



Proposed Residential Development

59 Elm Grove

Barnham, West Sussex

PO22 0HJ

Flood Risk Assessment

On behalf of

77 Property Ltd

August 2014
1578-R1

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59 ELM GROVE
BARNHAM, WEST SUSSEX
PO22 0HJ

Flood Risk Assessment

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Supporting Documents

Environment Agency Flood Map
Topographic Survey Plan
Existing Drainage Plan
Proposed Site Plan
Proposed Drainage Layout and Flood Flow Route Plan

59 ELM GROVE
BARNHAM
WEST SUSSEX PO22 0HJ

Proposed Residential Development

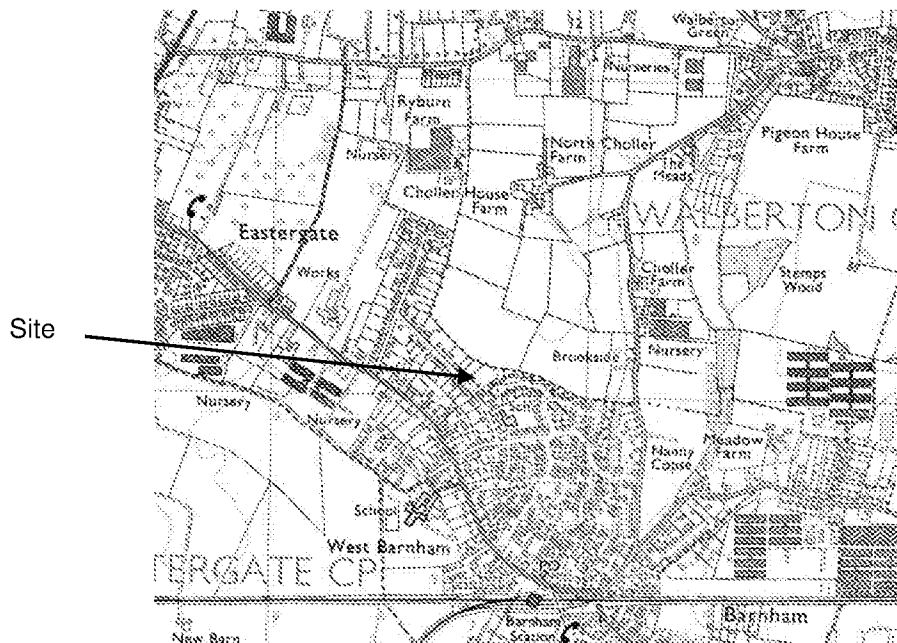
Flood Risk Assessment

1. BACKGROUND

- 1.1 This report has been produced on behalf of 77 Property Ltd in support of a proposed new residential development on land at 59 Elm Grove in Barnham, West Sussex.
- 1.2 The Flood Risk Assessment has been prepared generally in accordance with the on-line Planning Practice Guidance, Flood Risk and Coastal Change (PPGFRCC).

2. THE SITE

- 2.1 The site is located on land at 59 Elm Grove in Barnham: OS Grid Reference SU 95644 05046. See below:



- 2.2 The site has an area of around 2950 sq.m and currently comprises a dwelling, garage, outbuildings and hardstandings (impermeable area approximately 360 sq.m).
- 2.3 The site is bounded by a watercourse (Main River) to the north east, residential properties to the south east and north west and fronts onto Elm Grove, which is a private road. It is located in the built up area of Barnham.
- 2.4 The surface water run-off rate from the existing site has been assessed using Microdrainage as follows:
ICP SUDS 0.6 l/s (Qbar)
ADAS 345 2.5 l/s (Qbar)

<u>ICP SUDS Mean Annual Flood</u>			
Input			
Return Period (years)	100	Soil	0.360
Area (ha)	0.295	Urban	0.000
SAAR (mm)	771	Region Number	Region 7
Results l/s			
QBAR Rural 0.6			
QBAR Urban 0.6			
Q100 years 1.9			
Q1 year 0.5			
Q50 years 1.4			
Q100 years 1.9			

<u>ADAS 345 Mean Annual Flood</u>			
Input			
Area (ha)	0.295	Soil Type Factor (Str)	1.000
Length (m)	100.000	Paved Area (%)	0.000
Average Slope (1:X)	100.0	Region Number	Region 7
AAR (mm)	771		
Results l/s			
Q0 - Peak Flood Flow 2.2			
Total Q0 2.2			
QBAR 2.5			
Q100 years 7.9			
Q1 year 2.1			
Q3 years 2.2			
Q5 years 3.2			
Q10 years 4.0			
Q20 years 5.0			
Q25 years 5.3			
Q50 years 5.6			
Q50 years 6.5			
Q100 years 7.9			
Q300 years 9.3			
Q500 years 9.8			
Q1000 years 12.8			

3. TOPOGRAPHY

- 3.1 The site has a gentle slope (approximately 1 in 100) from Elm Grove towards the water course and lies approximately at 10 metres above Ordnance Datum (m AOD).
- 3.2 Levels in the area generally fall gently from west to east.

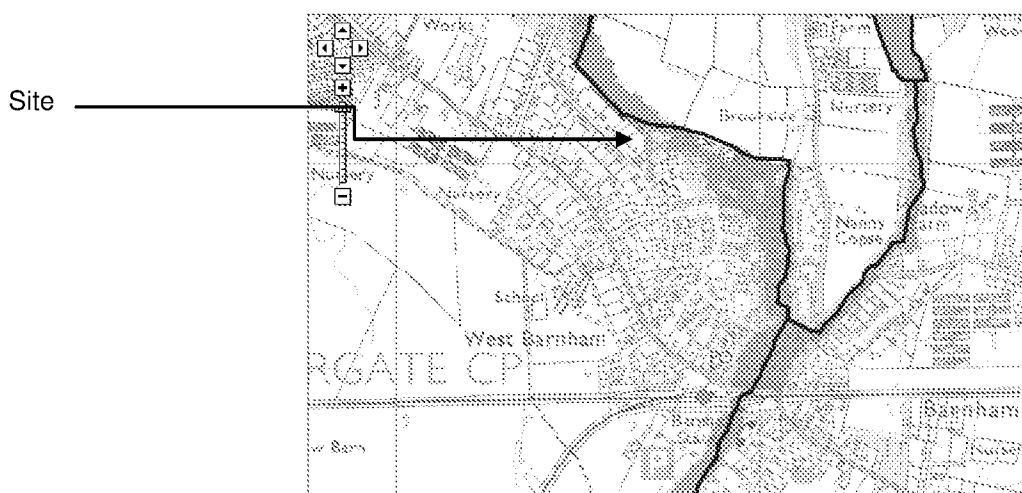
4 DEVELOPMENT

- 4.1 The development comprises the demolition of an existing garage and the erection of 3 detached houses and associated hardstandings. The existing dwelling on the site will remain.
- 4.2 The new development has an impermeable area of approximately 750 sq.m.
- 4.3 The proposed dwellings are to be located on the higher lying parts of the site, which are at lowest risk of flooding.

5. CONSIDERATION OF FLOODING ISSUES

- 5.1 Arun District Council has a Strategic Flood Risk Assessment, which is dated February 2008. Whilst reference has been made to the SFRA, it is not clear how up to date the data included within it is.
- 5.2 Arun District Council were requested to provide information regarding historic flooding. Their response was that there are known flooding issues in Elm Grove ranging from groundwater flooding to sewers overflowing/backing up but they could not confirm if this site was directly affected.
- 5.3 The site falls within the Lidsey catchment which is known to suffer from poor surface water drainage and high groundwater during wetter months. It is understood that during these wet periods, surface water and groundwater inundates the foul sewers causing them to back up or overflow. A groundwater relief system was installed in Elm Grove a number of years ago, the outfall for which passes through No.60 Elm Grove and discharges to the watercourse at the rear of the site.
- 5.4 The site falls within the area being investigated by the Lidsey Surface Water Management Plan (SWMP) which should identify specific issues and implement solutions to overcome those issues. It is understood that the SWMP is due to be released at the end of September 2014. The historic flooding referred to in 5.2 above should be relieved following implementation of the SWMP although at this stage the programme for that is not known.

- 5.5 The relevant extract from the Environment Agency's Flood Map for Planning is reproduced below.



Environment Agency Flood Map

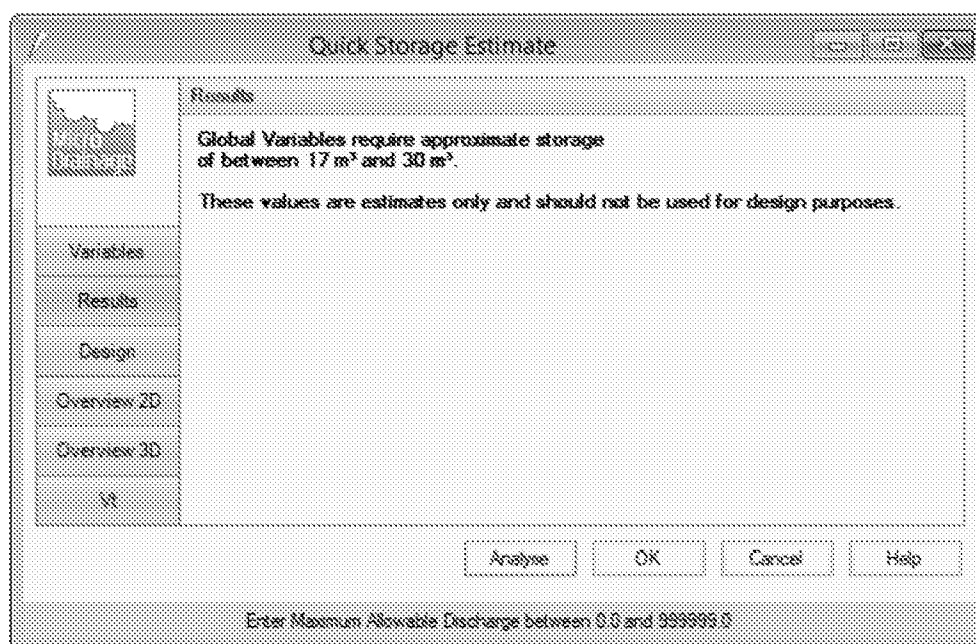
- 5.6 The Flood Map indicates the site to be in partially in Flood Zone 1 and partially in Zone 2, with some Zone 3 areas towards the rear of the site. Zone 1 is described as having "less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year". Zone 2 is described as "likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year" with Zone 3 land here having a 1 per cent or greater chance. The source of flooding is the adjacent watercourse.
- 5.7 The proposed dwellings are classed as 'more vulnerable'. The site has been laid out taking a sequential approach, placing the "more vulnerable" buildings on the higher ground, within Zone 1. In accordance with Table 3 in the PPGFRCC the development is appropriate for Flood Zone in which it lies. The sequential and exception tests are therefore not required.
- 5.8 Safe and dry access and egress to and from the proposed dwellings is available directly on to Elm Grove which is in Zone 1.
- 5.9 Flood Map Data has been obtained from the Environment Agency and has been assessed in relation to the existing and proposed site levels.
- 5.10 The Environment Agency flood data confirms that the flood level is approximately 99.2m above local survey datum (approx 8.05m AOD). Due to the proximity of the dwellings to Zone 2, it is proposed that the floor levels are at least 300mm higher than existing ground level. The proposed finished floor level should be set at a minimum of 99.5m to local datum (8.35m AOD).

6. FOUL AND SURFACE WATER DRAINAGE

- 6.1 There is an existing 225mm diameter public foul water sewer in Elm Grove, to which it is proposed connect the new development. As mentioned in 5.4 above, the sewers in this area are known to suffer from surface water and groundwater ingress causing them to back up or overflow. Whilst the proposed development will increase flows to the public sewer from the site, the increase is relatively insignificant. When calculated in accordance with Sewers for Adoption the average daily flow rate from the new development is just 0.02l/s.
- 6.2 It is believed that the run-off from the existing buildings and hardstanding drains to the watercourse, either directly or overland.
- 6.3 As mentioned in 5.4, a groundwater relief system runs along Elm Grove and through the neighbouring property and is an Arun District Council asset. Discharging surface water run-off from the development to this system is unlikely to be permitted.

Elm Grove is a private road and the carriageway is not formally drained.

- 6.4 Ground conditions comprise predominantly sandy/silty clay soils and percolation tests will be undertaken on the site to establish if infiltration methods of drainage can be used. It is expected that the infiltration rate will be relatively low and ground water levels are known to be seasonally high but porous paving may still operate well. Therefore SUDS techniques should be investigated and may comprise a combination of porous paving with conventional soakaways or geocells. A high level overflow to the watercourse may be required.
- 6.5 If surface water run-off from the new development is required to drain to the watercourse, a flow rate not exceeding existing would normally be chosen. However it is not practical to restrict flow to 0.6l/s (Qbar) and to ensure that the risk of blockage of the flow restrictor is minimized, consideration should be given to using a minimum flow rate of 5l/s. The increase in flow rate can be mitigated by the use of rainwater harvesting to provide water for use within the dwellings (toilet flushing) and/or for garden watering purposes.
- 6.6 The proposed drainage system should be designed to cater for the effects of climate change. Rainfall intensities should be increased by 30%.
- 6.7 An initial assessment of the volume of storage has been undertaken using Microdrainage Quick Storage Estimate, based on a restricted rate of 5l/s and a 1 in 100 year +30% storm:



- 6.8 Due to the site topography and high groundwater, this modest volume of storage will need to be provided at high level. This could be achieved by constructing some of the hardstandings using porous paving with storage provided within the granular sub-base. As mentioned in 6.5, rainwater harvesting should be considered to help reduce the volume of run-off leaving the development.
- 6.9 The DPC level of the new buildings will be a minimum of 150mm above adjacent ground levels (but see paragraph 8.3 below) and this, together with the general site topography, will provide a suitable level of protection against exceedence, ground water emergence and system failure.

7. OTHER SOURCES OF FLOODING

- 7.1 Tidal, fluvial, surface water, sewer and ground water flooding have been assessed above and the site is not considered at risk from any other sources of flooding.

8. FLOOD MITIGATION

- 8.1 As mentioned in 5.8 above, the site has been laid out taking a sequential approach to place the proposed new dwellings in Zone 1. However, due to the proximity of the dwellings to Zone 2, it is recommended that the floor levels should be set 300mm above the general surrounding ground level.
- 8.2 Due to the risk of groundwater emergence, ground shaping should be undertaken to ensure that well defined flow paths exist, directing any overland flows towards the watercourse.

-
- 8.3 The existing foul sewer is at risk of backing up due to surface water and groundwater ingress and it is recommended that an anti-flood valve is installed on the foul drainage system close to the highway. This will prevent any surcharging of the public foul sewer causing flooding on the site. Oversized manholes will be required to provide a volume of storage for periods when the anti-flood valve is closed.
- 8.4 Even though the proposed new buildings are considered to have a low risk of flooding due to their location and level, it is recommended that the occupiers subscribe to the Environment Agency Flood Alert service and consider preparing a Flood Plan.
- 8.5 Overall the proposed dwellings are considered at present to have a low flood risk.
- 8.6 The surface water strategy outlined in paragraphs 6.4 and 6.5 above will ensure that the risk of flooding off-site is not increased by suitably containing/disposing of the surface water run-off generated by the development on the site.

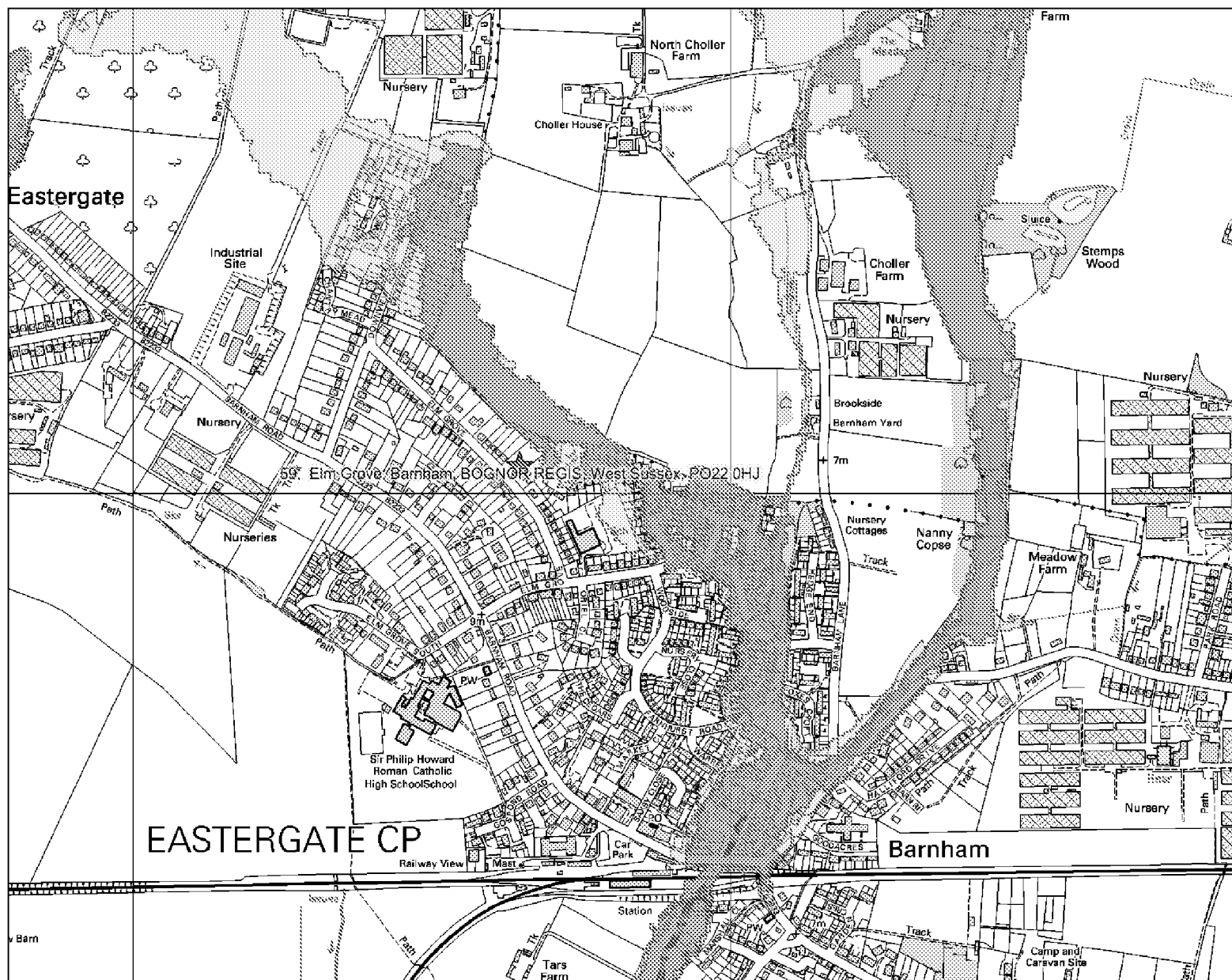
9. CONCLUSIONS

- 9.1 The site is shown to lie partially in Flood Zone 1 and partially in Flood Zones 2 and 3 on the Environment Agency's flood map. It has been laid out taking a sequential approach, placing the more vulnerable buildings in the areas at lowest risk of flooding.
- 9.3 The site is compatible with the Zone in which it lies, in accordance with PPGFRCC and is located in an area that is already built up.
- 9.4 Habitable accommodation will be constructed above the flood level affording protection to the proposed dwellings.
- 9.5 The site has been identified as possibly being at risk from sewer flooding and groundwater emergence. This can be mitigated by the installation of an anti-flood valve, raised floor levels and ground shaping to provide well defined overland flow paths.
- 9.6 The proposed drainage system should be sustainable, with infiltration drainage being given full consideration.
- 9.7 It is recommended that residents register with flood warning services and prepare a Flood Plan, which should be kept up to date, taking in to consideration potential periodic updates to Local and Flood Authorities flood data and risk assessments.
- 9.8 Providing the proposed mitigation measures are implemented, it is considered that the proposed dwellings will have a low risk of flooding.

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Environment Agency Flood Map

Barnham Flood Map



Scale 1:10,000



Flood Map for Planning (Rivers and Sea)

- Flood Map - Defences
- Areas Benefiting from Flood Defences
- Flood Map - Flood Storage Areas
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

Flood Map for Planning (Rivers and Sea) (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

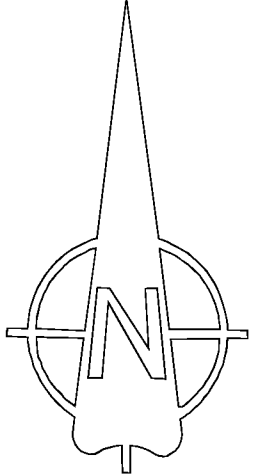
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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Topographic Survey

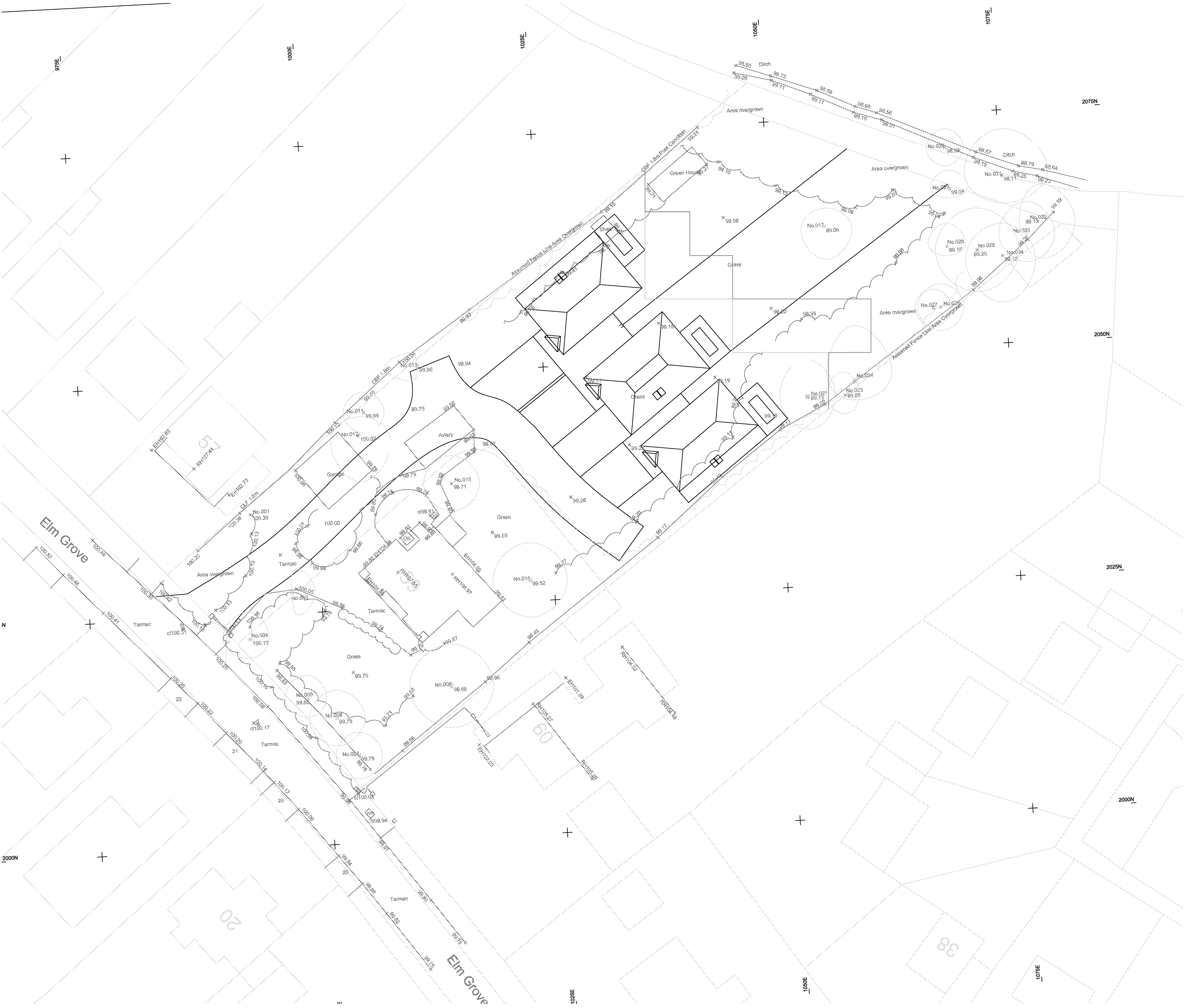
Proposed Site Plan

Notes

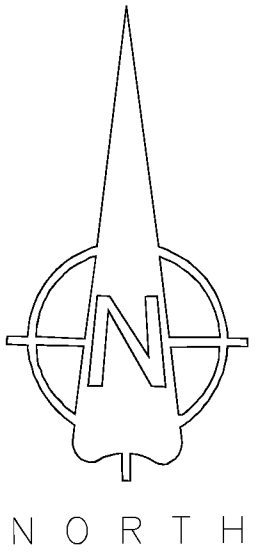
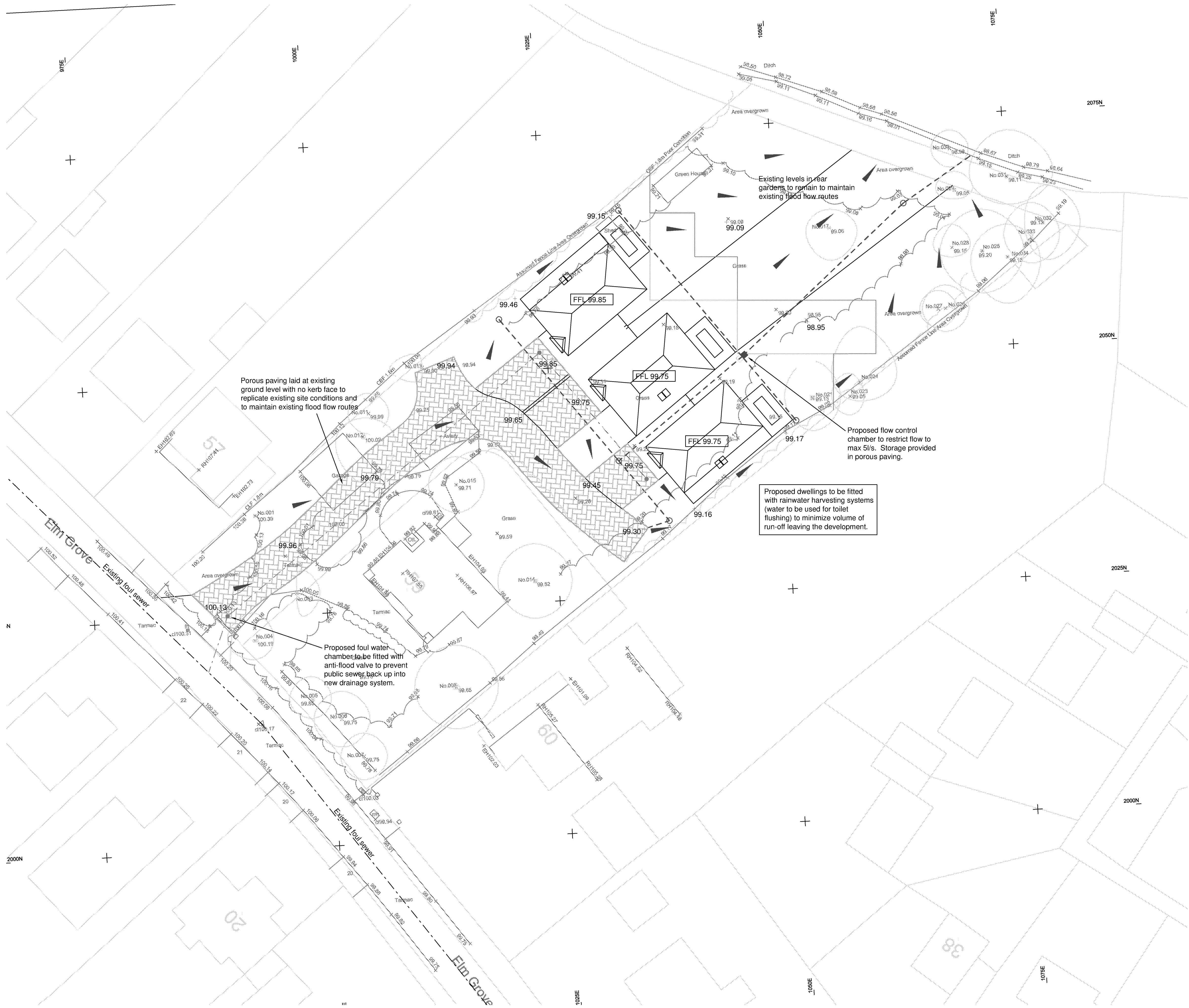


NORTH

Rev.	Description	App.	Chk.	Dm.	Date
Client					
77 Property Ltd					
Project					
59 Elm Grove Barnham					
Drawing Title					
Proposed Site Layout					
Robert Clark Associates Ltd Chartered Civil Engineers Willow Cottage, Herne Lane, Rustington West Sussex BN16 3EE Tel: 01903 778945 Fax: 01903 778967					
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Drawing Number 1578/P/D1.1		Revision		-	



Proposed Drainage Layout and Flood Flow Routes



DRAWING LEGEND

SURFACE WATER DRAINAGE	
	PROPOSED SURFACE WATER DRAIN
	FLOW CONTROL CHAMBER
	POROUS PAVING
	FLOOD FLOW ROUTES
	PROPOSED FOUL DRAINAGE
	PROPOSED BUILDING FINISHED FLOOR LEVEL
	PROPOSED GROUND LEVEL

Rev.	Description	App.	Chk.	Dm.	Date
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77 Property Ltd

Project
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Drawing Title
**Proposed Drainage Layout
and Flood Flow Routes**

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