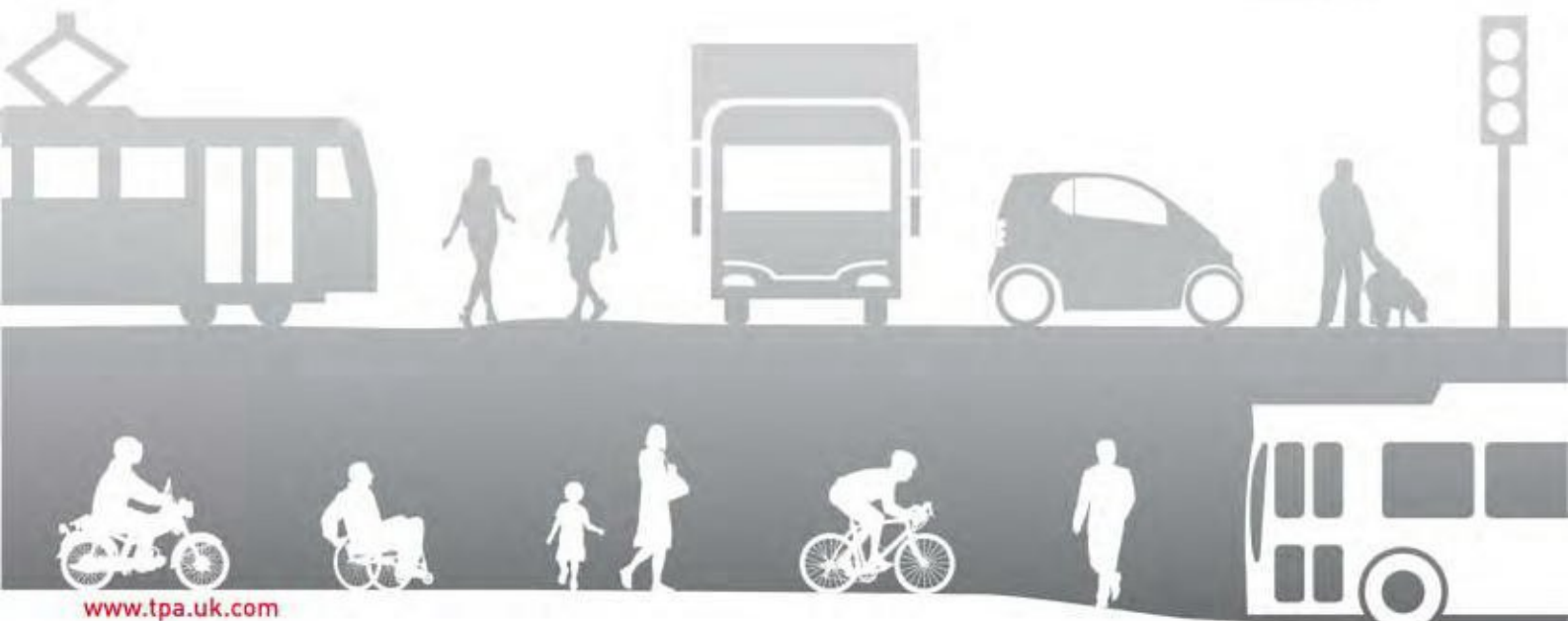


A Planning Application by
COTSWOLD BMW GROUP

In respect of
**Flagship Dealership with Car Showroom and Servicing,
GROVEFIELD WAY, CHELTENHAM**

**Site Specific Flood Risk Assessment
and Surface Water Management Plan**

June 2013




DOCUMENT SIGNATURE AND REVIEW SHEET

Project Details

Project Title:	Flagship Dealership with Car Showroom and Servicing, GROVEFIELD WAY, CHELTENHAM		
Project No.:	1303-30	Report No.:	1303-30/FRA/01/A
Client:	COTSWOLD BMW GROUP		

	Prepared By:	Checked By:	Approved for issue
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Date	JUNE 2013	JUNE 2013	

Document Review

Revision	Date	Description	Checked By
A	25.06.13	Amended to suit Rainwater Harvesting requirements.	CMR 

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1 EXECUTIVE SUMMARY

INTRODUCTION

- 1.1 Transport Planning Associates have been appointed to provide a combined Site Specific Flood Risk Assessment (FRA) and Surface Water Management Plan (SWMP) for Cotswold BMW Group's land off Grovefield Way, Cheltenham.
- 1.2 The purpose of this FRA and SWMP is to identify the historical, current and future flood risks of the development as well as to identify the developer's strategy to reduce the impact of the development upon the neighbouring surface watercourses.
- 1.3 This Flood Risk Assessment has been carried out in accordance with the National Planning Policy Framework (NPPF), March 2012 and Planning Policy Statement 25 annexes D and E, which although have now been replaced by the NPPF, are still best practice methods to proving the appropriateness of a site's proposals with regards to its location and its susceptibility to flooding. The Surface Water Management Plan has been carried out in accordance with PPS25 Annex F and Ciria document C697 'The SuDS Manual'.

METHOD STATEMENT

Flood Risk Assessment

- 1.4 To ascertain the potential flood risks to the development site a desktop study has been undertaken gathering information from the British Geological Survey 'Bedrock Map', the Environment Agency 'Flood Maps', and historical and current regional information from the 'Strategic Flood Risk Assessment for local development framework – Level 1' – produced by Halcrow, on behalf of Cheltenham Borough Council, dated September 2008, the 'Preliminary Flood Risk Assessment' – produced by Gloucestershire County Council, dated November 2011 (see Appendix D).
- 1.5 Early correspondence with the Environment Agency's (EA) Riversmeet House, Tewkesbury, Gloucestershire office, helped to determine the local areas main points for concern. Local knowledge of the area provided valuable information on the EA's concerns for the site which will be addressed within the report.
- 1.6 Information found within these resources was then used to ascertain the development site's risk of flooding through following the guidance provided within the PPS 25, Annexes D and E. The annexes provide categorisation methods to ascertain the risk of flooding to the development site, its potential to increase flooding to the immediate and broader areas, the proposed land use's appropriateness to the flood zone and the mitigating requirements of the flood risk assessment to prove its appropriateness for development.

Surface Water Management Plan

- 1.7 Planning Policy Statement 25, Annex F outlines the requirements of the Surface Water Management Plan to satisfy the development's requirements to reduce the risk of flooding to the immediate and surrounding areas.

- 1.8 As the development site is more than 1 hectare the Environment Agency will be consulted at the planning stage of the development and as such will require proof that the proposed development will not increase the existing Greenfield surface water run-off discharge rate or volume. The Interim Code of Practice for Sustainable Drainage Systems (ICPSuDS) (for developments less than 50ha) method of calculating Qbar was used to calculate the Greenfield run-off rate.

- 1.9 The SWMP will acknowledge the sources of flooding discovered in the FRA, provide guidance to the developer on how to manage surface water run-off and provide evidence that proves that the developed site's surface water run-off will be managed on-site, using appropriate SuDS, to at least mimic existing Greenfield run-off flows.

2 EXISTING SITE CONDITIONS

SITE DESCRIPTION

- 2.1 The parcel of land as identified on the site location plan (Appendix A.1) is located approximately 2 kilometres west of Cheltenham town centre, approached by Grovefield Way, a major access road which joins the A40 approximately 800m north from the site. The existing site is located within the business sector of Cheltenham and is surrounded by either agricultural land or business buildings. There are no main rivers running through or in the immediate vicinity of the site, although there is an unnamed ordinary watercourse which runs along the northern boundary of the site before being culverted where it crosses beneath the A40.
- 2.2 The commercial scheme area consists of approximately 2.35 hectares of green fields and is bounded by tree lined hedgerows. The site has a level difference of up to 6m from approximately 38.5mAOD on the south-east boundary, to approximately 32.5mAOD in the north-west corner of the development site.
- 2.3 The British Geological Survey and Environment Agency Maps have been studied to identify the site's Geological and Hydrogeological properties. The following figures show the information shown within them.

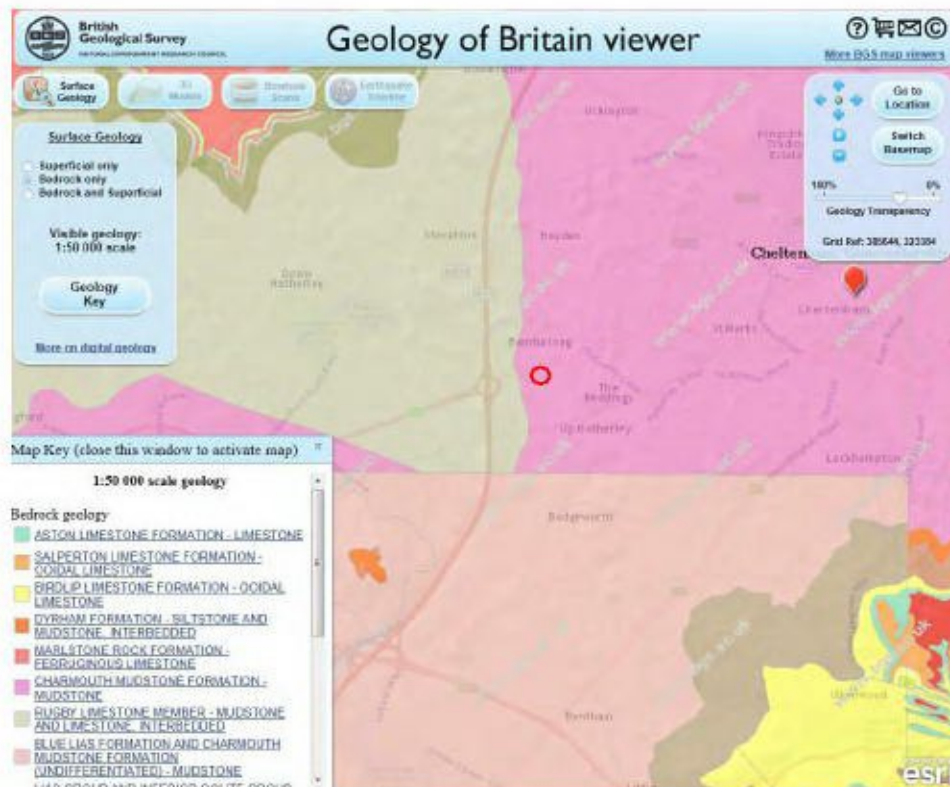


Figure 1a British Geological Survey Data – Bedrock Map

- 2.4 As can be seen in Figure 1a the British Geological Survey 'Bedrock Map', the site is underlain by the Charmouth Mudstone formation classification of bedrock material, a sedimentary bedrock formed approximately 190 to 202 million years ago in the Jurassic Period, where the local environment was previously dominated by shallow seas. There is no evidence of superficial deposits located within this area.

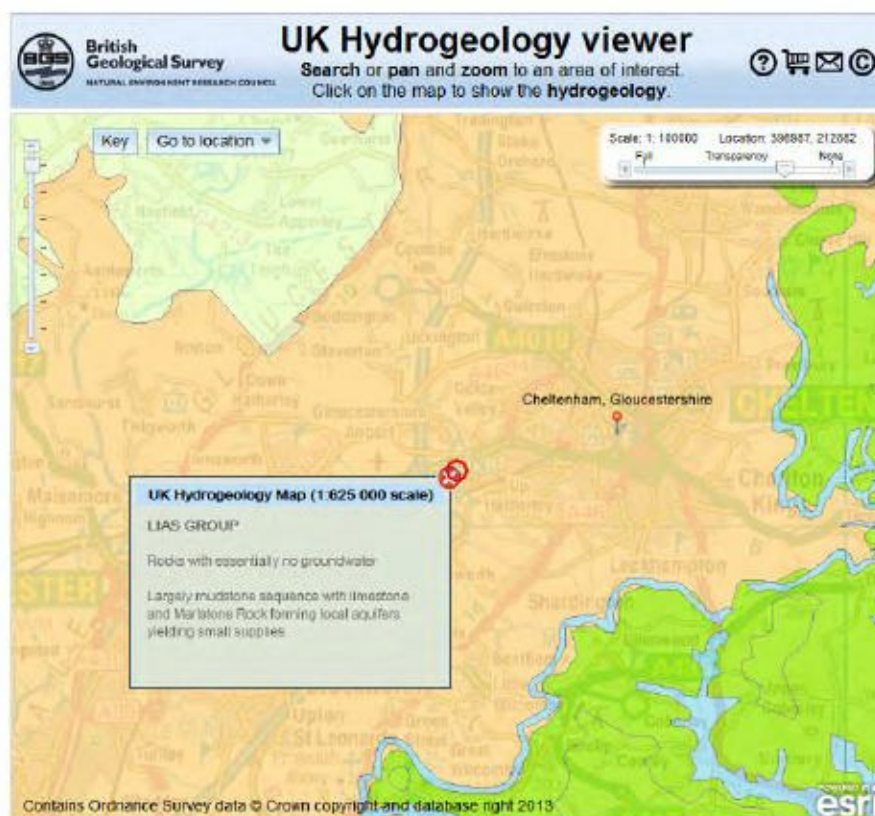


Figure 1b British Geological Survey Data – UK Hydrogeology Map

- 2.5 Figure 1b the British Geological Survey Data 'UK Hydrogeology Map' shows the potential for the ground to hold water. The area surrounding the development in Cheltenham is over the Lias group of bedrock material where the ground essentially has no groundwater. As shown on the map some local intrusions of Limestone provide localised aquifers with low yielding capacity.
- 2.6 Further to the map information in figures 1a and 1b above, an assessment of the site's infiltration properties is required to identify the site specific hydrological properties and storage capabilities. Although the map information provided in Figures 1a and 1b shows the ground to have little or no infiltration properties, site based trial pits with infiltration testing will provide more accurate ground properties which would not necessarily be shown on the maps.
- 2.7 A 'Site Investigation Report' carried out by Structural Soils Ltd in July 2008, provided information on three infiltration tests carried out across random locations on site. The results showed no soakage for the duration of the tests which were carried out in

accordance with BRE365 (see Appendix G). Soakaways would not be practical to use on this site.

SURFACE WATER RUN-OFF ANALYSIS

- 2.8 The development site is classified as being Greenfield with the site being solely covered in vegetation. The Surface Water run-off for the site is accepted at the Greenfield run-off rate, in accordance with PPS25, Annex F – Managing Surface Water.
- 2.9 Windes and the ICP-SUDS was used to calculate the Greenfield Run-off rate for the onsite development, (IH124 would be used if the development site is greater than 50 ha in area). The site area, amounts to approximately **2.35 ha** and based on Flood Studies Report (FSR) Figure 1.2.4, gives a $QBAR_{rural}$ (average annual flood) rate of **8 l/s** (see Appendix C.1). The proposed development must not generate more runoff than this if it is proposed to discharge to a natural watercourse.
- 2.10 The developed site will provide 1.65 ha of impermeable area, made up of 0.761ha from roof area, 0.142 ha from driveways, 0.037 ha from footpaths and .0668 ha from driveways and parking bays.
- 2.11 Since the implementation of the Flood and Water Management Act, April 2010, new developments have to recognise exceedance in design. Appendix A.5 shows the overland flood route for the site based on existing site levels. The arrows shown on the plan indicate the direction of run-off flow through the site. Additional arrows outside the site are also shown indicating how run-off from the site affects neighbouring landowners.

3 FLOOD RISK ASSESSMENT - CONSULTATION AND POLICY GUIDANCE

CONSULTATION

- 3.1 As part of the research into the Flood Risk Assessment for this development, the Environment Agency (EA) and Severn Trent Water were consulted.
- 3.2 The response from looking at the EA flood maps confirms that the development site falls within Flood Zone 1. As the site is greater than 1 ha, Annex's D and E of PPS25 should still be adhered to within the planning application and that a Site Specific Flood Risk Assessment with incorporated Surface Water Management Plan should be submitted with the planning application.
- 3.3 The EA 'Flood Map' (see Appendix E) helped to ascertain the Flood Zone for the site with reference to the site's proximity to potential flood sources. The flood map for the area covering Grovefield Way showed the site as being within Flood Zone 1 where there is a less than 0.1% or 1 in 1000 probability of flooding in any one year. The nearest area for concern is approximately 750m south of site along Ham Brook an ordinary watercourse and tributary of the River Severn that runs through Gloucester approximately 7.69km west from the site.
- 3.4 Early correspondence with the EA confirmed the site is situated on Lias Formation Clays. The aquifer designation of the bedrock material was designated as being Unproductive, whereby the material's capacity for the storage of groundwater is too low to recognise.
- 3.5 The groundwater vulnerability designation for the site is Minor whereby the potential for groundwater to pose a flood risk to the site is low.
- 3.6 The EA confirmed that the site is not located over a groundwater source protection zone, whereby the site's location is far enough away from a source of drinking water to be deemed to have no impact.
- 3.7 The EA confirmed that the site is located in an area where surface water is vulnerable to Nitrates. Sites within these zones must comply with the Nitrate Pollution Prevention Regulations 2008, which are about to be amended during 2013. The impact of Nitrates upon the surface water strategy will require water cleansing facilities within the SuDS.
- 3.8 Asset Location searches were also carried out as part of this assessment with Severn Trent Water and their response was received in May 2013. The Asset Location maps show the location of a public Foul Water sewer within North Road West which runs along the southern boundary of the site. The map information provided shows a public surface water sewer running in a northerly direction along the length of Grovefield Way to the eastern

boundary of the site (see Appendix B for Asset location maps provided by Severn Trent Water).

POLICY GUIDANCE

3.9 The Flood Risk Assessment has considered National Policy and Local planning strategies in order to understand the wider implications of the development upon its surrounding area.

3.10 NATIONAL POLICY - 'NATIONAL PLANNING POLICY FRAMEWORK' (NPPF), MARCH 2012.

3.11 The NPPF takes over from where PPS25 left off, although looks further into more community driven priorities. Its main driver is sustainability making developments concentrate on how the proposals impact upon the community in which it resides. It incorporates a number of key objectives including providing quality homes, improving quality of life and meeting the challenge of climate change, flooding and coastal change.

3.12 Where the NPPF relates to Flooding and Flood Risk it states:-

100. *Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:*

- *Applying the Sequential Test;*
- *If necessary, applying the Exception Test;*
- *Safeguarding land from development that is required for current and future flood management;*
- *Using opportunities offered by new development to reduce the causes and impacts of flooding; and*
- *Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking*

101. *The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment will provide the*

basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding.

102. *If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding; the Exception Test can be applied if appropriate. For the Exception Test to be passed:*

- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the test will have to be passed for development to be allocated or permitted.

Table 1 Flood Zones Categorization (PPS25 Table D.1)

<p>Zone 1 Low Probability</p> <p>Definition</p> <p>This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).</p> <p>Appropriate uses</p> <p>All uses of land are appropriate</p> <p>FRA requirements</p> <p>For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or local considerations require particular attention. See Annex E for minimum requirements.</p> <p>Policy aims</p> <p>In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of development, and the appropriate application of sustainable drainage techniques.</p>
<p>Zone 2 Medium Probability</p> <p>Definition</p> <p>This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5 -0.1%) in any year.</p> <p>Appropriate uses</p> <p>The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in table D.2 are appropriate in this zone.</p> <p>Subject to the Sequential Test being applied, the highly vulnerable uses in table D.2 are only appropriate in this zone if the Exception Test is passed.</p> <p>FRA requirements</p> <p>All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.</p>

<p>Policy aims</p> <p>In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.</p>
<p>Zone 3a High Probability</p> <p>Definition</p> <p>This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.</p> <p>Appropriate uses</p> <p>The water-compatible and less vulnerable uses of land in Table D.2 are appropriate in this zone.</p> <p>The highly vulnerable uses in table D.2 should not be permitted in this zone.</p> <p>The more vulnerable and essential infrastructure uses in table D.2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.</p> <p>FRA requirements</p> <p>All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.</p> <p>Policy aims</p> <p>In this zone, developers and local authorities should see opportunities to:</p> <ol style="list-style-type: none"> i. reduce the overall level of flood risk in the area through the layout and form of development and appropriate application of sustainable drainage techniques; ii. relocate existing development to land in zones with a lower probability of flooding; and iii. create space for flooding to occur by restoring functional flood plain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.
<p>Zone 3b The Functional Flood Plain</p> <p>Definition</p> <p>This zone comprises land where water has to flow or be stored in times of flood.</p> <p>Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.</p> <p>Appropriate uses</p> <p>Only the water-compatible uses and the essential infrastructure listed in table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to:</p> <ul style="list-style-type: none"> - remain operational and safe for user in times of flood; - result in no net loss of floodplain storage; - not impede water flows; and - not increase flood risk elsewhere. <p>Essential infrastructure in this zone should pass the Exception Test.</p> <p>FRA requirements</p> <p>All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.</p> <p>Policy aims</p> <p>In this zone, developers and local authorities should seek opportunities to:</p> <ol style="list-style-type: none"> i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and ii. relocate existing development to land with a lower probability of flooding.

Table 2 Flood Risk Vulnerability Classification (PPS25 Table D.2)

<p><u>Essential Infrastructure</u></p>	<p>Essential transport infrastructure (including mass excavation routes) which has to cross the area at risk.</p> <p>Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.</p> <p>Wind turbines.</p>
<p><u>Highly Vulnerable</u></p>	<p>Police stations, Ambulance stations and Fire station and Command centres and telecommunications installations required to be operational during flooding.</p> <p>Emergency dispersal points.</p> <p>Basement dwellings.</p> <p>Caravans, mobile homes and park homes intended for permanent residential use.</p> <p>Installations requiring hazardous substances consent. (where there is a risk demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').</p>
<p><u>More Vulnerable</u></p>	<p>Hospitals.</p> <p>Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.</p> <p>Buildings used for: dwelling houses; student's halls of residence; drinking establishments; nightclubs; and hotels.</p> <p>Non-residential uses for health services, nurseries and educational establishments.</p> <p>Landfill and sites used for waste management facilities for hazardous waste.</p> <p>Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</p>
<p><u>Less Vulnerable</u></p>	<p>Police, ambulance and fire stations which are not required to be operational during flooding.</p> <p>Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure.</p> <p>Land and buildings used for agriculture and forestry.</p> <p>Waste treatment (except landfill and hazardous waste facilities).</p> <p>Mineral working and processing (except for sand and gravel working).</p> <p>Water treatment works which do not need to remain operational during times of flood.</p> <p>Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).</p>

Water-compatible Development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Dock, marinas and wharves. Navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.
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Table 3 Flood Risk Vulnerability and Flood Zone ‘Compatibility’ (PPS25 Table D.3)

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	x	Exception Test required	✓
	Zone 3b	Exception Test required	✓	x	x	x

3.13 This development site is within Flood Zone 1 (Table 1), the proposed commercial land use is categorised as being ‘Less Vulnerable’ from effects of flooding (Table 2). Table 3 indicates that a ‘Less Vulnerable’ categorised site, such as proposed for this site, is an appropriate land use for a Flood Zone 1 and an Exception Test is not required.

NATIONAL POLICY – ‘PLANNING POLICY STATEMENT 25, DEVELOPMENT AND FLOOD RISK’ (PPS 25), MARCH 2010.

- 3.14 PPS 25, although now replaced by the NPPF, is still a useful guide to proving the appropriateness of a site's proposals with regards to its location and its susceptibility to flooding.
- 3.15 The policies outlined in PPS25 are designed to make regional and local planning authorities re-consider land uses in their strategic development plans, concentrating on the suitability of land uses within flood zones and give clear guidance on their responsibilities. Planning applications for individual developments will therefore have to consider the suitability of the proposed land use in the flood zone prior to the planning application.
- 3.16 Annex D of PPS25, refers to the 'Sequential Test', a tool used to gauge the suitability of a proposed development within a flood zone, with guidance being made to steer new development towards flood zone 1. Table D.1 outlines the categorisation of the different flood zones with flood zone 1 having the lowest probability and flood zone 3b having the highest with suitability being a Functional Floodplain. Table D.2 classifies the vulnerability of land uses from flooding. Table D.3 then matches the compatibilities of the site's vulnerability with the flood zone and then sees if an 'Exception Test' is required.
- 3.17 Annex E of PPS25, refers to 'The Assessment of Flood Risk', outlining the necessity of all developments to produce a Flood Risk Assessment that clearly proves that the proposed development has identified the sources of flood risk and mitigating measures that are required to reduce the risk of flooding to the users of the development in the future. Paragraph E.9 states:
- Planning applications for development proposals of 1 hectare or greater in Flood Zone 1 and all proposals for new development located in Flood Zones 2 and 3 (see Table D.1, Annex D) should be accompanied by a FRA. This should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed, taking climate change into account. For major developments in Flood Zone 1, the FRA should identify opportunities to reduce the probability and consequences of flooding. A FRA will also be required where the proposed development or change of use to a more vulnerable class may be subject to other sources of flooding (see Annex C) or where the Environment Agency, Internal Drainage Board and/or other bodies have indicated that there may be drainage problems.
- 3.18 Annex F of PPS25, refers to 'Managing Surface Water', outlining the need to implement a strategy for dealing with surface water runoff as part of the Flood Risk Assessment. This annex refers to the effect of the development upon the surrounding area with a need to reduce its permeability. The annex also introduces the need for a sustainable urban drainage systems to be incorporated where possible on site to manage surface water in a manner which is easy to maintain and which provides benefit to the area. Reference to the Local Planning Authority's need to promote the use of SuDS is also made.

REGIONAL STRATEGY

'PRELIMINARY FLOOD RISK ASSESSMENT' (PFRA) – GLOUCESTERSHIRE COUNTY COUNCIL – NOVEMBER 2011

- 3.19 The PFRA was prepared by Gloucestershire County Council to fulfil their requirements as the Lead Local Flood Authority (LLFA) under the Flood Risk Regulations. The purpose of the PFRA was to assess past and future floods with significant harmful consequences and identify the areas of most significant flood risk in the catchment. The PFRA aimed to assess past flood incidents, identify the potential for future flooding and identify the area's most susceptible to significant flooding to aid the production of a flood mitigation strategy.
- 3.20 Gloucestershire identifies its catchment as being predominantly rural in setting whose population is mainly centred on Gloucester, Cheltenham, Stroud and Cirencester. The River Severn is the main Catchment River in the county although some of the southern Cotswold district feeds the River Thames and the western side of the Forrest of Dean feeds the River Wye.
- 3.21 Historical flooding incidents within the area are:-
- Cheltenham Borough – July 1967 & summer 2007.
 - Cotswold District – March 1947, July 1968, August 1977, Sept 1992, Oct 1993, April 1998, Dec 2000, Summer 2007, Jan 2008.
 - Forest of Dean – March 1947, July 1968, Dec 1981, Dec 2000, summer 2007.
 - Gloucester City – Jan 1939, March 1947, July 1968, Dec 1981, Jan 1990, Dec 2000, Summer 2007.
 - Stroud – Jan 1939, March 1947, Dec 1965, July 1968, Dec 1981, Jan 1990, Dec 2000, Summer 2007.
 - Tewkesbury Borough – Jan 1939, March 1947, July 1968, Dec 1981, 1985, Jan 1990, April 1998, Dec 2000, Summer 2007.
- 3.22 The PFRA identified that the floods of the summer of 2007 were created by a dry spring followed by prolonged periods of intense rainfall which led to surface water overloading sewers and high river levels bursting their banks.
- 3.23 Cheltenham is mentioned in the historic flooding part of the report as having over 600 properties being flooded by the summer 2007 floods. Cheltenham suffered from Fluvial (River Chelt, Wymans Brook, Hatherley Brook, Mill Stream), surface runoff and exceedance from highway drains and public sewers. The areas mainly affected were

Charlton Kings (70 properties), River Chelt (230 properties), Hatherley (100 properties), Prestbury (70 properties) and Whaddon (250 properties).

- 3.24 Although there were several areas severely affected by flooding as mentioned above, the population densities within these areas weren't high enough to make it to the Environment Agency's Flood Risk Areas.

LOCAL STRATEGY

'STRATEGIC FLOOD RISK ASSESSMENT FOR LOCAL DEVELOPMENT FRAMEWORK – LEVEL 1' – PRODUCED BY HALCROW, ON BEHALF OF CHELTENHAM BOROUGH COUNCIL, DATED SEPTEMBER 2008.

- 3.25 The purpose of the level 1 SFRA was to assess and map all forms of flood risk from groundwater to river sources taking into account future climate change to allow councils to use as an evidence base for locating future development.
- 3.26 The SFRA breaks down the Borough into Flood Risk Zones in accordance with PPS25 'Development and Flood Risk', this information helps to set out the Borough's spatial strategy for development.
- 3.27 Historic flood map information provided within the report identified two areas close to the development site as suffering flooding during the July 1968 floods, one approximately 50m north-west of the site on the opposite side of the A40, the other approximately 100m south-west of the site on the Reddings. The historic flood map also shows areas along Hatherley Brook which suffered flooding during the summer 2007 floods, the nearest being approximately 200m east of the site next to the roundabout junction with the A40.
- 3.28 The information found within this report identified that although the development site itself was not subject to flooding historically and is not predicted to suffer flooding in the future, consideration will need to be made towards both Hatherley Brook and the Reddings, two areas which have historically suffered flooding.

4 SURFACE WATER MANAGEMENT PLAN (SWMP)

- 4.1 Currently the development land is made up of approximately 2.35 ha of green fields on the outskirts of Cheltenham, adjacent to the A40. The site has no evidence of built structures, is bound to the north and east with hedgerows with the south and west boundaries being unbound, forming part of the overall larger site for future development. It is proposed to provide a new access road off Grovefield Way, a Flagship Dealership with car showroom and servicing building with a 3000m² footprint and car parking. The developed site will provide approximately 1.65 ha of impermeable area.
- 4.2 The introduction of Schedule 3 of the Flood and Water Management Act, 2010, when it arrives, intends to put the onus of flood risk and the management of surface water onto the Lead Local Flood Authority. The implementation of the National SuDS Standards in October 2013 will provide the SuDS Approving Body (already set up within local councils) with implementable standards which they will use to assess suitability of development proposals.
- 4.3 Paragraph 3.8 confirms that the Asset Location maps, provided by Severn Trent Water, show the location of a public Foul Water sewer within North Road West which runs along the southern boundary of the site. The map information provided shows a public surface or combined water sewer running in a northerly direction along the length of Grovefield Way to the eastern boundary of the site. Foul Water sewers from the development can connect to the existing public Foul Water Sewer under a Section 104 agreement with Severn Trent Water, (see Appendix B for details of the asset location maps).
- 4.4 PPS 25 Annex F paragraph F8 says, 'Regional planning bodies and local authorities should promote the use of SuDS for the management of run-off. Local Planning Authorities (LPAs) should ensure that their policies and decisions on applications support and complement Building Regulations on sustainable rainwater drainage. These give priority to the use of infiltration drainage systems over first watercourses and then sewers.'
- 4.5 PPS25 Annex F paragraph F10 says, 'The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development, unless specific off-site arrangements are made and result in the same net effect.'
- 4.6 It is proposed that the presence of a suitable Aquifer is unlikely beneath the site and based on this the SWMP recommends the use SuDS for attenuation purposes only in a manner which actively reduces the discharge rate of the surface water runoff from site and provides water cleansing.
- 4.7 To achieve this, the drainage strategy recommends the use of the following:-

- Domestic drainage from roofs shall enter into a rainwater harvesting system that will provide grey water to the premises for use within its toilets and vehicle wash facilities, the tank will be required to store up to 50m³ based upon the demand loadings calculated for the peak water usage of the premises. The remaining volume of runoff for up to and including the 1 in 100 year event will overflow from the storage tank into extra depth of filter material provided by the permeable paved car park.
 - Permeable Paved attenuation structures within western parking court will attenuate flows generated by the parking court itself as well as from the hard surfaced driveway areas, for storm events up to and including the 1 in 100 year storm event as indicated in Appendix A.4.
 - Highways will use a combination of a piped drainage network and lined filtration trenches to attenuate carriageway and footway run-off from the site. The filter drains will be sized to accommodate the 1 in 100 year storm event before entering a piped drain.
 - All drainage systems will discharge into the minor watercourse running along the northern boundary via a Flow Control Chamber, which will be designed to limit discharge to Greenfield runoff rates.
- 4.8 The implementation of Sustainable Drainage Systems will both attenuate and cleanse the run-off from the site improving the quality before entering the watercourse.
- 4.9 The Storage Estimates provided in Appendix C.2 show that for the 1 in 100 year return period, and assuming there is no infiltration properties through the ground (based upon hydrology map information from the British Geological Survey website and historic soakage testing carried out in 2008 as shown in Appendix G), between **916m³** of **1303m³** attenuation will need to be provided by the onsite surface water management system.
- 4.10 It is proposed that the western parking court uses permeable paving to accommodate runoff from itself as well as from the hard surfaced drives. Based an area of 5385m² and approximately 260mm depth of filter material and allowing for a 30% void ratio, a total of **417m³** volume of attenuation can be provided (see Appendix C.3).
- 4.11 It is proposed that impermeable areas provided by the new business premises will enter into a rainwater harvesting system. The runoff volumes generated by these areas for storm events up to and including the 1 in 100 year return period (+30 climate change allowance) will be required to be attenuated within a two phased storage system. Storage calculations have been provided for these areas estimated at a volume of **482m³**. It is proposed that **50m³** is re-used within grey water services within the building and the remaining **432m³** will overflow into extra granular material storage beneath the permeable paving within the western car park. Based upon a car park area of 5385m² and a void ratio of 30%, an additional 267mm depth of filter material is required beneath the permeable paved car park (see Appendix C.4 for permeable car park design calculations, which include additional

- roof areas). A crated system could be used but at twice the cost of the additional granular material.
- 4.12 It is proposed that between 101m³ and 144m³ runoff generated by the highway areas are attenuated within lined filtration trenches. Using a design of trench approximately 2.2m wide, 1m deep, approximately 200m long and allowing 30% void ratio more than **122m³** volume of attenuation can be provided (see Appendix C.5 for the highway infiltration trench design calculations).
- 4.13 Through the implementation of the SuDS features described in paragraphs 4.10 – 4.12 a total of **1021m³** attenuation has been provided. Although paragraphs 4.10 - 4.12 show the site has the capacity to manage the storage requirements of the 1 in 100 year event, surface water management plans should account for exceedances where, for example, storm events exceed the 1 in 100 year return period. Appendix A.5 indicates their direction of flow which can be seen to be directed towards the north-west corner of the site.

APPROPRIATE SuDS TRAIN

- 4.14 Permeable paving – Permeable paving can be utilised beneath parking areas or driveways and can be lined to act as an attenuation system. The system uses a permeable block paver, which is similar to a normal block paver but has notches cut out of the corners, allowing water to permeate. The construction below is similar to that of a normal driveway construction but a layer of geo-textile material is placed on top of the upper sub-base to prevent the sand from the laying course washing through and filling the voids. The lower sub-base is made up of 10-63mm filter material.
- 4.15 Granular Filtration Trenches – Are long, narrow trenches back filled with 63mm – 10mm graded filter material allowing attenuation and water cleansing of the surface water runoff before discharge. They are lined with a membrane to prevent infiltration and ingress of silts (although the membrane can be replaced with a perforated geo-textile for infiltration purposes) and can either be specified with a perforated pipe at the bottom where flow direction is required or can incorporate a fin drain detail. Detailing of these trenches is important as a catch-pit should be incorporated at the inlets to the trench so that some silts can be filtered out prior to the trench which extends their practical working life.
- 4.16 Rainwater Harvesting – Is an above ground storage system consisting of a filtration unit connected to a storage tank which collects the runoff from the roofs, filters the runoff through several carbon filters before pumping the cleansed water through the commercial premises as grey water for use in toilets and wash facilities. Water re-cycling is becoming more popular as increase in water bills make their utilisation more desirable.
- 4.17 Green / Brown Roofs – Is an Architectural SuDS feature which is an attractive alternative to Rainwater Harvesting. The systems actively incorporate planting within the roof structure which allow for runoff to be stored and then used to feed the plants. Brown roofs take another step further by incorporating boulders and logs within the roof structure to encourage Bio diversity. Although the runoff is not re-utilised within the building, as it would

be with rainwater harvesting, they don't require storage tanks or pumps to move the runoff about. The additional cost of their construction can be offset by the reduction in attenuation requirements to below ground surface water drainage systems.

- 4.18 Swales – Are an above ground storage system consisting of an open ditch, with sloping sides and a flat base they provide attenuation and water cleansing properties. With a large surface area, they allow evaporation of contaminants as well as up to 20% of the stored runoff. They do however require large amounts of land take which are not always attractive to developers or adopting authorities and are not suitable for use with the proposed Masterplan layout.

5 RECOMMENDATIONS

5.1 Having carried out the Flood Risk Assessment and Surface Water Management Plan we can recommend the following:

- The site's commercial land use, being classified as 'Less Vulnerable', is suitably located within Flood Zone 1 which is in accordance with NPPF 'Technical Guidance' Tables 1-3 and PPS25, Annex D, Tables D1 – D3, chapter 2.
- It is recommended that parking courts use permeable block paving to cleanse and attenuate runoff from private footpaths and the driveways themselves.
- It is recommended that the main access road through the site is designed so as to drain into the lined filtration structures, located beneath footways, or Swales if space permits.
- Although priority should normally be given to using soakaways to reduce surface water run-off volume the site's geological and hydro-geological limitations make their use impractical. The location of the minor watercourse proves a more suitable discharge point.
- A detailed ground investigation, including infiltration testing and contamination analysis is carried out before detailed drainage designs are agreed, to ascertain the suitability of the SuDS recommended in Surface Water Management Plan and the scale of water cleansing required prior to discharge.
- It is recommended that the site runoff, through attenuation on site, will discharge at no greater than 8l/s into the minor watercourse in the north-west corner of the site under an agreement with Cheltenham Borough Council.
- Foul Water from the development will be drained via a separate Foul Water Sewer, to be adopted under a Section 104 agreement with Severn Trent Water. Foul water will discharge at a rate agreed with Severn Trent Water into a public Foul Water sewer within North Road West.

6 CONCLUSION

- 6.1 The Flood Risk Assessment identifies that the proposed development site is within Flood Zone 1 therefore posing a low risk to flooding. The flooding problem areas near to the site should benefit from the on-site attenuation provided by the SWMP.
- 6.2 The asset location plans provided by Severn Trent Water show no evidence of public surface water sewers that would have opportunity to cause flood risk to the development site.
- 6.3 The topography of the development site shows overland flows directing towards the north-west boundary.
- 6.4 By using rainwater harvesting to re-use runoff generated by the roof areas of the commercial premises, runoff volumes are reduced, requiring less attenuation within below ground structures.
- 6.5 By using SuDS features such as the lined filtration trenches and the permeable block paving to attenuate flows up to the 1 in 100 year storm event, the runoff time of entry is delayed for the extreme storms thereby actively creating betterment to the existing Greenfield flows, reducing flood risk to the surrounding areas.
- 6.6 The Surface Water Management Plan identifies that although the impermeable area will be increased on site from the existing scenario through using SuDS and for attenuation as well as water cleansing, runoff from the site is not increased and its water quality is improved.
- 6.7 Foul Water from the site will be discharged into public foul water sewers off site under agreement with the adopting water authority, Severn Trent Water.

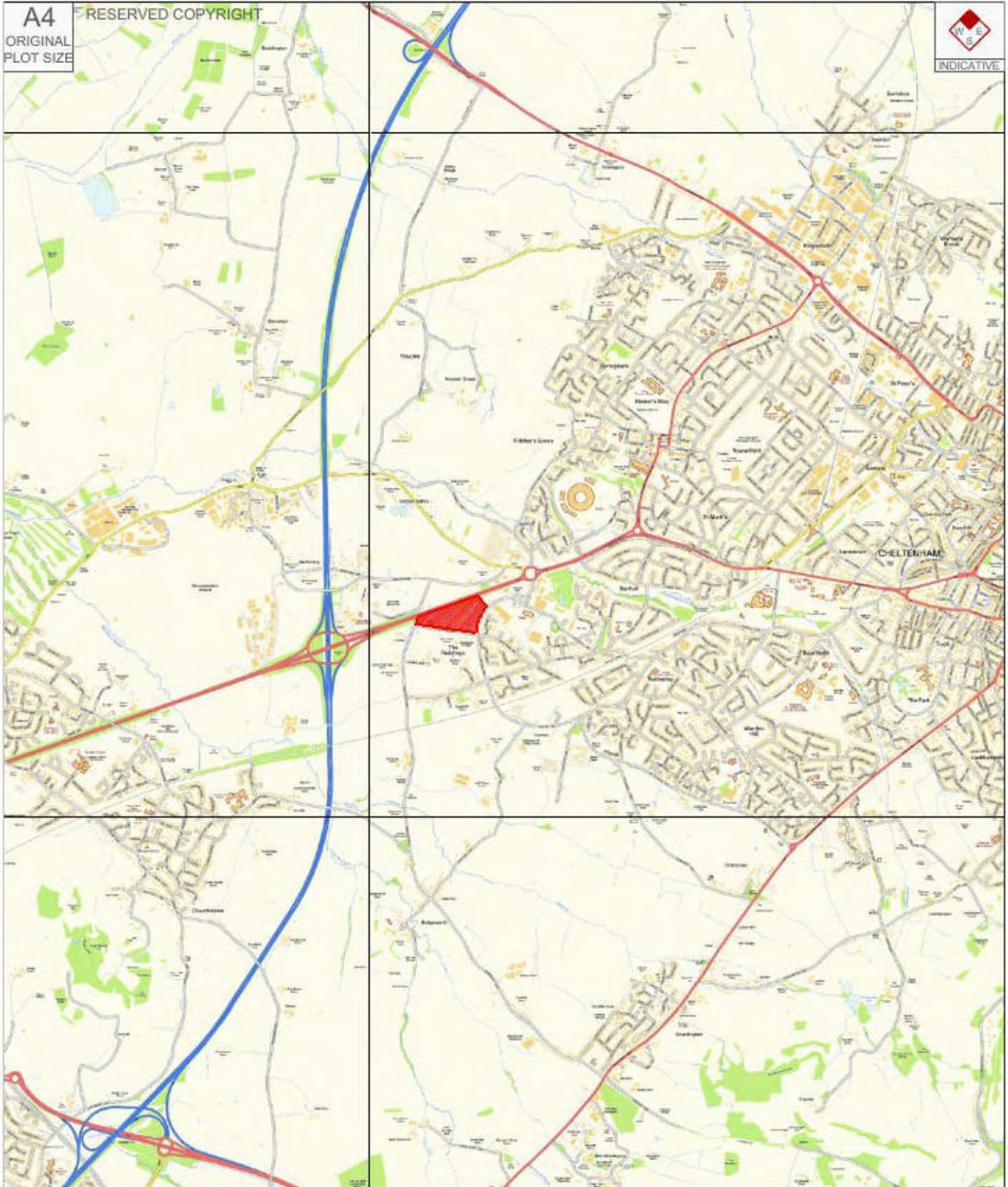
APPENDICES

APPENDIX A

SCHEME DRAWINGS

A4
ORIGINAL
PLOT SIZE

RESERVED COPYRIGHT



PROJECT: **LAND OFF GROVEFIELD WAY, CHELTENHAM** CLIENT: **COTSWOLD BMW GROUP**

TITLE: **SITE LOCATION PLAN**

NOTES:

STATUS: **INFORMATION**

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Rev	Date	Details	Drawn By	Checked By	Approved By

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	13.05.13	AJH	PCP	CMR
JOB NO:		DRAWING NO:		REVISION:
1303-30		Appendix A.1		-

REVISION:
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