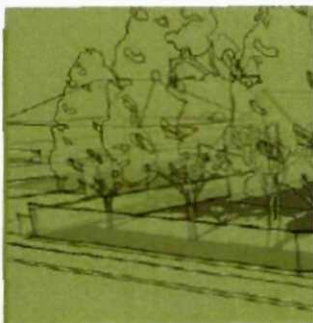




Flood Risk Assessment

Land at Market Street
Hoyland
South Yorkshire

March 2011

Stroma Unit 4
Pioneer Way
Pioneer Business Park
Castleford
WF10 5QU
T: 0845 621 11 11
E: info@stroma.com
www.stroma.com



Issue Status

Reference: Market Street, Hoyland – Flood Risk Assessment				
Issue:		Status	Prepared by	Checked by
V1	10.02.11	Draft		
V2	11.02.11	Draft		
V3	14.02.11	Draft	James Potter BSc (Hons), AIEMA	Rob Waiting BSc (Hons), MSc
V4	15.02.11	Final Draft	Environmental Consultant	Energy and Sustainability Consultant
V5	22.03.11	For Planning		
File Ref:	03-10-18517 FRA5			
Stroma Technology Ltd, 4 Pioneer Way, Castleford, WF10 5QU Telephone: 0845 621 1111 Fax: 0845 621 1112				

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1.0 Introduction

- 1.1 Stroma Technology have been commissioned by Litton Properties Ltd to perform a Flood Risk Assessment for the development site on Land at Market Street, Hoyland, South Yorkshire. The footprint proposed for development is currently occupied by the derelict remains of the former Wombwell School.
- 1.2 Planning Policy Statement 25 (PPS25) identifies that Flood Risk Assessments should be conducted for new developments proposed on the floodplains of rivers, sites potentially subject to coastal flooding, and for developments of one hectare in size and above.
- 1.3 The aforementioned site is in an area broadly classified by The Environment Agency (EA) as Flood Zone 1 the low flood risk area, under the jurisdiction of The Barnsley Metropolitan Borough Council Local Planning Authority. Each of the above was consulted prior to assessment. Surface water drainage located east of the site and in the Wombwell Road and Market Street highways are controlled by Yorkshire Water.
- 1.4 The existing land use on the site is classified by Planning Policy Statement 1 (PPS1), Planning Policy Statement 3 (PPS3) and Planning Policy 25 (PPS25) as Brownfield land. Table D2 of PPS25 states that D1 Class Order educational establishments such as the former Wombwell School are classified as 'more vulnerable' development to flooding. The proposed development is considered as 'less vulnerable' A1 commercial development.
- 1.5 The development is not required to undergo the Sequential Test of development sites as no alternative site is considered more preferential for this type of development in terms of flood risk, owing to the site's designation as Flood Zone 1, the low flood risk area, with an annual chance of flooding from rivers and the sea of <0.1%.
- 1.6 Site levels referenced in this report are to ordnance datum, taken by GPS device, and sourced from the topographic survey of the site, provided on the existing and proposed site layout plans, provided to our office by The Harris Partnership architectural practice.

2.0 The Site as Existing

- 2.1 The 2.6ha site is located in a predominantly residential area of Hoyland, however on the northwestern border of the site is the Platts Common Industrial Estate. The curtilage is flanked by Wombwell Road to the north, which appears to have historically provided primary vehicular and pedestrian access to the former school on the site. To the west is Market Street highway, this does not appear to have provided vehicular access however an ancillary pedestrian access is visible from aerial photography.
- 2.2 Approximately 10% of the existing plan area is occupied by the derelict footprint of the former school located on the site. Adjacent to this are areas of impermeable hardstanding formerly associated with playground and car parking areas. The combined impermeable footprint on the site occupies approximately 25% of the plan area.
- 2.3 The remainder of the site is occupied by soft landscaped areas associated with the former use on the site. Vegetation largely consists of unkempt areas of grass and scrub vegetation with a disjointed tree line roughly following the site boundaries, thus largely screening the site from the surrounding area.
- 2.4 Owing to time constraints associated with the planning application, Stroma Technology have been unable to directly obtain sewer information from the sewerage undertaker, Yorkshire Water. It appears from the surveyed drainage layout that the surface water conveyance system serving the former building benefitted from a direct connection to an independent surface water sewer. At this stage it is not yet known if the hardstanding associated with the former playground and car parking areas on the site is positively drained.

3.0 Development Proposal

- 3.1 The proposal involves the construction of a retail foodstore (Use Class A1) with associated access, servicing, car parking and landscaping. It is anticipated that approximately 70% of the plan area would be occupied by hardstanding following development.
- 3.2 The site would be predominantly occupied by the food store unit which would comprise a footprint of approximately 2,634m² with a 1,858m² sales area. South eastern areas of the building would contain integral office facilities, staff amenity areas, toilet facilities, and stock storage areas.
- 3.3 The proposal site would incorporate significant hardstanding with 192 customer car parking spaces, access roads and loading areas. Hardstanding associated with pedestrian access to the store and trolley storage would immediately surround the building on the southern and western borders of the unit.
- 3.4 The proposed development would maintain vehicular access to the Wombwell Road highway north of the site, with pedestrian access taken from both Wombwell Road and Market Street to the west. The main entrance to the building would be located on the south western corner of the proposed building. The finished floor level of the proposed store would be approximately 131.5m AOD.

4.0 Historical Flooding

- 4.1 Following liaison with the Environment Agency it is understood that this authority holds no historical records relating to the site of fluvial, surface water, or groundwater flooding. Owing to time constraints associated with the application, we were unable to confirm with the drainage undertaker Yorkshire Water whether records of surface water and sewer flooding are held in their archives.

5.0 Fluvial/Tidal Flooding

- 5.1 The proposed development site is located in an area of Flood Zone 1 which is classified as the low fluvial/tidal flood risk area with an annual exceedance probability (AEP) of 0.1% on average in any year. The site levels are shown in the topographic survey to vary between 121.44m AOD and 136.3m AOD, which is elevated above the characteristic level of the wider area.
- 5.2 There are no fluvial or tidal watercourses within the vicinity of the site, with the closest being Short Wood Dike which is located 1.5km northwest of the proposed development site. This watercourse lies within the 75m AOD contour line on the Ordnance Survey base of the flood map. Although it is accepted that these levels are far from definitive, it is considered that where a 55m level of freeboard exists between the site and the watercourse flood plain, the indicative nature of OS contour lines is sufficient to discount the viability of a fluvial flood risk posed by Short Wood Dike.
- 5.3 To the southeast of the site is the disused course of the Dearne and Dove Canal (Elsecar Branch). This watercourse is located approximately 2.0km from the proposal site and lies within the 55m AOD contour line of the OS base of the flood map. This indicates a level of freeboard of approximately 75m exists between the site and the watercourse. The fluvial flood risk posed by this water course (associated with its supplying river) may therefore be discounted upon this basis.

6.0 Surface Water Runoff / Sewer Exceedance – Off Site

- 6.1 Because the plot is shown to lie solely in an area of Flood Zone 1, the low flood risk area which lies outside of the 1 in 1000 year (0.1% AEP) flood outline from fluvial and tidal flooding sources, the primary focus of the flood risk management on the site should be the sustainable management of surface water arising from the site as a result of increased impermeable areas proposed as part of development.

- 6.2 The Flood Risk Assessment should be read in conjunction with the drainage statement and design drawings produced by BSP Consulting. The principles of these reports should comply with the surface water management criteria defined in Planning Policy Statement 25 (PPS25) which requires consideration of the use of infiltration systems, followed by a discharge into an open water course, an independent surface water sewer, or lastly into a combined sewer in that order of sustainable preference.
- 6.3 Where full use of infiltration systems is shown not to be possible, the primary focus of the drainage strategy would be to ensure that the peakflow runoff rate associated with the 1%, 3%, and 100% AEP peak flow storm events is not increased by the development, and similarly, the volume of runoff discharging to an accepting watercourse or sewer should be reduced to the lowest practical level.
- 6.4 It is considered in terms of a permissible runoff rate to the public sewer, the existing peak flow runoff which can be proven to discharge to the public sewer should be considered the existing baseline peakflow runoff from the site. A reduced peakflow runoff rate equivalent to 70% of the existing peakflow runoff rate should be considered the permissible/limiting discharge rate, where use of infiltration systems is inappropriate. The peak flow urban runoff rates should be derived in accordance with the Wallingford Procedure/Modified Rational Method methodologies outlined in CIRIA's SuDS Manual, (CIRIA reference C697) or utilising reputable drainage software such as Micro Drainage, or the Masterdrain packages.
- 6.5 The hardstanding areas external to the derelict building footprint should be considered to have a greenfield runoff rate if it cannot be proven that these areas are positively drained to the public sewer. Grass, trees and scrubland areas should also be considered as greenfield in terms of their runoff characteristic. In accordance with the PPS25 guidance, the greenfield runoff rates should be derived using the Institute of Hydrology's report 124 methodology or using reputable drainage software.
- 6.6 The calculated greenfield runoff rate for proposed development footprint, over the existing derelict school building footprint may be added to 70% of the existing proven discharge to the sewer, and this would form the final permissible discharge rate.

Use of infiltration techniques

- 6.7 Percolation tests should be undertaken on the site in accordance with the BRE Digest 365 methodology to ascertain the viability of soak away for disposal of surface water volumes arising from the increased impermeable footprint on the site. Consideration of soak away is a vital consideration owing to the increased runoff volume anticipated as a result of development which would discharge irrespective of the peak flow runoff rate.
- 6.8 The findings of these studies will be determined by the porosity of the site soils, and used to predict the required depth of soak away units on the site. It is anticipated that these studies would be undertaken as part of the drainage study by BSP Consulting to be read in conjunction with this report. Storm water discharged from trafficked surfaces should be subject to an appropriate level of treatment in accordance with the SuDS management chain outlined in CIRIA's SuDS manual. Where soak away is not viable, attenuation systems should be considered.

Discharge rainwater to a watercourse

- 6.9 Owing to the location of the nearest open watercourse being 1.5km from the proposal site, it is envisaged that a direct discharge to this would not be a viable or practical solution for disposal of storm water from the site.

Discharge rainwater to a surface water drain

- 6.10 Connection to the existing independent surface water sewer, which it is anticipated formerly served the school on the site, is considered the optimum solution in terms of the viability and sustainability of surface water disposal from the proposal site. Ideally use would make use of the existing outfall from the site. The structural integrity of this, and capacity of the outfall should however first be ascertained by a CCTV drainage survey on the site before formulation of the final drainage plans.

Discharge rainwater to a combined sewer

- 6.11 Whilst connection to the Yorkshire Water drainage network may be unavoidable, the least desirable discharge is to connect to a combined sewer containing both foul and surface water. If no alternative connection is available then this should be used as a last resort and discharge attenuated to the lowest possible rate.

Evaluation of storage solutions

- 6.12 To mitigate any increase in downstream flood risk as a result of the proposed development, storm water storage should be provided on the site to ensure no flooding from the 1% AEP storm event plus a 20% climate change allowance, with consideration for the allowable limited discharge from the site. The most viable methods of storm water storage are summarised below;

Rainwater harvesting

- 6.13 The most sustainable option is always to store rainwater on site, for use at a later time in a system such as the Storm Bank Rainwater Harvesting System. This option would disassociate the run-off from the storm event, thus removing the demand on the drainage system at peak times. In addition, it is recognised that re-use, rather than recycling, is more sustainable.
- 6.14 The sustainability would be increased further by using this stored water to replace highly refined, mains water supplied to the site. Some uses for this water can be in sanitary ware, irrigation and cleaning, amongst others. Analysis of water use on site would provide volumes of possible gains. At this early stage of the proposal it is understood that rainwater harvesting would be used for all toilet flushing in the unit.
- 6.15 For a development of this size and nature the potential water saving could be significant, however these volumes should not be calculated as part of the attenuation volume as these could not be guaranteed to remain free prior to a storm event, as the emptiness of the harvester would be dependent upon water use within the retail unit.

Green roofs

- 6.16 Under most circumstances green roofs would be a viable installation on large, flat roofed buildings such as the proposed, and a tangible benefit with regard to the anticipated peak flow runoff rate, and volume being discharged to the public sewer would be expected. The use of green roofs in this scenario is precluded by the incorporation of roof lights and wind catchers, anticipated as part of the Tesco Environmental Store Concept. This method of storm water attenuation is given no further consideration upon this basis.

Attenuate rain water in swales, wetlands and ponds

- 6.17 The use of ponds would result in the removal of these volumes from the sewer and overflow could be designed to discharge at varying times and rates of flow. On this site there is scope for the inclusion of reed beds and ponds in the soft landscaping areas however it is considered that these areas may well be susceptible to vandalism owing to the unrestricted access to the site.
- 6.18 The potential of these areas may also be limited by the lack of option to discharge large volumes of surface water to the ground. The use of this site, as a commercial site, may also limit the possibilities for large open water bodies on safety grounds and owing to loss of amenity space.

Attenuate rain water in tanks or sub base areas

- 6.19 There is scope for storing all storm water arising from the increased impermeable area on the site, in below ground open or sealed storage units such as the Stormbloc or Storm Cell products. Alternatively, storage could be provided in the aggregate sub base voids underlying permeable, hard surfaces, prior to discharge of surface water to soak away or the public sewer. It is anticipated that this would be a viable solution for storage without increasing project costs, as the structural requirements associated with HGV loading of hardstanding on the site will require a significant depth of aggregate

within the sub base. It is anticipated that this alone will provide ample storage within the aggregate void spacings for the 1% AEP plus climate change critical storage volume.

- 6.20 The most appropriate area for inclusion of subterranean storage would be beneath the proposed new car parking and loading areas and under private access roads. These areas could be left as an open system where groundwater conditions permit allowing for complete/partial infiltration of storm water volumes, where this is a suitable principle, which will in part be governed by the viability of the appropriate treatment of runoff. If infiltration is not suitable, then these areas could be sealed with a liner and act as the storage unit for an attenuation system.
- 6.21 To reduce underground storage volume, all runoff discharging to the sewer above the permissible discharge rate associated with the 1 in 30 year critical storm water volume plus 20% climate change could be accommodated below ground. Provision could then be made to accommodate the remaining volume, up to and including the critical 1 in 100 year storm with a 20% allowance for climate change, in sealed above ground basins formed by car parking areas.

7.0 Surface Water Run Off / Sewer Exceedance – On Site

- 7.1 At a site specific level, there is a risk that surface water from surrounding areas may inundate the proposed food store building on the site following intense rainfall events which pass across impermeable hardstanding or exceeds the capacity of surrounding soils.
- 7.2 The greatest risk of runoff water would be that from large continuums of hardstanding areas such as the adjacent Wombwell Road and Market Street highways adjacent to the site, and from internal areas of hardstanding such as the proposed food store, and areas of car parking associated with this.
- 7.3 Surface water drainage, is in situ on the Wombwell Road and Market Street highways, and would be provided on the proposed private access road. This would reduce the risk of surface water flooding from the highway, but could pose a flood risk in terms of sewer blockage or surcharging of the system resulting from a heavy rainfall event.
- 7.4 The Market Street highway adjacent to the site falls from its junction with Wombwell Road immediately west of the site to the south, beyond the site curtilage. Therefore, under the blockage/surcharge circumstance, significant overland flow paths along this highway would be channelled away from the site, confined by raised kerbs which provide approximately 100mm freeboard above the road gutter surface. These would largely prevent lateral movement of surface water off the public highway on to the site curtilage. The risk of surface water flooding from this highway is therefore considered low.
- 7.5 The Wombwell Road highway poses a more prominent flood risk to the site in terms of surface water runoff. This highway is shown to fall from the south west along a distance of approximately 0.75km to a point immediately northwest of the proposed development site, where surveyed levels are 134.96m AOD. Following intense rainfall overwhelming the highway drainage system, it is considered that pooling of surface water in this area could occur, and subsequently exceed the raised kerbs, and site thresholds, resulting in overland flow onto the proposed site.

- 7.6 Where overland flow from the adjacent highway did enter the curtilage, it is considered that the fall of the site to the south and east would be sufficient to naturally drain these volumes of surface water from the site, without on site ponding. It is considered that these flows would characteristically be shallow and slow flowing, and would not pose a danger to users of the site. Under most circumstances these would be expected to enter permeable pavement areas if incorporated with no tangible effect on the site.
- 7.7 The improved design of the onsite drainage system would accommodate flows up to and including the 1% AEP Storm with a 20% allowance for climate change. This would represent a reduced flood risk compared to the base line condition of the existing drainage network which is designed to an indeterminate standard. The new standard of design would largely negate the risk of overland flow from internal hardstanding areas.

8.0 Ground Water Flooding

- 8.1 It is considered highly unlikely that groundwater flooding would pose a risk to the development site and its occupants owing to the land form of the site and the surrounding area. The elevation of the site at approximately 130m AOD places it significantly above areas of surrounding land, and, as such it should be considered to be at a lower ground water flood risk from the wider groundwater table.
- 8.2 It is considered that a perched groundwater table could theoretically exist on the site, if a permeable soil, perhaps a made ground, overlay an impermeable subsoil or Bedrock. Owing to the convex landform of the site, it is considered that any emergence of groundwater across the site would be unlikely, and pooling of already emerged ground water could not occur for this reason. As such, significant depths could not amass and the flood risk from this perspective would remain low.

9.0 Access and Escape

- 9.1 Owing to the sites location in flood zone 1, the site is considered to provide a safe, dry access and egress route in accordance with Planning Policy Statement 25 with consideration for all locally occurring fluvial flooding for up to the 0.1% AEP scenario.

10.0 Loss of Flood Water Storage

- 10.1 Because the site does not lie in a fluvial/tidal floodplain, compensatory floodplain storage volume is not considered a statutory requirement for a PPS25 compliant Flood Risk Assessment in Flood Zone 1.

11.0 Mitigation

- 11.1 No specific mitigation measures are considered necessary for the compliance of the scheme with PPS25. A raised threshold should however be considered on the access to Wombwell Road associated with the proposed food store, as this would initially prevent ingress of surface water flows onto the site during minor failure of the highway drainage system. The threshold could be designed to match the crest level of the existing raised kerbs immediately adjacent to the access, and would prevent ingress of storm water depths up to approximately 100mm at this point on the highway.

12.0 BREEAM

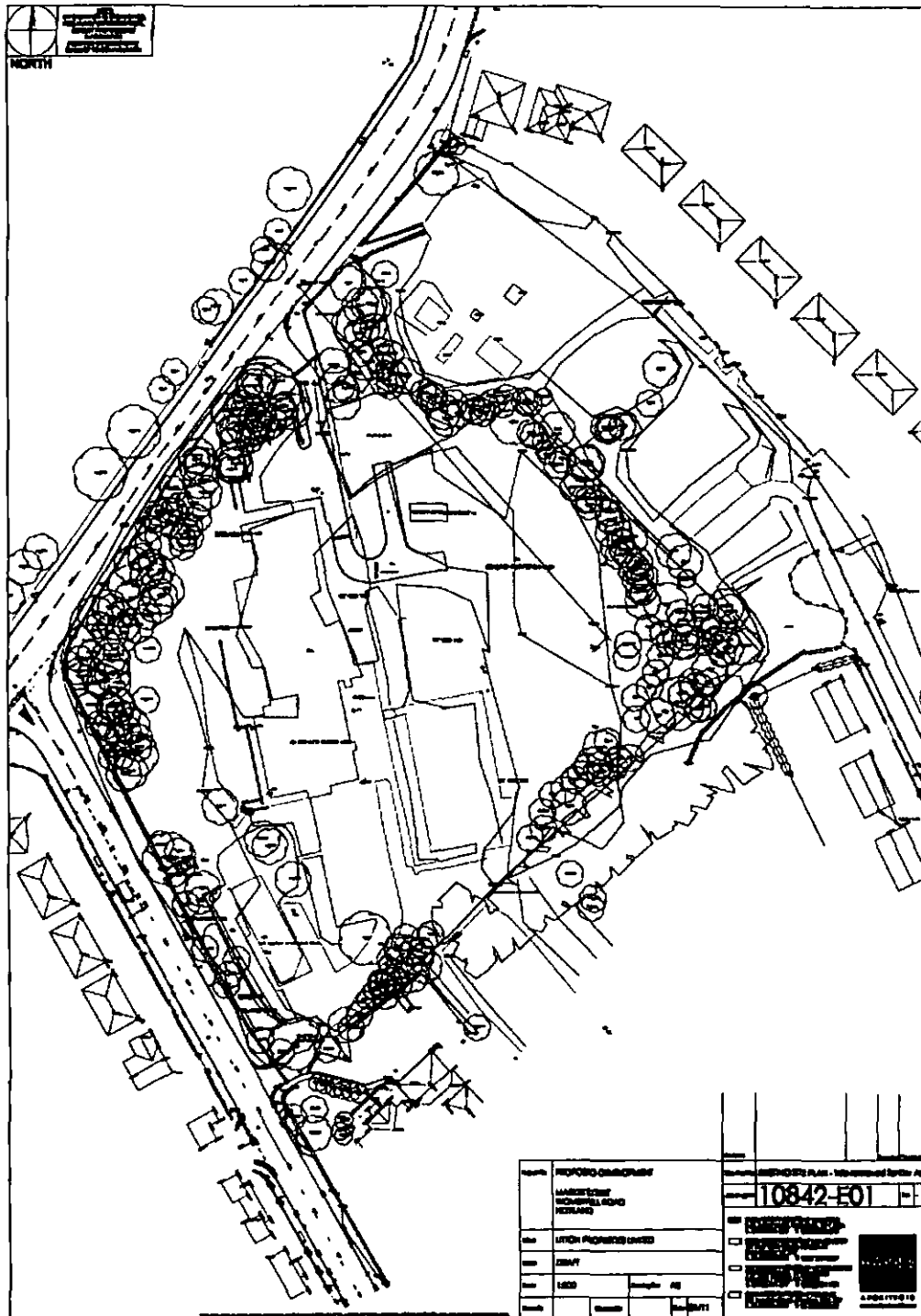
- 12.1 If the proposed food store is to undergo a BREEAM Assessment, it is considered that the evidence in this report is sufficient for the development to obtain the two 'flood risk' credits under Pol 5, because the assessed development is situated in a flood zone that is defined as having a low annual probability of flooding, and this site specific Flood Risk Assessment confirms that there is a low risk of flooding from all sources. The additional SuDS credit available under Pol 5 may be obtained by the BSP drainage strategy.

13.0 Conclusion

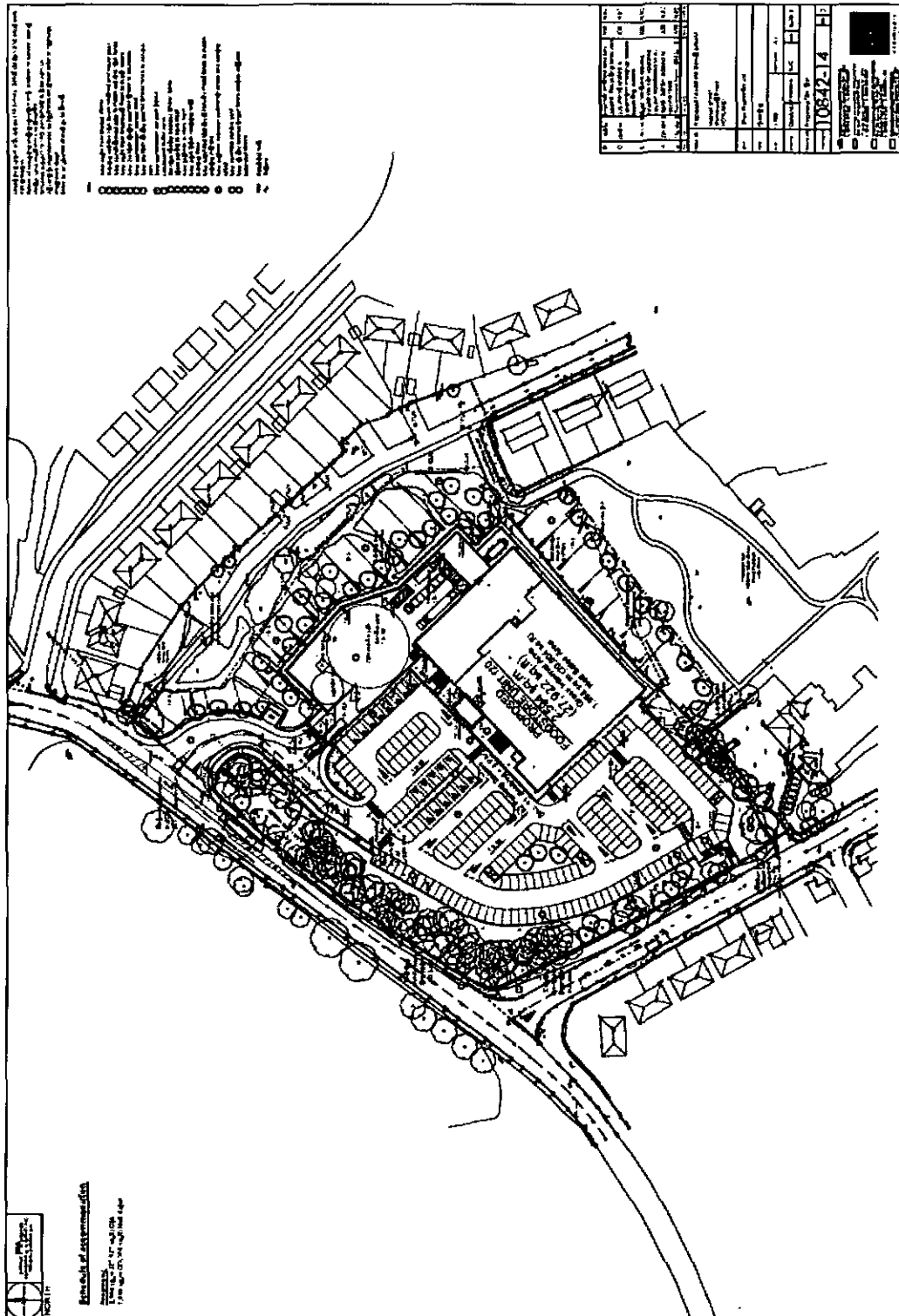
- 13.1 The proposed site is in an area of Flood Zone 1, the low fluvial flood risk area, and upon this basis all forms of development are considered appropriate from the perspective of PPS25. The site reduces the flood risk vulnerability classification of the site from 'more vulnerable' to 'less vulnerable' development to flooding.
- 13.2 Flooding from rivers and groundwater flooding is discounted upon the basis of the site elevation and landform, and an increased standard of storm water drainage is considered sufficient to negate the risk of surface water flooding from internal hardstanding for events up to the 1% AEP + Climate Change storm event on the site.
- 13.3 The residual flood risk to the site is considered as surface water flows arising from Wombwell Road. These volume flows could not be altered by the proposal, but their effects could be mitigated through a raised site threshold and/or designated safe flow routes through the site. The proposed food store would not incorporate raised floor level owing to accessibility requirements associated with shopping trolleys, wheelchairs etc, but this unit constitutes a 'less vulnerable' land use to flooding and as such this is deemed a tolerable risk compliant with PPS25.
- 13.4 Upon the above basis it is considered that the proposal accords with the principles contained within PPS25, and should be allowed to proceed on the basis of the proposed mitigation and the full drainage design by BSP Consulting.

Appendix A

Existing Topographical Survey



Proposed Site Plan



Appendix C

Flood Risk Map

