5 Potential Growth Areas

5.1 NPA1 - North East Sector (Inside the NNDR)

5.1.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although a tributary of the Stone Beck is situated within the area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.1.2 Water Resources and Supply

The North East Sector receives most of its water supply from River Wensum, which in turn feeds Heigham WTW. The sector is underlain by a Major Aquifer – High Groundwater Vulnerability Category. The inner part of NE Sector lies within Zone 2 Source Protection Zone (SPZ) for Norwich groundwater sources. The potential for growth beyond 10,000 new dwellings would require investigation to ensure water resources are protected.

The area is presently serviced by a number of potable water mains and as such servicing should not be an issue. However AWS will need to be consulted depending on the total number of properties that can be developed in this area. Consultation with AWS will verify capacities of existing potable water infrastructure.

5.1.3 Wastewater Drainage and Treatment

The STW (Whitlingham) which currently receives flows from this area currently has a DWF headroom capable of accommodating approximately 51860 new properties hence there is no constraint in terms of wastewater treatment. This area is serviced by a number of existing sewage pumping stations pumping flows to Whitlingham STW. The capacities of the sumps and rising mains will need to be investigated using hydraulic modelling. It should be noted that there is a significantly large existing development between this area and Whitlingham STW. Should the assessment of existing rising mains prove that there is a need to increase their capacity; the use of Whitlingham STW's existing headroom to absorb new properties in this area would become unfavourable. The reason being the relatively higher capital costs involved in providing new higher capacity sewers passing through existing developments. The associated increased energy use (hence operating cost) of pumping sewage also makes it less favourable to pump large volumes of sewage to Whitlingham STW.

5.1.4 Environmental

No designated environmental protection areas lie within the proposed growth area, although Crostwick Marsh SSSI is approximately 3km from the northern limits. Whitlingham STW is currently responsible for excessive phosphate discharges into the River Yare, which in turn affect the Broads SAC/Broadlands SPA. Any development in this policy area could therefore increase phosphate loads in the SAC without technological modifications to the STW[9].

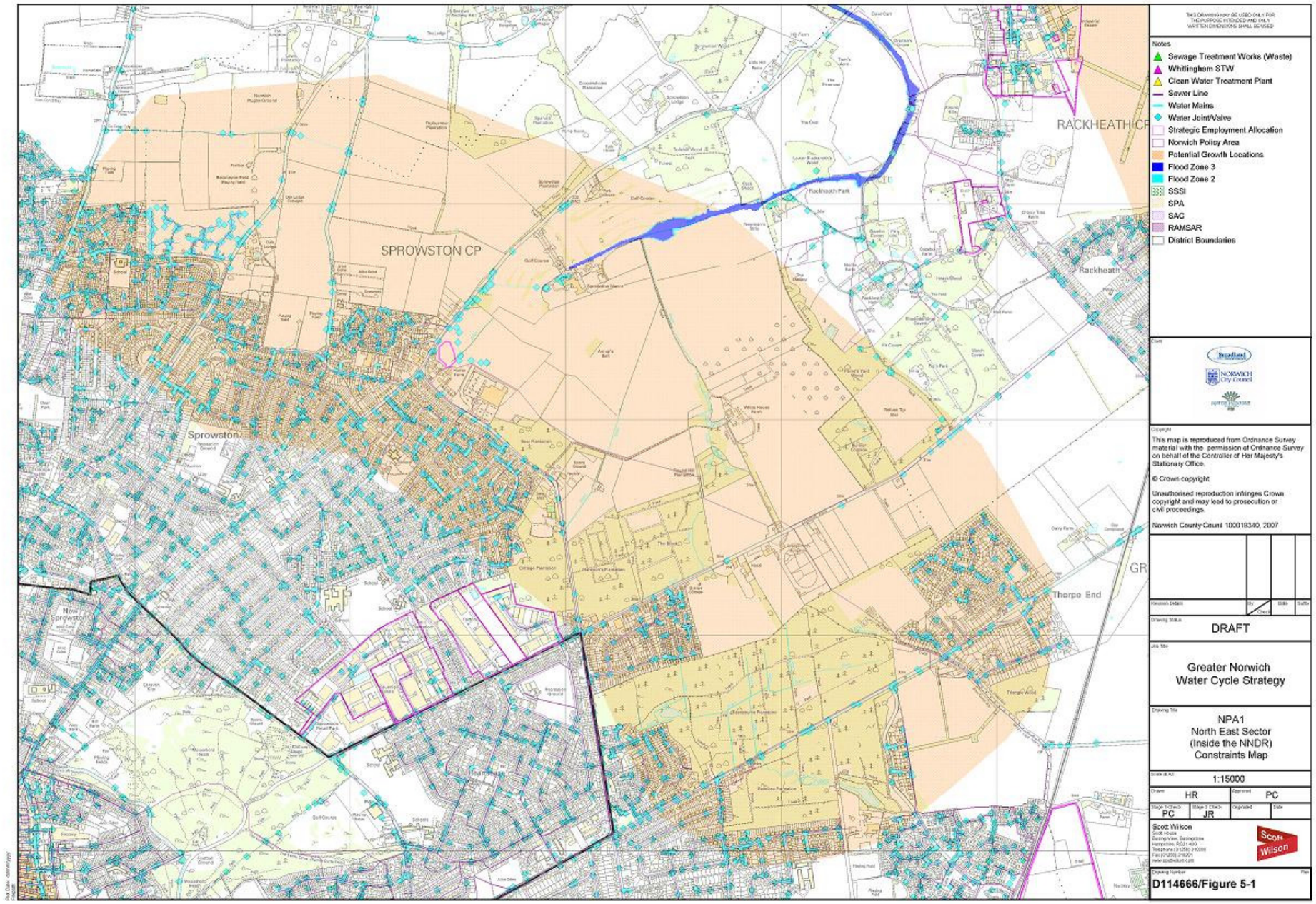
5.1.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues
- There are sufficient water resources for up to 10,000 new dwellings
- Whitlingham STW has capacity for in excess of 20000 new dwellings, however the sewage pumping mains are unlikely to take beyond 5000 new dwellings.
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur

Conclusion – Up to 5,000 houses are suitable in this Potential Growth Area

[9] At this stage it is not possible to precisely quantify the scale of phosphate inputs that would be likely to result from these development areas in the absence of mitigating technology. It has therefore been precautionary assumed throughout this chapter that any development area that may lead to increased phosphate loadings within European sites must be concluded to be likely to lead to significant adverse effects. This issue will be explored further in Stage 2.


SPROWSTON CP
RACKHEATH CP
Sprowston
Rackheath
Thorpe End
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
Flood Zone 2
SSSI
SPA
SAC
RAMSAR
District Boundaries
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Water Cycle Strategy
NPA1
North East Sector
(Inside the NNDR)
Constraints Map
1:15000
HR
PC
PC
JR
Scott Wilson
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5.2 NPA2 - North East Sector (Outside the NNDR, vicinity of Rackheath)

5.2.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although a tributary of the River Yare is situated within the area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.2.2 Water Resources and Supply

The North East sector receives most of its water supply from River Wensum/Heigham WTW. The NE Sector (outside the NNDR) is underlain by a Major Aquifer – High Groundwater Vulnerability Category, but lying further away from Norwich is within Zone 3 of an SPZ. The potential growth up to a maximum of 20,000 new dwellings could be accommodated provided sufficient water resources are available.

The following areas, which fall within the above sector, were considered for potable water infrastructure improvements by AWS:

Rackheath

An area to accommodate nearly 3,000 properties was identified and the following enabling works for water supply considered, approximately 4,750m of 355 HPPE from the junction of Mousehold Lane/Salhouse Road to site entrance on Green Lane West. These enabling works would be sufficient for the development of 3,000 properties and AWS will need to be consulted if additional properties are decided necessary.

5.2.3 Wastewater Drainage and Treatment

Rackheath (The Springs) STW currently serves a total PE of 1,807 within the Rackheath area based on information supplied by AWS. The STW has no headroom and hence would need upgrading to enable it to take any additional flows. At this stage it is assumed that any upgrade of the STW will only increase its capacity to a maximum of double its current capacity. Hence, if upgraded, the existing STW would be capable of taking an additional 1,807 PE. This equates to 860 new properties.

If the works were upgraded, the next constraint would be the receiving waters. Presently treated effluent is being discharged into the Dobbs Beck, which in turn discharges into the down stream marshes associated with the River Bure. It is an issue of environmental concern that increased treated effluent volumes without proper phosphorous treatment will result in an increase in nutrient levels within the Broads thereby exacerbating the existing nutrient problems within the Broads and Marshes. Hence treated effluent quality discharged to the environment will need to be of a very high standard in order to be able to either maintain current nutrient levels or improve upon existing levels. In expanding the works various forms of high treatment methods will need to be considered, for example Activated Sludge Plant with Phosphorous stripping or Membrane Bioreactor Technology (MBR). The MBR is a highly effective way of removing both soluble and particulate biodegradable material by elevating biomass concentrations producing high effluent quality. The Environment Agency will need to be consulted on the issue of increased treated effluent volumes at this location hence caution is required at this stage. The above methods of treatment will be investigated further in Stage 2 of the Water Cycle Study.

5.2.4 Environmental

No environmental protection areas lie within the development area boundary. The North Sector development area boundary is approximately 2.4km from Crostwick Marsh SSSI and 3km from the Bure Broads & Marshes SSSI to the north of the development area. Both these sites lie within the Broads SAC/Broadland SPA. Yare Broads & Marshes SSSI (also part of the Broads SAC/Broadland SPA) lies 0.9km from the southern boundary of the development area. Where possible development should be steered away from these SSSIs.

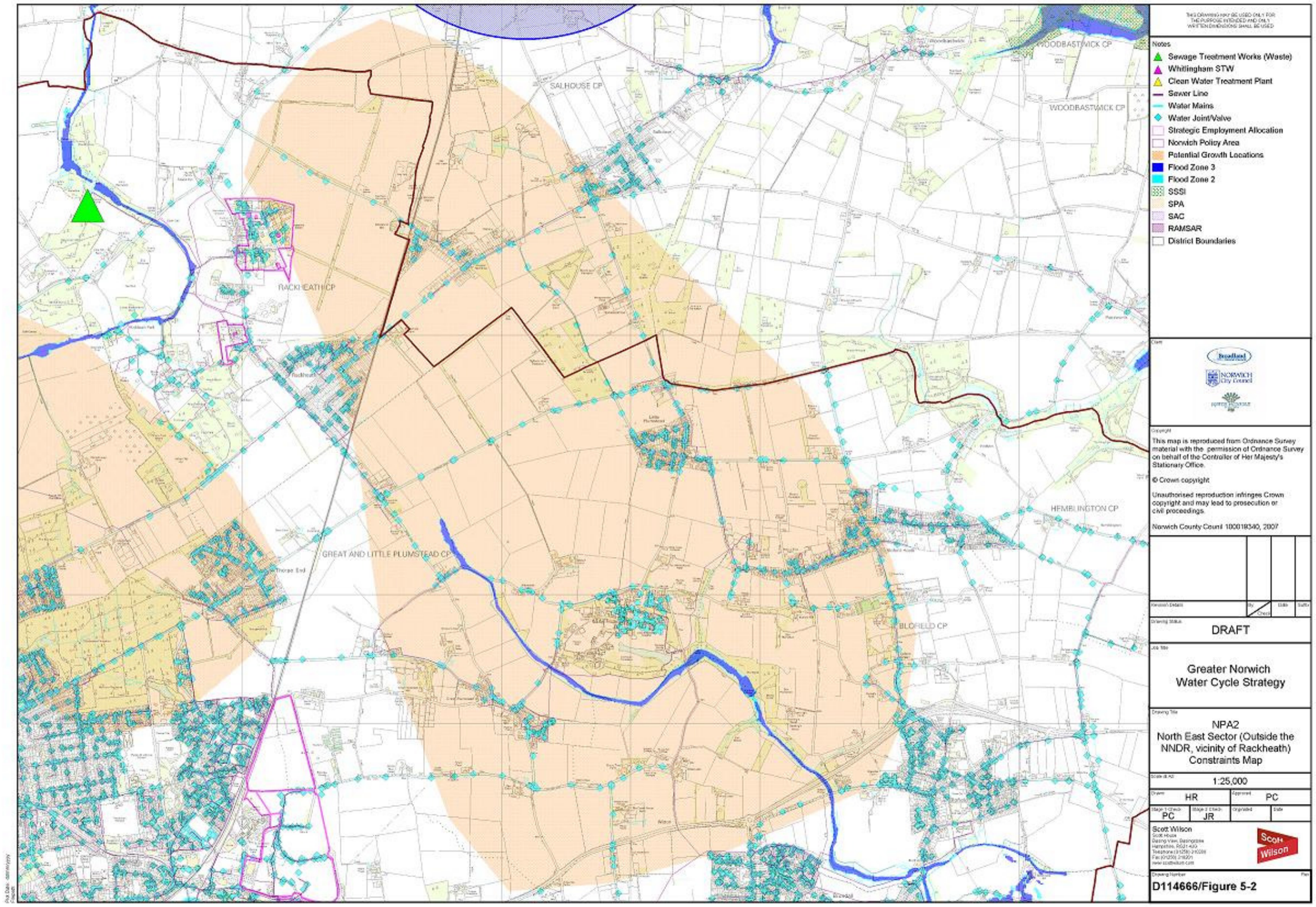
If sewage flows were redirected to Whitlingham STW this could increase the already unacceptable phosphate loading in the River Yare (and therefore the Broads SAC/Broadland SPA) to damaging levels.

5.2.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood issues;
- There is sufficient water resources for up to 20,000 new dwellings;
- The amber coding for the wastewater assumes that Rackheath STW can be upgraded to double its capacity and that the receiving watercourses can take the additional discharge from the STW;
- The green coding for environment assumes that sewage flows can be routed to Rackham STW. If they must be sent to Whitlingham STW, the coding would become amber for 5000-15,000 homes and red for over 15,000 homes.

Conclusion – Up to 1,000 houses are suitable in this Potential Growth Area unless the STW capacity is increased.


SALHOUSE CP
WOODBASTWICK CP
RACKHEATH CP
HEMBLINGTON CP
GREAT AND LITTLE PLUMSTEAD CP
BLOFIELD CP
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
Flood Zone 2
SSSI
SPA
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NPA2
North East Sector (Outside the NNDR, vicinity of Rackheath) Constraints Map
1:25,000
HR
PC
PC
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D114666/Figure 5-2

5.3 NPA3 - East Sector (Outside the NNDR)

5.3.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although a tributary of the River Yare is situated within the area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.3.2 Water Resources and Supply

The East Sector will be supplied mainly from River Wensum/Heigham WTW. The sector is underlain by a Major Aquifer – High Groundwater Vulnerability Category. The sector has a higher GW Vulnerability classification than both the North East Sectors (NPA1 and 2). The sector lies within Zone 3 of an SPZ. The potential growth beyond 15,000 new dwellings will require investigation to ensure water resources are protected.

This has been subject to previous public consultation as outlined in the JCS Document and AWS have identified the development near Blueboar Lane/Salhouse Road. The following enabling works would be sufficient for the development of approximately 3500 properties. Provision of approximately 2160m of 450mm HPPE from the junction of Mousehold Lane/Salhouse Road to site entrance on Salhouse Road.

5.3.3 Wastewater Drainage and Treatment

This area is also serviced by a number of existing sewage pumping stations pumping flows to Whitlingham STW and as such the rising mains will need to be investigated using the InfoWorks Modelling Tool during Stage 2 of the Water Cycle Study. Depending on the distribution of the properties and to which pumping station they gravitate to, rising mains will need to be checked against the new DWF emanating from various sections of the development. As the receiving STW is capable of accommodating a growth well in excess of 20,000 new properties, the constraints on developing this area have been assessed on the basis of the criteria set out relating to pumping of wastewater.

5.3.4 Environmental

No environmental protection areas lie within the development area boundary. The North Sector development area boundary is approximately 2.4km from Crostwick Marsh SSSI and 3km from the Bure Broads & Marshes SSSI (both of which lie within the Broads SAC/Broadlands SPA, as it the Yare Broads & Marshes SSSI which lies within 0.9km). Where possible development should been steered away from these SSSIs.

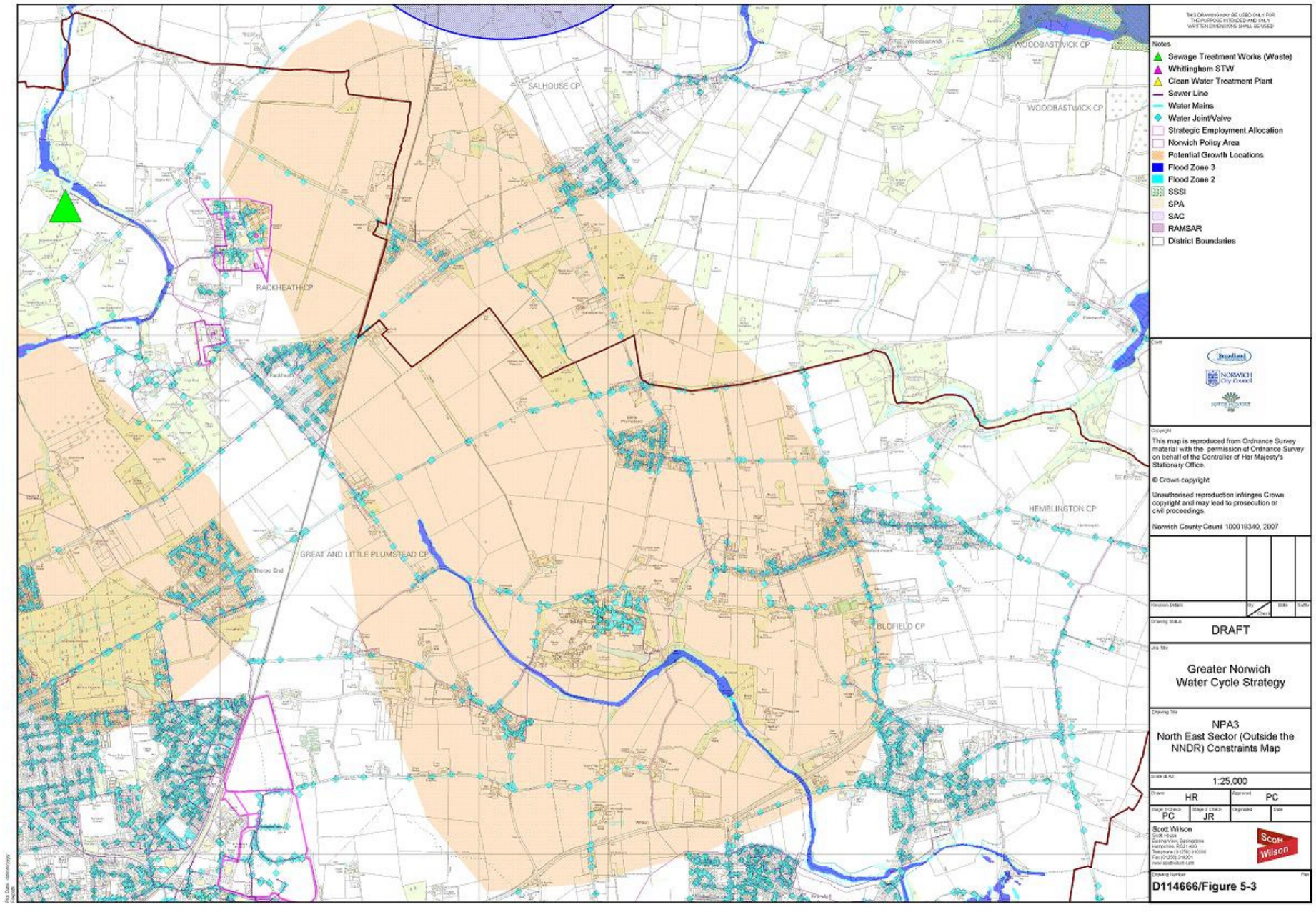
As with NPA1, sewage from this area will increase phosphate loadings discharged from Whitlingham STW and could therefore result in an adverse impact on the Broads SAC/Broadland SPA without technological modifications to the STW.

5.3.5 Summary

Possible Dwelling Scenario	Constraints			
	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- There is sufficient water resources for up to 15,000 new dwellings
- There is no constraint due to receiving STW however there may be constraints due to capacities of existing pumping mains.
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur.

Conclusion – Up to 5,000 houses are suitable in this Potential Growth Area, with more depending on the pumping constraints.


SALHOUSE CP
WOODBASTWICK CP
RACKHEATH CP
GREAT AND LITTLE PLUMSTEAD CP
HEMBLINGTON CP
BLOFIELD CP
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
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5.4 NPA4 - North East and East Combination

5.4.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although a tributary of the River Yare is situated within the area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.4.2 Water Resources and Supply

The conclusion for North East and East Sectors would be that growth beyond 15,000 new dwellings would require investigation to ensure protection of water resources. It should be noted that the growth figures for individual sectors must not be combined together. If development takes place towards the high end of the range (20,000 new dwellings in the North East Sector – outside NNDR) it would be advisable to check that there are sufficient water resources available.

Based on the assessment in 4.5.1.3 above the proposed development is given an amber traffic light in view of further consultations required with AWS to ascertain the extent of enabling works required to provide properties up to say 8,000 instead of 3,500.

5.4.3 Wastewater Drainage and Treatment

This area is also serviced by a number of existing sewage pumping stations pumping flows to Whitlingham STW and as such capacities of sumps, and rising mains will need to be investigated using the InfoWorks Modelling Tool during Stage 2 of the Water Cycle Study. Depending on the distribution of the properties and to which pumping station they gravitate to, rising mains will need to be checked against the new DWF emanating from various sections of the development. As the receiving STW is capable of accommodating a growth well in excess of 20,000 new properties, the constraints on developing this area have been assessed on the basis of the criteria set out in section Appendix E relating to pumping of wastewater.

5.4.4 Environmental

No environmental protection areas lie within the development area boundary. The North Sector development area boundary is approximately 2.4km from Crostwick Marsh SSSI and 3km from the Bure Broads & Marshes SSSI to the north of the development area. Both these sites lie within the Broads SAC/Broadlands SPA. Yare Broads & Marshes SSSI (also part of the Broads SAC/Broadlands SPA) lies 0.9km from the southern boundary of the development area. Where possible development should be steered away from these SSSIs.

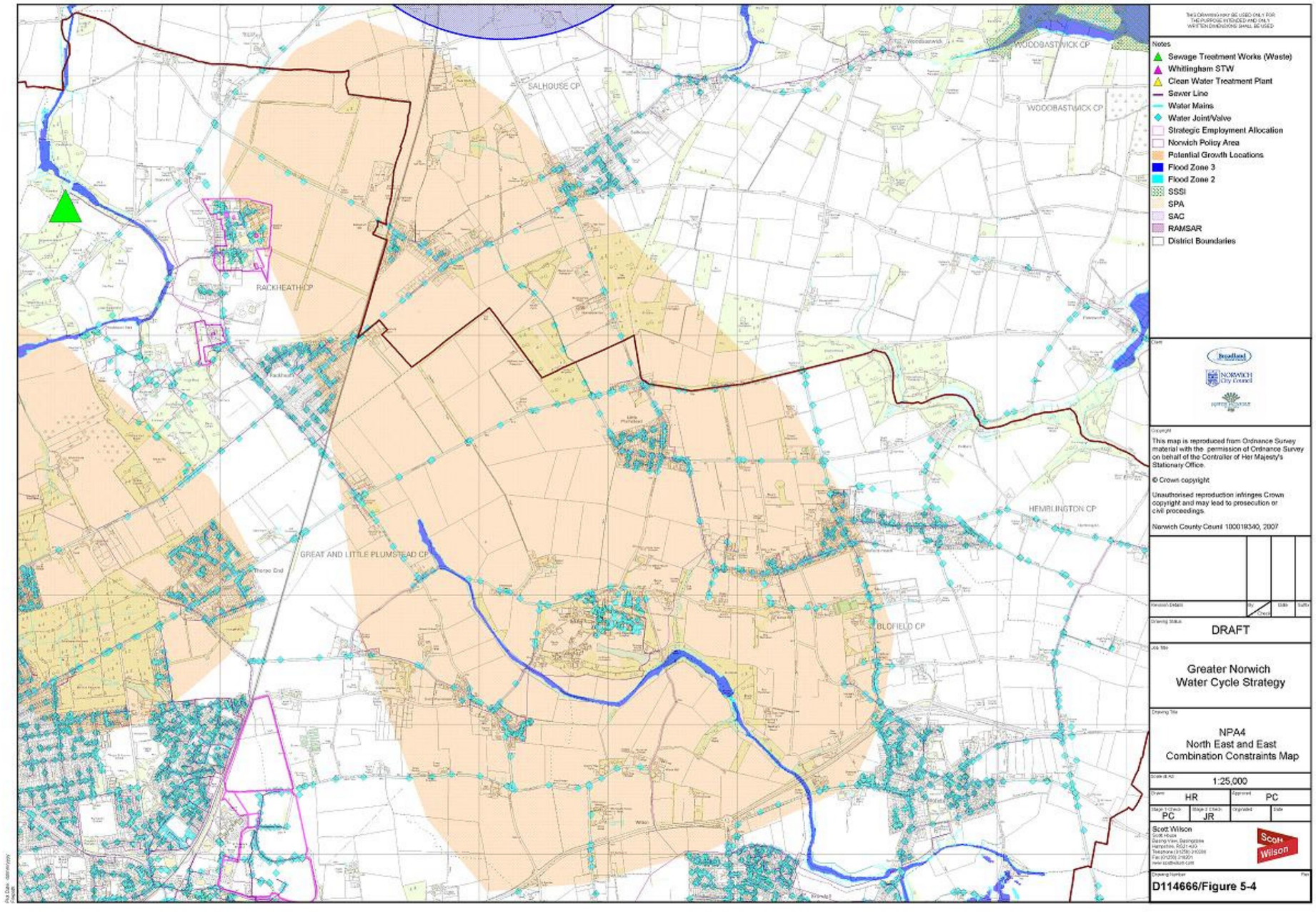
As with NPA1 and NPA3, sewage from this area will increase phosphate loadings discharged from Whitlingham STW and could therefore result in an adverse impact on the Broads SAC/Broadland SPA without technological modifications to the STW.

5.4.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- There are sufficient water resources for up to 15,000 dwellings
- There is no constraint due to receiving STW however there may be constraints due to capacities of existing pumping mains.
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur.

Conclusion – Up to 5,000 houses are suitable in this Potential Growth Area, with more depending on the pumping constraints.


SALHOUSE CP
WOODBASTWICK CP
RACKHEATH CP
GREAT AND LITTLE PLUMSTEAD CP
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BLOFIELD CP
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NPA4
North East and East
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5.5 NPA5 - South East Sector (Vicinity of Poringland)

5.5.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although there are reported localised flood incidents associated with the Ashby St Mary watercourse and Hillingdon Beck. The upper limit of the River Chet is also situated in the southeastern extent of this area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.5.2 Water Resources and Supply

The South East Sector is supplied mainly from groundwater sources (supported conjunctively by Heigham WTW). No spare capacity of these sources (information from AWS) means that this sector starts form the position of requiring investigation for any development. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability. Part of this sector lies within Zone 1 of an SPZ. The potential for growth beyond 5,000 new dwellings is not advised on the basis of the risk to groundwater resources.

Though poorly related to the City Centre, a network of potable water mains service this area. Capacity of existing water tanks might need to be investigated during Stage 2 of the Water Cycle Study. Hence new consumption figures will need to be modelled against present supply and storage tanks capacities.

5.5.3 Wastewater Drainage and Treatment

The Poringland area is serviced by Poringland STW catering for a PE of 4,389. The consented treatment level of the works is as outlined below:

Table 5-1: Poringland STW 2006 Consent Data

2006 PE	DWF (m3/d)	FFT (m3/d)	TSS	BOD	AmmN	P
4,389	1,130	2,930	30	18		

Source: AWS

There are two scenarios that can be developed for the proposed development namely

a) Draining all flows to Poringland STW.

The existing headroom at the STW can only accept an additional 385 properties.

Modifications to the works will be needed to introduce phosphorous stripping. Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal.

b) Draining all flows to Whitlingham STW.

As an alternative and assuming 7000 to 8000 dwellings are to be developed in the area, the wastewater flows could be drained and pumped to Whitlingham STW. The following will be anticipated, draining to a low point close to Framingham, Osier Carr and thereafter pumping to a high point close to Kirby Road, Guide Post before gravitating to Whitlingham STW. Hence for this scenario the following enabling works will be required:

- Approximately, 3.4 km of 300mm diameter gravity main,
- 1 No. Sewage Pumping Station to pump 7,098m3/d,
- Approximately 1.4km long rising main, 150mm in diameter.

5.5.4 Environmental

The South East Sector boundary lies adjacent to Caistor St Edmund Chalk Pit SSSI. However this site is not hydrologically sensitive. Nonetheless great care should be taken in situating development within this area.

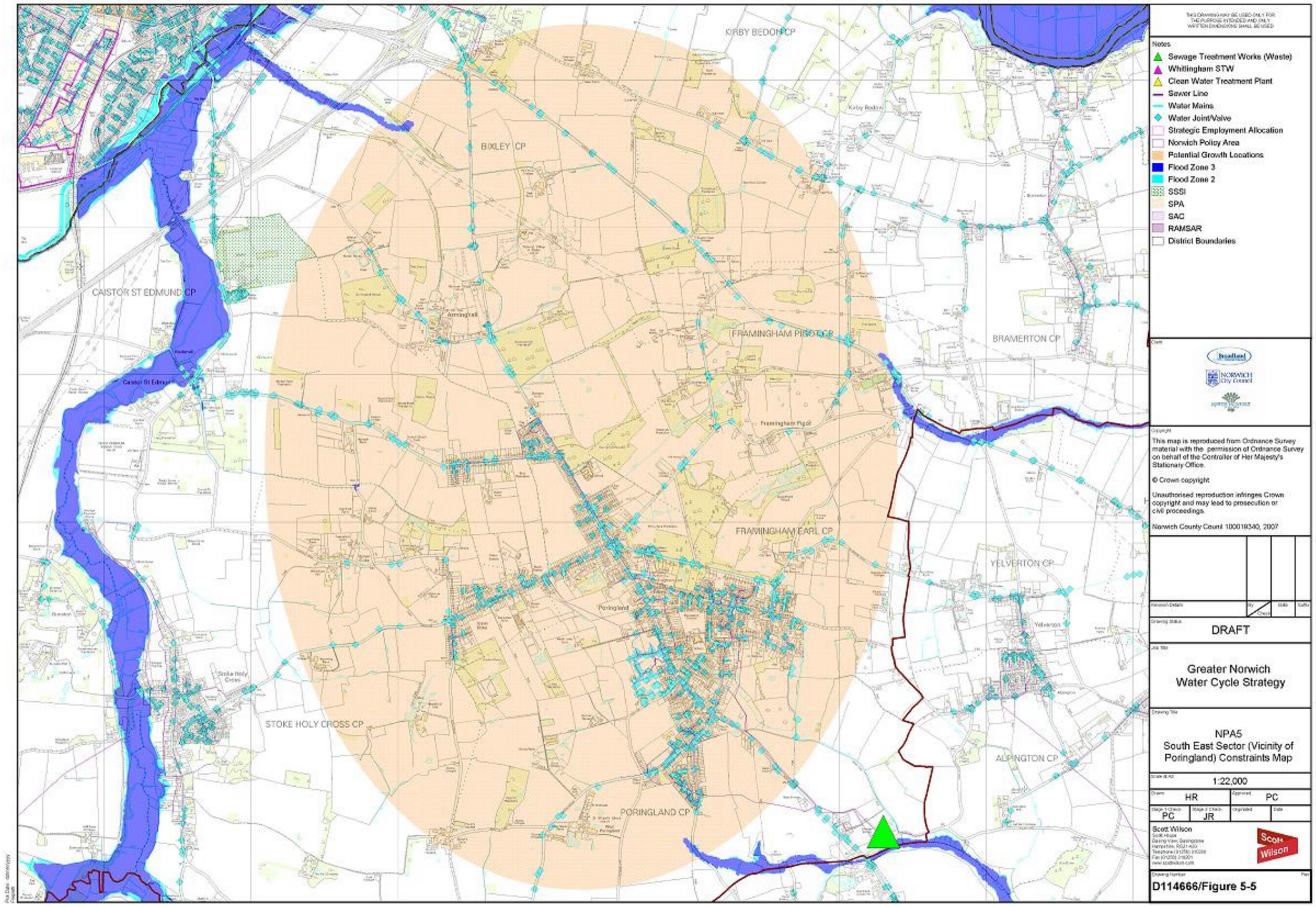
If sewage flows were redirected to Whitlingham STW, this could increase the exisitng unacceptable phosphate loading in the River Yare (and therefore the Broads SAC/Broadlands SPA) to damaging levels.

5.5.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- Growth beyond 5,000 new dwellings is not advised on the basis of risk to groundwater resources.
- For wastewater , any significant development will require capital investment in new infrastructure.
- The green coding for environment assumes that sewage flows can be routed to Poringland STW. If they must be sent to Whitlingham STW, the coding for 5000-10,000 homes would become amber and the 15-20,000 option would become red. The amber shading for housing levels above 10,000 is related to the proximity to Caistor St Edmund Chalk Pit SSSI – as housing levels above 10,000 may be difficult to accommodate without adverse impacts on this site.

Conclusion – Up to 5,000 houses are suitable in this Potential Growth Area, with more depending on the pumping constraints.


KIRBY BEDON CP
BIXLEY CP
CAISTOR ST EDMUND CP
FRAMINGHAM PIGOT CP
BRAMERTON CP
FRAMINGHAM EARL CP
YELVERTON CP
STOKE HOLY CROSS CP
PORINGLAND CP
ALPINGTON CP
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NPA5 South East Sector (Vicinity of Poringland) Constraints Map
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5.6 NPA6 - South Sector (A11-A140 Outside A47)

5.6.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although there are a number of small tributaries of the River Yare in the vicinity of Intwood. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.6.2 Water Resources and Supply

The South Sector is supplied mainly from groundwater sources with no spare capacity (information from AWS). The close proximity to Norwich may mean that a possibility exists for a feed from Heigham WTW. The sector will require investigation for any development. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability. The sector lies outside Zone 3 of an SPZ. The potential for growth beyond 5,000 new dwellings is advised against on the basis of the risk to groundwater resources.

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document. However for a stand alone development capacities of feeder mains will need to be investigated in Stage 2 of the Water Cycle Study.

5.6.3 Wastewater Drainage and Treatment

This proposed location is within the vicinity of Stoke Holy Cross STW, which is currently serving a PE of 1761. With only a headroom of 78 properties, it can be assumed that Stoke Holy Cross STW has no flow headroom. The STW would need substantial upgrade in order to treat increased flows. An MBR Treatment Plant could be considered as a treatment option to deal with phosphorous removal. This will be further investigated in Stage 2 of the Water Cycle Study.

5.6.4 Environmental

There are no environmental protection areas within the development area. The South Sector development area lies approximately 3km to the south west of Caistor St Edmund Chalk Pit SSSI, while a further SSSI (Shotesham Common) lies 1.5km to the south east.

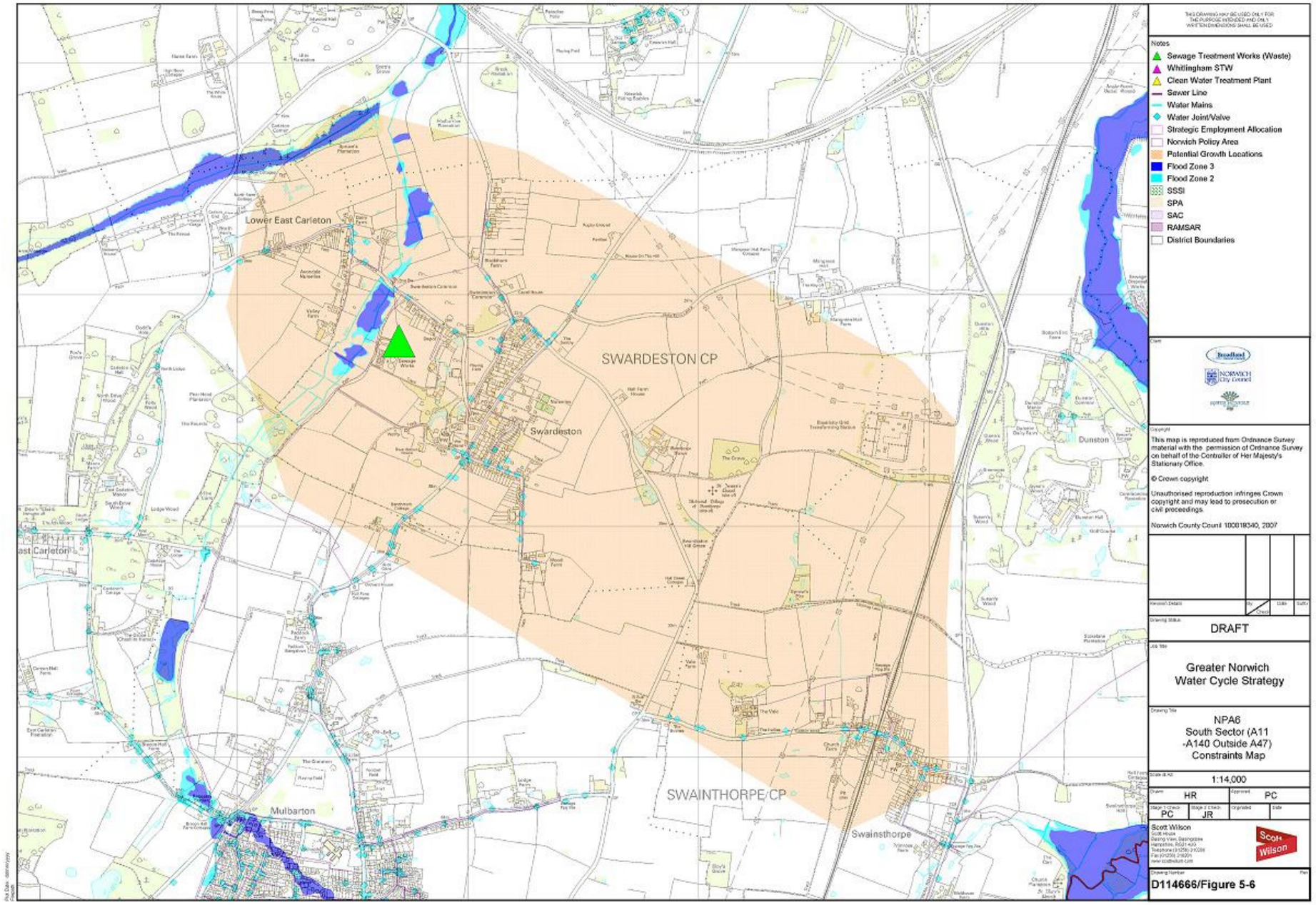
It is likely that development in this area would require sewage to be treated at Stoke Holy Cross STW, which has not been identified as being responsible for excessive phosphate discharge to European sites.

5.6.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- Any new development will require investigation. Growth beyond 5,000 new dwellings advised against on the basis of risk to groundwater resources.
- There is a significant constraint on wastewater as there is no spare capacity at the existing STW.
- There are no significant environmental constraints

Conclusion – Due to STW limitation there is no current growth potential.


Lower East Carleton
SWARDESTON CP
Swardeston
Dunston
Mulbarton
SWAINTHORPE CP
Swainsthorpe
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
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Flood Zone 2
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NPA6 South Sector (A11 -A140 Outside A47) Constraints Map
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5.7 NPA7 - South West Sector (A11-B1108)

5.7.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although a tributary of the River Yare situated west of Hethersett has been identified as having associated flood risks. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.7.2 Water Resources and Supply

The South West Sector is supplied mainly from groundwater sources with no spare capacity (information from AWS). The close proximity to Norwich may mean that a possibility exists for a feed from Heigham WTW. The sector will require investigation for any development. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability. The sector lies outside Zone 3 of an SPZ and further away than the South Sector (NPA6), hence the reason for there being the potential for growth beyond 5,000 new dwellings within this sector.

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document and as such AWS has identified enabling works in this area for approximately 1050 properties comprising 2925m long 355mm HPPE main from junction of Colman Road/Jessop Road to junction of Colney Lane /Round House Way, presently under construction. Number of properties can be increased but consultations with AWS will be required to ascertain additional enabling works required.

5.7.3 Wastewater Drainage and Treatment

The targeted area is located between Hethersett and Cringleford. Flows from Hethersett pass through Cringleford and the combined flows drain to Whitlingham STW.

The main constraint will be capacity of the existing sewers to Whitlingham STW. InfoWorks modelling in Stage 2 of the Water Cycle Study will ascertain this capacity. Therefore the number of properties to be developed in this location can be increased but consultations with AWS will be required to ascertain additional enabling works required.

5.7.4 Environmental

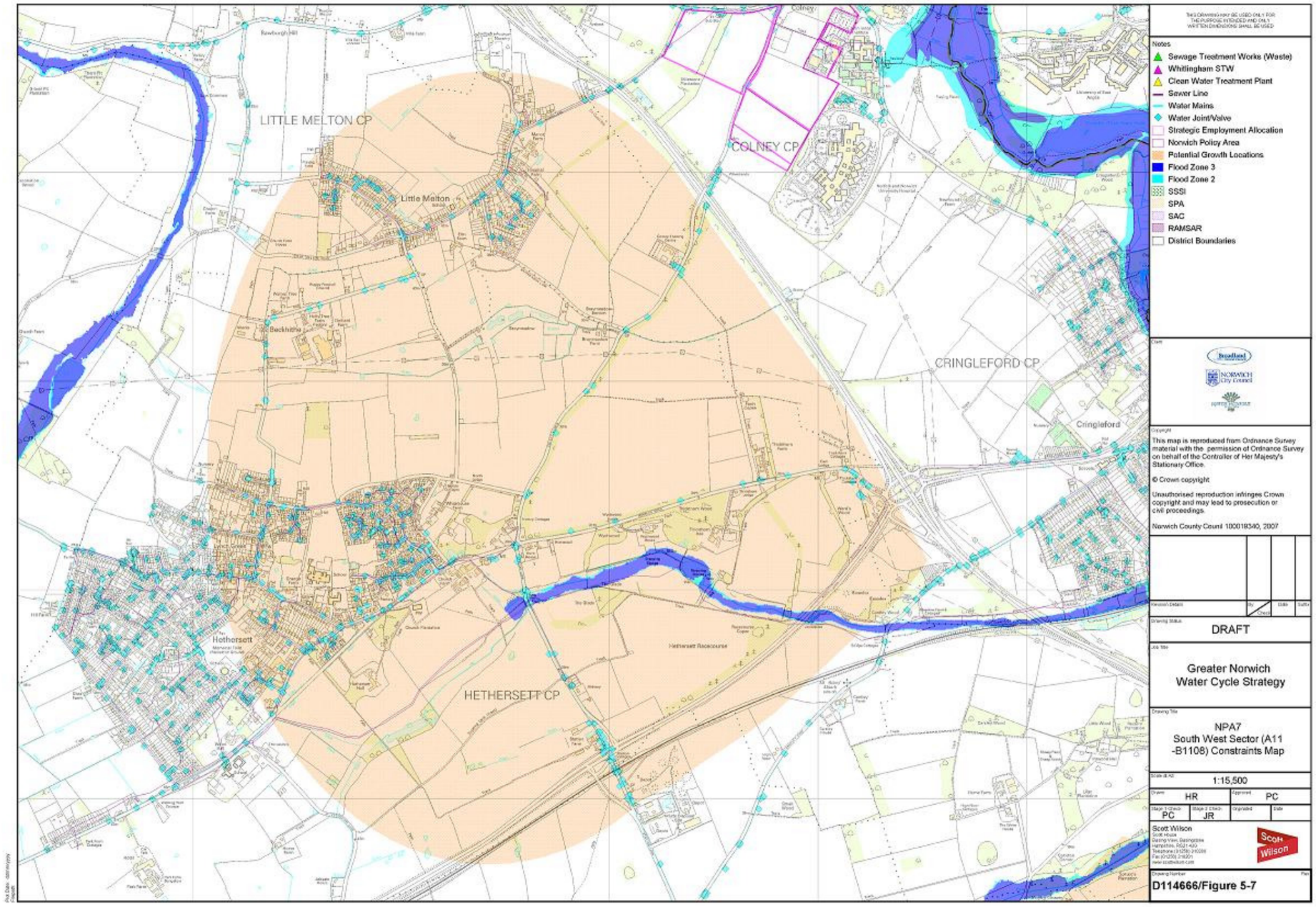
There are no environmental protection areas within the development area or its in close proximity to its boundary. However, development within this area is likely to increase sewage treatment loads at Whitlingham STW leading to increased phosphate discharge into the River Yare (and thus the Broads SAC/Broadland SPA).

5.7.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- Any new development will require investigation. There may be the potential for growth beyond 5,000 new dwellings.
- The receiving STW has adequate capacity, however, the capacity of existing sewers needs to be assessed and is unlikely to be adequate;
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur.

Conclusion – Up to 5,000 houses are suitable in this Potential Growth Area, with water resource assessment required and the impact of phosphates assessed.


LITTLE MELTON CP
COLNEY CP
CRINGLEFORD CP
HETHERSETT CP
Little Melton
Hethersett
Cringleford
Colney
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
Flood Zone 2
SSSI
SPA
SAC
RAMSAR
District Boundaries
Broadland
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NPA7 South West Sector (A11 -B1108) Constraints Map
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HR
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Scott Wilson
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5.8 NPA8 - West Sector (River Yare to River Wensum)

5.8.1 Flood Risk and Hydrology

There are significant fluvial flood risks associated within the southern and north boundaries of this area, from the River Wensum and River Yare respectively. The watercourse flowing eastwards through Costessy has flood risks associated with it. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.8.2 Water Resources and Supply

The West Sector receives most of its water from River Wensum/Heigham WTW. The sector is underlain by a Major Aquifer – High Groundwater Vulnerability Category. This sector lies within Zone 1 SPZ for Costessy Borehole (Norwich). There is potential for growth of up to 1,000 new dwellings, although 5,000-10,000 new dwellings would require investigation. The potential for growth beyond 10,000 new dwellings is advised against on the basis of the risk to groundwater resources.

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document. However for a stand alone development capacities of feeder mains will need to be investigated in Stage 2 of the Water Cycle Study.

Other environmental constraints will need to be considered as area is characterised by sensitive river valleys.

5.8.3 Wastewater Drainage and Treatment

This area currently drains to Whitlingham STW which has spare capacity to take up to 51861 new properties. However all foul drainage emanating from the new development will have to pass through the centre of Norwich. The existing foul drainage system through Norwich is assumed to be at capacity and this can only be verified through modelling in Stage 2 of the Water Cycle Study. It is therefore reasonable to conclude that this area cannot take much additional development. Therefore either the existing sewers passing through Norwich should be upgraded, or to avoid passing flows through the city centre, a new STW should be constructed. The new STW can be in an area strategically located to treat flows from NPA8 West Sector, NPA 9 North West Sector and NPA 10 North Sector. Consideration of the impact on the SACs in the area and downstream will need to be considered.

5.8.4 Environmental

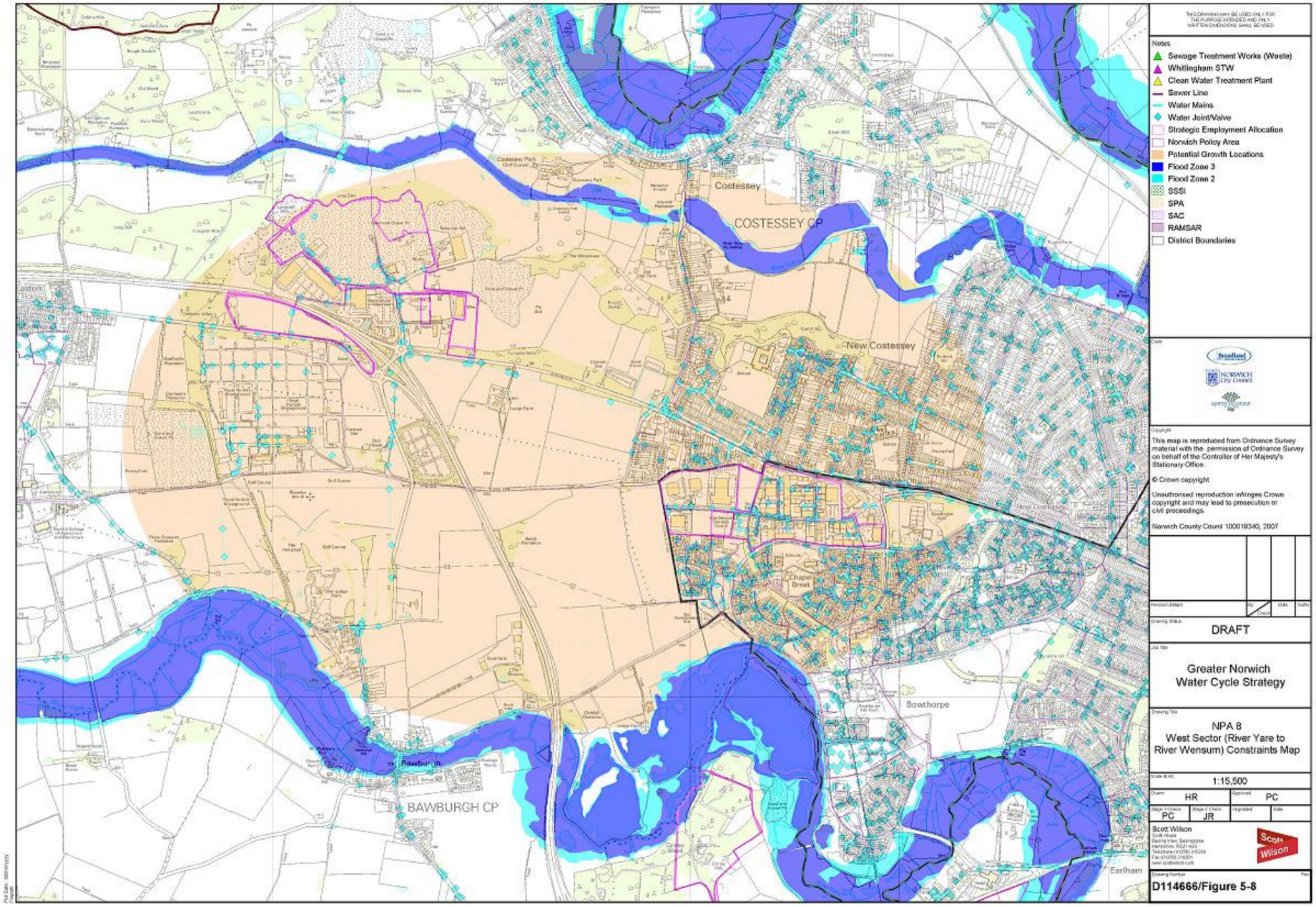
There are no environmental protection areas within the development area. However, the northern boundary of this development area lies 0.2km from the River Wensum SSSI and Broads SAC. Where possible development should be steered away from the vicinity of this area and it will be necessary to ensure that any new STW that is constructed does not increase materially phosphate loadings to the Rivers Yare or Wensum.

5.8.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are potentially significant flood risk issues associated with this;
- Small new developments acceptable (<1,000 new dwellings). Developments between 1,000 and 10,000 new dwellings will require investigation. Growth beyond 10,000 new dwellings advised against on the basis of risk to groundwater resources.
- For wastewater, the amount of new development has been limited to 1,000 new dwellings on the basis that anything higher would require a new STW to be constructed.
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur. In addition, the very close proximity of this site to the Broads SAC adds further constraint to this location.

Conclusion – It is recommended that no development is located here.


Costessey
COSTESSEY CP
New Costessey
Bawburgh
BAWBURGH CP
Bowthorpe
Earlham
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
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SPA
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District Boundaries
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NPA 8
West Sector (River Yare to River Wensum) Constraints Map
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5.9 NPA9 - North West Sector (A1067-NNDR)

5.9.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although this depends on the extent of the proposed growth; the River Wensum is situated to the south of the site. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.9.2 Water Resources and Supply

The North West Sector receives it water from River Wensum/Heigham WTW. The sector is underlain by a Major Aquifer – High Groundwater Vulnerability Category. This sector lies outside Zone 3 of an SPZ. The potential growth beyond 5,000 new dwellings would require investigation to ensure water resources are protected. The North West Sector lying closer to the city's surface water supply sources has a slight lower cut-off for requiring investigation over the North East Sector inside NNDR (NPA1).

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document and they have identified two areas Dereham Road and Queens Hill as areas amenable to development. These areas were assumed to provide nearly 3000 properties between them and enabling works were not required.

5.9.3 Wastewater Drainage and Treatment

Flows from a new development in this area will have to pass through Norwich. The existing foul drainage system through Norwich is assumed to be at capacity and this can only be verified through modelling in Stage 2 of the Water Cycle Study.

If existing foul drainage network through Norwich is at full capacity other alternative treatment sites would need to be considered. Hence, this location will need to be looked at in conjunction with NPA 8 during Stage 2 of the Water Cycle Study. Therefore this development requires further investigation and caution is required at this stage.

5.9.4 Environmental

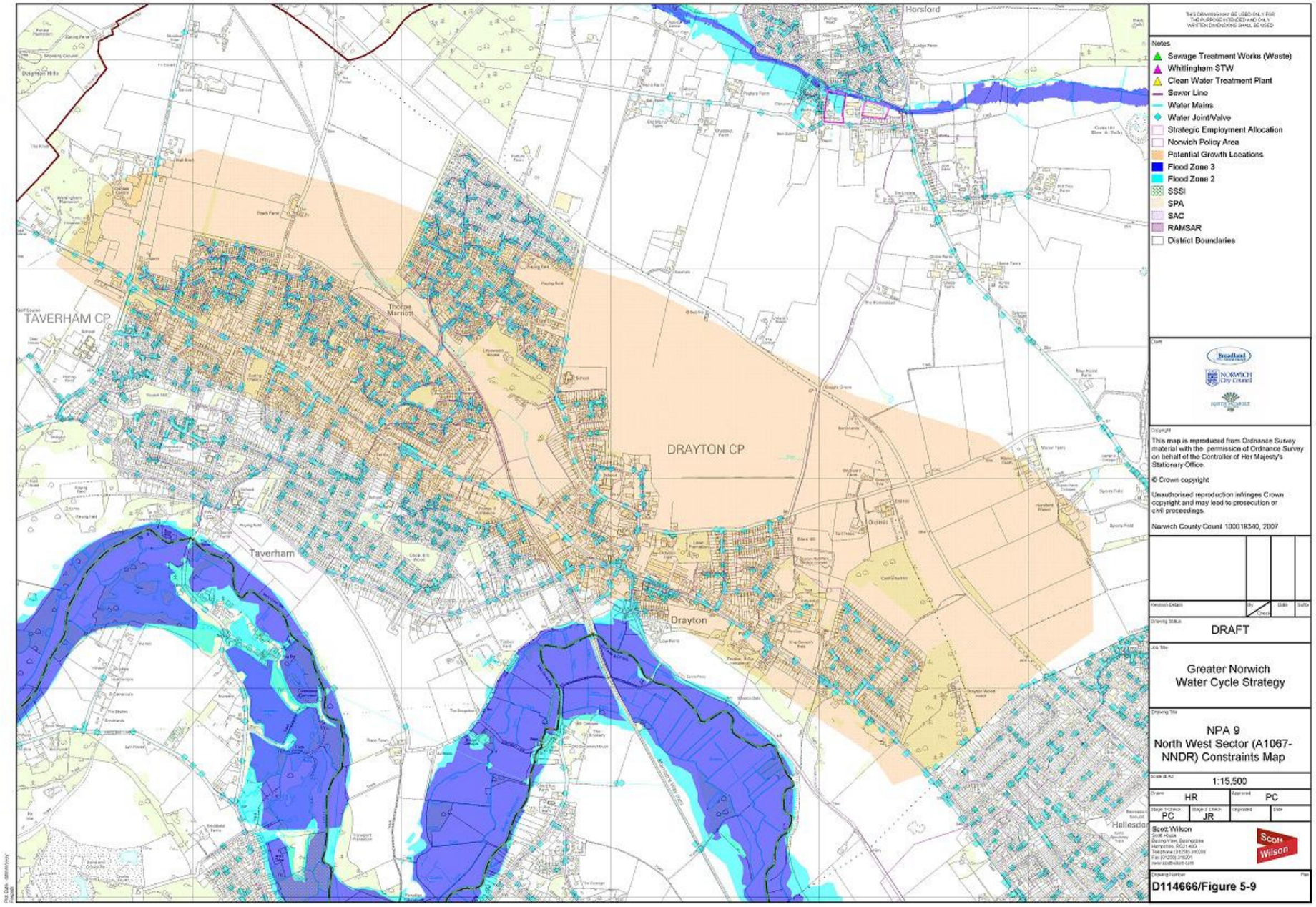
There are no environmental protection areas within the development area. However, the northern boundary of this development area lies 0.2km from the River Wensum SSSI and Broads SAC. Where possible development should be steered away from the vicinity of this area and it will be necessary to ensure that any new STW that is constructed does not increase phosphate loadings to the Rivers Yare or Wensum.

5.9.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- There are sufficient water resources for up to 5,000 new dwellings. Development beyond this figure will require further investigation.
- Caution on wastewater constraint is applied pending establishment of capacity of existing sewers and or feasibility of a new STW;
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur. In addition, the very close proximity of this site to the Broads SAC adds further constraint to this location.

Conclusion – Up to 1,000 homes may be developed.


Horsford
TAVERHAM CP
DRAYTON CP
Taverham
Drayton
Thorpe Marriott
Hellesdon
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
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D114666/Figure 5-9

5.10 NPA10 - North Sector (North of Airport)

5.10.1 Flood Risk and Hydrology

There has been flood risk associated with the Stone Beck, which bisects the proposed growth area towards the east. This is particularly prevalent in the Newton St Faith and New Hainford areas. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.10.2 Water Resources and Supply

The North West Sector receives water from River Wensum/Heigham WTW. The sector is underlain by a Major Aquifer – High Groundwater Vulnerability Category. This sector lies outside Zone 3 of an SPZ. The potential growth beyond 5,000 new dwellings would require investigation to ensure water resources are protected. As per the North West Sector (NPA 9), the close proximity of the city's surface water supply sources means the a slightly lower cut-off than for the North East Sector – inside NNDR would apply.

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document. However for a stand alone development capacities of feeder mains will need to be investigated in Stage 2 of the Water Cycle Study.

5.10.3 Wastewater Drainage and Treatment

Flows from this area currently pass through Norwich on their way to Whitlingham STW. The existing foul drainage system through Norwich is assumed to be at capacity and this can only be verified through modelling in Stage 2 of the Water Cycle Study.

As proposed in Appendix C, flows from this development can be drained to a new STW.

5.10.4 Environmental

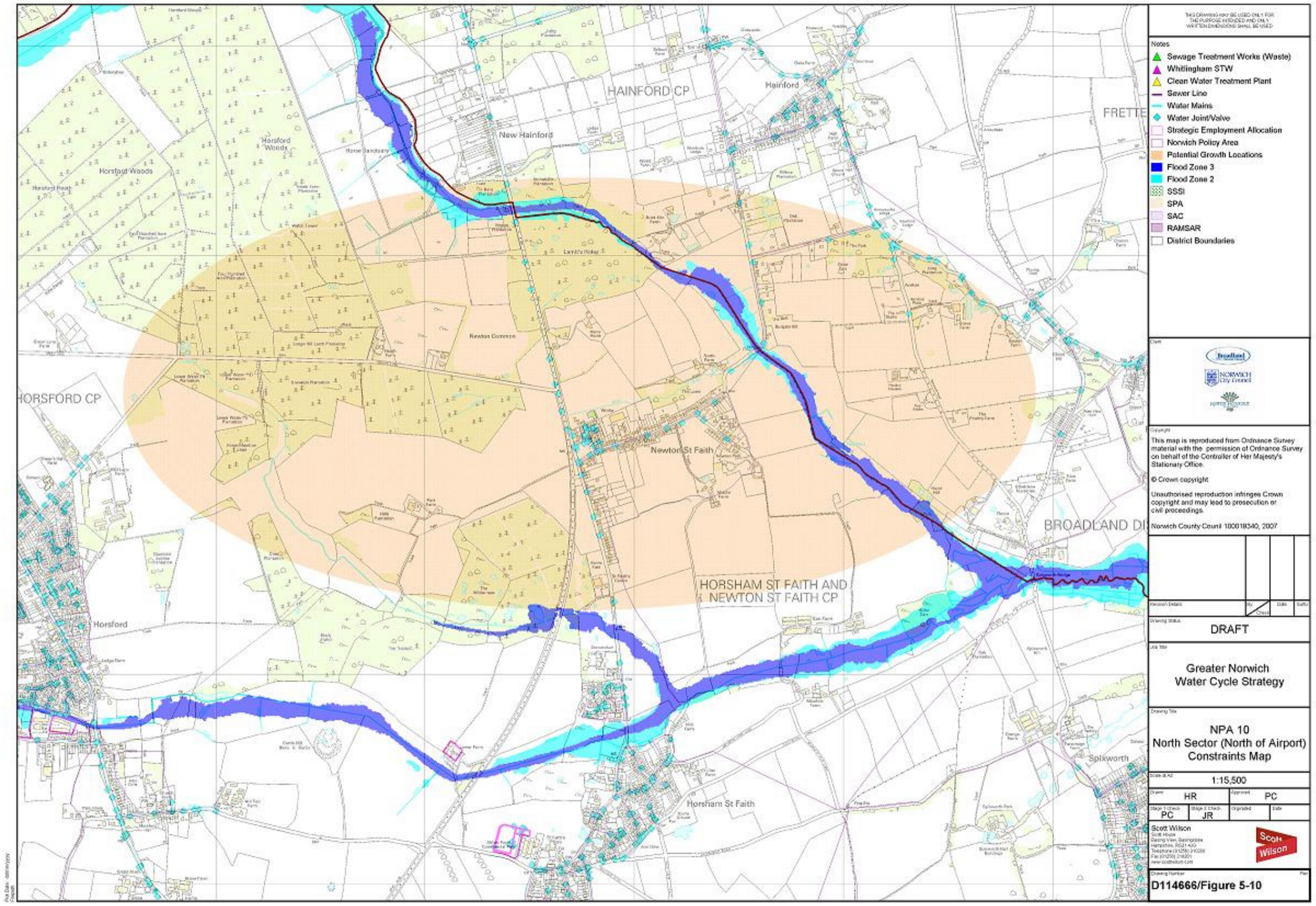
There are no environmental protection areas within the development area. The North Sector development area boundary is approximately 2kms away from the Crostwick Marsh SSSI (part of the Broads SAC/Broadlands SPA).

5.10.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There are no significant flood risk issues;
- There are sufficient water resources for up to 5,000 new dwellings. Development beyond this figure will require further investigation.
- Caution on wastewater constraint is applied pending establishment of capacity of existing sewers and or feasibility of a new STW;
- There are no perceived environmental issues.

Conclusion – Currently up to 1,000 houses are possible, however with investment into water supply and wastewater treatment up to 20,000 houses are suitable in this Potential Growth Area.


HAINFORD CP
Hainford
New Hainford
Horstead Woods
Horsford Woods
Newton Common
Newton St Faith
HORSFORD CP
HORSHAM ST FAITH AND NEWTON ST FAITH CP
Horsford
Horsham St Faith
Spixworth
Notes
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Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
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Flood Zone 2
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NPA 10
North Sector (North of Airport)
Constraints Map
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5.11 NPA11 – Wymondham

5.11.1 Flood Risk and Hydrology

There are a number of flood risks associated within this proposed growth areas from the north flowing tributaries of the River Tiffey. Areas that may be affected include those to the south and southeast of Wymondham, as well as the areas to the north and west. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

The Environment Agency have identified that there is considerable evidence of flooding across Wymondham. The source of flooding is likely to be connected with the infrastructure in the town. It is therefore recommended that potential growth within this area be undertaken with caution as lack of data may be underestimating the impact of flooding, and hence over-estimating the potential development options. It is highly recommended that this should be investigated in Stage 2.

5.11.2 Water Resources and Supply

This potential growth area is likely to be supplied mainly from groundwater sources. Limited information is available on these sources. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability and lies outside Zone 3 of an SPZ. The potential growth beyond 5,000 new dwellings would require checks on whether sufficient water resources are available.

It is AWSs position that potable water supplies will not be an issue for the 2031 horizon as outlined in their Norwich Area Strategy Document. However for a stand alone development capacities of feeder mains will need to be investigated in Stage 2 of the Water Cycle Study.

5.11.3 Wastewater Drainage and Treatment

Wymondham is serviced by the Wymondham STW catering for a PE of 17,178. The Consented treatment level of the works is as outlined below;

Table 5-2: Wymondham STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
17,178	4,400	25	12	4	

Source: AWS

Wymondham STW has some flow headroom and nearly 4,058 properties can be accommodated within this headroom. Modifications to the works will be required to introduce phosphorous stripping. Based on conclusions drawn by the Environment Agency, phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal. Hence this development requires further investigation and hence caution is required at this stage.

5.11.4 Environmental

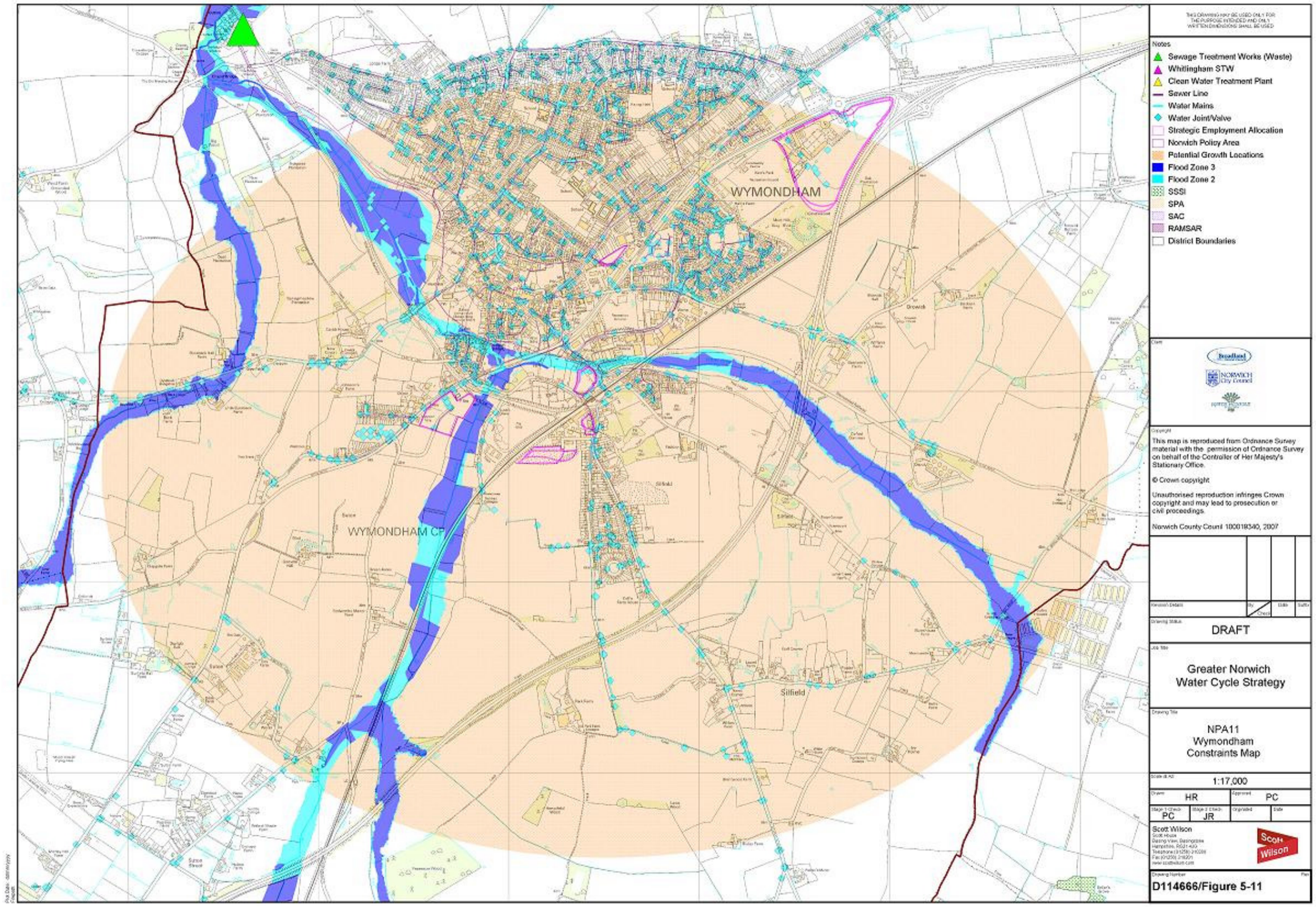
There are no environmental protection areas within the development area. The SSSI site at Lower Wood, Ashwellthorpe lies 1km away from the south east of the development area boundary. It will be necessary to ensure that any new STW that is constructed does not increase phosphate loadings to the Rivers Yare or Wensum.

5.11.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-4,000				
4,000-10,000				
10,000-15,000				
15,000-20,000				

- There are a number of fluvial flood risk issues, however they are not perceived to be significant. There are unknown drainage related flooding issues which needs to be investigated in Stage 2;
- There is potential for growth up to 5,000 new dwellings. Beyond this checks will be required on the water resource position.
- From a wastewater perspective there is potential for developing up to 4,000 new homes;
- The limit on the number of homes will be governed by the water quality issues.
- There are no significant environmental constraints provided that any new STW can avoid discharging significant levels of phosphate to the Rivers Yare or Wensum

Conclusion –Currently up to 4,000 houses are possible, however this needs to be reviewed in light of the unknown risk of drainage related flooding.


WYMONDHAM
WYMONDHAM CP
Silfield
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
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Water Cycle Strategy
NPA11
Wymondham
Constraints Map
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5.12 CITY - Norwich City

5.12.1 Flood Risk and Hydrology

There are a number of likely sources of flood risk associated with this potential growth point including surface water drainage and surcharging of the existing drainage infrastructure and flood risks associated with the River Yare and River Wensum. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.12.2 Water Resources and Supply

Norwich City is supplied from Heigham WTW and development is assumed to comprise infill areas and that these will be fed from the existing local network. It is AWSs position that potable water supplies will not be an issue for the 2031 horizon. Hence AWS has identified the following sites, Deal Ground and Utilities site and Bowthorpe Phase 3 that can accommodate nearly 1,050 properties. The Deal Ground and Utilities site will require the following enabling works approximately 400 m long, 280mm HPPE main from junction of Bracondale/Martineau Lane to site entrance on The Street, Trowse, whilst the Bowthorpe Phase 3 site will require no enabling works.

The potential for growth within the City of Norwich will need to consider that it is underlain by a Major Aquifer – High Groundwater Vulnerability Category. The sector also lies within Zone 1 SPZ for Norwich groundwater source. There is potential for growth of up to 1,000 new dwellings, although 5,000-10,000 new dwellings would require investigation. The potential for growth beyond 10,000 new dwellings is advised against on the basis of the risk to groundwater resources. (see Section 8.2).

5.12.3 Wastewater Drainage and Treatment

Norwich City is serviced by Whitlingham STW and from data supplied by AWS; Whitlingham STW has a calculated flow headroom of 21,782 m3/d as outlined below:

Table 5-3: Whitlingham STW 2006 Consent Data

Calculated DWF (m3/d)	Consented DWF (m3/d)	Calculated Headroom (m3/d)	DWF Calculated Headroom PE 2006	Average Property Occupancy PE No.	No. of Properties based on Calculated Headroom 2006
44,468	66,250	21,782	108,908	2.1	51,861

Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal. But Whitlingham STW was identified as having the highest contribution to existing nutrient levels in the Yare Broads and Marshes site, with a level in the order of roughly 41% of phosphorous loads. Hence more stringent treatment levels might be required if additional flows are discharged to Whitlingham STW.

The existing sewer network within Norwich City is at this juncture assumed to be at full capacity, whilst it may be argued that isolated infill areas can be developed if immediate sewers have capacity. It is the cumulative effect of flows from such developments in the downstream sewer network leading to Whitlingham STW which is of concern and as such shall be assumed to be the main driver in deciding whether infill development can be accommodated without any major improvements to the network. It should also be noted that Norwich City is a heavily built area and part of it is sitting on an unconfined chalk strata, hence any proposed sewer network improvements will need to take due cognisance of all these constraints.

In order to identify any areas amenable to development with some degree of certainty hydraulic modelling will need to be carried out in Stage 2 of the Water Cycle Study. The InfoWorks Modelling Tool will be used to identify areas prone to flooding as a result of upstream developments.

AWS have identified as part of the infill development two sites, Deal Ground and Utilities site and Bowthorpe Phase 3 that are located such that their flows will not pass through the city. However their impact on down stream sewers will be investigated in Stage 2 of the Water Cycle Study.

5.12.4 Environmental

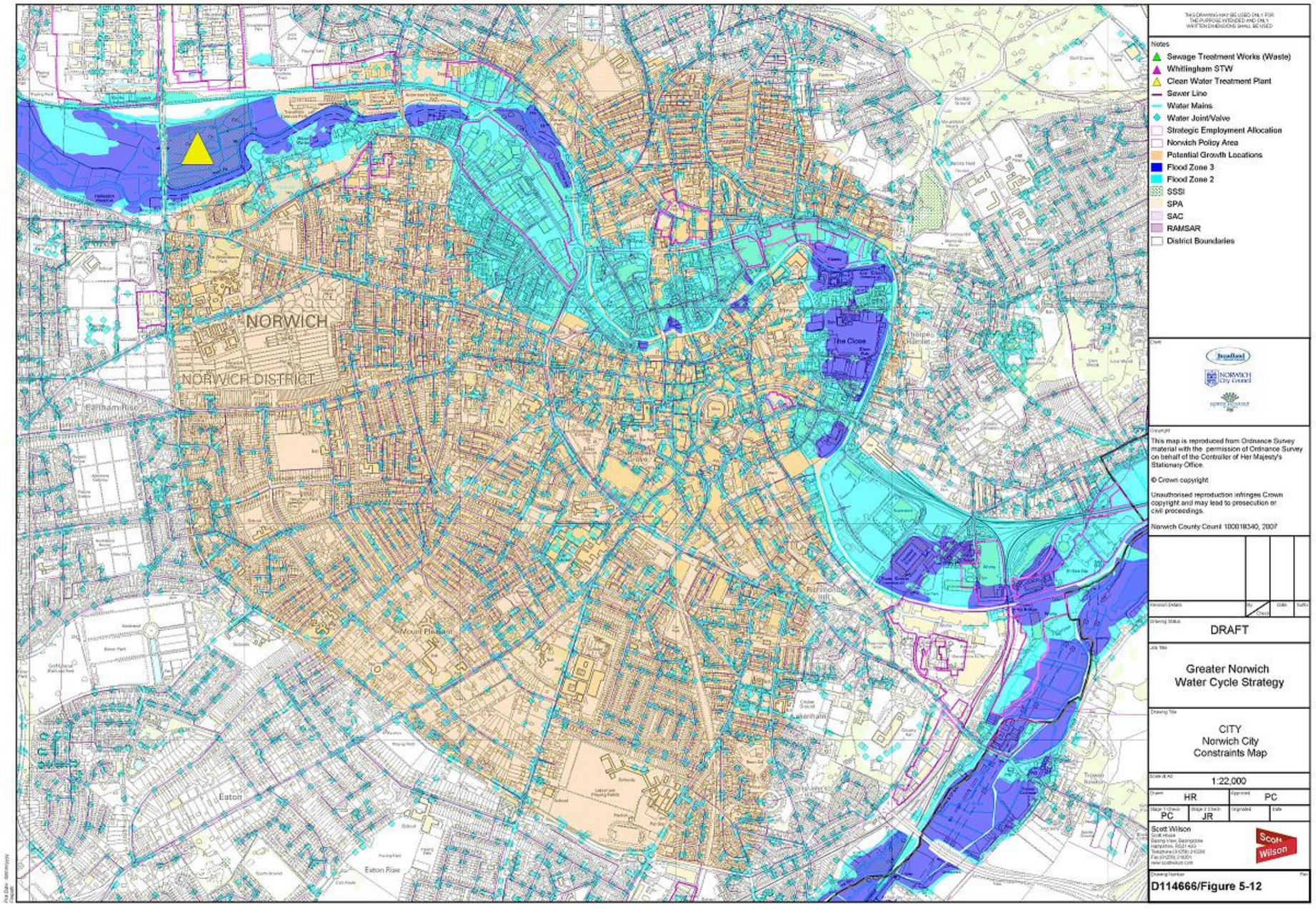
The Sweetbriar Road Meadows SSSI and St. James' pit SSSI lie on the northwest border of the development area. Where possible development should be steered away from these areas. It is likely that development here will increase phosphate loadings discharged by Whitlingham STW. This will have an adverse effect upon the Broads SAC/Broadland SPA without technological modifications to the STW.

5.12.5 Summary

Possible Dwelling Scenario	Constraints			
	Flood Risk	Water Resources	Wastewater	Environment
0-1,000				
1,000-5,000				
5,000-10,000				
10,000-15,000				
15,000-20,000				

- There may be significant flood risk issues associated within development;
- Small new developments acceptable (<1,000 new dwellings). Developments between 5,000 and 10,000 new dwellings will require investigation. Growth beyond 10,000 new dwellings advised against on the basis of risk to groundwater resources;
- Developments in excess of 10,000 new dwellings is not recommended as it is assumed that existing sewers cannot be easily upgraded;
- Technological modifications to Whitlingham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur. In addition, the very close proximity of this site to two SSSIs adds further constraint to this location.

Conclusion – Currently up to 1,000 houses are suitable, however further investigation is required if this is to be increased.


NORWICH
NORWICH DISTRICT
Eaton
Eaton Rise
Mount Pleasant
Earlham Rise
The Close
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
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Norwich City
Constraints Map
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5.13 RPA1 –Reepham

5.13.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although there are flood zone 3 areas shown from tributaries of the River Wensum. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.13.2 Water Resources and Supply

Reepham is supplied mainly from groundwater sources. No supply issues have been mentioned by AWS. The sector is underlain by Major Aquifer – with Highest Groundwater Vulnerability Classification (High – 1) and lies outside Zone 3 of an SPZ. There is potential for growth up to 1,000 new dwellings without threatening groundwater resources. Investigation will be required above this figure.

5.13.3 Wastewater Drainage and Treatment

Reepham is serviced by the Reepham STW catering for a PE of 4064. The Consented treatment level of the works is as outlined below;

Table 5-4: Reepham STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
4,064	850	45	30	10	

Source: AWS

Reepham STW has a consented DWF of 850m3/d and a calculated DWF of 714m3/d. Based on these figures as given by AWS and an assumed average property occupancy of 2.1 the anticipated number of properties are as outlined below:

Table 5-5: Anticipated Number of New Properties (Reepham)

Calculated DWF (m3/d)	Consented DWF (m3/d)	DWF Calculated Headroom PE (2006)	Property Occupancy PE No.	No. of Properties based on TSFR Headroom
714	850	682	2.1	325

Source: AWS

The above figure must be treated with caution since measured DWF through the works seems to be greater than the calculated DWF. If this is the case, this would result in a smaller headroom figure. i.e. if measured DWF is used in the assessment the number of properties drops to approximately 157.

Modifications to the works will be needed to introduce phosphorous stripping. Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal.

5.13.4 Environmental

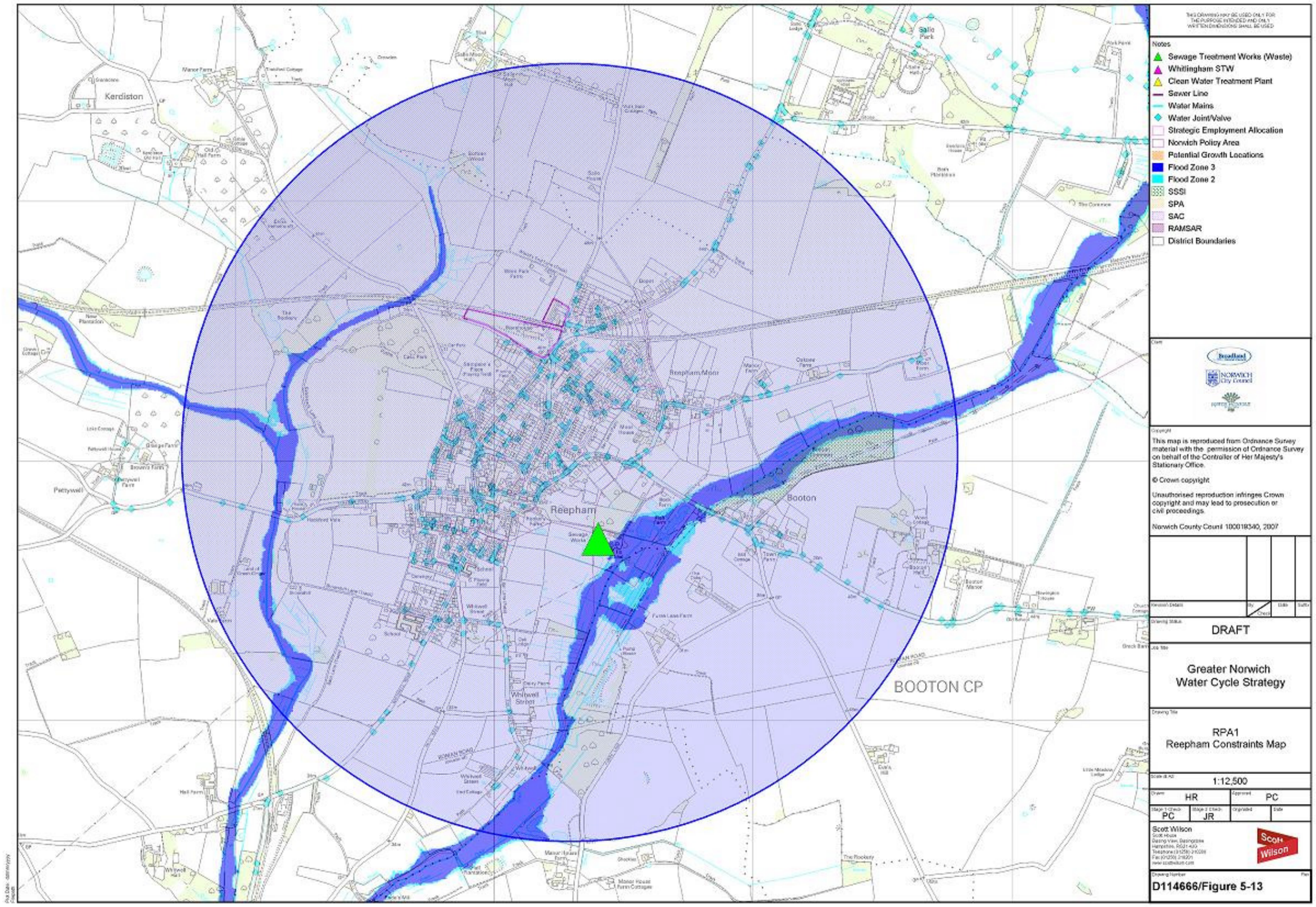
Booton Common SSSI (part of the Broads SAC/Broadlands SPA) lies to the east of the development area. Where possible development should be steered away from this area. Development in this area will increase phosphate loads discharged by Reepham STW and therefore could have an adverse effect on both the Broads SAC/Broadland SPA and the River Wensum SAC, without technological modifications to the STW.

5.13.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood issues up to 1,000;
- There is potential for growth up to 1,000 new dwellings without threatening groundwater resources.
- The existing STW limits additional growth to just 325 new dwellings;
- Technological modifications to Reepham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur.

Conclusion – Currently up to 100 houses are possible.


Kerdiston
Reepham
Reepham Moor
Booton
BOOTON CP
Notes
Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
Flood Zone 2
SSSI
SPA
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District Boundaries
Broadland
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RPA1 Reepham Constraints Map
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5.14 RPA2 –Aylsham

5.14.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although Flood Zone 3 has been identified with the upper tributaries of the River Bure. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.14.2 Water Resources and Supply

Aylsham is supplied mainly from groundwater sources. No supply issues have been identified by AWS. The sector is underlain by Major Aquifer – with Highest Groundwater Vulnerability Classification (High – 1) but lower than nearby Reepham (RPA1). The sector lies outside Zone 3 of an SPZ. There is potential for up to 2,000 new dwellings within this sector.

5.14.3 Wastewater Drainage and Treatment

Aylsham is serviced by the Aylsham STW catering for a PE of 8,884. The Consented treatment level of the works is as outlined below;

Table 5-6: Aylsham STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
8,884	1,440	60	40	5	1

Source: AWS

Aylsham STW has no flow headroom but one or two properties can be accommodated as part of infill development. Any major development would require upgrading of works.

5.14.4 Environment

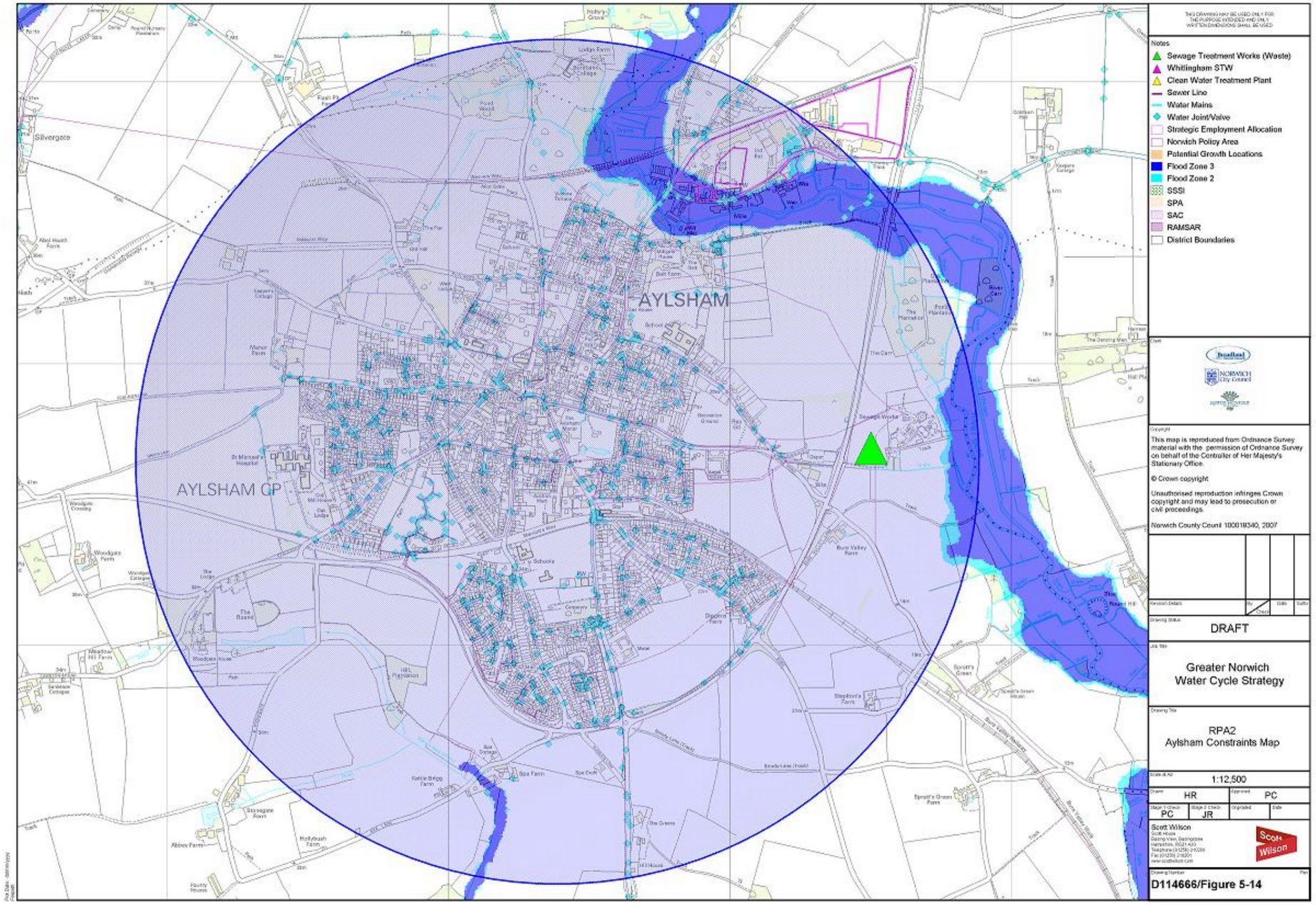
There are no environmental protection areas within the development area. Cawston & Marsham Heath SSSI lies 2km away from the south east of the development area boundary. Development in this area would result in sewage treatment by Aylsham STW, which has not been identified as posing a risk to any European sites.

5.14.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0				
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood risk issues;
- There is sufficient water resources for up to 2,000 new dwellings
- There is no wastewater treatment capacity to accommodate any growth.
- There are no environmental problems

Conclusion – Due to STW limitation there is no current growth potential.


AYLSHAM
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Silvergate
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Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
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5.15 RPA3 – Wroxham

5.15.1 Flood Risk and Hydrology

There are a number of sources of flood risk associated with this potential growth point that includes tidal and fluvial flooding associated with the River Bure. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.15.2 Water Resources and Supply

Wroxham is supplied mainly from groundwater sources. No supply issues have been identified by AWS. The area is underlain by Major Aquifer - High Groundwater Vulnerability and lies within a Zone 1 of an SPZ. The potential for growth beyond 1,000 new dwellings is advised against on the basis of the risk to groundwater resources. Developments beyond 500 new dwellings will require investigation.

5.15.3 Wastewater Drainage and Treatment

Wroxham is serviced by the Belaugh STW catering for a PE of 8,717. The Consented treatment level of the works is as outlined below;

Table 5-7: Belaugh STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
8717	2,273	80	30	10	1

Source: AWS

Belaugh STW has a calculated DWF headroom of 804 m3/d. The anticipated number of properties that can be accommodated within this headroom based on the 2006 calculated PE headroom is as outlined below:

Table 5-8;Anticipated Number of New Properties (Reepham)

Calculated DWF (m3/d)	Consented DWF (m3/d)	DWF calculated Headroom PE (2006)	Property Occupancy PE No.	No. of Properties based on calculated Headroom
1,469	2,273	4,021	2.1	1,915

Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal.

5.15.4 Environmental

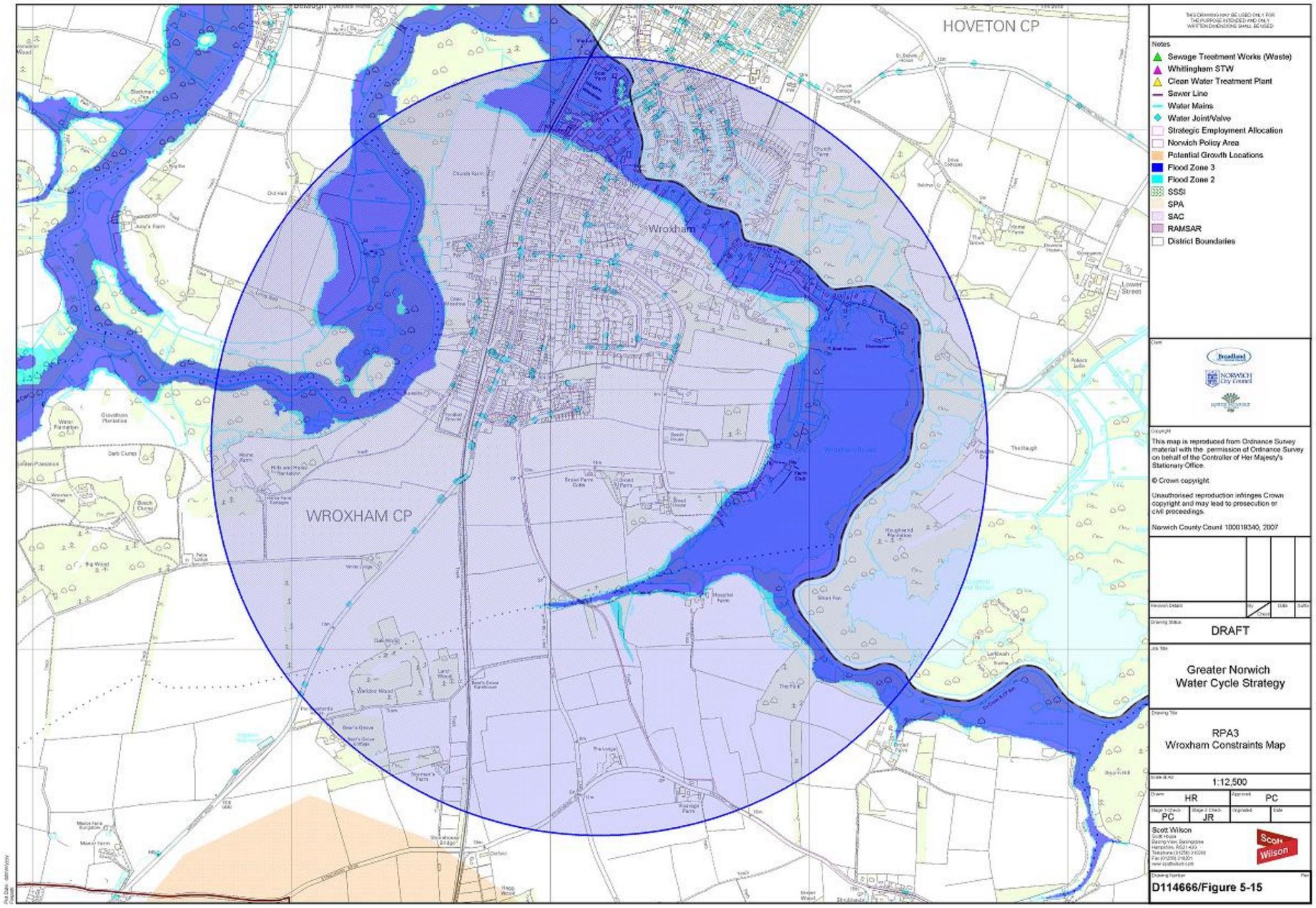
There are no environmental protection areas within the development area. To the west of the Wroxham development boundary is the Bure Broads and Marshes SSSI (part of the Broads SAC/Broadlands SPA). Development in this area would increase phosphate discharges by Bylaugh STW, which could have an adverse effect on the River Wensum SAC (into which the Bure ultimately drains).

5.15.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are possible flood risk issues depending on the siting of the development;
- There is potential for growth up to 500 new dwellings without threatening groundwater resources. Beyond this figure will require investigation.
- The existing STW has capacity to enable growth of up to 2,000 new dwellings;
- Technological modifications to Bylaugh STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur.

Conclusion – Currently up to 500 houses are possible, however further investigation is required if this is to be increased.


HOVETON CP
WROXHAM CP
Wroxham
Lower Street
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Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
Potential Growth Locations
Flood Zone 3
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SSSI
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Drawing Title
RPA3 Wroxham Constraints Map
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Rev

5.16 RPA4 – Acle

5.16.1 Flood Risk and Hydrology

There are significant tidal flood risks within this area that may be augmented during peak fluvial flows. This is especially prevalent to the east of the site and should be avoided where possible. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.16.2 Water Resources and Supply

Acle is supplied mainly from groundwater sources. No supply issues have been mentioned by AWS. The sector is underlain by Major Aquifer – with High Groundwater Vulnerability and lies outside Zone 3 of an SPZ. There is potential for up to 2,000 new dwellings within this sector.

5.16.3 Wastewater Drainage and Treatment

Acle is serviced by the Acle-Damgate STW catering for a PE of 3,829. The Consented treatment level of the works is as outlined below;

Table 5-9: Acle STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
3,829	720	60	40	15	

Source: AWS

The calculated DWF for Acle-Damgate STW indicates that the Works has headroom for 141 properties. However, the measured DWF indicates that it has no flow headroom. It is therefore uncertain whether there is headroom or not at this Works. In any event, any major development would require upgrading of works.

5.16.4 Environmental

Decoy Carr SSSI and Damgate Marshes SSSI (both part of the Broads SAC/Broadlands SPA) lie actually within the development area of Acle. These sites cover approximately half of the development area and there the constraints of these environmental protection areas should be carefully considered when developing in this area.

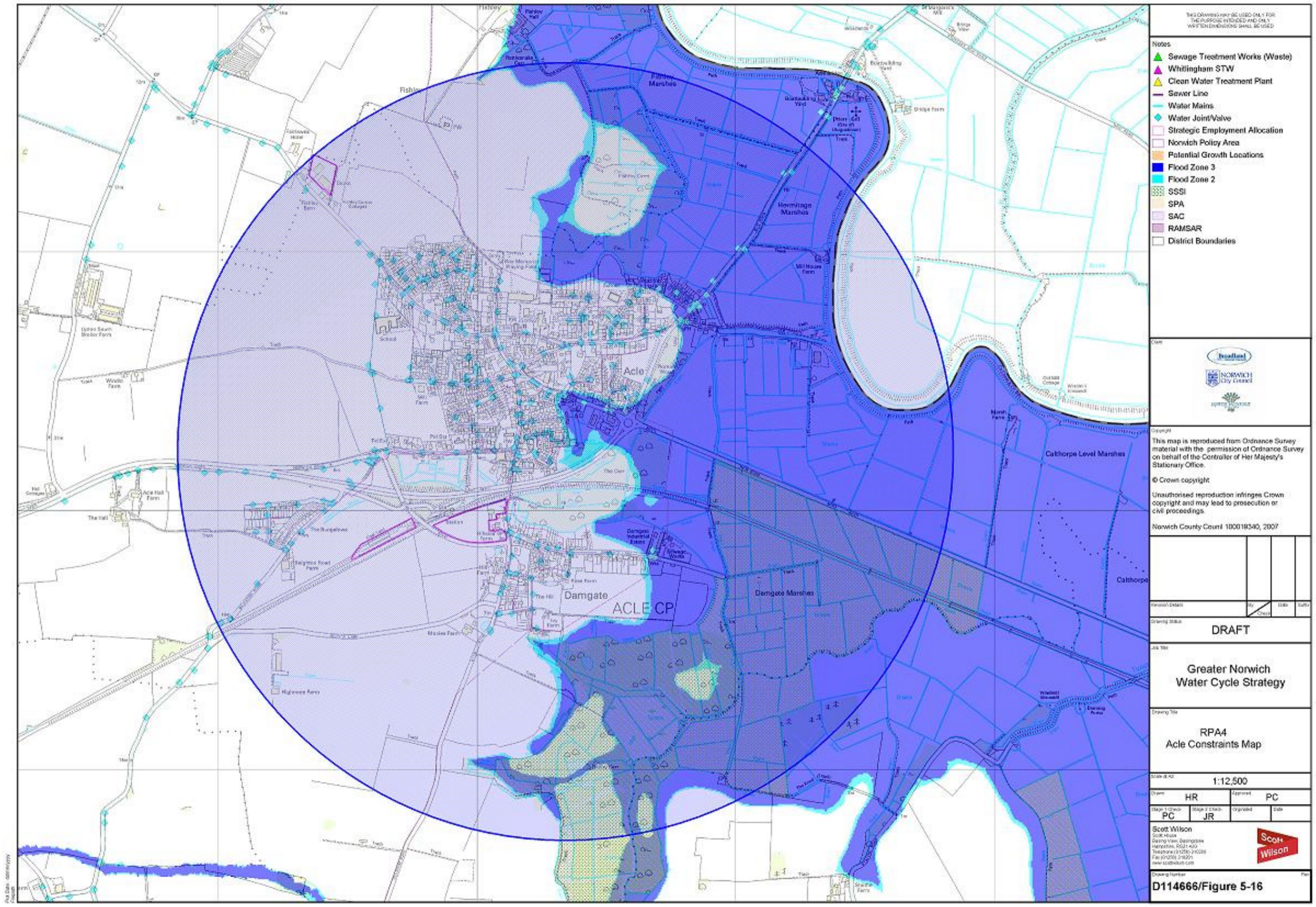
Development in this area would result in sewage treatment by Acle-Damgate STW, which has not been identified as posing a risk to any European sites.

5.16.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are likely to be significant impacts on flood risk;
- There is sufficient water resources for up to 2,000 new dwellings
- There may be sufficient wastewater treatment capacity for at least 100 new dwellings.
- Although there are unlikely to be significant adverse impacts on European sites, considerable environmental constraints are imposed by the presence of two SSSI which lie within the development area.

Conclusion – Up to 100 homes are acceptable, however flood risk and environmental concerns will have to be assessed.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Sewage Treatment Works (Waste)
Whitlingham STW
Clean Water Treatment Plant
Sewer Line
Water Mains
Water Joint/Valve
Strategic Employment Allocation
Norwich Policy Area
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Flood Zone 2
SSSI
SPA
SAC
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District Boundaries
Acle
Damgate
ACLE CP
Damgate Marshes
Calthorpe Level Marshes
Hermitage Marshes
Fishley Marshes
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5.17 RPA5 – Hingham

5.17.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.17.2 Water Resources and Supply

Hingham is supplied mainly from groundwater sources. No supply issues have been mentioned by AWS. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability and within Zone 2 of an SPZ. There is potential for up to 2,000 new dwellings within this sector.

5.17.3 Wastewater Drainage and Treatment

Flows from Hingham are pumped to Wymondham STW, hence capacity of pump station and rising main will need to be investigated during Stage 2 of the Water Cycle Study. It must be noted also that development in this area will be affected by any expansion in Wymondham. Wymondham STW has a headroom of 4058 properties.

5.17.4 Environmental

There are no nature conservation areas within the Higham development boundary. However, Sea Mere SSSI lies approximately 0.2km from the development area boundary. Great care would therefore be required to ensure that housing did not result in an adverse effect on this hydrologically sensitive site.

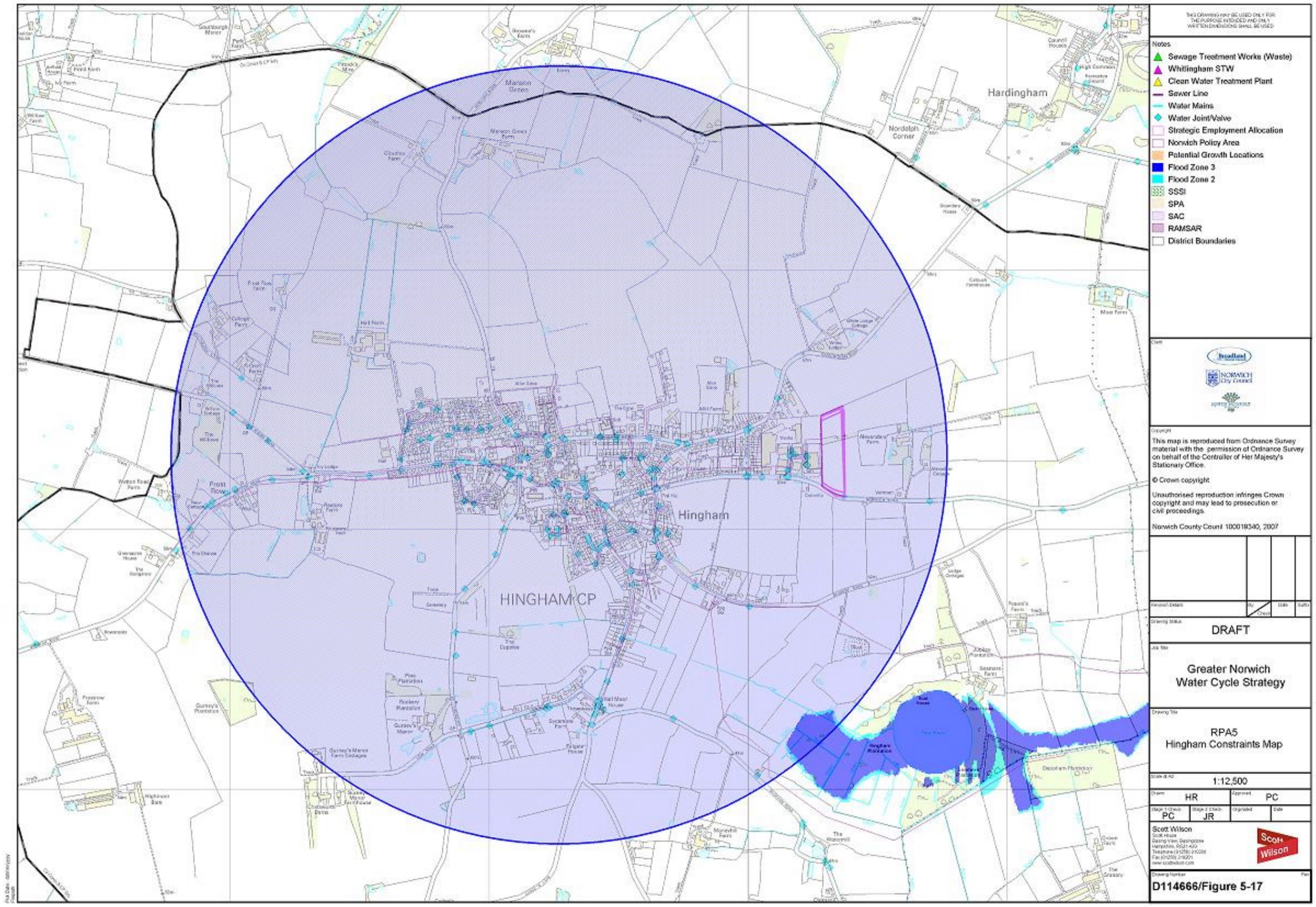
Development in this area would result in sewage treatment by Wymondham STW, which may lead to damaging phosphate discharges into the Broads SAC/Broadlands SPA.

5.17.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood risk issues;
- There are sufficient water resources for up to 2,000 new dwellings;
- There is sufficient STW capacity
- Technological modifications to Wymondham STW would be required to ensure that significant adverse impacts on the Broads SAC/Broadland SPA did not occur. Moreover, environmental constraints are imposed by the presence of a hydrologically sensitive SSSI in close proximity to the development area.

Conclusion – Up to 500 homes is acceptable, however the impacts on the environment should be assessed and potential impacts to Wymondham considered and assessed.


Hardingham
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Notes
Sewage Treatment Works (Waste)
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Sewer Line
Water Mains
Water Joint/Valve
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RPA5 Hingham Constraints Map
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5.18 RPA6 – Diss

5.18.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although Flood Zone 3 has been identified with the upper tributaries of the River Waveney. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.18.2 Water Resources and Supply

Diss is supplied mainly from groundwater sources but with no spare capacity (information from AWS). The sector is underlain by Major Aquifer – High Groundwater Vulnerability and lies within Zone 1 of an SPZ. Any new development will require investigation because of the water resource position. Development beyond 1,000 new homes advised against on the basis of risk to groundwater resources.

5.18.3 Wastewater Drainage and Treatment

Diss STW currently receives a DWF of 2000m3/d. With a consented DWF capacity of 4032m3/d, the works has a headroom of 2032m3/d. Hence the Works can accommodate a further 4838 new properties.

5.18.4 Environmental

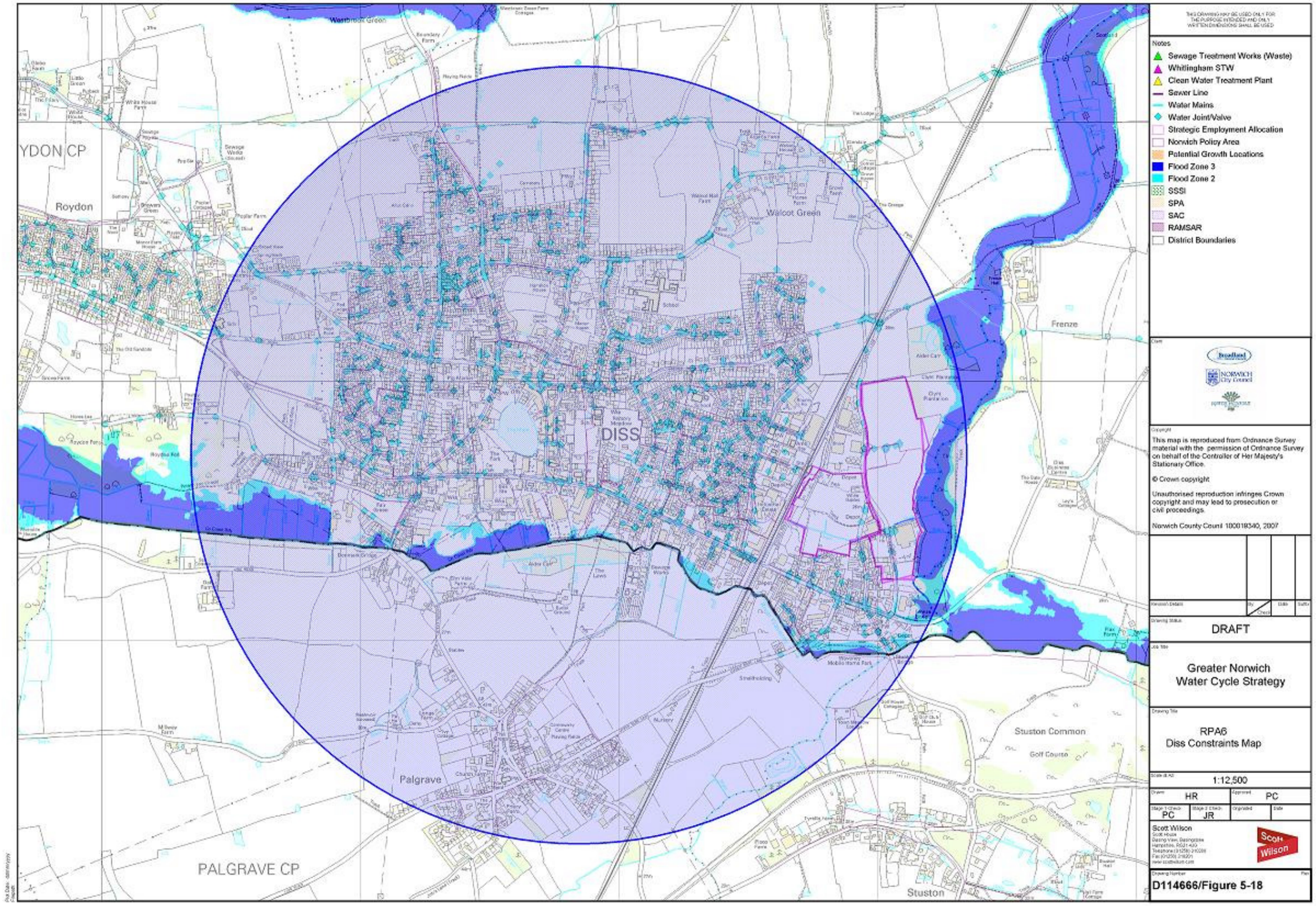
There are no nature conservation areas within the Diss development boundary. However, Wortham Ling SSSI lies approximately 1km away to the west of the development area boundary. Development in this area would result in sewage treatment by Diss STW, which has not been identified as posing a risk to any European sites.

5.18.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood risk issues associated with the site;
- Growth beyond 1,000 new dwellings advised against on the basis of risk to groundwater resources.
- There are no wastewater treatment constraints affecting development of properties.
- There are no significant environmental issues.

Conclusion – Up to 1,000 homes is acceptable, subject to information on the existing wastewater treatment available.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YDON CP
Roydon
Walcot Green
DISS
Frenze
Palgrave
PALGRAVE CP
Stuston Common
Golf Course
Stuston

5.19 RPA7 – Harleston

5.19.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although Flood Zone 3 has been identified with the mid-catchments tributaries of the River Waveney. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.19.2 Water Resources and Supply

Harleston is supplied mainly from groundwater sources but with no spare capacity (information from AWS). Any new development will require investigation of spare capacity because of the water resource position. The sector is underlain by Major Aquifer – High Groundwater Vulnerability and outside Zone 3 of an SPZ.

5.19.3 Wastewater Drainage and Treatment

Harleston is serviced by the Harleston STW catering for a PE of 5,510. The Consented treatment level of the works is as outlined below;

Table 5-10: Harleston STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
5,510	1,392	34	17	5	

Source: AWS

Harleston STW has a flow headroom of 501 m3/d. The anticipated no of properties that can be accommodated within this headroom based on the 2006 calculated PE headroom is as outlined below:

Table 5-11: Anticipated Number of New Properties (Harleston)

Calculated DWF (m3/d)	Consented DWF (m3/d)	DWF Calculated Headroom PE (2006)	Property Occupancy PE No.	No. of Properties based on TSFR Headroom
891	1,392	2,503	2.1	1,192

Modifications to the works will be the need to introduce phosphorous stripping. Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal.

5.19.4 Environmental

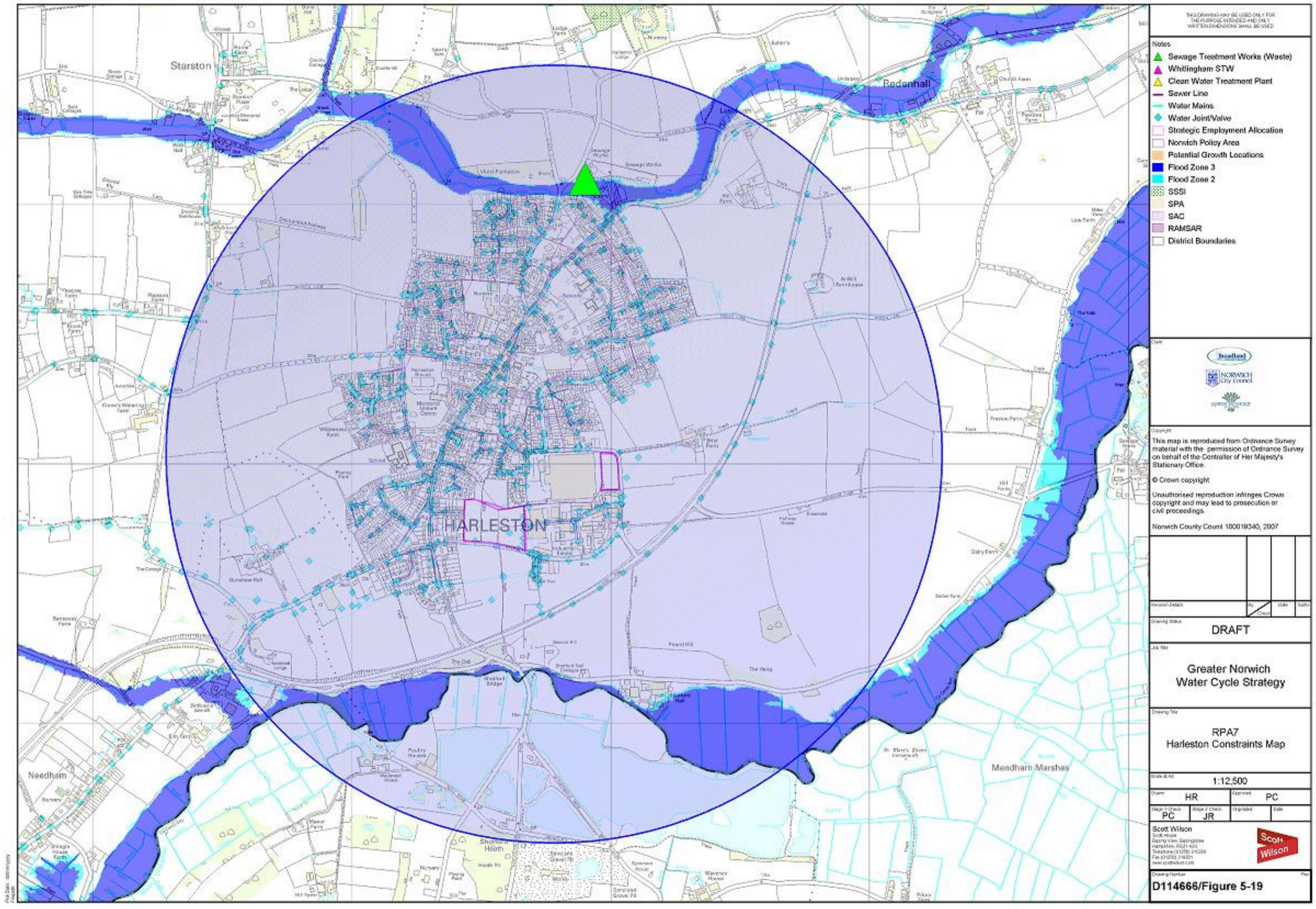
Gawdyhall Big Wood SSSI lies approximately 0.35km away to the north of the development area boundary. Great care would therefore be required to ensure no adverse effect of development resulted on this site, but it is not believed that this site is particularly hydrologically sensitive. Development in this area would result in sewage treatment by Harleston STW, which has not been identified as posing a risk to any European sites.

5.19.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood risk issues relating to the site;
- Any new development will require investment for water resources.
- Headroom at existing STW can take flows from at least 1,000 new dwellings.
- There are no significant environmental constraints.

Conclusion – Currently there is no potential for development, unless there is investment in water supply.


Starston
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Needham
Shelton Heath
Mendham Marshes
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5.20 RPA8 – Loddon

5.20.1 Flood Risk and Hydrology

There are no significant fluvial or tidal flood risks within this area, although Flood Zone 3 has been identified with the upper tributaries of the River Chet. This area is situated within the tidal reaches of this river and as such is considered to have more significant risks associated with it. A site-specific assessment of the risks should be undertaken and development located where possible in Flood Zone 1. The SFRA should provide appropriate data for Sustainable Drainage Systems.

5.20.2 Water Resources and Supply

Loddon is supplied mainly from groundwater sources. No supply issues have been identified by AWS. The sector is underlain by Major Aquifer – Intermediate Groundwater Vulnerability and lies outside Zone 3 of an SPZ. There is potential for up to 2,000 new dwellings within this sector.

5.20.3 Wastewater Drainage and Treatment

Loddon is serviced by the Sisland STW catering for a PE of 6,614. The consented treatment level of the works is as outlined below;

Table 5-12: Sisland STW 2006 Consent Data

2006 PE	DWF (m3/d)	TSS	BOD	AmmN	P
6,614	1,600	40	20	5	

Source: AWS

Sisland STW has a flow headroom of 644 m3/d. The anticipated number of properties that can be accommodated within this headroom based on the 2006 calculated PE headroom is as outlined below:

Table 5-13: Anticipated Number of New Properties (Sisland)

Calculated DWF (m3/d)	Consented DWF (m3/d)	DWF Calculated Headroom PE (2006)	Property Occupancy PE No.	No. of Properties based on TSFR Headroom
1,156	1,600	2,221	2.1	1,058

Modifications to the works will be the need to introduce phosphorous stripping. Based on conclusions drawn by the Environment Agency phosphorous levels in the Broads and Marshes will not be affected if increased flows are introduced in conjunction with phosphorous removal.

5.20.4 Environmental

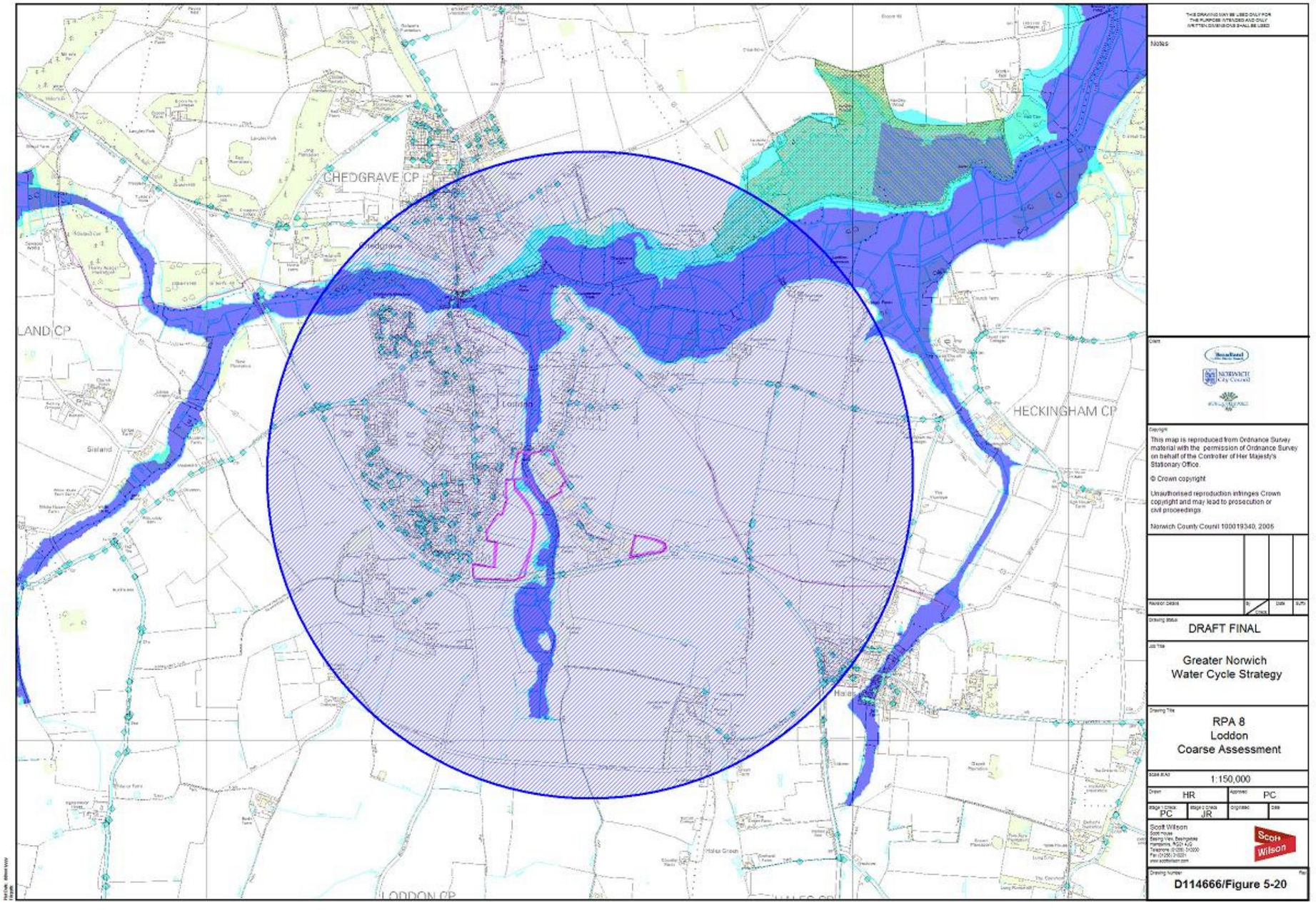
There are no environmental protection areas within the Loddon development boundary. However, Hardley Flood SSSI (part of the Broads SAC/Broadlands SPA) lies in close proximity to the northeast border of the development area boundary. Great care must therefore be taken in locating development in the vicinity of this hydrologically sensitive site. Development in this area would result in sewage treatment by Sisland STW, which has not been identified as posing a risk to any European sites.

5.20.5 Summary

	Constraints			
Possible Dwelling Scenario	Flood Risk	Water Resources	Wastewater	Environment
0-100				
100-500				
500-1,000				
1,000-2,000				

- There are no significant flood risk issues, however, consideration of the proposed location of the development should be undertaken;
- There is potential for up to 2,000 new dwellings within this sector in terms of water resources.
- From a wastewater perspective, only 2,000 new dwellings can be developed.
- Consideration of the impacts on the environment need to be assessed for larger developments

Conclusion – Up to 2,000 homes is acceptable, with consideration of the impact on environment and flood risk.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LAND CP
HECKINGHAM CP
LODDON CP
Loddon
Sisland
Hales Green
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Drawing Title
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