

TECHNICAL NOTE

Date: 28 May 2020

File Ref: GS/CC/P20-2007/01TN

Project: Saham Toney Parish Flood Risk Study

Subject: Saham Toney Parish – Review of Current Flooding Issues and Neighbourhood Plan Policies

1.0 INTRODUCTION

- 1.1 This Technical Note provides information with respect to Flood Risk and Drainage matters for three allocated sites within the Norfolk Parish of Saham Toney. The three sites are allocated as part of the Neighborhood Plan (Designated as STNP 1, STNP 4 and STNP 7) with their locations shown within the enclosed information.
- 1.2 This report also considers how the development of the three allocated sites could affect homes and property in the immediately surrounding areas through reviewing the relevant policies associated with them as well as wider development management policies relating to flood risk and drainage measures.
- 1.3 This report will inform further policy making by Saham Toney Parish Council as part of their Neighborhood Plan.

Scope of Work

- 1.4 The agreed scope of works for this assessment is as follows:
- Provide an overview of the existing situation with regard to flood risk and flood events, to form context for the study of additional sites;
 - Provide high-level recommendations of measures that might alleviate existing surface water flood risk and flood events;

- Review the Neighborhood Plan's 8 surface water drainage management policies and relevant aspects of 4 site allocation policies and recommend any policy amendments and/or additions that would best ensure that the development of the three new sites will not add to flood risk on the sites themselves or nearby property or infrastructure. Based on the assumption that infiltration drainage will be possible, particularly highlight measures most likely to ensure no additional surface water enters the watercourse or culvert under Hills Road. Suggests what additional measures, if any, could/should be specified in policy to deal with a possible future scenario where infiltration is not possible;
- Highlight any existing policy measures that would be expected to be particularly effective in managing flood risk;
- By reference to the sites' masterplan drawing, provide recommendations as to how the green areas on each site could best be utilised to alleviate flood risk. In this respect, advise a number of alternates with some information about the relative cost and expected effectiveness of each;
- Provide text that can be used in information to villagers that briefly summarises the review and the various policy measures being implemented in a way that could be expected to allay concerns as far as possible; and,

Sources of Information

1.5 As part of this study, the following documents have been obtained and reviewed and are appended to this report:

- Briefing document and background information provided by Saham Toney Parish Council;
- Saham Toney Neighborhood Plan Policies (Appendix A);
- Masterplan for allocated sites (Appendix B);
- 2016 flood event photographs (Appendix C); and,
- Lead Local Flood Authority (LLFA) report on 2016 flooding (Appendix D).

Constraints and Limitations

1.6 The copyright of this report is vested in Create Consulting Engineers Ltd and the Client, Saham Toney Parish Council. The Client, or their appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Ltd or the Client.

1.7 Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

- 1.8 Create Consulting Engineers Ltd has endeavored to assess all information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy or information relied upon. Information from third parties has not been verified by Create Consulting Engineers Ltd unless otherwise stated in this report.

2.0 SITE SETTING, EXISTING DRAINAGE ISSUES AND POTENTIAL MITIGATION OPTIONS

Location and Topography

- 2.1 The Parish of Saham Toney is located to the North East of Watton in central western Norfolk. Generally topography in the study area falls towards an Ordinary Watercourse which flows in a southwest direction through farmland to the north and west of Pages Lane and Hills Road before flowing through a culvert beneath Hills Road and private gardens to the east. The watercourse then comes above ground again passing along the rear of properties north of Chequers Lane before turning in a southerly direction and joining a tributary of the River Wissey (Watton Brook) circa 1.1km to the south

Existing Flooding Issues

- 2.2 Based on information provided by the Client along with a review of information provided by the LLFA, flood event photographs and the online Surface Water Flood Mapping¹ (accessed online, May 2020) it is apparent that during times of heavy rainfall flooding regularly occurs at the junction of Page's Lane, Chequers Lane and Hills Road and sometimes to nearby dwellings.
- 2.3 The surface water flooding experienced in this area appears to be a result of the following factors:
- Because of the local topography, highway runoff, surface water runoff from residential properties and to an extent runoff from surrounding gardens and arable areas (due to the generally cohesive and clay based nature of the catchment) flows towards this low point where water congregates.
 - This is compounded by the aforementioned watercourse passing through this area which is draining an arable catchment to the north west, again which experiences increased levels of runoff as a result of the cohesive nature of the catchment.
 - The only transmission device beneath Hills Road and gardens to the east is a culverted section of watercourse which is understood to be 600 mm in diameter. It is evident that in times of heavy rainfall and increased runoff from the local catchment this culvert is undersized whilst blockages have regularly occurred through poor

¹ Online Surface Water Flood Mapping: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode>

maintenance by Norfolk County Council Highways and riparian landowners downstream.

- Where the watercourse downstream also flows above ground the channel is generally not well maintained and therefore transmission of flood flows is poor.
- An overflow 'moat' at Page's Place (The Old Manor) was filled in sometime in the last decade, this lay upstream of the flooding hotspot and provided a degree of attenuation storage.

Potential Mitigation Options

2.4 Further to a review of the flood risks posed and extant flooding issues the following provides a summary of a number of high level options for their management and mitigation:

- The culvert beneath Hills Road (highway controlled) and beneath riparian gardens to the east could be upsized. This would increase capability for transmitting flood flows, however the agreement of all parties would be required (Norfolk County Council Highways and riparian land owners) and hydraulic modelling would be required to confirm a suitable culvert size and that the flood risks posed downstream are also not increased through the increased transmission. Also it will be key to check if the culvert passes below open ground in rear gardens as this could pose significant issues (and costs) if not.
- More regular maintenance of the culvert inlet/outlet could be undertaken by the relevant controlling party to ensure the full capacity is retained to allow for better transmission in storm periods.
- In line with the above regular maintenance of the open sections of watercourse both upstream and downstream could be undertaken by the relevant riparian owners, this would allow for better transmission of water downstream as well as less transmission of debris to the culvert entry point (causing blockage) during storm conditions.
- A number of management principles could be employed in the upper rural and urban catchments, including:
 - Directional ploughing of arable land to slow the runoff to the watercourse.
 - Natural Flood Management to slow runoff including log dams for example and rewilding to retain as much water in the upper catchment as possible or at least flatten the time to peak.
 - Implementation of water butts within properties that drain to the area affected. Whilst these have a minimal effect individually and rely on usage, as a combined effect between a number of households they can be quite effective in flash summer events.
 - Implementation of better highway drainage for roads that drain to the watercourse, either by endeavoring to retain flows closer to source or routing beyond the area at risk of flooding. Obviously the downstream impacts need to be considered as per the points above in this case.

- Permeable surfacing in private areas could also be encouraged to control runoff at source through water retention methods, i.e. storage for re-use, implementation of attenuation and diversion of flows.
- 2.5 The above options are not necessarily exhaustive but provide some general principles which could be developed further, however they largely require the corporation of a number of local property/land owners and Norfolk County Council highways whilst costs of implementation obviously will have a large impact of viability.

3.0 REVIEW OF NEIGHBORHOOD PLAN SURFACE WATER DRAINAGE MANAGEMENT POLICIES AND RELEVANT ASPECTS OF SITE ALLOCATION POLICIES

- 3.1 This section provides a review the Saham Toney Neighbourhood Plan's eight surface water drainage management policies and relevant aspects of the four site allocation policies. For ease each policy has been broken down into a section with individual discussion points below.
- 3.2 As a general comment it is noted that the policies are currently very robust and if made a mandatory consideration for planning applications will force developers along the correct routes with a view to minimising flood risk wherever possible.
- 3.3 With regards to the request to highlight measures most likely to ensure no additional surface water enters local watercourses if infiltration drainage is or isn't possible, Policy 8H already considers this through reference to the SUDS hierarchy so forces developers to consider rainwater re-use and infiltration drainage first, followed by other SUDS measures to limit flows to greenfield runoff rates and more critically runoff volumes (Policy 8B). Some points have however been raised to tighten the policies up, make more specific reference to certain national policies and to be more descriptive about the SUDS hierarchy (this is key as it pushes developers into trying to retain as much water on site as possible in the first instance, either through infiltration drainage or not). Also with Policy 8E referencing water quality this will ensure developers include a suitable SUDS management train which will keep as much water as possible on site in open features allowing passive infiltration and evaporation.
- 3.4 Considering the four site specific policies it is recommended, as per the comments below, that the text relating to flood risk/drainage is standardised where possible across all four sites to state a full Flood Risk Assessment should be produced in line with all national and local policy as well as the relevant STNP policies.

Policy 8A: Surface Water Management General Provisions

- 3.5 Re P8A.5 it is recommend this references high, medium and low surface water flood risk zones as the low risk extent can be used as a proxy for the medium risk extent (1 in 100 year) plus climate change as the NPPF requires this to be considered.

- 3.6 Re P8A.7 this should also reference Ciria C753 The SUDS Manual² as it is considered the best reference guide for the design of SUDS systems.
- 3.7 As a whole this policy should reference the NPPF guidance which states no development 'should increase flood risk elsewhere', this is key as if this is written into policy and it cannot be demonstrated the proposals don't increase the existing flooding issues then this can be used as a reason for ensuring amendments are made to the proposals. Text could also be added to suggest offsite flood risks should be improved 'wherever possible' in line with NPPF guidance.

Policy 8B: Surface Water Runoff (Discharge) Rate & Volume

- 3.8 Re P8B.1 it is recommend 40% climate change is referenced.
- 3.9 Re P8B.4 it is recommended this references the flood flow as a surcharged outfall as this is how it is considered in design software. The scale of event required to be considered as part of the surcharge should also be referenced (the 1 in 100 year plus relevant catchment specific climate change fluvial flow).
- 3.10 Re P8B.6 it is recommended 'greenfield rates' is changed to 'greenfield runoff volumes'.

Policy 8C: Infiltration Testing

- 3.11 Re P8C.2 it is recommended this is tweaked to state the testing should be submitted at the application stage. Normally this is only required for a detailed application upwards but you may wish for it to be submitted as part of outline proposals.
- 3.12 Re P8C.3 it is recommended 'or equivalent' is removed as BRE 365 is the only accepted standard for surface water drainage strategies.

Policy 8D: Surface Water Flood Risk and Climate Change

- 3.13 Re P8D.2 it is recommend only 40% is considered as this is the normal requirement now.
- 3.14 Re P8D.3 it is recommended this reads as follows: 'Peak river flow climate change allowances for the relevant catchment (in line with EA guidance *Flood Risk Assessments: Climate Change Allowances* shall be considered for ordinary watercourses as well as main rivers'.

² Ciria C753, The SUDS Manual, available at:

https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

Policy 8E: Surface Water Drainage and Water Quality

- 3.15 It is recommended further text is added to this policy to reference Ciria C753 The SUDS Manual and Chapter 26 (Part E)2 to ensure any proposals meet the relevant pollution indices referenced here.

Policy 8F: Management and Maintenance of Sustainable Drainage Systems

- 3.17 The policy should also reference Ciria C753 The SUDS Manual² as it is considered the best reference guide for the maintenance of SUDS systems and includes maintenance schedules for different SUDS features throughout (which are accepted as industry standard now).

Policy 8G: Resistance and Resilience of Sustainable Drainage Systems

- 3.18 Re P8G.1, P8G.2 and P8G.5 it is recommend 40% climate change is referenced.

Policy 8H: Design of Sustainable Drainage Systems.

- 3.19 Re P8H.2 it is recommended the SUDS hierarchy is listed out (as given below) to avoid any confusion and the storage and reuse of rainwater emphasised as this will be key to minimising water leaving sites where infiltration is not feasible.
- 3.20 The SUDS Hierarchy is detailed as follows:
1. Rainwater re-use (harvesting etc.)
 2. Infiltration (<2.0 mbgl)
 3. Discharge to watercourse
 4. Discharge to surface water sewer
 5. Discharge to combined sewer
 6. Deep infiltration (>2.0 mbgl)

Policy 2F: Common Criteria for Allocated Sites

- 3.21 No proposed amendments.

Policy 2H: Site Allocation STNP1: Grange Farm, Chequers Lane

- 3.22 Re Point C it is recommended further clarification is added with regards the provision of flood risk attenuation, whether this is for the site's drainage or offsite flooding for example. If offsite the form and full function of the feature should be detailed.
- 3.23 Re Point G no attenuation should be placed in areas already at risk of flooding, therefore if this attenuation is to deal with the existing flood risk that is fine, if not the attenuation for the development itself should be provided beyond the extent of the surface water flood zone.

Policy 2J: Site Allocation STNP4: Land at the Junction of Pound Hill and Page's Lane

- 3.24 No proposed amendments apart from comments noted at beginning of this chapter.

Policy 2K: Site Allocation Policy STNP7: Page's Farm

- 3.25 Re Point F it is recommended further clarification is added with regards the provision of flood risk attenuation, whether this is for the site's drainage or offsite flooding for example. If offsite the form and full function of the feature should be detailed.

4.0 USE OF GREEN AREAS IN ALLOCATED SITES FOR ALLEVIATING FLOOD RISK

- 4.1 The proposed site layout plans have been reviewed with regards the open space provided, as an initial comment it should be ensured, in order for them to provide the maximum SUDS benefit, they should be situated in the lowest parts of the site (so attenuation systems can be placed here) with corridors running back through the site to allow for the placement of SUDS measures to transfer flows above ground to the final attenuation prior to discharge offsite (should infiltration not be viable).
- 4.2 In terms of the best use of the green areas open SUDS features are always the most beneficial from all perspectives, including runoff rates/volumes, amenity, biodiversity and water quality. Therefore the green areas should be used for the placement of infiltration (if viable) or attenuation basins with the use of below ground cellular/concrete tanks resisted where possible. The use of open SUDS, if designed online so water flows through them prior to outfall, will vastly reduce runoff volume from all sites through the slowing of water, uptake by plants, passive infiltration and evaporation. If infiltration is not possible this is the most crucial thing that can be done to minimise the amount of water leaving the sites.
- 4.3 To further promote this the transmission of water to the attenuation devices should also be via open features (swales, filter strips etc.) to again promote the loss of water by other means prior to outfall. Permeable paving could also be used for all private drives and private roadways to encourage passive infiltration with toe drains included to transfer water to basins if the ground begins to waterlog. The use of permeable paving is another key measure for keeping water on site, although any adoptable roads cannot be permeable in line with Norfolk County Council design standards.
- 4.4 Suitable design of these features is key and full details on how they should be incorporated to maximise the above mentioned benefits is available in Ciria C753 The SUDS Manual².
- 4.5 Table 4.1 below provides a brief summary of available options and how their cost compares to conventional below ground attenuation and discharge offsite, which can be costed at circa £150.00 -£350.00 exc. VAT per cubic metre or traditional pipe networks.

SUDS Measure	Benefits and Relative cost compared to below ground attenuation/pipe networks
Rainwater Harvesting	<ul style="list-style-type: none"> • Likely increases cost over a traditional attenuation system as the volume provided cannot be accounted as part of the attenuation. • If infiltration is not viable this can stop <i>some</i> water from leaving the site but does ultimately depend on how well used the system is (i.e. how empty it is at the time of rainfall).
Green/blue/brown roofs	<ul style="list-style-type: none"> • Likely increases cost over a traditional attenuation system as the construction build up for such a feature is more costly. • Only applicable for flat roofs. • Can reduce water leaving the site through promotion of storage and evaporation. • Provides treatment of water that does pass through and back into wider site drainage system.
Online Infiltration/attenuation basins (above ground storage)	<ul style="list-style-type: none"> • Vastly reduces costs over a traditional buried system as the only real cost is the excavation and installation of inlets/outlets. • Increases site amenity values, promotes evaporation (if basins online) and provides significant levels of treatment/settlement when designed correctly.
Swales	<ul style="list-style-type: none"> • Vastly reduces costs over a traditional piped system as the only real cost is the excavation and installation of inlets/outlets. • Increases site amenity values, promotes evaporation and provides significant levels of treatment/settlement when designed correctly. • Does have an impact on space as usually takes a 6.0 m corridor adjacent to roadways.
Filter Strips and Filter Drains	<ul style="list-style-type: none"> • Vastly reduces costs over a traditional piped system as the only real cost is the excavation and installation of inlets/outlets. • Increases site amenity values, promotes evaporation and provides significant levels of treatment/settlement when designed correctly.
Permeable Paving (tanked or infiltrating)	<ul style="list-style-type: none"> • Costs are broadly equivalent to traditional pipe networks when built with underdrains (where infiltration is poor). • Provide significant benefits in terms of water quality, slowing the flow from the site (due to percolation time through the sub base) and promote increased evaporation.

Table 4.1 Comparison of SUDS methods against traditional below ground attenuation/pipe networks

5.0 CONCLUSIONS AND SUMMARY FOR VILLAGERS

- 5.1 This report has provided a high level overview of existing flood risk issues within the parish of Saham Toney and provided recommendations on how these outstanding issues could be resolved, either locally to the flooding hotspots or within the wider catchment.
- 5.2 Following this a review of the Neighborhood Plan's policies relating to flood risk and drainage and site specific allocation policies has been carried out. This has provided recommendations on how the policies can be tightened, however it is apparent that the Neighborhood Plan will positively steer developers to ensure the proposed new developments within Saham Toney minimise increases in flood risk offsite whilst also steering the building of the developments to the areas of lowest flood risk.
- 5.3 The breadth of the surface water drainage policies will ensure all matters relating to SUDS are considered and national guidance enforced wherever possible, to an extent to a much higher level than in other parts of Norfolk. The policies ensure infiltration drainage is used wherever possible and if this cannot be achieved as much water as possible is held back on site through the use of various SUDS measures, which are to be designed in line with the nationally accepted SUDS hierarchy.
- 5.4 A further review of the allocated sites' masterplans has been carried out and advice provided on the best ways the green space can be used as well as an analysis of the relative costs of using SUDS compared against traditional piped methods with below ground attenuation.
- 5.5 All these measures will ensure the development of the allocated sites will, as far as possible, not increase flood risk offsite whilst also providing safe and sustainable homes for future occupiers.

Written by: Graham Sinclair, BSc (Hons), MSc, DIC, C.WEM, MCIWEM

Enclosed;

Appendices

- A.** Relevant Policies of the Draft Saham Toney Neighbourhood Plan.
- B.** Masterplanning Layout for Sites STNP1, 4 and 7 (taken from the Saham Toney Masterplanning Study, AECOM, February 2020)
- C.** Photos of Flood Events in Saham Toney
- D.** Extract from a Norfolk County Council Flood Investigation Report

APPENDICES

APPENDIX A

Relevant Policies of the Draft Saham Toney Neighbourhood Plan

POLICY 8A: SURFACE WATER MANAGEMENT GENERAL PROVISIONS

P8A.1 All development proposals shall include a site-specific Surface Water Drainage Strategy. That Strategy, including any necessary flood risk mitigation measures, should be agreed as a condition of the development, before any work commences on the site, and implemented before the new development is connected to the existing drainage system. Development will not be allowed to proceed until this condition has been discharged.

P8A.2 All development proposals coming forward within the areas of high, medium and low risk from surface water flooding as identified by the Environment Agency in its up to date online maps, shall include a site-specific Flood Risk Assessment that gives adequate and appropriate consideration to all sources of flooding and the proposed method of surface water drainage.

P8A.3 All proposals shall have a neutral or positive impact on surface water drainage.

P8A.4 All development proposals shall demonstrate engagement with the relevant agencies and shall seek to incorporate appropriate mitigation measures to manage flood risk and reduce surface water run-off to the development and wider area.

P8A.5 All proposals in areas of high or medium risk of surface water flooding, regardless of size, shall be reviewed by the Lead Local Flood Authority (for the means of surface water disposal) and the Statutory Water Undertaker (where surface water is proposed to be discharged into the public sewerage network) prior to being decided.

P8A.6 Permission for proposals for which no other practicable alternative exists to dispose of surface water other than a public sewer, shall only be granted if it is confirmed by Anglian Water, the Local Highways Authority, or their agents that there is adequate spare capacity in the existing system taking future development requirements into account.

P8A.7 As a condition of their adoption, SuDS drainage schemes shall comply with the guidelines given in Water UK's "Sewers for Adoption", Edition 8, 2019, or any more up to date version made available.

POLICY 8B: SURFACE WATER RUNOFF (DISCHARGE) RATE & VOLUME

P8B.1 Appropriate on-site water storage measures shall be incorporated in the drainage scheme to intercept, attenuate or store long term surface water run-off within the development site boundary, up to and including the 1% AEP (Annual Exceedance Probability) event plus climate change allowance.

P8B.2 For the 100% AEP and the 1% AEP events, the peak runoff rate from a site to any highway drain, sewer or surface water body:

- a) For greenfield developments, shall never exceed the peak greenfield runoff rates for the same events;

- b) For brownfield developments, shall be as close as reasonably practical to the greenfield runoff rates for the same events, but shall never exceed the rates of discharge from the site for the same event prior to redevelopment.

P8B.3 Proposals shall identify appropriate SuDS discharge outlets for surface water runoff (both above and underground).

P8B.4 Where discharge is into an ordinary watercourse with known surface water flooding issues, a flood flow (i.e. watercourse bank full) shall be applied as a constraint in runoff calculations.

P8B.5 Drainage strategies shall consider and account for the potential increase in the volume of runoff from a development as a result of increases in the area of impermeable surfaces.

P8B.6 Where it is not possible to dispose of any runoff additional to greenfield rates on the site, final runoff rates shall be restricted further to ensure compliance with Standard S6 of the SuDS Non-Statutory Technical Standards (2015) or any subsequent update of those standards.

P8B.7 Where runoff from off-site sources is drained together with the site runoff, the contributing catchment shall be modelled as part of the drainage system in order to take full account of the additional inflows to the site.

P8B.8 Where runoff from off-site sources is conveyed separately to a site's proposed drainage system the flood risk should be managed in accordance with BS8533:2011 "Assessing and managing flood risk in development – code of practice".

P8B.9 Surface water run-off mitigation measures shall address any identified risk of flooding in the Lead Local Flood Authority's order of priority: Assess; Avoid; Manage and Mitigate.

P8B.10 For residential developments, an allowance based on development density for increases in impermeable surfaces throughout the lifetime of a development shall be considered in runoff calculations, up to total impermeable surface percentage of 100%. The allowance shall be:

- a) 10%, where density is less than or equal to 25 dwellings per hectare;
- b) 8%, where density is greater than 25, but less than or equal to 30 dwellings per hectare;
- c) 6%, where density is greater than 30, but less than or equal to 35 dwellings per hectare;
- d) 4%, where density is greater than 35, but less than or equal to 45 dwellings per hectare;
- e) 2%, where density is greater than 45 dwellings per hectare.

POLICY 8C: INFILTRATION TESTING

P8C.1 All proposals shall include an assessment of the suitability of the underlying geology to discharge collected surface water to the ground via infiltration.

P8C.2 Evidence from infiltration tests shall be submitted to support the assumed infiltration rate(s) across a site.

P8C.3 Infiltration testing shall be undertaken in line with BRE Digest 365 guidance, or equivalent, and shall include a minimum of three tests undertaken within 24 hours at each location.

P8C.4 The depth of testing shall be representative of the drainage proposals.

POLICY 8D: SURFACE WATER FLOOD RISK & CLIMATE CHANGE

P8D.1 Assessment of flood risk and design of a surface water drainage system shall include allowance for climate change in accordance with the most up to date Government guidance.

P8D.2 For sustainable drainage systems, both 20% and 40% climate change scenarios shall be tested for developments with a lifespan over 50 years.

P8D.3 Peak river flow climate change allowances shall be considered for ordinary watercourses as well as main rivers.

POLICY 8E: SURFACE WATER DRAINAGE & WATER QUALITY

P8E.1 All proposals shall consider risk to water quality that may arise, taking account of the final discharge location(s).

P8E.2 Where piped components are proposed as part of a surface water drainage scheme, non-piped SuDS components shall be used to treat water prior to final discharge.

P8E.3 Providing it is separated from other surface water runoff residential roof water may be directly discharged to a watercourse or soakaway without treatment.

P8E.4 The sensitivity of the receiving waterbody (ground or surface) should be considered and extra water quality treatment provided if a protected resource is identified.

P8E.5 Protection of water quality in the Breckland SAC and Norfolk SAC shall be given high priority.

POLICY 8F: MANAGEMENT & MAINTENANCE OF SUSTAINABLE DRAINAGE SYSTEMS

P8F.1 All proposals shall appropriately address the management and maintenance of SuDS to account for the construction and long-term operation of all components of the drainage system, both surface and sub-surface.

P8F.2 Proposals shall sufficiently consider the likely maintenance requirements of new and existing drainage infrastructure over the design life of a development, including those for ordinary watercourses that are bounded by, or within a development site.

P8F.3 All proposals shall provide a SuDS Management and Maintenance Plan including:

- a) A maintenance schedule of work detailing the activities required and who will adopt and maintain the surface water drainage features for the lifetime of the development; and
- b) Clear maintenance and management proposals for SuDS elements, including riparian ownership of ordinary watercourses or culverts, and their associated funding mechanisms.

P8F.4 Where SuDS is not proposed to be adopted by the Local Highways Authority or Anglian Water, maintenance plans and schedules shall be included with a proposal, clearly communicating requirements on any future property owners, in accordance with section 12 and 11.4 of British Standard BS8582:2013. Such communication shall include explanation of the consequences of future property owners not carrying out the maintenance.

P8F.5 Appropriate easements shall be provided around SuDS features to allow access for maintenance.

P8F.6 Where pumping is proposed as part of SuDS, It shall be demonstrated that appropriate maintenance proposals are included for the pumping system.

POLICY 8G: RESISTANCE & RESILIENCE OF SUSTAINABLE DRAINAGE SYSTEMS

P8G.1 SuDS capacity shall be such that no onsite flooding or increased offsite flood risk will occur for events up to the drainage system standard of service capacity, which shall be taken as the 1% AEP plus climate change allowance. All proposals shall demonstrate how impacts to people and property will be minimised where this is a residual risk of flooding (i.e. if the drainage system capacity will be exceeded in an event greater than the 1% AEP event plus climate change).

P8G.2 All proposals shall demonstrate that safe access and egress through a site will be maintained during a flood event that exceeds the 1% AEP plus climate change.

P8G.3 It shall be demonstrated that the drainage system is designed so that unless specifically designated to hold or convey water, flooding will not occur in any part of a building or utility plant susceptible to water.

P8G.4 In all cases there shall be a minimum of at least 150mm freeboard between proposed external ground levels and property finished ground floor levels (FFL).

P8G.5 Resistance and resilience measures shall be included where there is a residual risk of flooding. In such cases, as a minimum, property FFL throughout the development shall be set to a minimum of 300mm freeboard above the anticipated flood levels in a 1% AEP event plus climate change from any source of flooding. This shall be increased to 600mm where there is uncertainty about flood levels.

P8G.6 The design of the drainage system for exceedance flow management shall take account of any residual flood risk for the site. An assessment shall also be made of the likely significance of risks associated with the following scenarios:

- a) A blockage or failure of a drainage system component;
- b) Failure of any embanked storage facility; and
- c) Rainfall events that are larger than the storms used for the design of the drainage system.

P8G.7 Where there is a residual risk of flooding, design shall be such that water on roads where speed limits do not exceed 30mph shall be no greater than 100 mm deep where there are kerb upstands.

P8G.8 All proposals shall demonstrate the use of appropriately flood resistant / resilient construction.

POLICY 8H: DESIGN OF SUSTAINABLE DRAINAGE SYSTEMS

P8H.1 Surface water runoff shall be controlled as near its source as possible through a sustainable drainage approach.

P8H.2 The provision of a sustainable urban drainage system (SuDS) is the preferred method to manage surface water runoff, and the proposed method of draining a site shall be in accordance with the sustainable drainage hierarchy.

P8H.3 All necessary SuDS design data and calculations shall be presented with proposals and shall demonstrate the system will function satisfactorily throughout its lifetime.

P8H.4 Where a SuDS solution is proposed, outline or final SuDS Design Statements shall be provided at appropriate stages of a planning application.

P8H.5 Design of the proposed drainage system shall be such that runoff is completely contained within the system for all events up to the standard of service for the critical duration event for the system (the 1% AEP plus allowance for climate change).

P8H.6 All drainage system proposals shall be guided by the drainage section of the most up to date version of the Saham Toney Village Design Guide and the most up to date version of CIRIA Report C753 The SuDS Manual.

P8H.7 The layout of a development site and its drainage system shall be designed so that surface water that enters the site from off-site sources is conveyed safely around or through the site, without compromising the level of service of the proposed drainage system or introducing unacceptable additional risk on-site or downstream.

P8H.8 The layout of a development site and the drainage system should be designed so that natural low-lying areas and overland conveyance pathways are used to manage surface runoff, where appropriate, providing they do not pose an unacceptable risk to the new development or downstream areas.

P8H.9 Infiltration drainage shall generally be shallow (less than 2m deep); deeper methods shall only be used in exceptional circumstances.

P8H.10 SuDS features shall be provided with appropriate inlets, outlets and control components to manage the flow of water. Such components shall be resistant to blockage.

P8H.11 There shall be a minimum of 1.2m between the base of any soakaway and seasonally high groundwater levels.

P8H.12 Proposals that include measures to capture rainwater for appropriate re-use will be supported.

P8H.13 SuDS should be attractive and enhance visual amenity with well-designed features.

P8H.14 Wherever practical SuDS shall be designed to join biodiversity habitats together.

P8H.15 Design of SuDS shall promote evapotranspiration through appropriate planting.

P8H.16 Proposals shall consider and where possible make use of the contribution that trees and woodlands can provide to help resolve a range of water management issues.

P8H.17 Wherever possible and practical, drainage system design proposals shall take every opportunity to improve (i.e. lessen) existing flood risk on a site and/or in downstream areas.

P8H.18 Where applicable, design of SuDS systems shall include measures to improve land drainage via watercourses or ditches that form part of a site or run adjacent to its boundary, and make adequate provision for their future maintenance.

P8H.19 Culverting of existing watercourses shall be avoided wherever possible. If adopted, it shall be in accordance with the Lead Local Flood Authority's Standing Advice 1: Ordinary Watercourse Consenting.

P8H.20 SuDS design shall meet the most up to adoption standards of the Highways Authority and/or Anglian Water as applicable.

POLICY 2F: COMMON CRITERIA FOR ALLOCATED SITES

P2F.1 All residential development proposals shall comply with the following:

P2F.2 A full ecological appraisal shall be provided with the planning application, and shall include details of any mitigation measures necessary to preserve biodiversity on the site.

P2F.3 Satisfactory biodiversity and wildlife-friendly measures shall be incorporated into the design of the dwellings, gardens and public areas.

P2F.4 Development shall include positive measures commensurate with the site size to enhance green infrastructure.

P2F.5 Highway visibility splays no less than 2.4m x 59m shall be provided to each side of the site access where it meets the highway, and shall be in broad compliance with the indicative site access drawings given in Policy Maps 2F.1 -9.

P2F.6 Where existing sewer and/or water mains in Anglian Water's ownership are located within a site boundary, site layout shall be designed in a way that satisfactorily takes them into account.

POLICY 2H: SITE ALLOCATION STNP1: GRANGE FARM, CHEQUERS LANE

P2H.1 Development of predominantly brownfield land amounting to approximately 1.06 hectares at Grange Farm, Chequers Lane, designated as Site STNP1, and as shown on Policy Map 2H, for up to 10 new dwellings, will be permitted subject to meeting the following criteria:

- a) The site boundary shall be as shown on Policy Map 2H;
- b) The proposals are guided by the masterplanned layout shown on Policy Map 2G.1, or where they significantly differ, an alternative masterplanned layout must be provided in order to demonstrate compatibility with the requirements set out in this policy;
- c) Of the total area, approximately 0.09 hectares as shown on Policy Map 2H is set aside for the provision of flood risk attenuation measures, a footpath linking the site to Page's Lane and landscaping only.
- d) Single storey dwellings are expected on this site; two storey dwellings may be acceptable if built form is sympathetic to houses on the opposite side of Chequers Lane and it is demonstrated through a proportionate Landscape and Visual Appraisal (see g. below) that the built form will be sensitive to the open landscape setting found in this location;
- e) Safe access to and from the site shall be provided by a single access road at the east end of the site, no less than 4.8m in width and to a standard suitable for its adoption by the Local Highways Authority. Site layout shall be such as to preclude future access to land south or west of the site boundary, other than for agricultural purposes;
- f) A pedestrian footpath shall be provided from the highway access point to link with the existing public footpath on Page's Lane to the west of the site;

- g) A Flood Risk Assessment shall be submitted, describing the means of surface water drainage; including details of how surface and storm water will be managed on-site to safeguard dwellings and their residents, site access and egress, and the ground water environment, and to ensure no increase in off-site surface water flood risk. A bio-retention area or infiltration area shall be provided in the area of the site's greatest risk of surface water flooding, with a minimum length / area that calculations demonstrate to be adequate to prevent flood risk to properties and/or off-site. Development shall avoid areas at risk of surface water flood or drainage risk;
- h) A proportionate Landscape and Visual Appraisal shall be provided with the planning application and shall demonstrate how the site layout, design and landscaping preserves, and is sympathetic to the landscape character and visual amenity of the area in which the site is located. The assessment shall take account of cumulative impact with other sites allocated in close proximity to this site;
- i) The Ecological Assessment for the site shall include:
 - i. Reference to historical stone curlew species records, if available, pertaining to the grid cell(s) in which a proposal is located;
 - ii. The results of a site-specific stone curlew survey undertaken over a period from early April to mid-May, undertaken with appropriate sensitivity to species disturbance;
 - iii. Where stone curlews are identified on a site, the proposal shall include a site-specific Habitats Regulations Assessment that includes proposed mitigation measures. Proposals lacking acceptable mitigation measures, where such are required, will not be permitted.
- j) A Ground Contamination Risk Assessment shall be provided with the planning application, based on a full intrusive ground investigation, and shall set out in detail all measures required to eliminate identified risks;
- k) Development shall be screened as part of a suitable landscaping scheme.

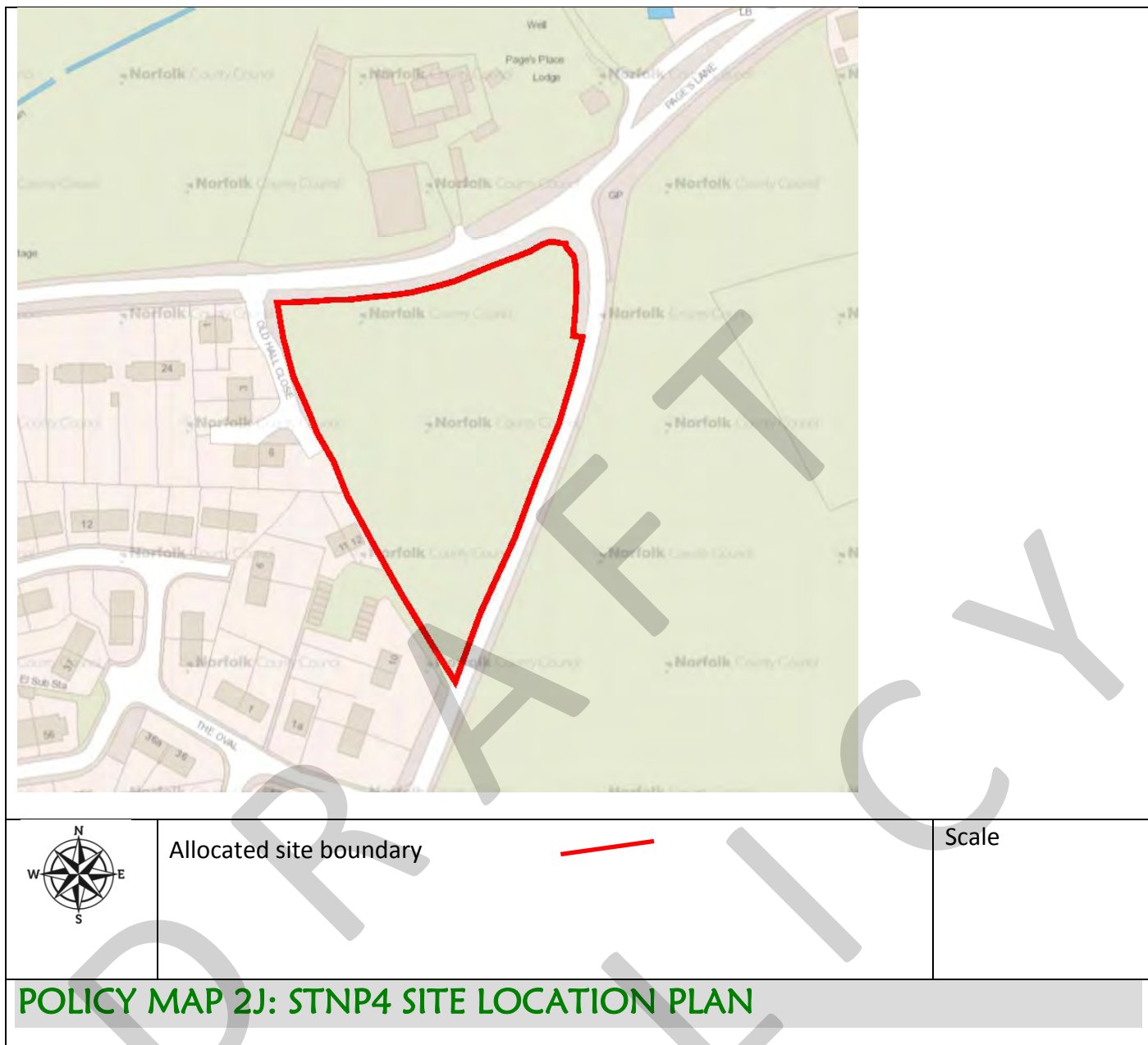
P2H.2 This site is expected to be developed between 2025 and 2028.

P2H.3 This site is required to deliver no fewer than 2 affordable homes.

- c) Safe access to and from the site shall be provided onto Page's Lane, no less than 4.8m in width and to a standard suitable for its adoption by the Local Highways Authority;
- d) A Flood Risk Assessment shall be submitted, describing the means of surface water drainage; including details of how surface and storm water will be managed on-site to safeguard dwellings and their residents, site access and egress, and the ground water environment, and to ensure no increase in off-site surface water flood risk. Development shall avoid areas at risk of surface water flood or drainage risk;
- e) A proportionate Landscape and Visual Appraisal shall be provided with the planning application and shall demonstrate how the site layout, design and landscaping preserves, and is sympathetic to the landscape character of the area in which the site is located. The assessment shall take account of cumulative impact with other sites allocated in close proximity to this site. In particular site layout and landscaping shall be such that site retains a publicly open vista north-west from Pound Hill towards land beyond Page's Lane;
- f) The Ecological Assessment for the site shall include:
 - i. Reference to historical stone curlew species records, if available, pertaining to the grid cell(s) in which a proposal is located;
 - ii. The results of a site-specific stone curlew survey undertaken over a period from early April to mid-May, undertaken with appropriate sensitivity to species disturbance;
 - iii. Where stone curlews are identified on a site, the proposal shall include a site-specific Habitats Regulations Assessment that includes proposed mitigation measures. Proposals lacking acceptable mitigation measures, where such are required, will not be permitted.
- g) The existing trees and hedges on the site boundaries shall be retained, or replaced by alternate planting that is demonstrated to improve the landscape;
- h) Site layout and landscaping shall be such as to have no detrimental impact on the setting of Page's Place. A Heritage Statement shall be submitted to demonstrate this.

P2J.2 This site is expected to be developed between 2025 and 2028.

P2J.3 This site is required to deliver a minimum of 4 affordable homes.



POLICY MAP 2J: STNP4 SITE LOCATION PLAN

POLICY 2K: SITE ALLOCATION STNP7: PAGE'S FARM

P2K.1 Development of predominantly brownfield land amounting to approximately 0.54 hectares at the Page's Farm, Page's Lane, designated as Site STNP7, and as shown on Policy Map 2K, for up to 8 new dwellings, will be permitted subject to meeting the following criteria:

- The site boundary shall be as shown on Policy Map 2K;
- The proposals are guided by the masterplanned layout shown on Policy Map 2G.1, or where they significantly differ, an alternative masterplanned layout must be provided in order to demonstrate compatibility with the requirements set out in this policy;
- Safe access to and from the site shall be provided by a single private shared driveway joining Page's Lane, of width no less than 4.5m;

- d) Provision shall be made to widen Page's Lane to an extent agreed with the Local Highway Authority from the most western point at which the site adjoins the highway east to the junction of Page's Lane and Pound Hill;
- e) A pedestrian footpath shall be provided along the full length of the widened section of highway, of width no less than 2m;
- f) A Flood Risk Assessment shall be submitted, describing the means of surface water drainage; including details of how surface and storm water will be managed on-site to safeguard dwellings and their residents, site access and egress, and the ground water environment, and to ensure no increase in off-site surface water flood risk. Development shall avoid areas at risk of surface water flood or drainage risk. A bio-retention area or infiltration area shall be provided in the area of the site's greatest risk of surface water flooding, with a minimum length / area that calculations demonstrate to be adequate to prevent flood risk to properties and/or off-site;
- g) A proportionate Landscape and Visual Appraisal shall be provided with the planning application and shall demonstrate how the site layout, design and landscaping preserves, and is sympathetic to the landscape character of the area in which the site is located. The assessment shall take account of cumulative impact with other sites allocated in close proximity to this site;
- h) The contribution of the site area to the setting of Key View 3 is enhanced;
- i) The Ecological Assessment for the site shall include:
 - i. Reference to historical stone curlew species records, if available, pertaining to the grid cell(s) in which a proposal is located;
 - ii. The results of a site-specific stone curlew survey undertaken over a period from early April to mid-May, undertaken with appropriate sensitivity to species disturbance;
 - iii. Where stone curlews are identified on a site, the proposal shall include a site-specific Habitats Regulations Assessment that includes proposed mitigation measures. Proposals lacking acceptable mitigation measures, where such are required, will not be permitted.
- j) A Ground Contamination Risk Assessment shall be provided with the planning application, based on a full intrusive ground investigation, and shall set out in detail all measures required to eliminate identified risks;
- k) The brownfield site shall be entirely cleared and all decontamination measures identified by the risk assessment shall be implemented;
- l) The existing boundary trees and hedges shall be retained, or replaced with alternate natural planting that enhances the landscape;
- m) Site layout and landscaping shall be such as to have no detrimental impact on the setting of Page's Place. A Heritage Statement shall be submitted to demonstrate this;

P2K.2 This site is expected to be developed between 2033 and 2036.

P2K.3 This site is required to deliver no fewer than 2 affordable homes.



Allocated site boundary



Scale

POLICY MAP 2K: STNP7 SITE LOCATION PLAN

APPENDIX B

Masterplanning Layout for Sites STNP1, 4 and 7

(taken from the Saham Toney Masterplanning Study, AECOM, Feb 2020)



Key

-  Site boundaries
-  Ancient and/or broadleaved woodland
-  New or reinforced hedges and tree cover
-  New low-level soft landscaping
-  Water
-  Existing buildings
-  Listed building
-  Existing roads
-  Proposed land for residential development
-  Proposed open space
-  Proposed roads
-  Proposed footways
-  Proposed junction traffic calming and safety improvements
-  Proposed dropped kerbs/ pedestrian crossing
-  Proposed Pages Lane road widening
-  Main site access
-  Proposed footway along existing roads
-  Proposed footpath with views towards Saham Mere
-  Proposed pedestrian access
-  Proposed gate agricultural vehicle-only access to field south of Site STNP 1
-  Ditches to be restored
-  Open views to be retained/enhanced
-  Key Views designated in the Neighbourhood Plan



Proposed garages

Proposed 1 storey houses:



- 1 bedroom



- 2 bedrooms



- 3 bedrooms

Proposed 2 storey houses:



- 2 bedrooms



- 3 bedrooms



- 4+ bedrooms



Affordable housing units


















Area for flood risk attenuation measures

APPENDIX C

Photos of Flood Events in Saham Toney

Photos provided by parishioners and given below, illustrate some of the flooding that has taken place in the Neighbourhood Area, including the June 2016 event:

Richmond Road at Watton Brook 	Hills Road / Ploughboy Lane 	Cley Lane / Bell Lane/ Ovington Road / Chequers Lane Junction 
Chequers Lane-Hills Road 	Chequers Lane-Ploughboy Lane 	Page's Lane 
Amy's Close / Bell Lane 	Ploughboy Lane 	Ovington Road 
Chequers Lane 	Page's Lane 	Hills Road 
Page's Lane 	Page's Lane 	Page's Lane 

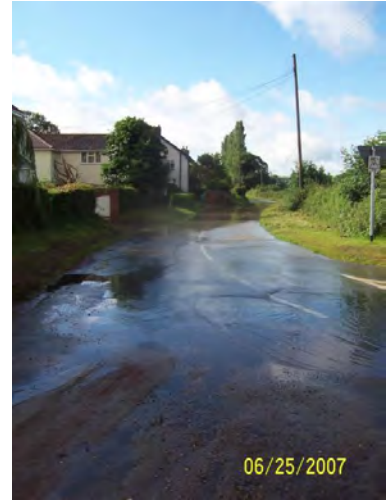
Hills Road north of Saham Hills



**Hills Road / Ploughboy Lane
Junction**



**Hills Road / Ploughboy Lane
Junction**



APPENDIX D

Extract from a Norfolk County Council Flood Investigation Report

Flood Investigation Report

Flooding in Watton and surrounding area on 23 June 2016



Report Reference: FIR015

Draft Report Final, prepared by Mark Ogden on 12 December 2017



Norfolk County Council

Contents

Executive Summary.....	3
Map of catchments used within this report	6
Justification for Flood Investigation.....	7
Flooding and flood risk within the Saham Toney Watercourse Catchment.....	9
Flooding and flood risk within the Ovington Cross Watercourse Catchment	16
Flooding and flood risk within the South Moor Watercourse Catchment	22
Flooding and flood risk within the Watton Green watercourse Catchment	27
Flooding and flood risk within the Hembeck Catchment.....	33
Flooding and flood risk within the Watton Centre Catchment.....	41
Flooding and flood risk within the Merton Common Watercourse Catchment.....	49
Flooding and flood risk within the King Row Watercourse Catchment.....	54
Flooding and flood risk across the wider Watton Brook catchments	58
Disclaimer.....	62
Appendix A - Key definitions and responsibilities	63

Executive Summary

(a) Flooding incidents

Flooding in Watton, Saham Toney and Ovington occurred on 23 June 2016. The rainfall event on this date generated 164 reports of flooding that led to the identification of 73 properties that had suffered internal flooding. The properties affected were concentrated in 8 separate catchments¹ with other isolated reports received outside of these. A summary of the 73 properties affected in each catchment are set out below;

- Saham Toney Watercourse – 12 properties
- Ovington Cross Watercourse – 9 properties
- South Moor Watercourse – 1 property
- Watton Green Watercourse – 9 properties
- Hembeck Catchment – 13 properties
- Watton Centre Catchment – 23 properties
- Merton Common Watercourse – 3 properties
- King Row Watercourse – 1 property and 1 risk to life
- Wider area of Watton Brook catchment – 2 properties

The incidents of internal flooding in Watton and its environs occurred in the following parishes and at the approximate locations listed below;

- Ashill Parish - Church Road
- Griston Parish - Lancaster Avenue
- Little Cressingham Parish - Threxton Road Industrial Estate
- Merton Parish - Watton Road
- Ovington Parish - Saham Road, Dereham Road,
- Saham Toney Parish - Cley Lane, Pages Lane, Hills Road, Ovington Road, Chequers Lane, Bell Lane, Brandon Road
- Shipdam Parish - King Row
- Watton Parish - Jubilee Road, Brandon Road, Lovell Gardens, Horseshoe Close, Sharman Avenue, Saham Road, Swaffham Road, Meadow Grove, Stokes Avenue, Nelson Court, Langmere Road, Watton Green, High Street and Glebe Road.

19 residents whose properties flooded in June 2016 stated that they had previously experienced flooding. 8 residents referred to a flood event on 15 June 2009 which caused some internal flooding. 1 resident referred to an event in 1992 that also caused internal flooding. 5 residents reported other flood events as having caused external flooding on the following dates May 2016, 31 August 2015, 25 June 2007, 2008 and 1976. 5 residents reported flooding having occurred previously but did not state when or what the impact was.

¹ What are catchments? - To aid the investigation process and, for ease of presentation, the incidents of flooding within this report have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of Risk Management Authorities. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

(b) Flooding causes

As the flooding that occurred in Watton in 2016 was concentrated in 8 separate catchments it is evident that certain causes of flooding were only apparent in certain locations. This is particularly true when considering the different run-off characteristics between highly urbanised catchments such as Watton Centre and those of predominantly rural catchments such as Merton Common. More detail on the causes that occurred at the individual catchment level can be found in each section of this report however some of the key trends identified in the flooding of 2016 have been summarised on below;

- The rainfall experienced on 23 June 2016 was recorded East of Watton as being a 1 in 46 year event². However, it is likely that localised areas of the catchment saw a much greater rainfall event as a number of the properties that were internally flooded only correlated with the 1 in 100 year or 1 in 1000 year flood extent mapping. This judgement is supported by the extensive evidence of flooding submitted to the LLFA.
- A large number of the properties impacted are situated on an overland flow paths and/or are below the level of the nearest highway.
- Flooding from watercourses occurred in three catchments that are associated with Saham Toney Watercourse, Hembeck and Ovington Cross Watercourse. A number of features on the watercourses such as culverts had the effect of restricting flood flows experienced during the event.
- The capacity of surface water drainage including land drains, highway drainage and private property drainage was exceeded due to the significant levels of rainfall that fell during the event.
- The capacity of the foul network was also exceeded due to the ingress of surface water into the foul network. This caused the foul network to surcharge in a number of locations during the event with several residents reporting foul water entering their property.
- The flooding in several locations was exacerbated by the loss of drainage features including ditches and pond.
- Features such as kerbs, walls, garden fences and alleyways had the effect of containing or channelling flood water near to properties.
- In some locations the water on the public highway was pushed towards properties by passing vehicles.
- Flood water entered properties through the unprotected structure of the building. This included via features such as low thresholds at entrances, unprotected air bricks and services conduits.

² Recent rainfall - This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced across the catchments that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded. Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns across each catchment. Where there is no available data within this radius this will be stated.

(c) Key recommendations

The recommendations set out in the report have been summarised below. Specific recommendations for each individual catchment are set out within the report. Please note a large number of these recommendations have already been followed up by the respective organisations identified. Progress against these recommendations will be assessed as part of an addendum to this report to be undertaken a year from the date of publication of this report.

All Risk Management Authorities should;

- Communicate with affected residents where their assets have given rise to the flooding of properties.
- Review the appropriateness of their response to flooding.
- Determine the integrity and/or capacity of their assets and their maintenance where they have contributed to the flooding of properties to understand the systems role in accommodating rainfall events as well as mitigating flooding.

Property owners of affected properties should;

- Confirm the integrity, capacity and appropriateness of their property drainage
- Determine if works are needed to remove the risk posed by structures that form obstructions to flows.
- Determine if it is appropriate for them to protect their buildings through flood protection measures.
- Seek their own legal advice if they are concerned about the responsibilities and liabilities of themselves and/or others.
- **All property owners** should remove any inappropriate surface water connections to the foul sewer system and direct flows to alternative points of discharge where it doesn't increase flood risk.

Norfolk County Council should;

- Work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce run-off and increase the attenuation of flood water to reduce the impacts of flooding. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait for measures to be approved through national funding schemes.
- Work with property owners to assess the road structure to identify if it could be amended to route flood water away from the affected properties to alternative points of discharge, or other solutions as practicable.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.
- Communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders
- Determine if works are needed to remove the risk posed by structures that form obstructions to watercourse flows and communicate with affected parties and riparian owners
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

Anglian Water should;

- Work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.

Breckland District Council should review their approach to the use of their permissive to maintain watercourses powers under the Land Drainage Act 1991.

Justification for Flood Investigation

The purpose of this report relates to Section 19 of the Flood and Water Management Act 2010. This legislation sets out that the County Council, in its role as Lead Local Flood Authority for Norfolk, should investigate the role and response of organisations to significant flooding incidents. Significant flooding is deemed to be those incidents that impact upon people, property and infrastructure.

The Norfolk Local Flood Risk Management Strategy Policy UC2 (Flood Investigation) sets out the thresholds the Lead Local Flood Authority will apply to its formal flood investigation role. This states an investigation will be undertaken where it is determined that;

- (a) There is ambiguity surrounding the source or responsibility for a flood incident, and/or;
- (b) There is cause to investigate the flood incident, due to either its impact, or consequence

In judging the impact or consequence of a flood event Norfolk County Council uses the criteria set out below;

- Any risk to loss of life or serious injury.
- One or more residential or business property flooded internally.
- One or more critical services/installations and vulnerable person's properties flooded internally; and/or rendered inoperable or their functions severely compromised due to the access to the premises being impassable; and/or resulting in a loss of service impacting on the local community.
- Any section of a national category 3 road or above and/or flooding to priority 1 and 2 gritting routes made impassable due to flooding.
- Flooding adversely impacting a rail link by making it impassable.

It was deemed necessary to complete a formal Investigation Report into the flooding in Watton in 23-25 June 2016 as:

- multiple residential properties were internally flooded.
- multiple commercial properties were internally flooded.
- a number of roads were made impassable
- a number of motorists became stranded with flood water causing risk to life

This impact met Norfolk County Council's threshold for triggering the undertaking of a formal flood investigation.

The flood investigation report aims to:

- provide a transparent and consistent review of recent flooding.
- identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- identify what their response has been or will be to the flooding.
- make recommendations as to how the flood risk could be mitigated or reduced.
- provide new evidence of the level of risk faced by communities in Norfolk that can be used in current funding bids in support of flood mitigation schemes.

Mitigation measures include property level protection, reinstating lost drainage features, reviewing or increasing maintenance regimes and increasing the capacity of the drainage network.

The flood investigation report cannot:

- Resolve the flooding issues or provide designed solutions.
- Force authorities to undertake any of the recommended actions.

Location:

Saham Toney Watercourse

Legend



Flood Reports



Bridges



Watercourses



Main Rivers



1 in 100 Flood Risk

Flooding and flood risk within the Saham Toney Watercourse Catchment

Description of catchment

This catchment covers a large area of land to the North of Saham Toney. The topography generates two watercourses that converge at the junction of Ploughboy Lane and Chequers Lane. The flooding in this catchment was concentrated in three locations, near to both the watercourses North of the village and also downstream of the point of confluence.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (main rivers) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	0	37	2
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	0	63	2
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

Flood incidents within this catchment

Within this catchment 25 reports of external and internal flooding have been received. Out of these 25 reports 12 incidents of internal flooding have been confirmed and assessed as part of this investigation. These incidents are detailed in the table below.

Incident as reported	What was the response to the flood incident
<p>On the 23/06/2016 - 4 properties were internally flooded on Cley Lane, Saham Toney. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 28 June 2016, (FWF/16/3/2871) • a resident via personal communication on the 5 September 2016, (FWF/16/3/3270), (FWF/16/3/3271) • a resident via personal communication on the 31 January 2017, (FWF/16/3/4307) 	<ul style="list-style-type: none"> • The Fire and Rescue Service visited three of the affected residences to offer advice and to gather information during the incident. • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. • Anglian Water Services Ltd visited one residence to investigate a pollution issue linked to the flooding incident. • Norfolk County Council (Highways) carried out measures to minimise the impact of flooding after the incident.
<p>On the 23/06/2016 - 3 properties were internally flooded on Pages Lane, Saham Toney. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via email correspondence on the 29 June 2016, (FWF/16/3/2864) • the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/3/3385) • a resident via personal communication on the 31 January 2017, (FWF/16/3/4313) 	<ul style="list-style-type: none"> • The Fire and Rescue Service visited one of the affected residences to offer advice and to gather information during the incident. • Norfolk County Council (Lead Local Flood Authority and Highways) visited affected residents to offer advice and to gather information after the incident. • Norfolk County Council (Highways) carried out measures to minimise the impact of flooding after the incident.
<p>On the 23/06/2016 - 1 property was internally flooded on Hills Road, Saham Toney. This incident was reported by a resident via an online flood report form on the 6 August 2016, (FWF/16/3/3126)</p>	<ul style="list-style-type: none"> • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. • Norfolk County Council (Highways) carried out measures to minimise the impact of flooding after the incident.
<p>On the 23/06/2016 - 2 properties were internally flooded on Chequers Lane, Saham Toney. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via an online flood report form on the 15 August 2016, (FWF/16/3/3181) • Breckland District Council via email correspondence on the 18 July 2016, (FWF/16/3/3862) 	<ul style="list-style-type: none"> • The Fire and Rescue Service visited affected residents to offer advice and to gather information during the incident. • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
<p>On the 23/06/2016 - 1 property was internally flooded on Ovington Road, Saham Toney. This incident was reported by a resident via a flood questionnaire on the 12 September 2016, (FWF/16/3/3525)</p>	<ul style="list-style-type: none"> • No authority visited the affected property however Norfolk County Council (Lead Local Flood Authority) contacted resident to offer advice and to gather information after the incident.
<p>On the 23/06/2016 - 1 property was internally flooded on Church Road, Ashill. This incident was reported by a</p>	

resident via an online flood report form on the 22 July 2016, (FWF/16/3/3022)

- Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
- The Fire and Rescue Service responded and pumped out during the incident.

Recent rainfall within the catchment

There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Historic flooding incidents within the catchment

One resident stated that there had been minor external flooding experienced approximately one month prior to the flood event. During the investigation no other information highlighting historic flooding issues within this catchment has been provided.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Cley Lane, Saham Toney, 23/06/2016 Pages Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016 Ovington Road, Saham Toney, 23/06/2016	Run-off from significant rainfall across the catchment was directed along flow paths towards the surface water drainage network and the watercourse. These flows could not be accommodated by the receiving watercourse which led to the overloading of connecting drainage. Flows that could not be accommodated by the watercourse and drainage system found their way into the affected properties. The evidence provided by residents when compared against risk mapping suggests the rainfall event experienced on the 23 June 2016 would be classed as significant and beyond the capacity of existing drainage provision.	Property owners, Land owners, Riparian owners, Anglian Water, Norfolk County Council
Church Road, Ashill, 23/06/2016	Run-off from significant rainfall across the catchment was directed along flow paths on which the property was situated.	Property owners
Cley Lane, Saham Toney, 23/06/2016 Pages Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016 Ovington Road, Saham Toney, 23/06/2016	Surface run-off flowed onto the highway and then was conveyed via dropped kerbs onto the accesses of the properties, which contributed to the concentration of flooding at the affected properties. At many locations the depth and significance of flooding also breached other boundary features.	Property owners Highway authority
All locations within the catchment, 23/06/2016	The flood water entered many of the properties through the unprotected structure of the building. This included via features such as low thresholds at entrances, unprotected air bricks and services conduits.	Property owners
Cley Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016	Significant rainfall made its way into the foul sewer system via unsealed manholes and property connections causing it to surcharge elsewhere. This surcharging contributed to the flooding at a number of the affected properties.	Anglian Water Property owners
Pages Lane, Saham Toney, 23/06/2016 Church Road, Ashill, 23/06/2016	The loss of drainage features within the catchment (such as dykes, ditches, ponds) and the amendments of principal drains and watercourses through straightening, embanking and culverting exacerbated the impact of flooding. It was reported by one resident that the obstruction of a culvert reduced the resilience of the drainage system to the flood event.	Riparian owners

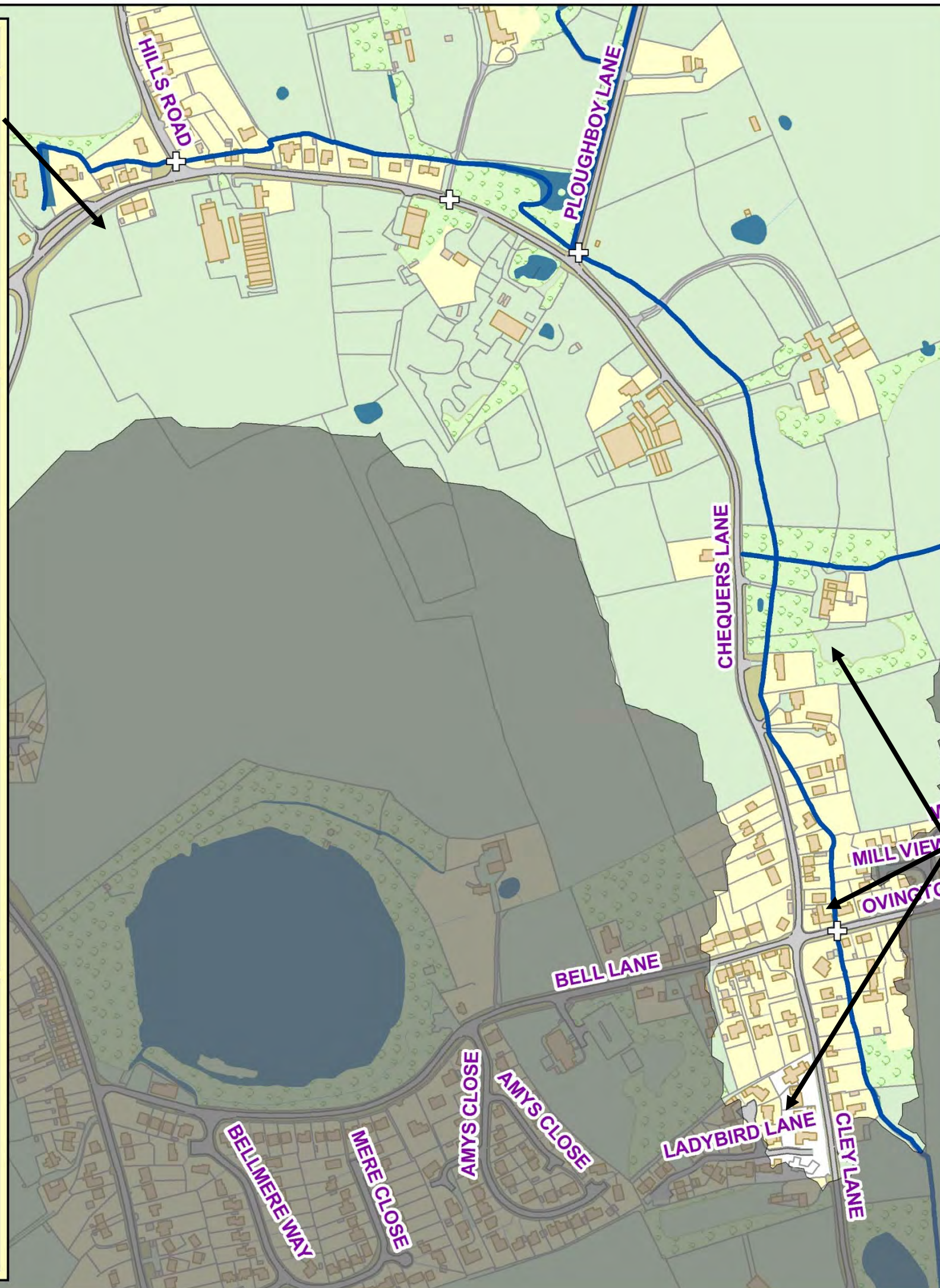
Flooding experienced at / on	Recommendation	Who has responsibility to follow up the recommendation?	Timescale
Cley Lane, Saham Toney, 23/06/2016 Pages Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016 Ovington Road, Saham Toney, 23/06/2016	Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce run-off and increase the attenuation of flood water to reduce the impacts of flooding. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait for measures to be approved through national funding schemes.	Norfolk County Council, Property owners	12 months
Cley Lane, Saham Toney, 23/06/2016 Pages Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016 Ovington Road, Saham Toney, 23/06/2016	Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.	Norfolk County Council, Property owners	12 months
Pages Lane, Saham Toney, 23/06/2016	Norfolk County Council would seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.	Norfolk County Council, Riparian owners	12 months
Pages Lane, Saham Toney, 23/06/2016	Anglian Water should work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.	Anglian Water	12 months
Cley Lane, Saham Toney, 23/06/2016 Hills Road, Saham Toney, 23/06/2016 Chequers Lane, Saham Toney, 23/06/2016	Property owners should remove any inappropriate surface water connections to the foul sewer system and direct flows to alternative points of discharge.	Property owners	12 months
Church Road, Ashill, 23/06/2016	Property owners should approach landowners to seek improvements in land management to reduce the levels of run-off from agricultural land.	Property owners	12 months

Flood and Drainage Details

Hills Road and Pages Lane – Internal flooding experienced on 23 June 2016

Causes – Significant rainfall caused run-off to exceed the capacity of the receiving watercourse. Run-off also directed onto the road that conveyed flows onto property accesses.

Recommendations – Norfolk County Council to explore funding for flood mitigation and to determine flood routing opportunities. Riparian owners to maintain watercourse.



Location: **Saham Toney Watercourse**

External flooding – 15 other reports of external or unconfirmed internal flooding were also received.

The majority of these were located near to the confirmed internal flooding incidents.

1 of the reports was for an unconfirmed incident that occurred in Ashill.



Chequers Lane and Cley Lane – Internal flooding experienced on 23 June 2016

Causes – Significant rainfall caused run-off to exceed the capacity of the receiving watercourse. Run-off also directed onto the road that conveyed flows onto property accesses.

Recommendations – Norfolk County Council to explore funding for flood mitigation and to determine flood routing opportunities. Riparian owners to maintain watercourse.

Legend

- ⊕ Bridges
- Water bodies
- Watercourses
- Main Rivers