Appendix E

OPTIONS MAPS

Legend

- Model Extent
- Hotspot Boundary
- Existing Preferential Flowpath

Flood depths (1 in 30 year):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Large storage area west of Park Way to reduce river levels throughout town.
2) Storage / attenuation upstream of Park Way to reduce flows downstream and therefore the potential risk of fluvial flooding - location to be investigated.
3) Site visit to determine if PLP is required.
4) Site visit to confirm the flowpaths from Sun Street and Bridge Street to the car parks.
- Some landscaping may be required within the car park to encourage flows towards the river.
- PLP for properties at the junction of Sun Street and Bridge Street.
5) A preferential flowpath exists from Hollow Lane to Queen Street and then to Portmill Lane. Proposed mitigation:
- Speed bump along Queen Street to reduce water draining into Portmill Lane.
- Minor landscaping of Queen Street to encourage water to flow towards the car park and then into the river south of Portmill Lane.
6) Upsize pipes that run from Hazlewood Close to the river to reduce localised ponding.
7) Water is draining from The Avenue towards this area and then downstream. To mitigate this:
- Visit site to investigate the options to attenuate water within the field adjacent to the school area.
- Install pipes along The Avenue that connect to those along Verulam Road; it is recommended that the pipes along Verulam road are upgraded.
8) More detailed modelling is required to confirm flowpaths at the intersection between Grove Road and the A505.
9) Model results show flooding in this area but there are uncertainties associated with the downstream boundary of the model. Therefore more investigations or more detailed modelling are required to confirm the flooding.

HOTSPOT 6 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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AWD	AS	JB	FI	09/09/16	NTS	6808-H6-Q0030-OPTIONS	B

Legend

- Model Extent
- Hotspot Boundary
- Existing Preferential Flowpath

Flood depths (1 in100CC):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Large storage area west of Park Way to reduce river levels throughout town.
2) Storage / attenuation upstream of Park Way to reduce flows downstream and therefore the potential risk of fluvial flooding - location to be investigated.
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- Some landscaping may be required within the car park to encourage flows towards the river.
- PLP for properties at the junction of Sun Street and Bridge Street.
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- Visit site to investigate the options to attenuate water within the field adjacent to the school area.
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8) More detailed modelling is required to confirm flowpaths at the intersection between Grove Road and the A505.
9) Model results show flooding in this area but there are uncertainties associated with the downstream boundary of the model. Therefore more investigations or more detailed modelling are required to confirm the flooding.

HOTSPOT 6 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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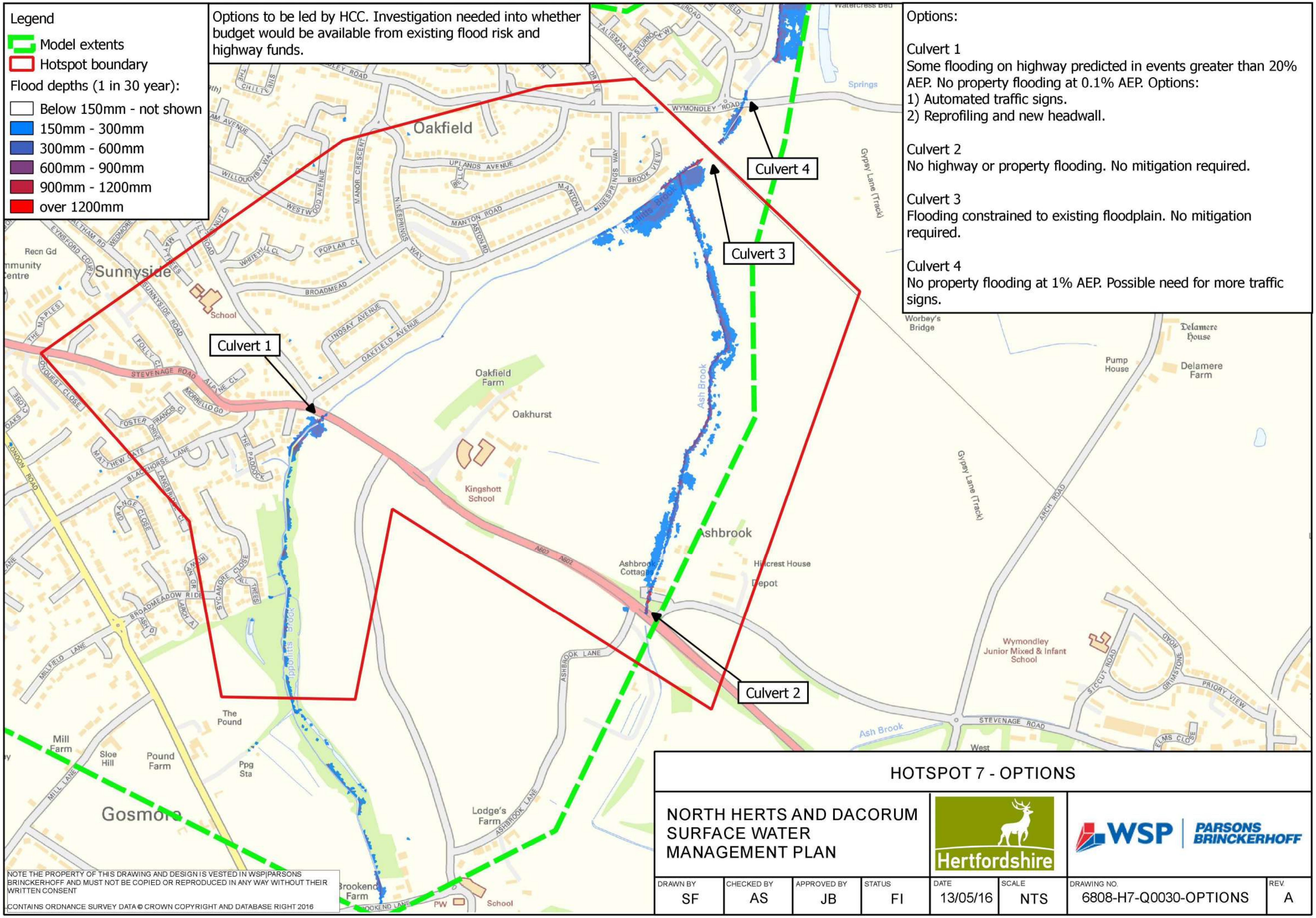

Legend

- Model extents
- Hotspot boundary

Flood depths (1 in 30 year):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options to be led by HCC. Investigation needed into whether budget would be available from existing flood risk and highway funds.

Options:

Culvert 1
Some flooding on highway predicted in events greater than 20% AEP. No property flooding at 0.1% AEP. Options:
1) Automated traffic signs.
2) Reprofiling and new headwall.

Culvert 2
No highway or property flooding. No mitigation required.

Culvert 3
Flooding constrained to existing floodplain. No mitigation required.

Culvert 4
No property flooding at 1% AEP. Possible need for more traffic signs.

HOTSPOT 7 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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Legend

- Model extents
- Hotspot boundary

Flood depths (1 in 100CC):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options to be led by HCC. Investigation needed into whether budget would be available from existing flood risk and highway funds.

Options:

Culvert 1
Some flooding on highway predicted in events greater than 20% AEP. No property flooding at 0.1% AEP. Options:
1) Automated traffic signs.
2) Reprofiling and new headwall.

Culvert 2
No highway or property flooding. No mitigation required.

Culvert 3
Flooding constrained to existing floodplain. No mitigation required.

Culvert 4
No property flooding at 1% AEP. Possible need for more traffic signs.

Culvert 1

Culvert 2

Culvert 3

Culvert 4

HOTSPOT 7 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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Legend

- Model extent
- Hotspot Boundary
- Option areas
- Scheduled monument area

Flood depths

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:
1) Increase conveyance under railway. Short term - Construct southwest sewer in public footpath. Long term - new culvert beneath railway. Historical records of flooding required to support business case.
2) SuDS retrofit/detention basin/soakaway in playing fields.
3) Work with developers/planners to ensure suitable land use as warehousing redeveloped over the longer term.
4) Detention/soakaway - Natural FRM along flowpath as permissions/designations allow.
5) Consider Property Level Protection for properties that have previously experienced flooding and/or are at high risk.

Scheduled monument - mitigation in this area may be restricted.

1

2

3

4

5

BALDOCK

Football Ground
Sewage Ppg Sta
Car Pk
Clothall Common
Cemetery
Hall
Depot
Pav
War Meml
Recn Gd
Sports Centre
New Farm
Recreation Ground
Brandles Close School
Football Ground
Liby
Pol Sta
Garden Centre
Home Land Farm
Cambrai Farm
Hypermarket
Ind Est
Caravan Park
School
Schools
Poultry

HOTSPOT 12 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

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Legend

- Model extent
- Hotspot Boundary
- Option areas
- Scheduled monument area

Flood depths

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:
1) Increase conveyance under railway. Short term - Construct southwest sewer in public footpath. Long term - new culvert beneath railway. Historical records of flooding required to support business case.
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3) Work with developers/planners to ensure suitable land use as warehousing redeveloped over the longer term.
4) Detention/soakaway - Natural FRM along flowpath as permissions/designations allow.
5) Consider Property Level Protection for properties that have previously experienced flooding and/or are at high risk.

Scheduled monument - mitigation in this area may be restricted.

1
2
3
4
5

BALDOCK

HOTSPOT 12 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

WSP | PARSONS BRINCKERHOFF

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Legend

- Model extents
- Hotspot boundary
- Modelled extents outside of key study area

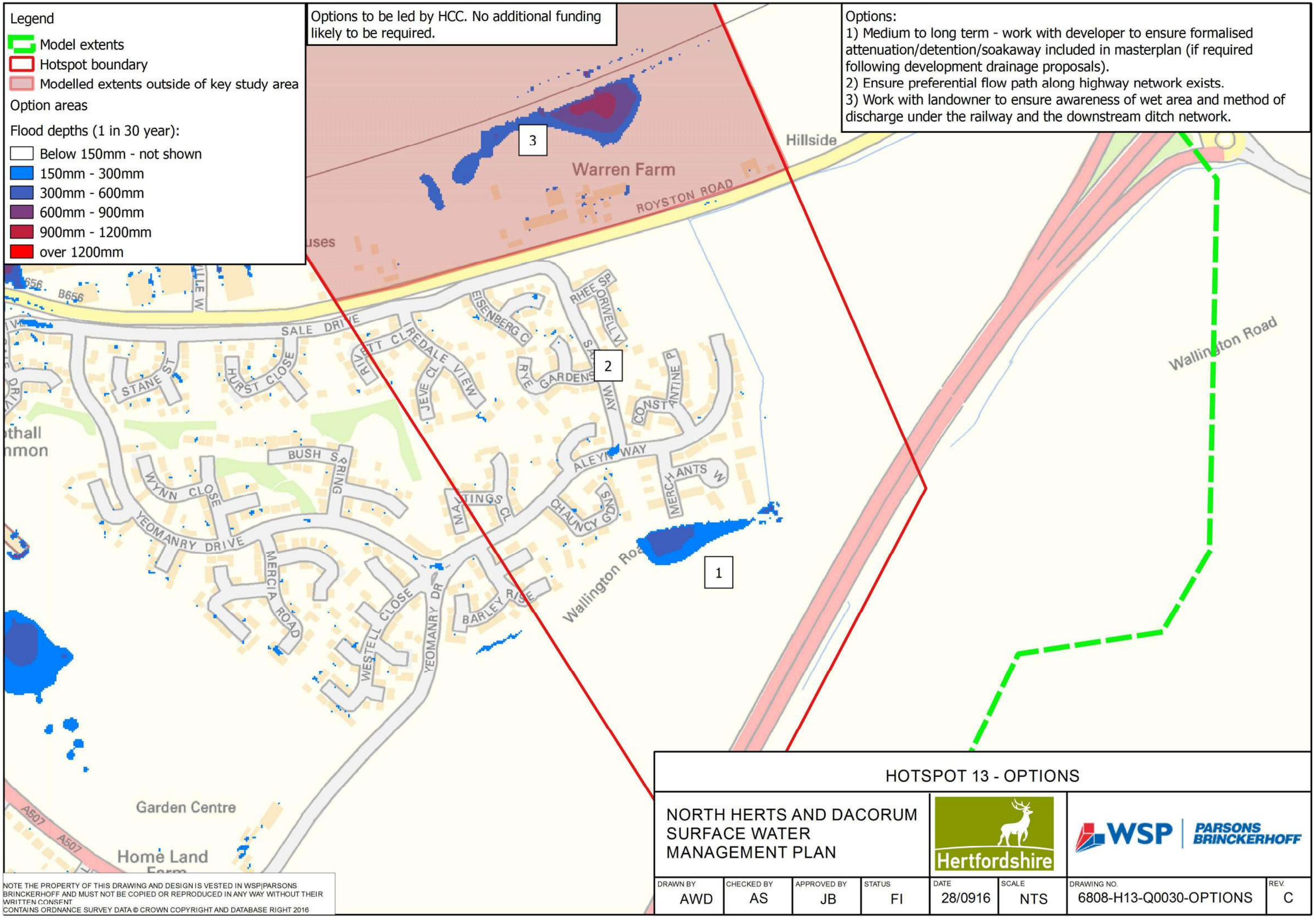
Option areas

Flood depths (1 in 30 year):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options to be led by HCC. No additional funding likely to be required.

Options:
1) Medium to long term - work with developer to ensure formalised attenuation/detention/soakaway included in masterplan (if required following development drainage proposals).
2) Ensure preferential flow path along highway network exists.
3) Work with landowner to ensure awareness of wet area and method of discharge under the railway and the downstream ditch network.



HOTSPOT 13 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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Legend

- Model extents
- Hotspot boundary
- Modelled extents outside of key study area

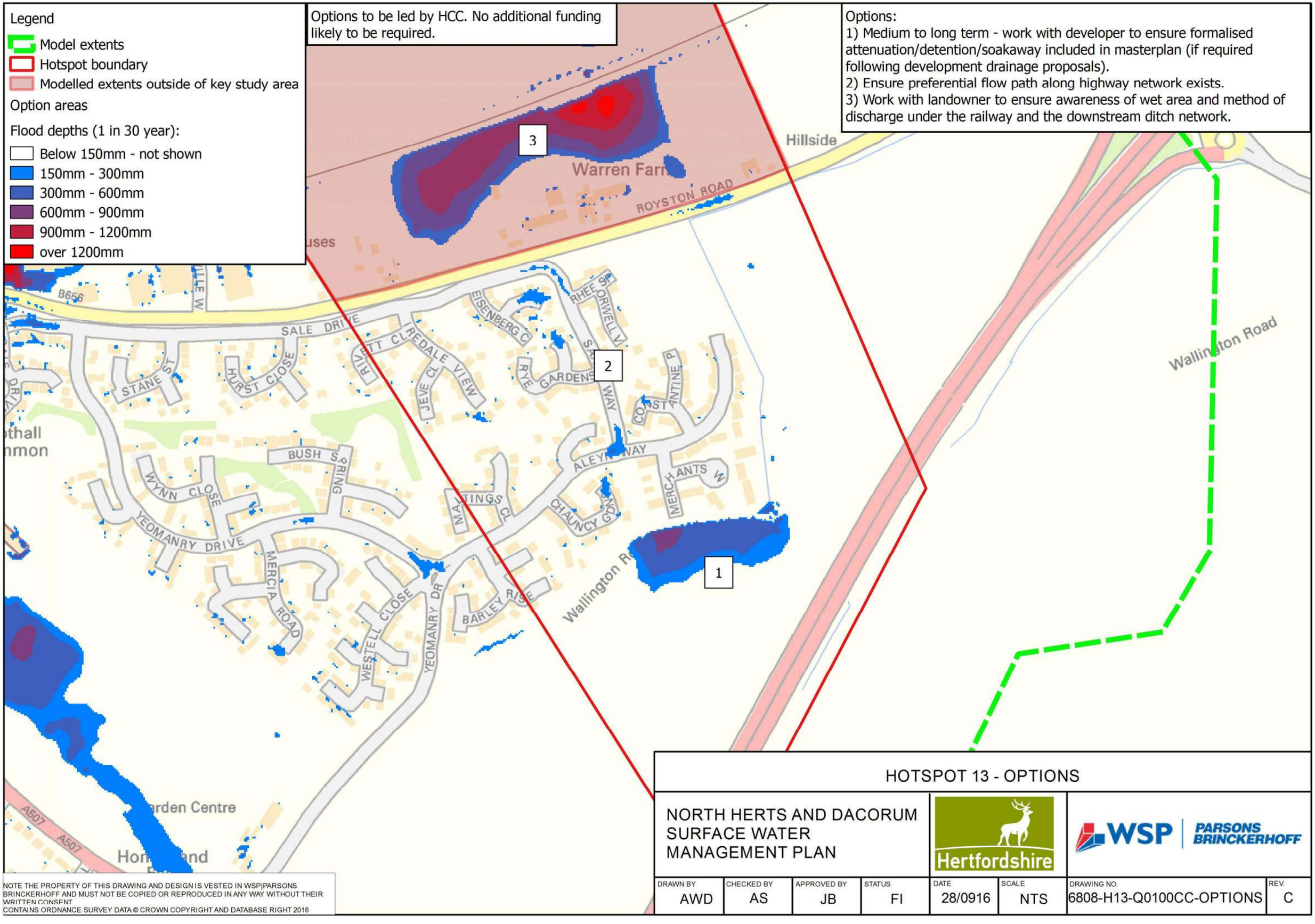
Option areas

Flood depths (1 in 30 year):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options to be led by HCC. No additional funding likely to be required.

Options:
1) Medium to long term - work with developer to ensure formalised attenuation/detention/soakaway included in masterplan (if required following development drainage proposals).
2) Ensure preferential flow path along highway network exists.
3) Work with landowner to ensure awareness of wet area and method of discharge under the railway and the downstream ditch network.



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HOTSPOT 13 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

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Legend

- Model extents
- Option areas
- Proposed cut off drain
- Existing highway drainage

Flood depths (1 in 30 year):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Medium term - if this area is still likely to be developed, work with planners and developers to ensure exceedance pathways and soakaways/detention areas are in place to attenuate both flowpaths from the west. Short term - enhance cut off drain for both flowpaths.
2) Liaise with Highways England to ensure suitable maintenance regime.
3) Attenuation/soakaway in recreation ground.
4) Ensure a preferential flowpath exists along the highway.
5) Assess potential for soakaway but consider implications on railway. Increase flow conveyance to underpass and downstream highway to the open fields.
6) Upstream rural attenuation area.
7) Improve drainage and connectivity preferentially utilising highway drainage.
8) Utilise existing highway drainage and attenuation/infiltration area.

HOTSPOT 17 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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Legend

- Model extents
- Option areas
- Proposed cut off drain
- Existing highway drainage

Flood depths (1 in 100CC):

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Medium term - if this area is still likely to be developed, work with planners and developers to ensure exceedance pathways and soakaways/detention areas are in place to attenuate both flowpaths from the west. Short term - enhance cut off drain for both flowpaths.
2) Liaise with Highways England to ensure suitable maintenance regime.
3) Attenuation/soakaway in recreation ground.
4) Ensure a preferential flowpath exists along the highway.
5) Assess potential for soakaway but consider implications on railway. Increase flow conveyance to underpass and downstream highway to the open fields.
6) Upstream rural attenuation area.
7) Improve drainage and connectivity preferentially utilising highway drainage.
8) Utilise existing highway drainage and attenuation/infiltration area.

HOTSPOT 17 - OPTIONS

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

WSP | PARSONS BRINCKERHOFF

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Legend

- Model extents
- Hotspot boundary

Flood depths

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Improve highway ditch
2) Attenuation area at the bottom of the ditchs
3) Attenuation and bund in the green triangle to reduce water flowing down the side road of Cambridge Road
4) Potential attenuation on the green areas located between main Cambridge Road (A505) and the side road
5) Speedbump to keep water in Cambridge Road (A505)
6) Site visit to investigate potential flow containment to highway and the potential installation of Property Level Protection measures
7) Attenuation/swale in green islands in Cambridge Road
8) Investigate flowpath between properties and back garden flow barrier
9) Speed bump and raise kerb/fence to keep water on Cambridge Road (A505).
10) Contain water on the A505 and keep it from entering the parallel side road. This could provide the opportunity to relocate accesses onto the side road to reduce flows into the curtilage of properties.

HOTSPOT 30 - OPTIONS (1 IN 30 YEAR)

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

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Legend

- Model extents
- Hotspot boundary

Flood depths

- Below 150mm - not shown
- 150mm - 300mm
- 300mm - 600mm
- 600mm - 900mm
- 900mm - 1200mm
- over 1200mm

Options:

1) Improve highway ditch
2) Attenuation area at the bottom of the ditchs
3) Attenuation and bund in the green triangle to reduce water flowing down the side road of Cambridge Road
4) Potential attenuation on the green areas located between main Cambridge Road (A505) and the side road
5) Speedbump to keep water in Cambridge Road (A505)
6) Site visit to investigate potential flow containment to highway and the potential installation of Property Level Protection measures
7) Attenuation/swale in green islands in Cambridge Road
8) Investigate flowpath between properties and back garden flow barrier
9) Speed bump and raise kerb/fence to keep water on Cambridge Road (A505).
10) Contain water on the A505 and keep it from entering the parallel side road. This could provide the opportunity to relocate accesses onto the side road to reduce flows into the curtilage of properties.

HOTSPOT 30 - OPTIONS (1 IN 100CC YEAR)

NORTH HERTS AND DACORUM SURFACE WATER MANAGEMENT PLAN

Hertfordshire

WSP | PARSONS BRINCKERHOFF

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