5.20	2.20

Rainfall event	Greenfield runoff volume (m^3)	Existing runoff volume[2] (m^3)	Potential runoff volume without attenuation (m^3)	Potential minus existing (m^3)
6 hour 1 in 30 year	0.80	3.86	6.72	2.86
6 hour 1 in 100 year	1.00	4.83	8.41	3.58
6 hour 1 in 100 year + 20% CC	N/A	N/A	10.09	5.26
6 hour 1 in 100 year + 45% CC	N/A	N/A	12.19	7.36

[2] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

6 Runoff destination



Options for the destination for the runoff generated on-Site have been assessed in line with the prioritisation set out in the Building Regulations Part H document (HM Government, published in 2010 and updated in 2015) and Defra's Non-statutory Technical Standards for SuDS (2015).

Flow attenuation using infiltration SuDS (discharge to ground) is generally the preferred option. If discharge to ground is not available, runoff discharge to surface water is the other preferred method. Only if these two options are impractical should discharge to the sewer network be considered.

Discharge to ground

According to GeoSmart's SD50 mapping the Site has moderate potential for infiltration, with permeable underlying River Terrace deposits but the potential for a shallow groundwater table.

Spatial constraints mean that a 5m buffer between building foundations and focused infiltration features cannot be provided as required by Building Regulation (2010). Focused infiltration features are therefore not considered to be feasible.

There are no known issues identified relating to Site contamination or the presence of a SPZ.

Discharge to surface watercourse

The Site is not located within 100 m of a surface water feature, due to the significant drainage pipework that would be required this is not considered a feasible option for discharging runoff.

Discharge to sewer

GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the Southern Water asset location plan there is a public surface water sewer, located adjacent to the north of the Site, therefore discharge to sewer is likely to be appropriate. As infiltration to ground and discharge to watercourse is not considered to be feasible, discharge to this surface water sewer is proposed.

7 Water quality

A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate "train" or sequence of SuDS components that are connected in series. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015). The proposed development is of very low (roof water) to low hazard (runoff from car parking and road). The Site does not lie within an SPZ and therefore additional treatment stages are not required.

Table 7. Level of hazard

Hazard	Source of hazard
Very Low	Residential roof drainage
Low	Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste (incl. scrap-yards).

The recommended minimum number treatment stages suggested for the different runoff waters identified for the proposed development is highlighted in the table below.

Table 8. Minimum number of treatment stages for runoff

		Sensitivity of the receiving water body		
		Low	Medium	High
Hazard	Low	1	1	1
	Med	2	2	2
	High	3	3	3

8 Client checklist



A drainage strategy should now be compiled on the basis of the information provided. Prior to installation of the Site drainage system it is recommended that the client carries out the following checks to confirm the development proposals. GeoSmart would be able to support with any updates required to the drainage scheme, please contact us and we would be happy to provide you with a proposal to undertake the work.

Table 9. Potential SuDS limitations

Conditions in Non-Statutory Technical Standards (Defra, 2015), limitations to infiltration SuDS	Do these conditions arise at the Site?
Is the surface runoff greater than the rate at which water can infiltrate into the ground?	
Is there an unacceptable risk of ground instability?	
Is there an unacceptable risk of mobilising contaminants?	
Is there an unacceptable risk of pollution to groundwater?	
Is there an unacceptable risk of groundwater flooding?	
Is the infiltration system going to create a high risk of groundwater leakage to the combined sewer?	

Table 10. SuDS design considerations

Confirm that potential flooding on-Site in excess of the design storm event and exceedance flow routes have been considered.	
Review options for the control of discharge rates (e.g. hydrobrake).	
Confirm the owners/adopters of the drainage system. Consider management options for multiple owners.	
Is there an unacceptable risk of pollution to groundwater?	
Review access and way leave requirements.	
Review maintenance requirements.	

Health and safety considerations for SuDS

GeoSmart reports may include outline strategies or designs to support with development plans. Any drawings or advice provided do not comprise any form of detailed design. Implementation of any conceptual scheme options may constitute 'Construction Work' as defined by CDM Regulations (2015).

The CDM Regulations place specific Health and Safety duties on those commissioning, planning and undertaking construction works. If you are uncertain what this means you should seek the advice of your architect, builder or other competent professional.

GeoSmart does not provide health and safety advisory services but we are required to advise you of your general responsibilities under CDM (visit http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/ for more information).

Please remember that detailed design work should be undertaken by a competent professional who might be your engineer, architect, builder or another competent party.

9 Methodology and limitations of study

This report assesses the feasibility of infiltration SuDS and alternative drainage strategies in support of the Site development process. From April 6th 2015 SuDS are regulated by Local Planning Authorities and will be required under law for major developments in all cases unless demonstrated to be inappropriate. What is considered appropriate in terms of costs and benefits by the Planning Authority will vary depending on local planning policy, and Site setting. The Lead Local Flood Authority will require information as a statutory consultee on major planning applications with surface water drainage implications. The National Planning Policy Framework requires that new developments in areas at risk of flooding should give priority to the use of SuDS and demonstrate that the proposed development does not increase flood risk downstream to third parties.

How was the suitability of SuDS estimated for the Site?

There are a range of SuDS options available to provide effective surface water management that intercept and store excess runoff. When considering these options, the destination of the runoff should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2010) and Defra's National Standards for SuDS (2015):

1. Discharge to the ground;
2. Discharge to a surface water body;
3. Discharge to a surface water sewer;
4. Discharge to a local highway drain; and
5. Discharge to a combined sewer.

Data sets relating to each of the potential discharge options have been analysed to assess the feasibility of each option according to the hierarchy set out above. Hydrogeological characteristics for the Site are assessed in conjunction with the occurrence of SPZ's to assess infiltration suitability. The Site has been screened to determine whether flood risk from groundwater, surface water, fluvial or coastal sources may constrain SuDS. The distance to surface water bodies and sewers has been reviewed gauge whether these provide alternative options.

GeoSmart SuDS Infiltration Suitability Map (SD50)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the suitability for infiltration drainage in different parts of the Site and indicates where further assessment is recommended. In producing the SuDS Infiltration Suitability Map (SD50), GeoSmart used data from the British Geological Survey on groundwater levels, geology and permeability to screen

for areas where infiltration SuDS may be suitable. The map classifies areas into 3 categories of High, Medium and Low suitability for infiltration SuDS. This can then be used in conjunction with additional data on Site constraints to give recommendations for SuDS design and further investigation.

The primary constraint on infiltration potential is the minimum permeability of the underlying material and in some cases the range in permeability may be considerable, ranging down to low. The map classifies these areas as moderate infiltration suitability requiring further investigation. In cases where the thickness of the receiving permeable horizon is less than 1.5 meters then additional Site investigation is recommended. If the Site is at risk of groundwater flooding for up to the 1% annual occurrence the map classifies these areas as moderate infiltration suitability requiring further investigation.

The GeoSmart SuDS Infiltration Suitability Map (SD50) is a national screening tool for infiltration SuDS techniques but a Site specific assessment should be used before final detailed design is undertaken. Further information on the GeoSmart SuDS Infiltration Suitability Map (SD50) is available at geosmartinfo.co.uk

How is the suitability to discharge to sewers and watercourses calculated?

The suitability to discharge to discharge to sewers and watercourses has been calculated using the distance from the Site to both. For example, where the Site is within 50 m of a surface water body. Discharge to surface water is potentially appropriate subject to land access arrangements and a feasibility assessment. Where the Site is within 50 m of a sewer, discharge to sewer is potentially appropriate subject to land access arrangements and a feasibility assessment. The utility company should be contacted to agree connection feasibility and sewer capacity.

Further information relating to sewers available in the area can be found in Appendix C.

What is a Source Protection Zone?

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied. The zones are used to set up pollution prevention measures in areas which are at a higher risk. The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors. Inner zone (Zone 1) is defined as the 50 day travel time from any point below the water table to the source (minimum radius of 50 metres). Outer zone (Zone 2) is defined by a 400 day travel time. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

How was surface water runoff estimated from the Site?

In accordance with The SuDS Manual (C753) (CIRIA, 2015), the Greenfield runoff from the Site has been calculated using the IoH124 method and is assumed representative of the runoff generated on the undeveloped surfaces that are affected by the proposed development. The method used for calculating the runoff complies with the NPPF (MHCLG, 2023). For the impermeable surfaces, it has been assumed that 100% runoff will occur (calculations provided in Appendix B). Rainfall data is derived from the Flood Estimation Handbook (FEH), developed by NERC (2009). Only areas affected by the proposed development are considered in the flow and volume calculations. Permeable areas that remain unchanged are not included in the calculations as it is assumed these will not be actively drained and attenuated.

What is the peak discharge rate?

An estimation of peak runoff flow rate and volume is required to calculate infiltration, storage and discharge requirements. The peak discharge rate is the maximum flow rate at which surface water runoff leaves the Site during a particular storm event, without considering the impact of any mitigation such as storage, infiltration or flow control. Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. If all drainage is to infiltration there will be no discharge off-Site. Discharging all flow from Site at the existing 1 in 100 event would increase flood risk during smaller events. Flow restriction is generally required to limit the final discharge from Site during all events as a basic minimum to the green field QBAR rate. A more complex flow restriction which varies the final discharge rate from the Site depending on the storm event will reduce the volume of storage required on-Site. Drainage to infiltration SuDS is subtracted from the total discharge off-Site to achieve a beneficial net affect.

What is the total discharge volume?

The total discharge volume is calculated on the basis of the surface water runoff that has the potential to leave the Site as a result of the assumed 6 hour duration design storm event. The runoff is related to the underlying soil conditions, impermeable cover, rainfall intensity and duration of the storm event. The total volume generated by the current Site is compared to the potential total volume from the developed Site (not taking into consideration any mitigation). The difference provides the minimum total volume that will need to be stored and infiltrated on-Site or released at a controlled rate. Guidance indicates that the total discharge volume should never exceed the runoff volume from the development Site prior to redevelopment for that event and should be as close as is reasonably practicable to the Greenfield runoff volume.

10 Background SuDS information



SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our website: http://geosmartinfo.co.uk/

Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on-Site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on-Site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the Site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the Site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole Site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns.

According to the guidance in Building Research Establishment (BRE) Digest 365 (2016) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

SuDS maintenance and adoption

Regular maintenance is essential to ensure effective operation of the soakaway(s) over the intended lifespan of the proposed development. A maintenance schedule for SuDs is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website: http://geosmartinfo.co.uk/

11 Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: FloodSmart Report		The FloodSmart Report range provides clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at a Site. Our consultants assess available data to determine the level of risk based on professional judgement and years of experience. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

12 References and glossary

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Glossary

General terms

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

The terms included in this glossary have been taken from CIRIA (2015) guidance.

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13 Appendices



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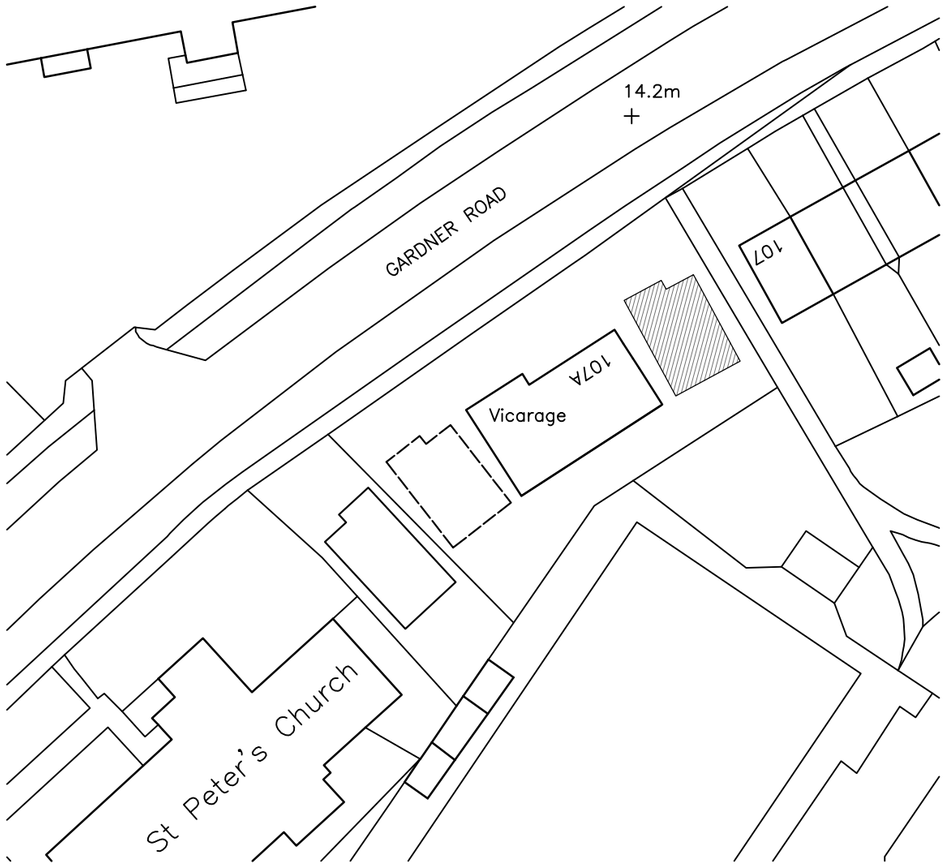
Appendix A



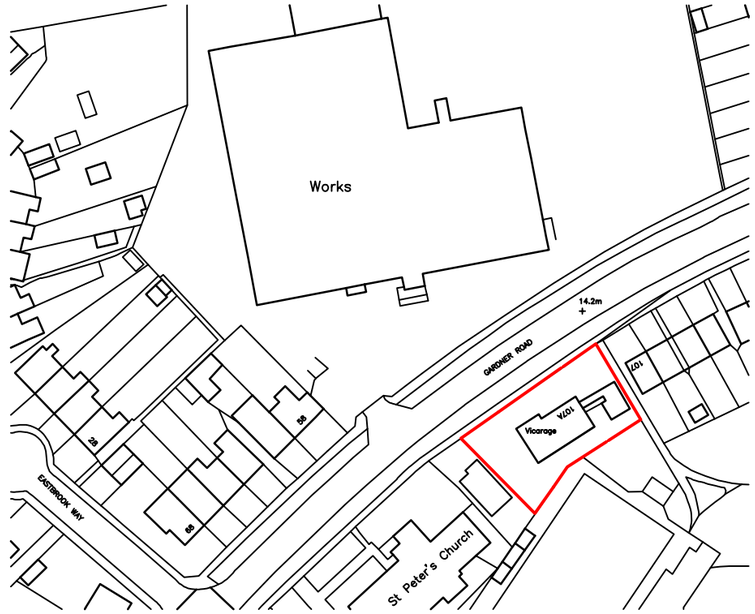
Site plans



Block Plan @ 1:500

0 10 25m

Scale 1:500



Location Plan @ 1:1250

0 10 20 30 50m

Scale 1:1250

N

Rev	Description	Date
A	Red outline added	17.12.21

Job Reference New House 107A Gardner Road Southwick	Client Sinnis Ltd
Drawing Title Site Plans	Drawing No / Rev ADC 1174/LP (1)

Date	Scale	Dwg Size	Plot Style	Drawn	Checked
13.12.21	1:500/1250	A3	ADC+red	CW	AD

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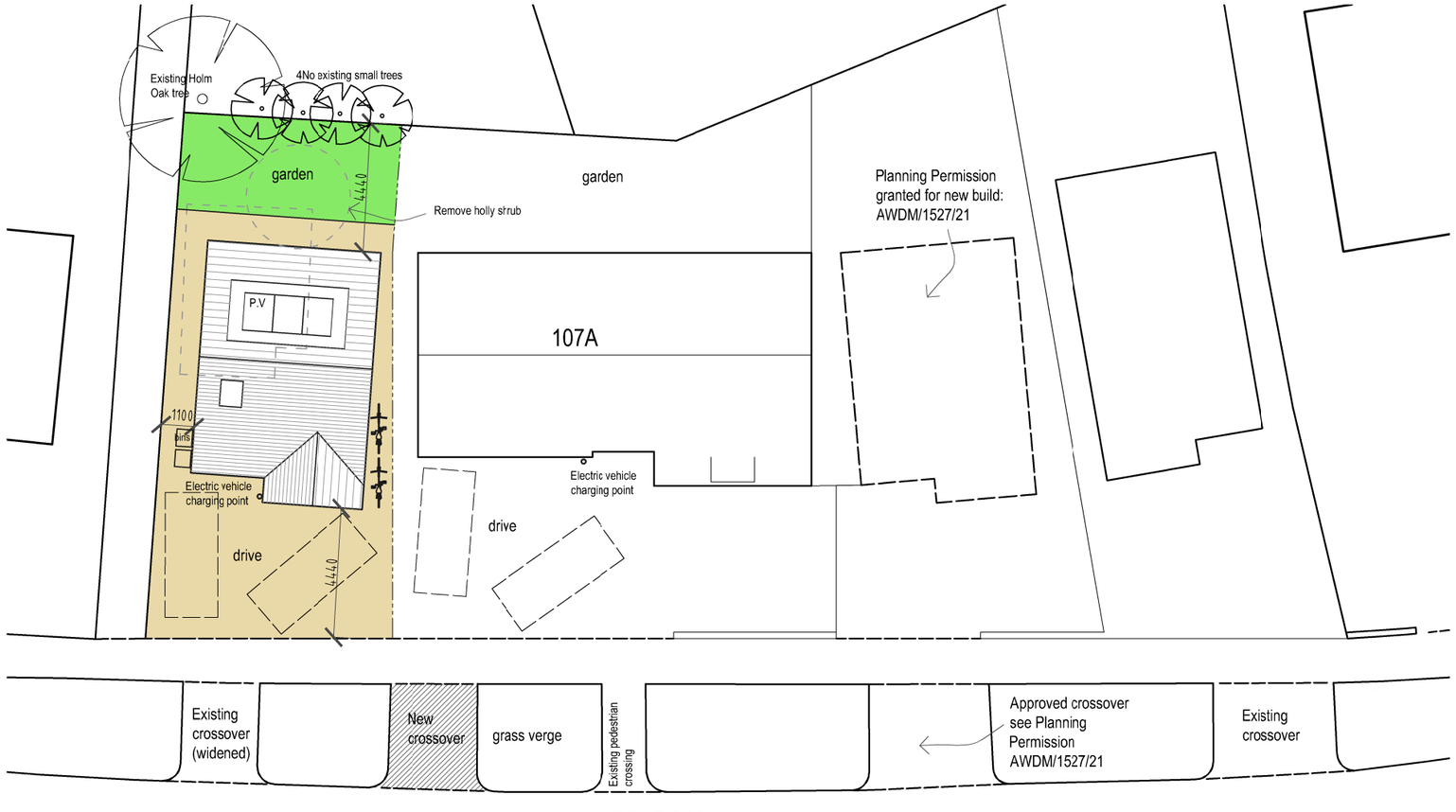
0 2 4 6 10m

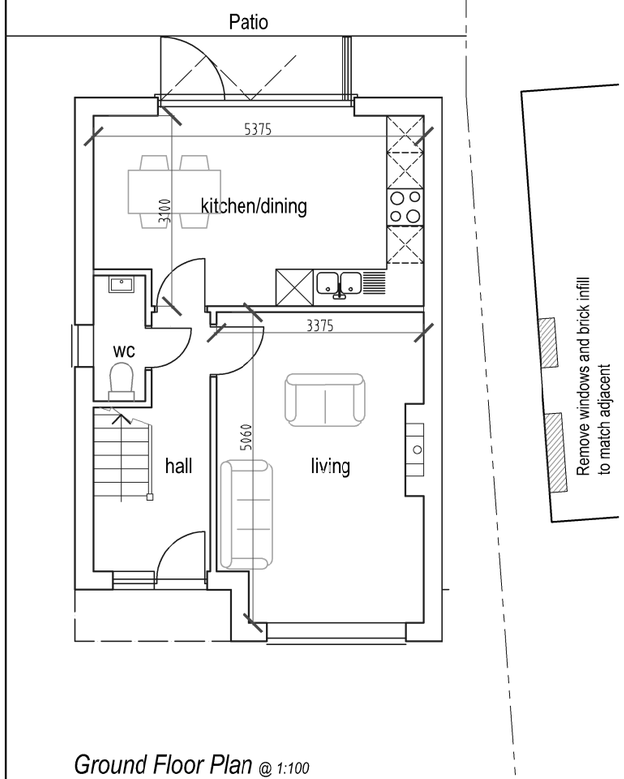
Scale 1:200



Site Plan @ 1:200

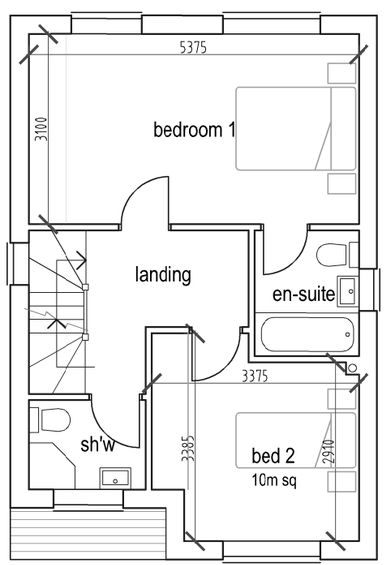
0 1 2 3 5m 10m

Scale 1:100



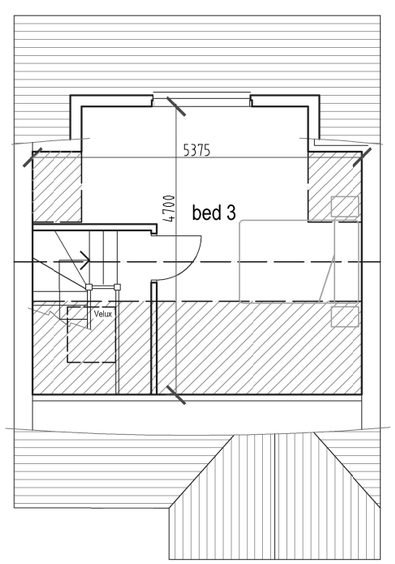
Ground Floor Plan @ 1:100

Gross Internal Area: 42.2m²



First Floor Plan @ 1:100

Gross Internal Area: 42.2m²



Roof Plan @ 1:100

Gross Internal Area: 19.4m²

Rev	Description	Date
F	Tree positions corrected	03.03.22
E	Existing trees added	08.02.22
D	New crossover adjusted	31.01.22
C	Existing crossover added	28.01.22
B	Traffic Island added and crossovers amended	24.01.22
A	Dimensions added to site plan	17.12.21

Job Reference	Client
New House 107A Gardner Road Southwick	Sinnis Ltd

Drawing Title	Drawing No	Rev
Proposed Plans	ADC1174/14	F

Date	Scale	Dwg Size	Plot Style	Drawn	Checked
07.12.21	1:100/200	A3	ADCcolourGR	CW	AD

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Appendix B



Rainfall runoff calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	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)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.012	5.00	14.300	600	151.083	137.896	1.300
2			14.300	600	149.175	141.574	1.490

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	4.143	0.600	13.000	12.810	0.190	21.8	100	5.04	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.660	13.0	1.6	1.200	1.390	0.012	0.0	24	1.130

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node 1 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	13.000	Diameter (m)	0.021		

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.850	Slope (1:X)	300.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	51	Depth (m)	0.300
Safety Factor	2.0	Width (m)	8.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 95.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	23	13.470	0.470	1.3	0.2195	0.0000	SURCHARGED
15 minute summer	2	1	12.810	0.000	0.6	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
30 minute winter	1	Orifice	2	0.6	1.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 95.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	26	13.924	0.924	3.5	1.2198	0.0000	SURCHARGED
15 minute summer	2	1	12.810	0.000	0.9	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
30 minute winter	1	Orifice	2	0.9	2.7

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Results for 100 year Critical Storm Duration. Lowest mass balance: 95.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	47	13.981	0.981	3.1	1.9334	0.0000	SURCHARGED
15 minute summer	2	1	12.810	0.000	0.9	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
60 minute winter	1	Orifice	2	0.9	4.5

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.33%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	49	14.110	1.110	4.4	3.5377	0.0000	FLOOD RISK
15 minute summer	2	1	12.810	0.000	0.9	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
60 minute winter	1	Orifice	2	1.0	6.5

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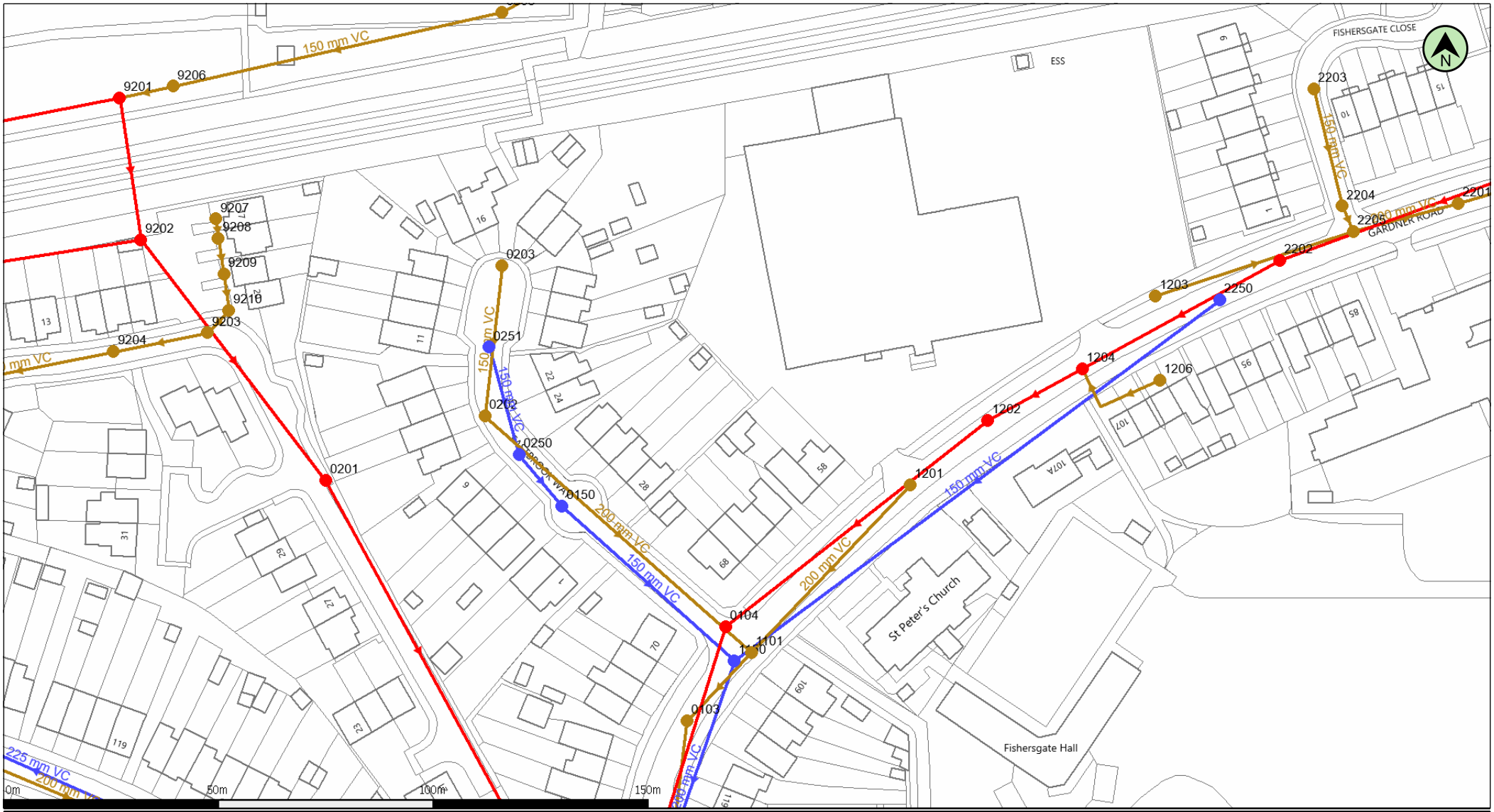
Appendix C

Southern Water Asset Location Plan



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Date: 30/01/24 | Scale: 1:1250 | Map Centre: 525104,105220 | Data updated: 21/11/23 | Our Ref: 1381298 - 1 | Wastewater Plan A4

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WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



davidsouth@geosmartinfo.co.uk

81076

WATER for LIFE from Southern Water

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0104	C	13.20	0.00	-
0201	C	14.50	10.45	-
1202	C	14.07	7.92	-
1204	C	0.00	0.00	-
2202	C	14.74	0.00	-
9201	C	13.85	9.20	-
9202	C	13.57	0.00	-
0103	F	13.03	11.07	-
0202	F	12.40	0.00	-
0203	F	12.50	0.00	-
0303	F	14.99	0.00	-
1101	F	13.15	11.20	-
1201	F	13.86	12.18	-
1203	F	0.00	0.00	-
1206	F	0.00	0.00	-
2201	F	15.17	0.00	-
2203	F	15.06	13.88	-
2204	F	14.82	13.66	-
2205	F	14.92	0.00	-
9203	F	12.95	11.74	-
9204	F	12.72	11.55	-
9206	F	0.00	0.00	-
9207	F	0.00	0.00	-
9208	F	0.00	0.00	-
9209	F	0.00	0.00	-
9210	F	0.00	0.00	-
0150	S	13.48	12.53	-
0250	S	12.80	0.00	-
0251	S	13.00	0.00	-
1150	S	13.20	11.89	-
2250	S	14.50	13.28	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

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Email: info@geosmartinfo.co.uk

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GeoSmart Information

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The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

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- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
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Martin Lucass

Commercial Director

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