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**North Hall Cottage
Mallion's Lane
Staplefield
RH17 6AT**

**Proposed Vehicular Access
Development**

Flood Risk Assessment

Issue	A
Date	14 Dec 2023
Prepared by	C. Maheshe
Verified by	M. Wojcieszak
Job No.	23144



Registered No. FS 37624

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APPENDICES

Appendix A – Site location plan and Development Proposals

Appendix B – Risk of Flooding from Surface Water Maps (Depth and Speeds)

Appendix C – West Sussex County Council Culvert Policy Requirements

1.00 Introduction

- 1.01 Monson Engineering has been instructed to prepare a Flood Risk Assessment for the proposed vehicular access on Mallion's Lane in Staplefield.
- 1.02 It is proposed to construct a vehicular access, parking and turning area, approximately 34m north of the existing pedestrian access to the North Hall Cottage (*Fig 1a/1b*).

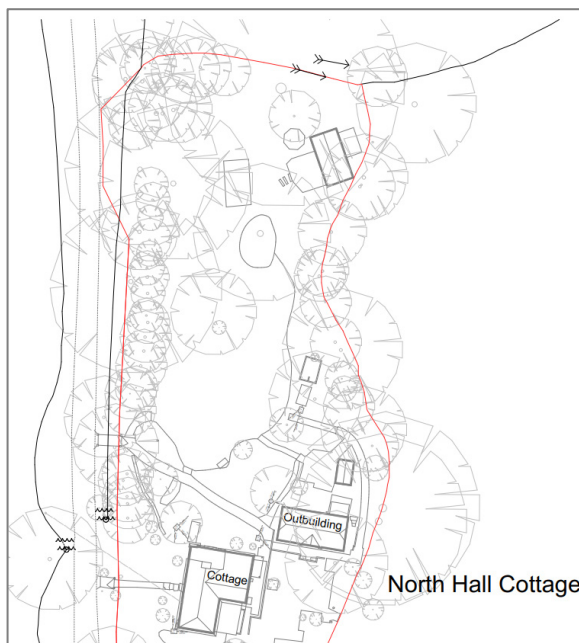


Figure 1a: Existing Site Plan

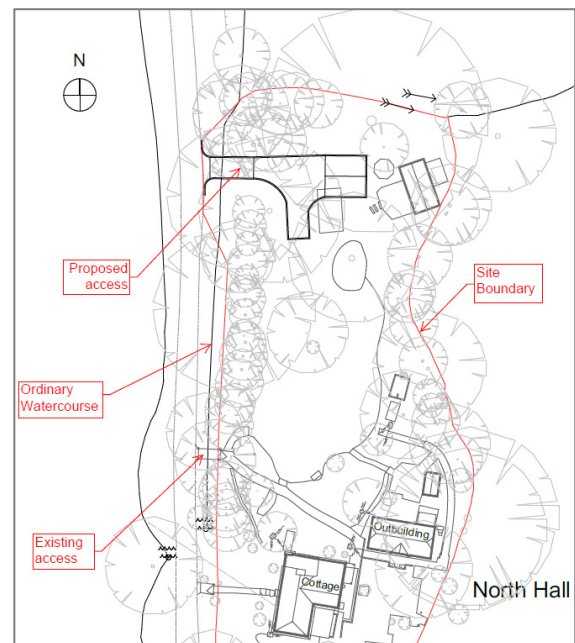


Figure 1b: Proposed Access

- 1.03 The proposed access is situated within flood zone 1 with respect to flood risk from rivers or the sea; however, the proposed access which will bridge over an existing ordinary watercourse is within high risk of surface water flooding.
- 1.04 Mid-Sussex District Council (MSDC) drainage team has therefore requested that a Flood Risk Assessment be carried out to ensure that the proposal will not increase flood risk on or off site. In addition, the team has requested that West Sussex County Council (WSCC) policy on culverting is considered, and evidence of this should be incorporated in this FRA.
- 1.05 This assessment will conform to the National Planning Policy Framework published in 2012, revised in July 2018, updated in February 2019 and revised in July 2021 with the last update in September 2023; the National Planning Practice Guidance published in 2016 (updated in 2019) and the West Sussex and Mid-Sussex local plan policies.

2.00 Development Description and Vulnerability Classification

- 2.01 It is proposed construct a residential vehicular access and two parking spaces with a turning area (Figures 1a & 1b). The approximate National Grid Reference of the site is TQ 27158 26935 (527158E, 126935N). A site location plan and development proposals can be found in **Appendix A**.
- 2.02 An access road is not explicitly listed in Table 2 (Flood risk vulnerability classification) of the Technical Guidance to the NPPF; however, this vehicular access will be constructed with a box culvert, a water compatible structure within high flood risk (33.3% AEP – *Figure 2*).

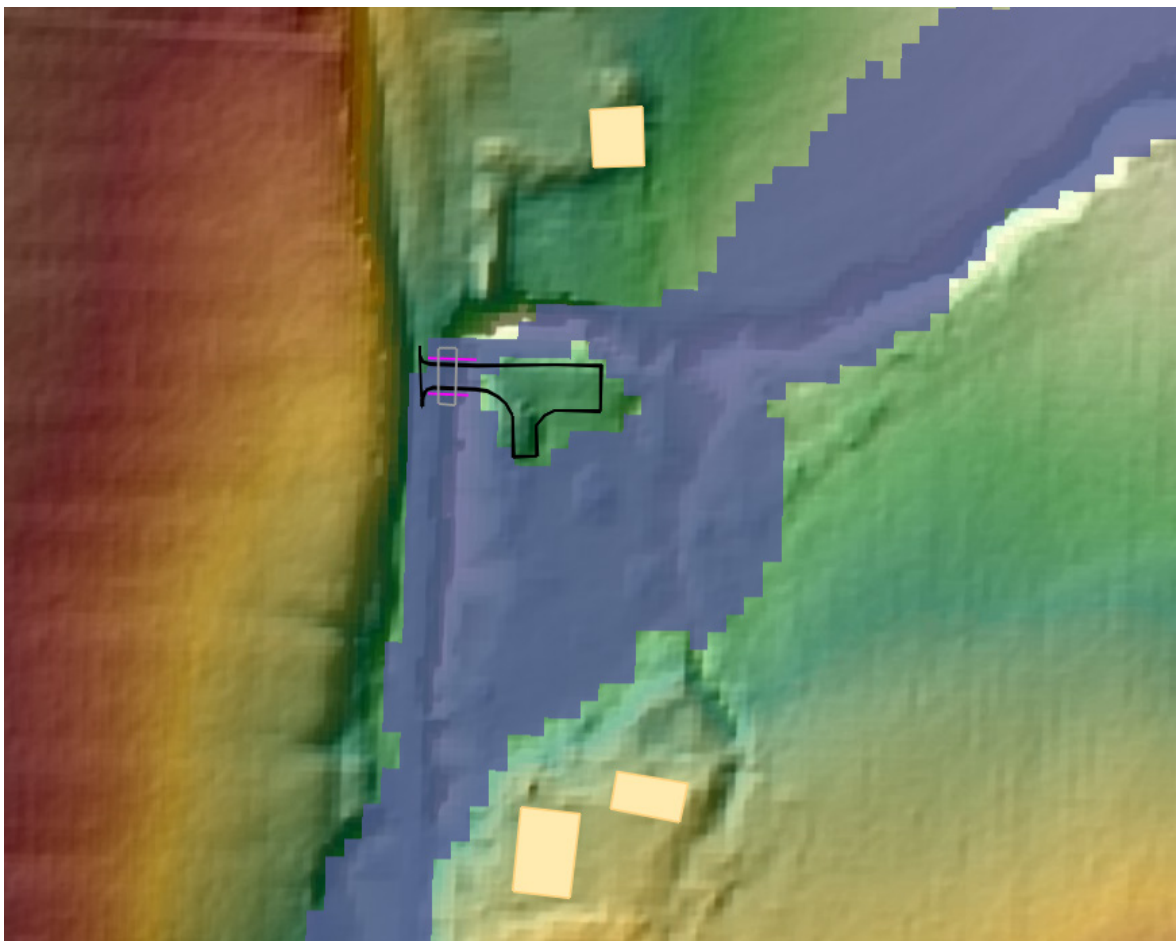
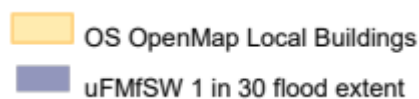


Figure 2: RoFSW (1 in 30) - **High Risk** taken as flood zone 3b (Source: ArcGIS online).



**Proposed Vehicular Access Development
Flood Risk Assessment**

- 2.03 It is proposed to culvert the existing ordinary water with an 1800 x 1200 box culvert (6.3m long) to allow for vehicular access. This culvert which is the foundation for the cross-over into a low-risk car park area is designed to be constructed and work in water conditions.
- 2.04 Based on the use as described above, this type of development can be taken as 'water compatible'.
- 2.05 The proposed development lies within flood zone 1 with respect to rivers or the sea flooding where all types of developments are appropriate according to the Technical Guidance to the NPPF (*Table 1*); however, the SFRA highlights that *'there are also areas of high surface water flood risk (1 in 30 annual probability) that should be considered as the functional floodplain, particularly in locations where there is nowhere else for the water to drain to. Due to this information not being available for most of the district, and the District Council not having the resource to map these areas it has been decided to take the precautionary approach and to assume that all areas covered by Flood Zone 3 are to be treated as areas of Flood Zone 3b'*.
- 2.06 Mid-Sussex LLFA also confirms that this location should be considered as flood zone 3b.

Flood Risk Vulnerability		Essential Infrastructure	water compatible	highly vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	X	Exception Test Required	✓
	Zone 3b Functional Flood Plain	Exception Test Required	✓	X	X	X

Table 1: The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; X means the development should not be permitted.

- 2.07 According to the technical guidance to the NPPF (*Table 1*), the proposed access which is formed by the culverting of the watercourse is water-compatible and thus permitted in flood zone 3b while the rest of the access and parking spaces are in an area of low surface water flood risk.

2.08 Sequential Test

As set out in paragraph 162 of the National Planning Policy Framework, the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. The proposed access and parking spaces are situated in an area of high flood risk from surface water. Demonstrating sequential test is not within the scope of this report; however, it is reported that the client had agreed access here in consultation with the Tree Protection Officer.

2.09 Exception Test

The Exception Test is not required to be implemented according to *Table 1*.

3.00 Definition of Flood Hazards

Flooding from the sea (tidal) and rivers (fluvial)

- 3.01 The EA flood map for planning (*Figure 3*) shows that the proposal currently lies within flood zone 1 therefore tidal and fluvial flood risk is very low.

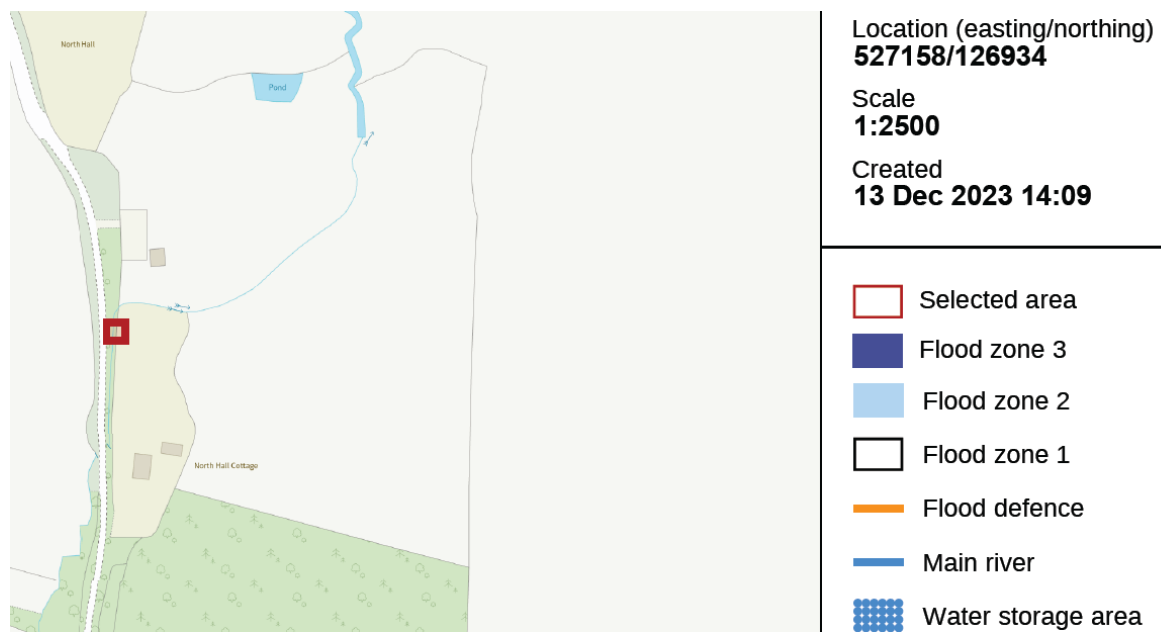


Figure 3: EA flood map for planning

Flooding from Surface Water Run-Off and Overland Flow (Pluvial)

- 3.02 Surface water flooding results from excess overland flow and ponding. This can be caused by intense short duration storms when the water does not have time to soak into the ground or at times when the ground is already saturated, and water cannot soak in at all. Within the built environment surface water will tend to collect more easily because the water cannot infiltrate or drain into the ground like it would do naturally. Poorly maintained drainage systems and blockages can increase the likelihood of surface water flooding and in urban areas this can include pollutants (particularly sewage).
- 3.03 The Risk of Flooding from Surface Water (RoFSW) GIS layer on ArcGIS online shows that there is a high risk (3.3% AEP) of surface water flooding concentrated along an existing watercourse (*Figure 2*).
- 3.04 The medium and low risk scenarios can be seen on *Figure 4 & 5*.

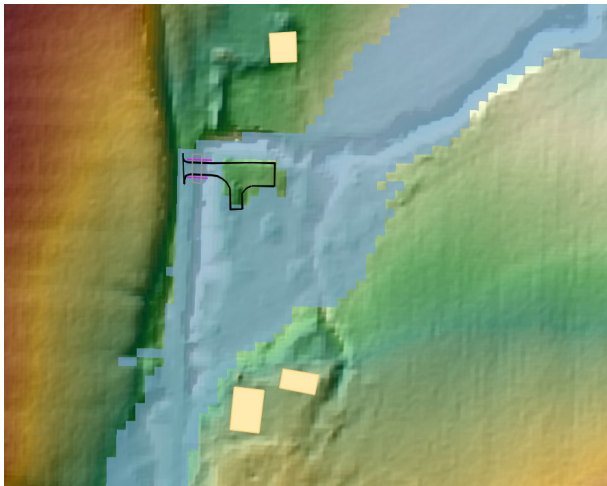


Figure 4: 1 in 100 (1% AEP) RoFSW – **Medium Risk**

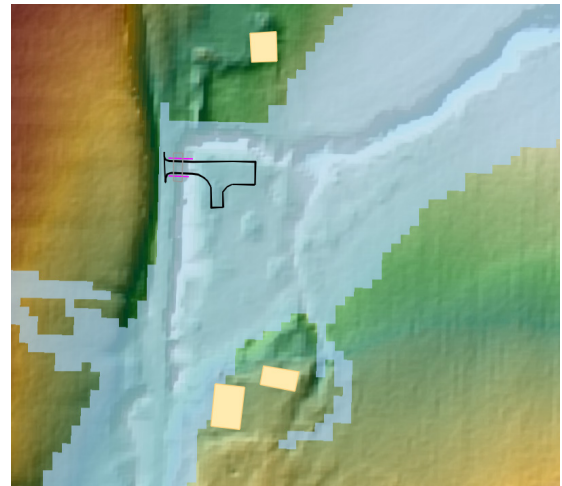


Figure 5: 1 in 1000 (0.1% AEP) RoFSW – **Low Risk**

- 3.05 The RoFSW depths and speed maps can be found in **Appendix B**; the left column and right column show depths and speeds respectively. These show that there will be speeds in excess of 0.25 m/s.
- 3.06 Given these speeds, surface water flood hazard poses a real risk to users of the proposed access and the car park spaces; however, it is important to note that no new receptors are introduced to this flood hazard as the proposed access and parking spaces will serve the existing North Hall Cottage.

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- 3.07 At the moment, resident(s) of Cottage already park their cars across the road (*Figure 6a/6b*) which means that anyone stepping out of the parked car has to cross the road (*Figure 6a/6b* – red arrow) to reach the cottage where flood flows are travelling north unimpeded (*Figure 6a/6b* - blue arrow).
- 3.08 It is likely that flood entering the site will be significantly slower and impeded due to the dense vegetation forming the western site boundary along the ditch.



Figure 6a: Direction of surface water flooding and resident (Source: Google Streetview)

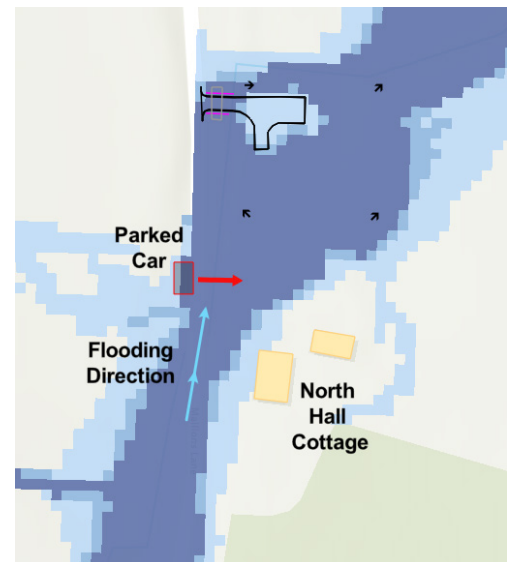


Figure 6b: Plan view of surface water flooding flow direction (Source: ArcGIS online)

- 3.09 Parking on the proposed two parking spaces is a better situation than the current one in terms of flood risk.
- 3.10 It is highly recommended that during the flood events, the users of the proposed development assess the situation and whenever possible, avoid areas of flood risk. Both the existing cottage and outbuilding are within an area of low surface water flood risk and thus can provide safe refuge.
- 3.11 The proposal does not increase flood risk to users of the existing North Hall Cottage but reduces this risk overall by removing the risk of crossing unimpeded surface water flooding which may carry debris of any size as it travels north on Mallion's Lane.
- 3.12 Although risk of flooding from surface water is high, the proposal does not increase it but rather minimises it therefore improving the situation for the residents of North Hall Cottage.

Flooding from Groundwater

- 3.13 Groundwater flooding occurs as a result of water rising from the underlying rock or from water flowing from abnormal springs. This can still occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater can still flow from areas where the ground level is high to the areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths, but during very wet periods where all the additional groundwater flowing towards this area, the water table can rise to the surface causing groundwater flooding.
- 3.14 The proposed culvert is a water-compatible structure and will not be affected by any rise in groundwater. There is no concern for the rest of the access and parking/turning area. Flood risk from this source is very low.

Artificial Sources: Flooding from Sewers

- 3.15 Sewer flooding events are usually the results of overloaded sewers following heavy rainfall or blockages caused by the misuse of the sewer system.
- 3.16 MapInfo GIS sewer records map (*Figure 7*) shows no public sewers in the vicinity of the proposal. In addition, any sewer flood will not hinder the intended use of the access and parking/turning area therefore flooding from this source is very low.

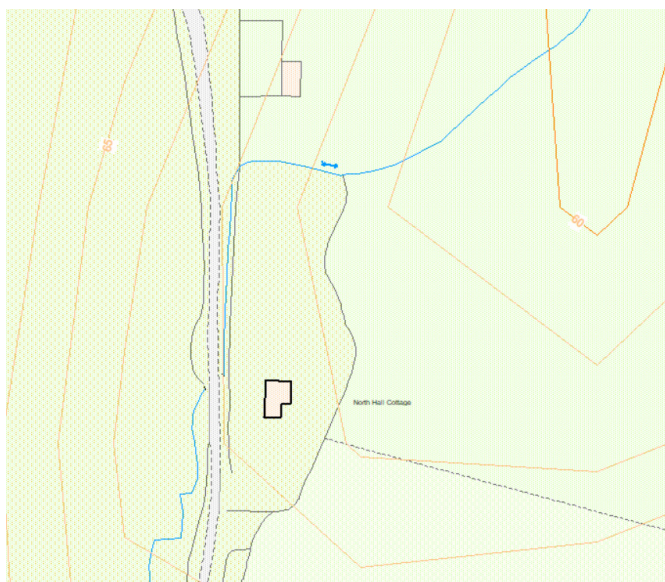
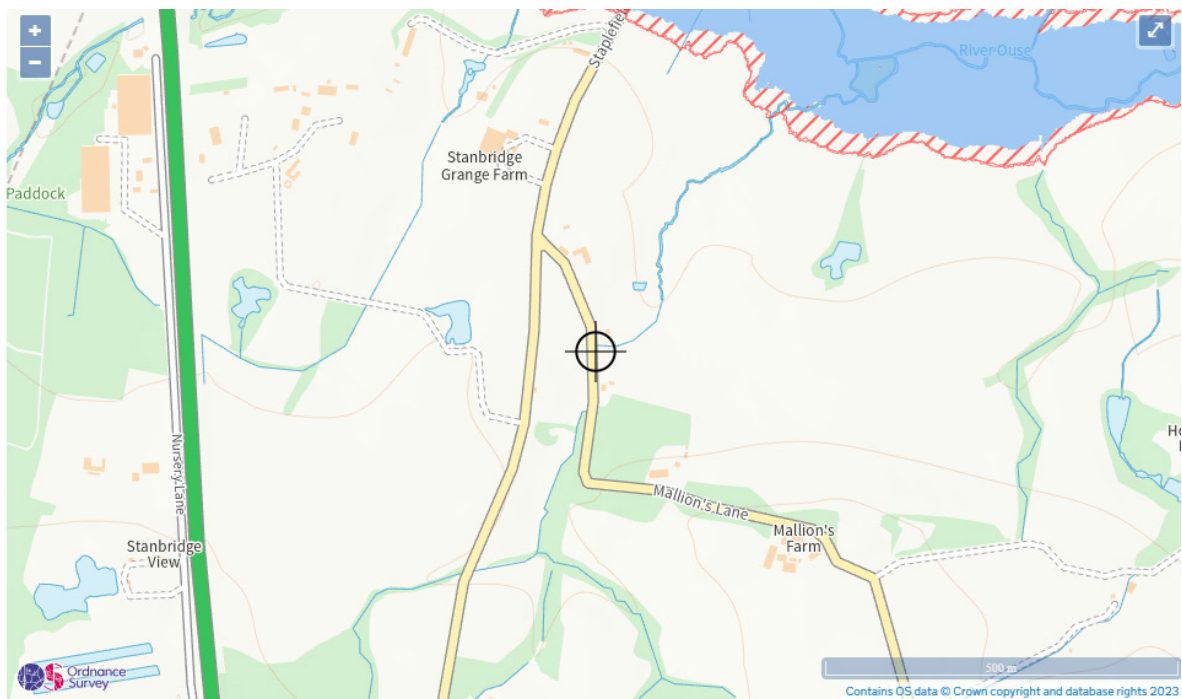


Figure 7: MapInfo GIS Sewer Records

Artificial Sources: Flooding from Reservoirs, Canals and other artificial sources

- 3.17 Reservoirs are artificial bodies of water, where water is collected and stored behind or within a man-made structure and released under control either to reduce the flow magnitudes in downstream channels or to meet a requirement when needed for purposes such as irrigation, municipal needs or hydroelectric power.
- 3.18 The long-term flood risk map for reservoirs shows no risk of flooding (*Figure 8*).



- 3.19 There are no other sources of flood risk identified.

4.00 Probability

- 4.01 The EA flood map for planning indicates that the proposed development site is currently in flood zone 1 which has a low risk of flooding from rivers or the sea.
- 4.02 The EA flood map for planning has been produced in part using a relatively coarse, national scale flood modelling strategy, and in part by detailed modelling. It is important to note that only the potential floodplain is modelled; the mitigating effects of any flood defences currently in place are not considered. For reference, the definition of the NPPF flood risk zones is included below.

Table 2: Definition of the NPPF Flood Zones (Source: Flood Risk and Coastal Change Guidance)

Zone	Description
1	Low Probability: Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
2	Medium Probability: Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).
3a	High Probability: Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).
3b	The Functional Floodplain: This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% (1 in 30) or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

5.00 Climate Change

- 5.01 Climate change is likely to increase the flows in rivers, raise sea levels and increase storms intensity.
- 5.02 Climate change allowance are the predictions of anticipated change for peak river flow, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height.
- 5.03 The proposed access development is currently in flood zone 1. During desktop study, no map has been found as part of the council's SFRA identifying the effects of climate change to flood zones. Given that the nearest flood zone is approximately 460m northeast from the proposal location with a level difference in excess of 6 metres (*Figure 9*), it is reasonable to assume that climate change effects on flood zone will not impact the application site.

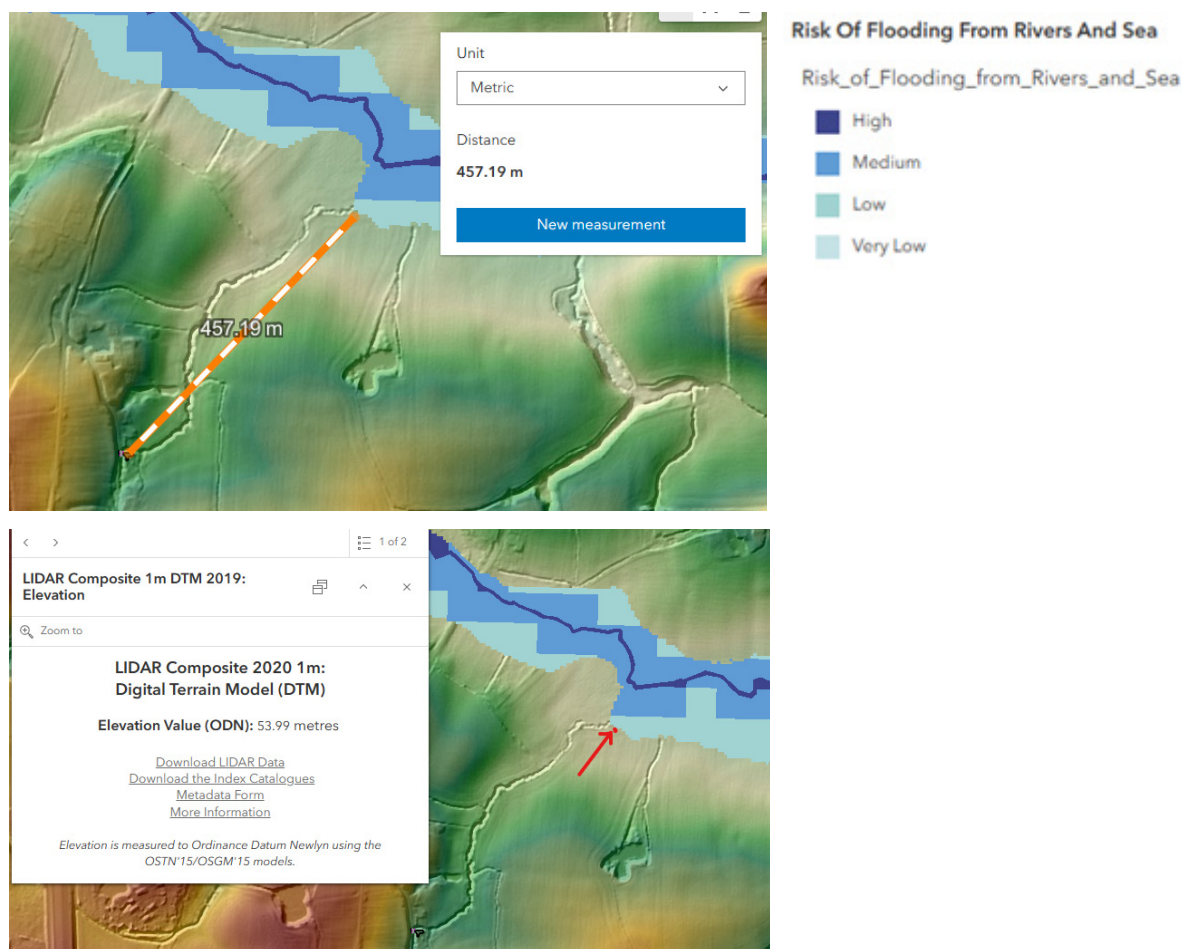


Figure 9: EA flood map for planning (ArcGIS layer)

- 5.04 The site is not located near the coast therefore sea level is not anticipated to be of any concern.

6.00 Mid-Sussex West Sussex Culvert Policy

- 6.01 West Sussex County Council's policy of culverting ordinary watercourses is summarised in its policy document as follows:

"West Sussex Local Authorities are in general opposed to the culverting of watercourses because of the potential for adverse effect on flood risk and ecology. The Competent Authority will therefore adopt a precautionary principle and only approve an application to culvert an ordinary watercourse if there is no reasonably practicable alternative or if the potential negative impact of culverting would be so minor that they would not justify a more costly alternative".

- 6.02 As the proposal consists of forming vehicular access into the application site from Mallion's Lane, culverting the watercourse is necessarily required to allow for private vehicles into and out of the site. WSCC policy on culvert design lists 17 requirements which have been addressed in the attached document in **Appendix C**.

7.00 Off-Site Impacts

- 7.01 The proposed access will be formed by culverting the watercourse making this water compatible. The culvert is designed (DWG 23144/01C) such that there will not be flooding as the dimension of the culvert is adequately chosen to provide adequate capacity, more details can be found in **Appendix C**.
- 7.02 There are no foreseen impacts on neighbouring properties or the surrounding area in relation to flood risk as a result of the proposed culvert which is much larger than the existing culvert approximately 45m upstream.

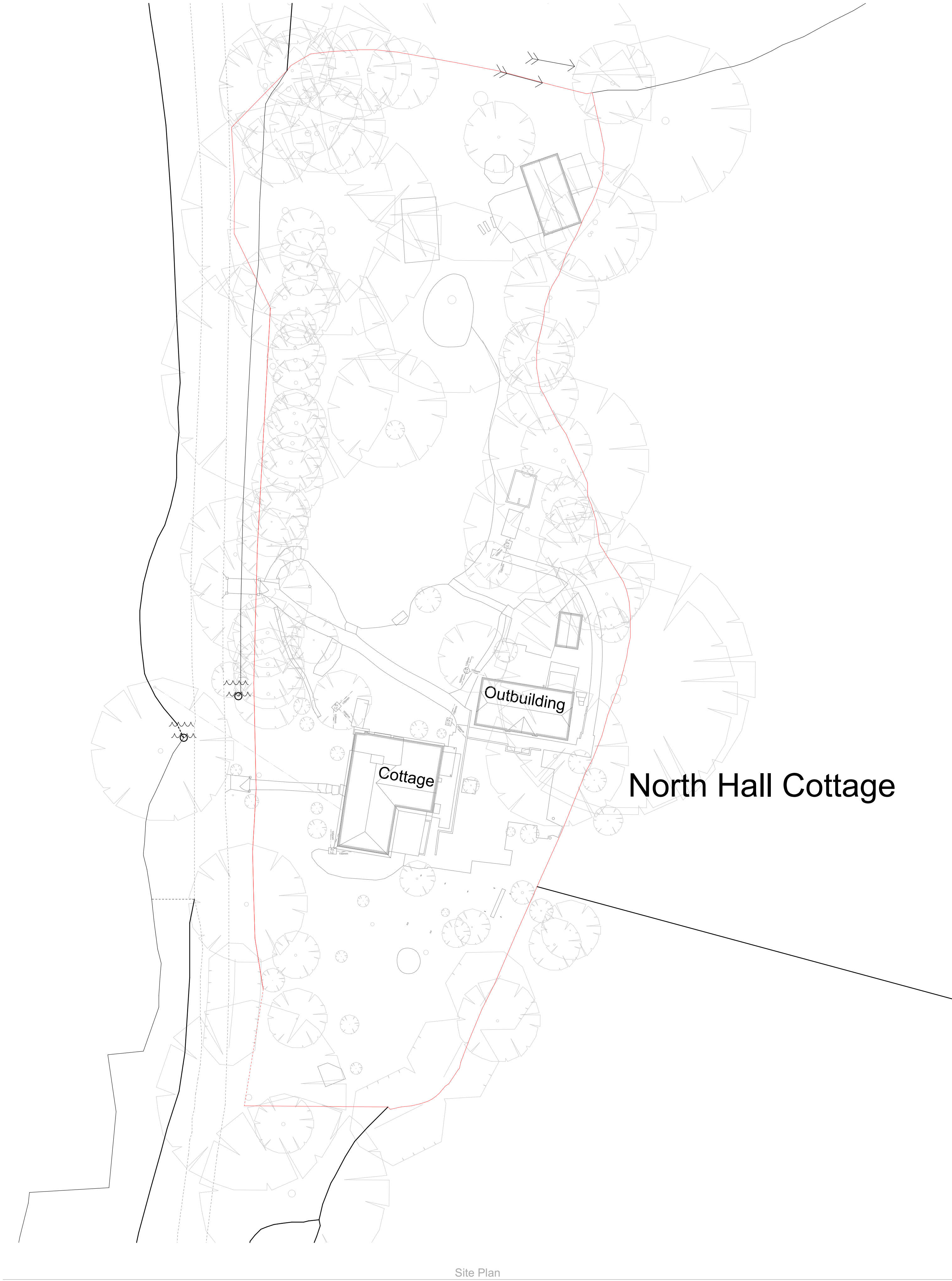
8.00 Residual Risks

- 8.01 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk could be settlement or blockage of the proposed culvert which may potentially disrupt surface water flood route or the existing stream.
- 8.02 Given the size of the culvert, minimal maintenance is anticipated. No settlement is anticipated considering the maximum car loading expected.

9.00 Conclusion

- 9.01 Monson Engineering has been instructed to prepare a Flood Risk Assessment to address the issues raised by Mid-Sussex District Council drainage team. This is in relation to the proposed vehicular access which will be formed by the installation of a precast 1800 x 1200 concrete box culvert as detailed on Monson's drawing 23144/01, Issue C at the time of writing this report.
- 9.02 The location of the proposed access lies in flood zone 1 with respect to rivers or sea flooding; however, this location is within high risk of surface water flooding which is the basis for MSDC team's concerns.
- 9.03 All sources of flood risk to the proposal and how the users of the proposal might be affected have been considered. All are considered very low with the exception of risk of flooding from surface water.
- 9.04 The existing situation for the resident of North Hall Cottage is such that they park their car(s) across the road which means that access to North Hall Cottage and back to the car is achieved via crossing Mallion's Lane. This is a far worse situation as surface water flood water travels north unimpeded and potential carrying debris of any size along Mallion's Lane. This situation poses a greater risk to users of the Cottage than parking on site which is what the proposal will facilitate.
- 9.05 The proposal does not introduce any more people receptor to the existing flood risk.
- 9.06 The proposal involves the installation of a relatively larger culvert than the existing one approximately 45 metres upstream. No issues have been reported for this existing culvert therefore the proposed culvert will provide adequate capacity to allow for water flow. Given its size, blockage is not of any concern.
- 9.07 West Sussex County Council policy on culverting has been considered. Culverting of this ordinary watercourse is essential to allow for vehicular access. Land drainage application will be made to the council for the proposed culverting works.
- 9.08 On the basis of the findings of this report, the proposed vehicular access development is considered to be suitable on the grounds of flood risk.

Appendix A – Site location plan and Development Proposals

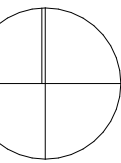


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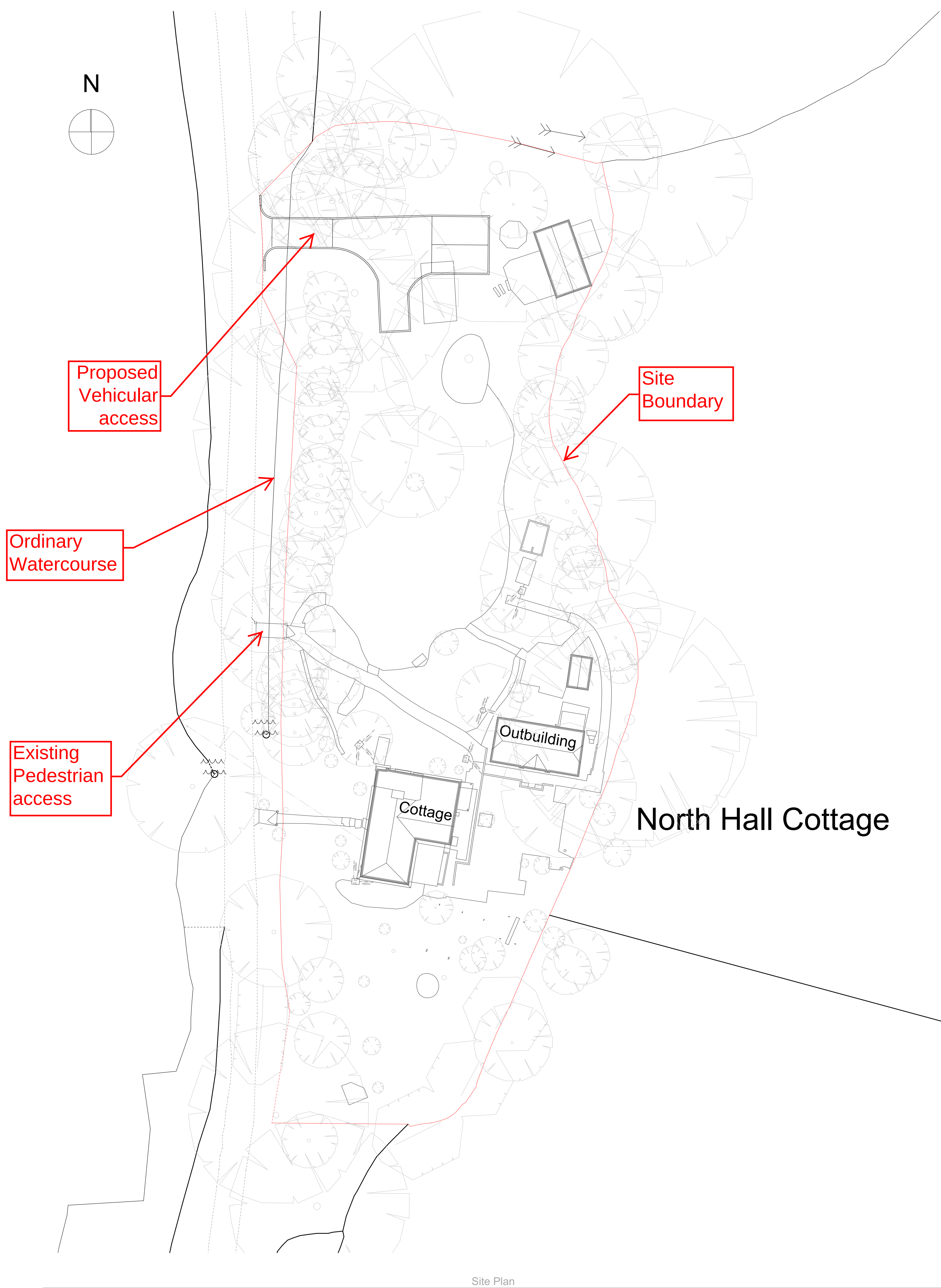
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Address: North Hall Cottage
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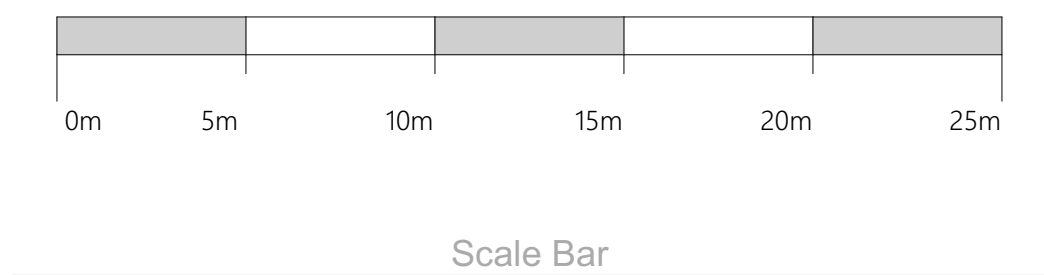
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Site Plan



Location Plan

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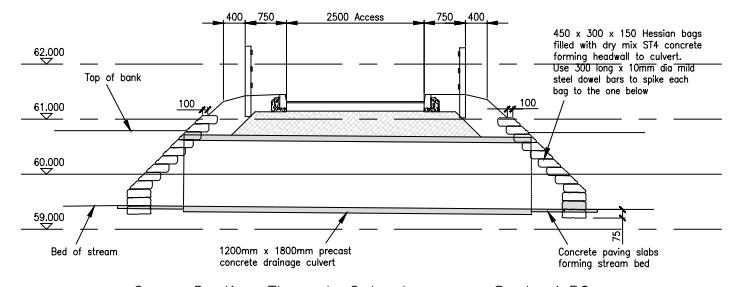
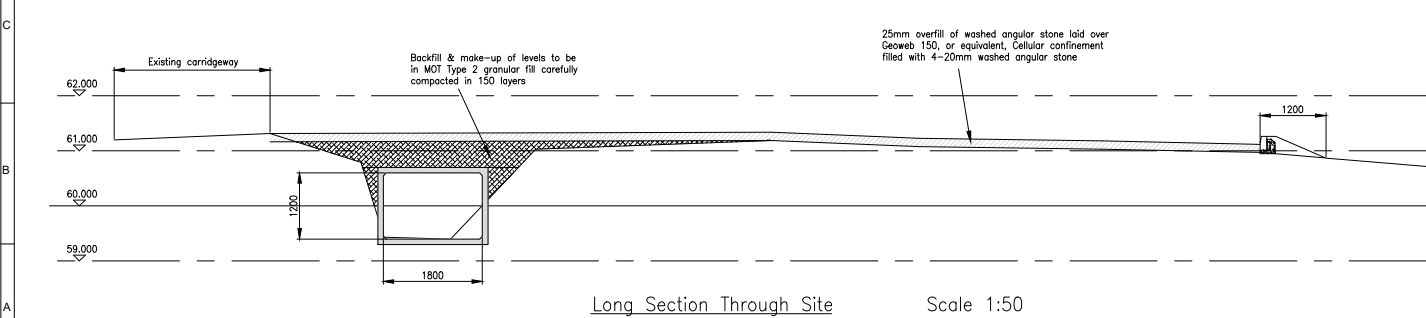
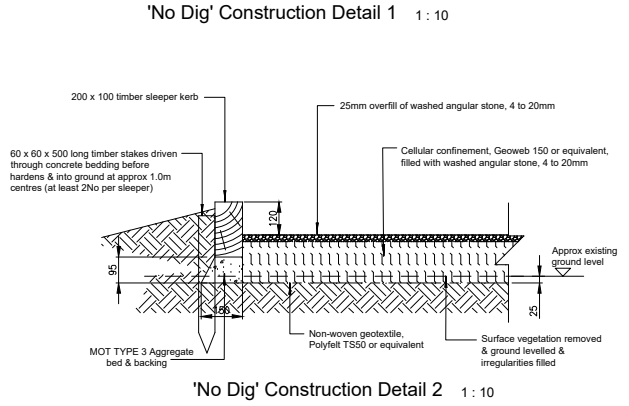
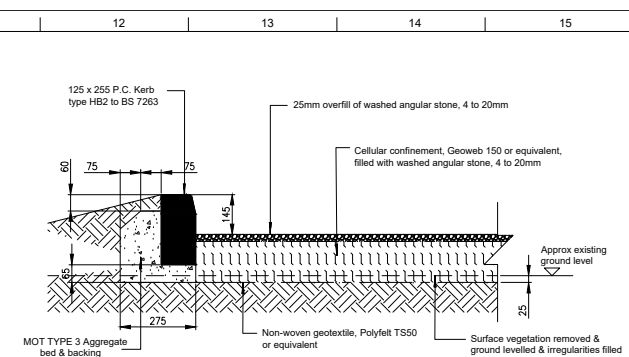
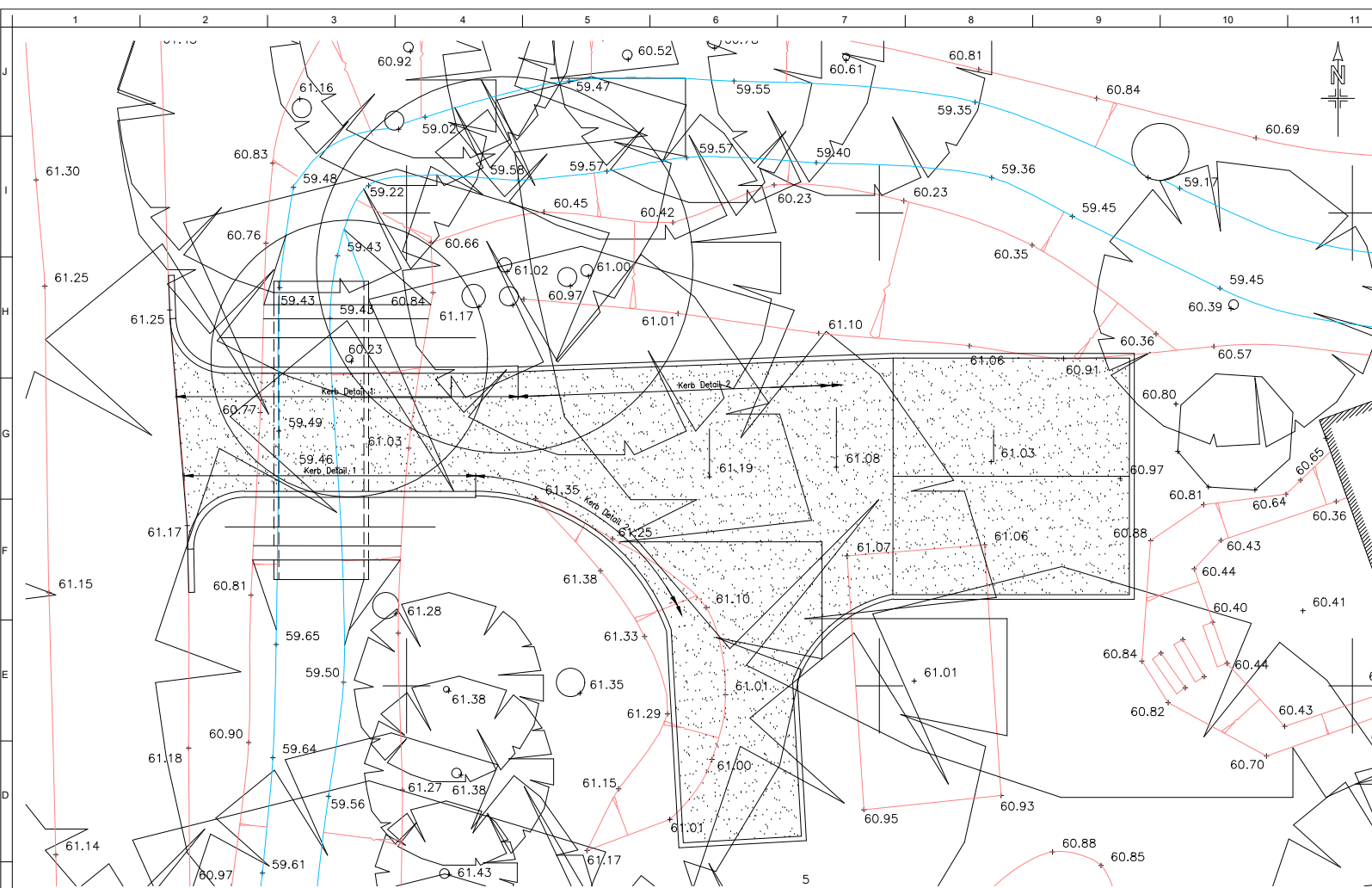
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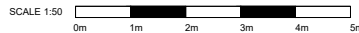
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Long Section Through Site Scale 1:50

Cross Section Through Culvert Scale 1:50



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C	MW	22/08/23	Timber sleeper details updated
B	PC	16/08/2023	Timber sleeper detailing added
A	PC	28/07/2023	Original Issue
Issue By	Date	Amendments	

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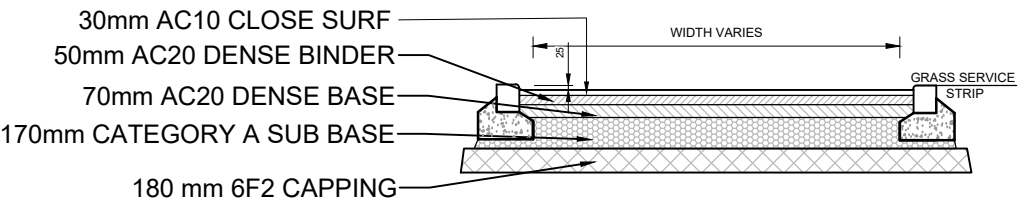
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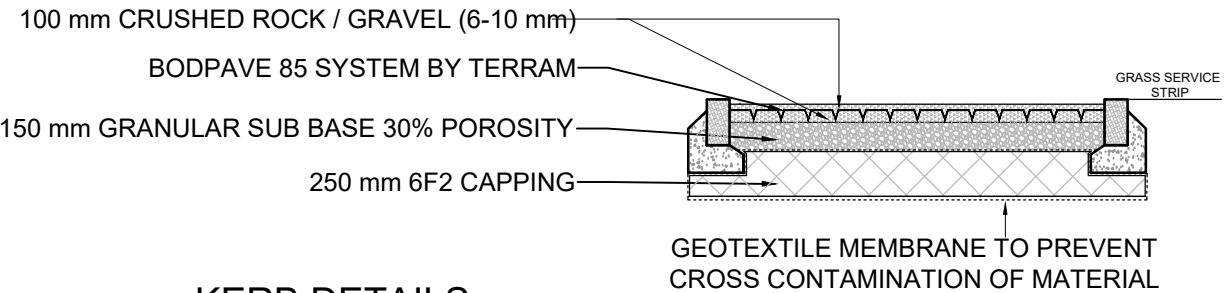
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- Plan, Sections & Details

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Drawing No: 23144 / 01
Issue: C

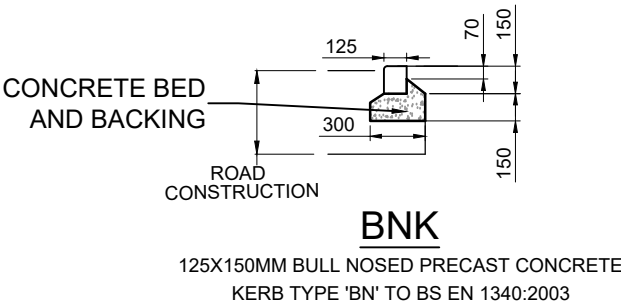
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CONSTRUCTION TO ESCC REQUIREMENTS



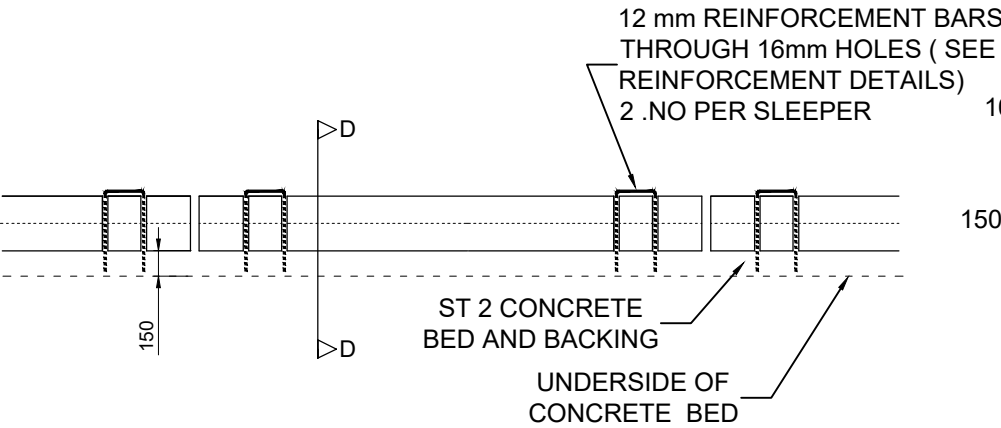
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USING BODPAVE 85 SYSTEM



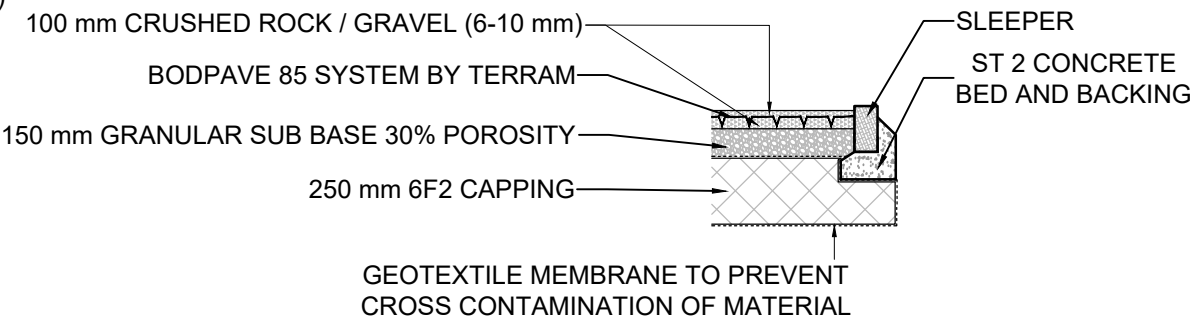
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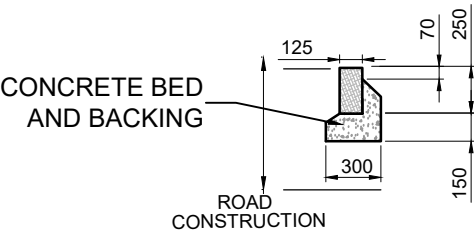
RAILWAY SLEEPER DETAILS



SECTION D - D



RAILWAY SLEEPER DETAILS



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A	MW	02/08/23	Original issue
Issue	By	Date	Amendments

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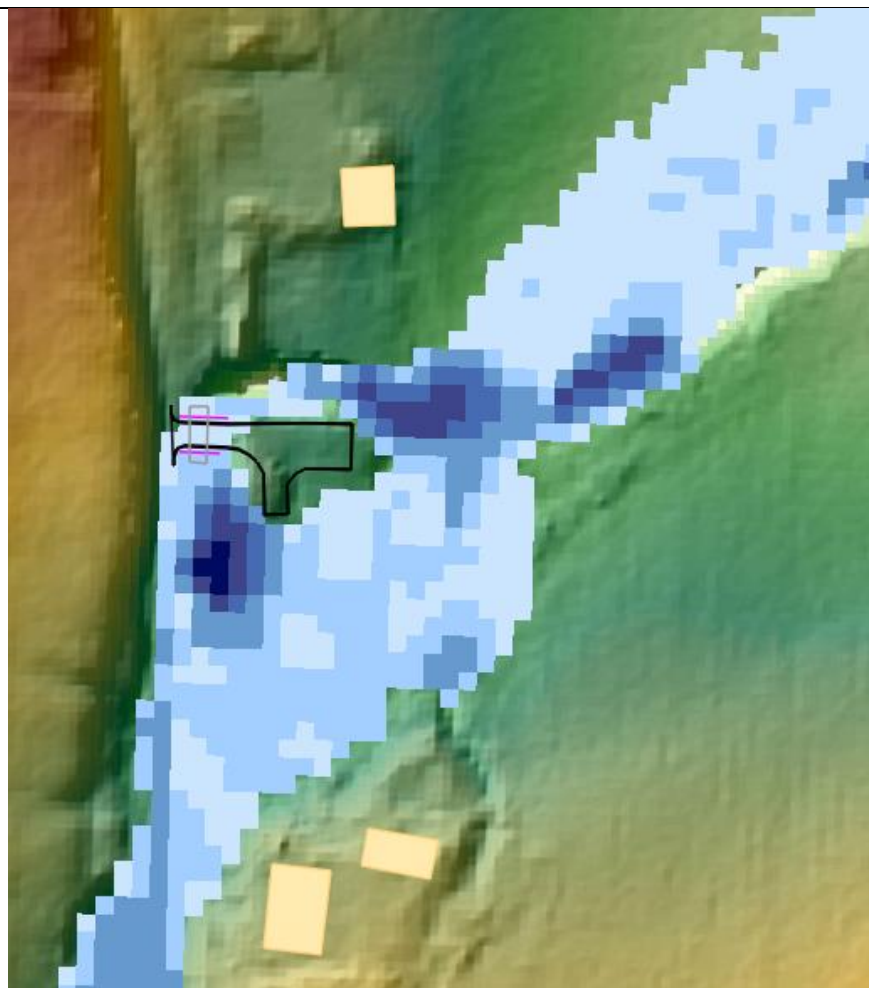
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Origin: Crowborough Size A3
Current Issue: Approved GL Date 02/08/23
Drawing Status: PRELIMINARY

Description:
Standard Driveway Details

Scale: N T S
Dwg No: 23144 / 02
Issue: A

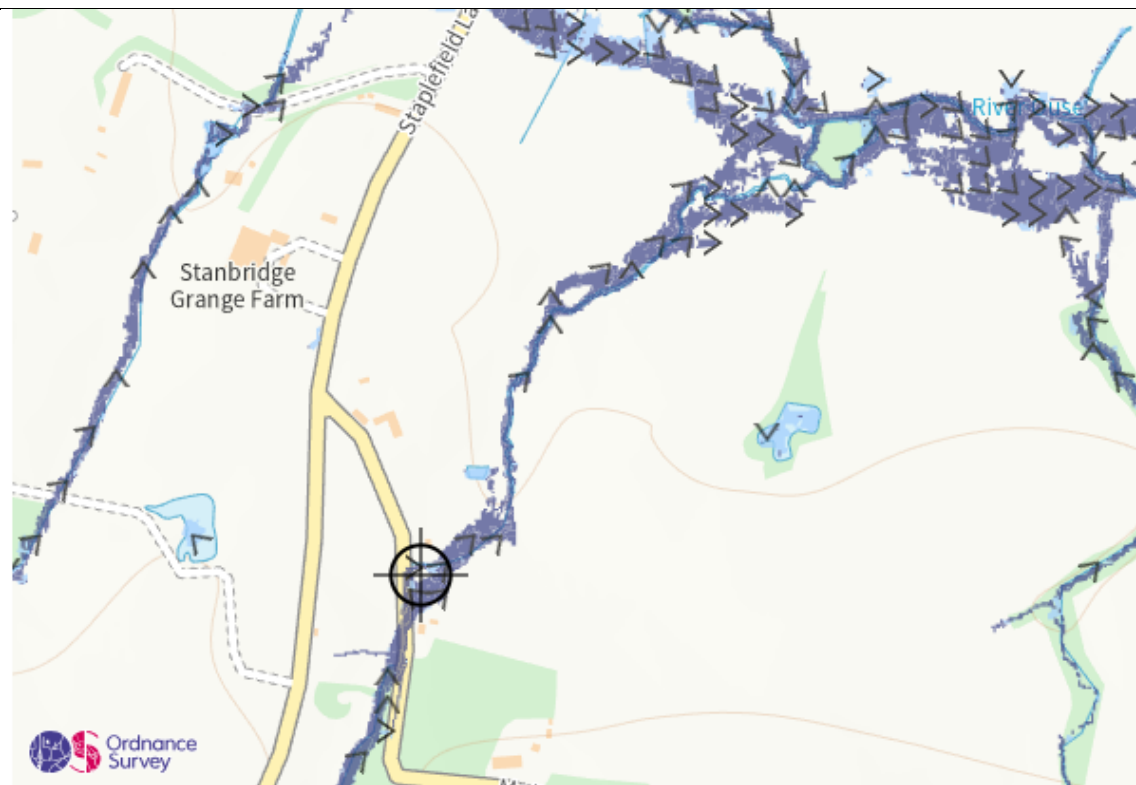
Appendix B – Risk of Flooding from Surface Water Maps (Depth and Speeds)



Risk of Flooding from Surface Water Depth: 3.3 percent annual chance

Risk_of_Flooding_from_Surface_Water_Depth_3_percent_annual_chance

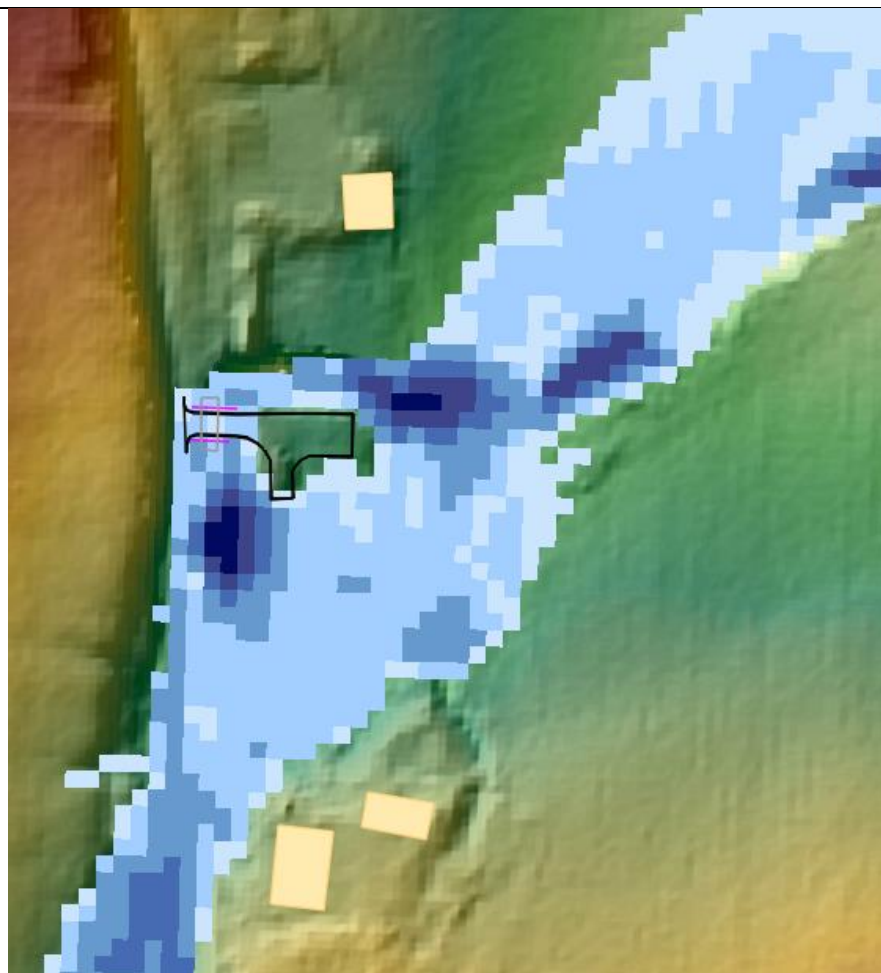
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- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



Surface water flood risk: water velocity in a high risk scenario

Flood velocity (metres/second)

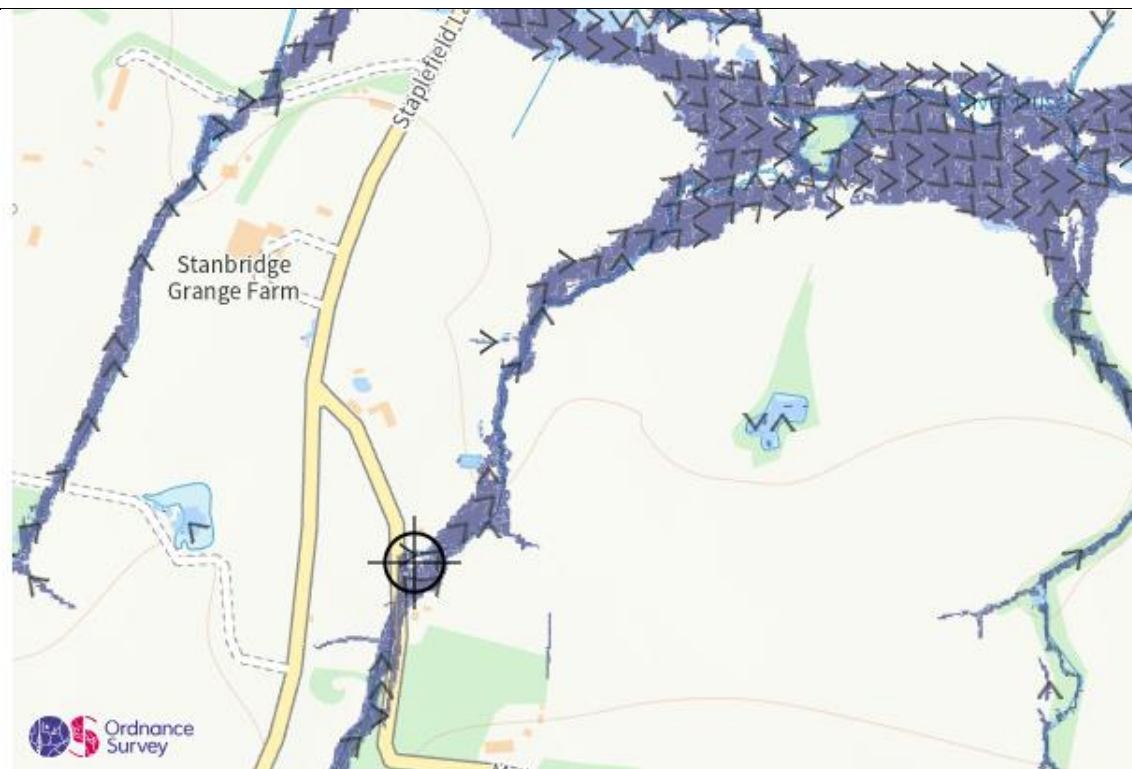
- Over 0.25 m/s
- Less than 0.25 m/s
- Direction of water flow
- Location you selected



Risk of Flooding from Surface Water Depth: 1 percent annual chance

Risk_of_Flooding_from_Surface_Water_Depth_1_percent_annual_chance

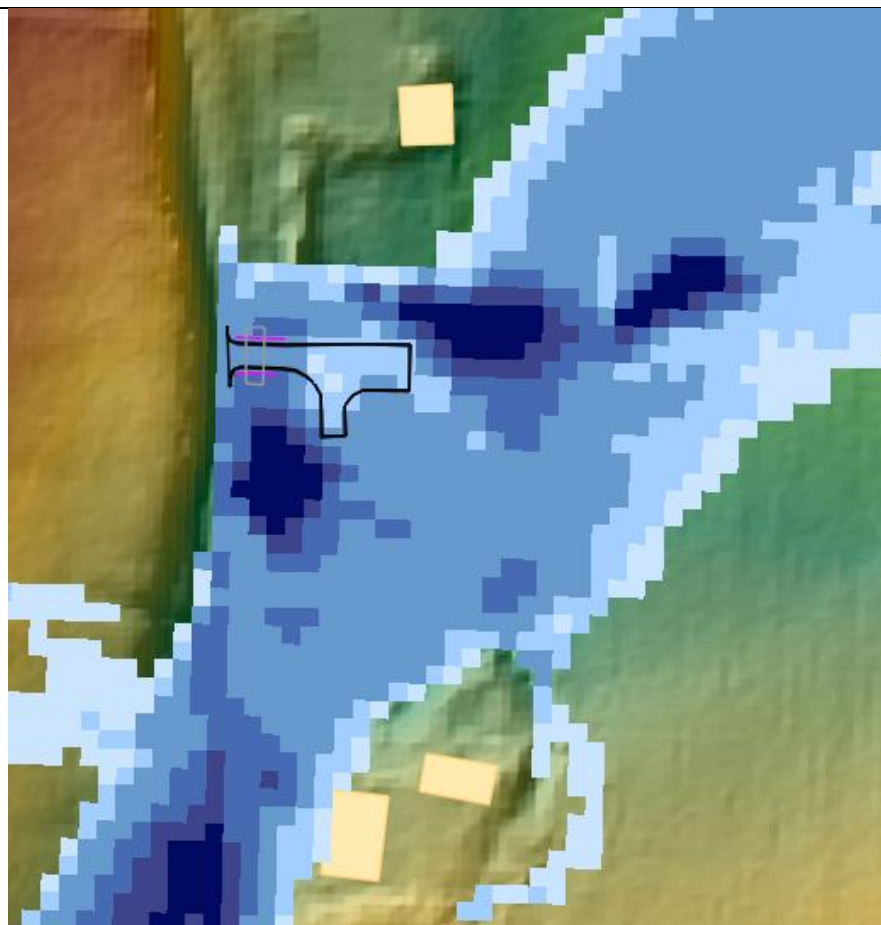
- Below 150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



Surface water flood risk: water velocity in a medium risk scenario

Flood velocity (metres/second)

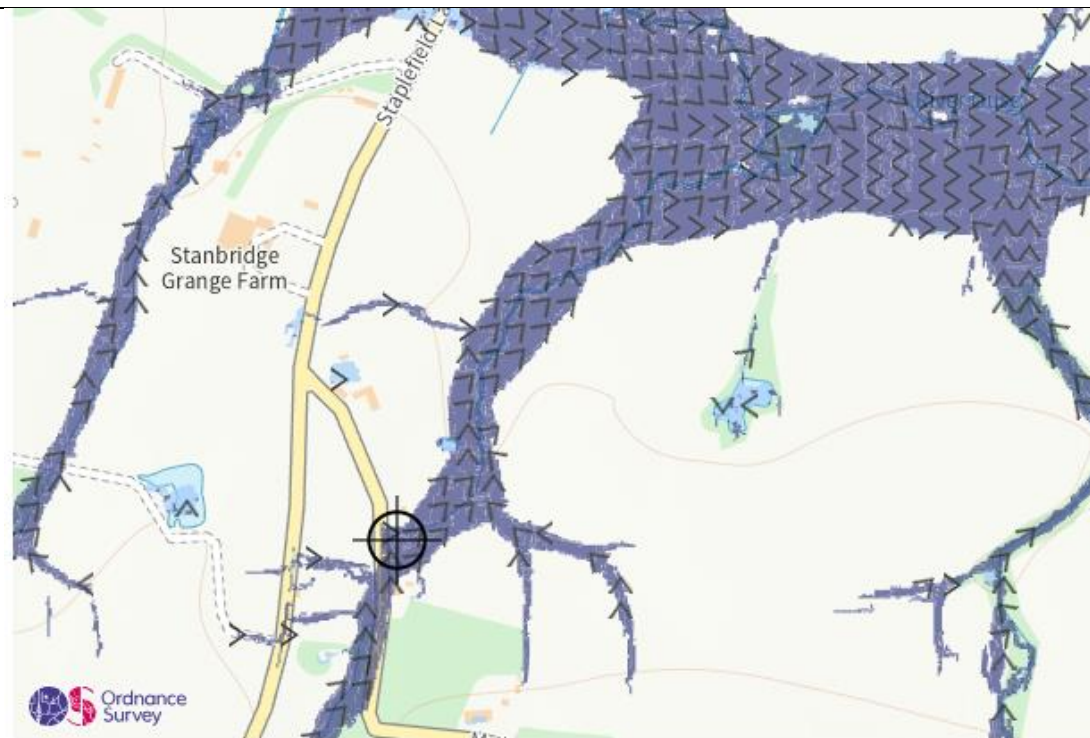
- Over 0.25 m/s
- Less than 0.25 m/s
- Direction of water flow
- Location you selected



Risk of Flooding from Surface Water Depth: 0.1 percent annual chance

Risk_of_Flooding_from_Surface_Water_Depth_0_1_percent_annual_chance

- Below 150mm
- 150-300mm
- 300-600mm
- 600-900mm
- 900-1200mm
- Over 1200mm



Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

- Over 0.25 m/s
- Less than 0.25 m/s
- Direction of water flow
- Location you selected

Appendix C – West Sussex County Council Culvert Policy Requirements

West Sussex Culvert Policy

Monson Engineering

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Project	North Hall Cottage, Mallions Lane, Staplefield RH17 6AT
Job No.	23144
Author	C.M.
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Checked by	M.W.
Approved by	M.W.

Revision	Dates	Notes
A	14/12/2023	

WEST SUSSEX COUNTY COUNCIL - CULVERT DESIGN REQUIREMENTS			
#	WSCC Culvert Policy Requirements	Status (Yes, No, TBC, N/A)	Comments / Notes
1	A detailed design will need to be submitted with your formal application for consent. Hydraulic calculations are to be submitted and include an allowance for climate change over the life time of the activity or development.	TBC	This will be provided when applying for land drainage consent, however, a proprietary precast concrete box culvert has been proposed with a cross-section flow area of 2.16 m ² where the nearest culvert upstream, which is located circa 50m upstream has cross-section flow area of 0.56m ²
2	The environmental implications of all options of the works should be considered in order to determine the least environmentally damaging solution supported with evidence	✓	The ecological survey report produced to support this application commented on the proposed culvert and its environmental implications.
3	Culvert length should be kept as short as possible and diameter as large as possible. Depending on local circumstances, we require a minimum culvert diameter of 450mm or as agreed with the local authority depending on watercourse size and flow.	✓	The length of the culvert has been kept as short as required (6.3m) to allow for the vehicular access. The Box culvert dimension is 1800 x 1200 which meets this diameter requirement.
4	The design of the culvert should consider any impact on flood flow. They must not increase flood risk to property. Consideration should also be given to the alternative flow paths in the event of a culvert becoming obstructed	✓	The proposed culvert has more than adequate capacity when compering to existing culvert upstream.
5	The shape of the culvert and the materials used should be chosen to satisfy hydraulic requirements and have a design life exceeding that of the structure	✓	A proprietary precast concrete box culvert with a design life of 120 years has been proposed. See cross sections produced, which adequately demonstrate the suitability of the shape against existing watercourse embankment. The proposed culvert will seamlessly capture the watercourse.
6	Pipes should be of a consistent cross-section within the culvert length unless adequate hydraulic transitions are incorporated into the design, this will be necessary when extending an existing culvert	✓	Proposed culvert is a box culvert with consistent cross-section for the whole length
7	Appropriate inlet and outlet structures should be provided to ensure a smooth hydraulic transition and avoid erosion. Headwall arrangements at the upstream and downstream ends of a culvert should be suitably keyed into the bed and banks of the watercourse, and should be appropriate to the local environment	✓	450 x 300 x 150 Hessian bags filled with dry mix ST4 concrete forming headwall and tailwall to culvert.
8	Where there are safety concerns, headwalls will need to be fitted with safe guarding measures ie. handrails, etc	✓	The drawing 23144 - 01 details the location of the proposed fencing location
9	Details should be stated of future maintenance and clearance arrangements, including access considerations. The responsibility for the maintenance of a culvert lies with the landowner or the person or management company who owns the culvert	✓	Minimal maintenance anticipated due to the size of the culvert
10	Sharp bends should be avoided and suitable access chambers provided at each change of direction in the culvert	N/A	The proposed culvert has no bends
11	Inlet and outlet screens may be required to prevent debris entering the culvert and causing clogging, or where there is a danger to public safety. Screens need to be sized and designed to reduce the risk of blocking and provision made for clearing and maintenance, including allowance for a removable front section (fitted with a padlock); wing walls should be sufficiently high to prevent bank erosion in the event of a blockage; flat screens should be avoided as these are prone to blockage.	✓	No need for the inlet and outlet screen - due to the size of the proposed culvert
12	Most culverts should be set so that the inlet/outlet is at the true bed level	✓	The proposed culvert is set at the true bed level
13	Applications with multiple small diameter culverts will generally be refused, only in exceptional circumstances where site constraints prevent a single pipe or box-culvert option being practical, will they be considered. This is a result of multiple culverts being more prone to blockage at the inlet.	N/A	Single box culvert is proposed
14	Syphons are generally not acceptable	N/A	No syphon is proposed
15	Where watercourses are subject to severe erosion and siltation problems, consideration should therefore be given to the provision of silt traps upstream of the culvert	N/A	No information suggests that this watercourse is subject to severe erosion and siltation problems
16	Services (for example sewers, gas pipes, water mains, etc.) should not impinge into the cross-section of the culvert	N/A	No such services exist in the watercourse
17	Vehicular loading needs to be considered where the culvert is located in trafficked areas and therefore suitable protection may be required	✓	Culvert is design to allow for vehicular access into the site.