



## **Section 19 Flood Investigation Report**

**July 20<sup>th</sup>, August 8<sup>th</sup>, August 10<sup>th</sup> 2014**

Flood and Water Management Act 2010

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**Document Control**

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# Introduction

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In June and July 2007 there was widespread flooding nationally brought about by prolonged, heavy rainfall which filled main rivers and ordinary watercourses, saturated the land and overwhelmed drainage and sewerage systems. The resultant flooding affected over 55,000 homes and businesses with insured losses approaching £3 billion. The Pitt Review was a government commissioned report into how the 2007 floods were managed. This Review resulted in the Flood and Water Management Act 2010 (FWMA 2010). The Act designated Unitary Authorities and County Councils as Lead Local Flood Authorities (LLFA's). A Lead Local Flood Authority is responsible for the management of local flood risk in its area which means surface water run-off, groundwater and ordinary watercourses.

One role that a LLFA has to carry out under Section 19 of the FWMA 2010 is to investigate flooding in its area to the extent it considers it necessary or appropriate. The triggers for a Section 19 investigation in North East Lincolnshire are:

- internal flooding of any property
- extensive flooding of the public highway and resultant disruption
- flooding of critical or vulnerable infrastructure

The flooding events of 20 July, and 8 and 10 August 2014 both required Section 19 investigations.

Other flood risk management authorities mentioned in these reports are:

- Environment Agency who are responsible for flood risk management from main rivers and the sea.
- Anglian Water who are responsible for providing drainage into urban areas by means of the public sewerage systems.

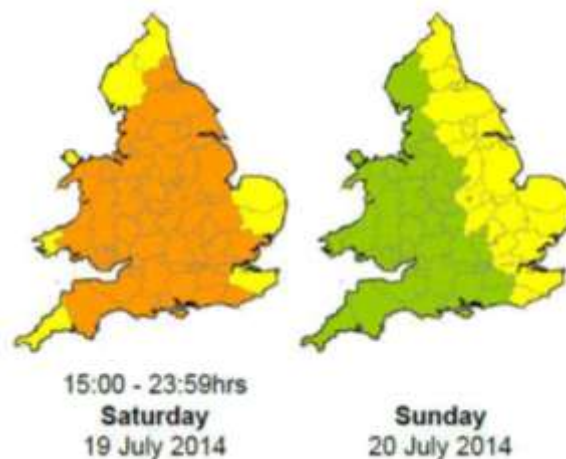
## Weather Forecasts/Flood Warnings

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In addition to the Met Office National Severe Weather Warnings, the other key source of information on the potential for flooding comes from the Flood Guidance Statement (FGS) issued by the Flood Forecasting Centre. This provides a daily flood risk assessment for Category 1 and 2 emergency responders to assist with strategic, tactical and operational planning decisions. The FGS assesses the risk for all types of natural flooding – coastal, tidal, river, groundwater and surface water flooding.

Yellow colouring on the FGS signifies a low flood risk. When the FGS is yellow, the Environment Agency will consider the need to hold a Flood Advisory Teleconference. However, in the case of surface water events, yellow FGS don't usually trigger a formal response as they occur frequently throughout the year and most do not result in any disruptive flooding. Amber colouring on the FGS signifies medium risk, and will usually trigger a Flood Advisory Teleconference.

On Friday 18<sup>th</sup> July 2014 there was an Amber warning issued for Saturday 19<sup>th</sup> July and a Yellow warning for Sunday 20<sup>th</sup> July.



(Source: Natural Hazards Partnerships)

The following statement was issued with the weather warnings, *"The Met Office is forecasting areas of heavy, thundery showers to continue to move northwards over England, Wales, Scotland today (Saturday), with Yellow and Amber warnings of rain in place. Further heavy, thundery showers are likely to develop in some eastern parts of the UK through Sunday and a Met Office Yellow warning of rain has been issued for eastern areas. Not everywhere within the warning areas will see thunderstorms, however where they do form, torrential downpours are possible"*.

On Friday 8<sup>th</sup> August a Yellow warning was received warning of the potential for localised flooding although the day before, on the Thursday, North East Lincolnshire wasn't included in the warning area; the Flood Guidance Statement wasn't upgraded until 10.30 on the Friday morning. This illustrates how the forecasting can only be used as guidance and the extent and impact of any rainfall event can never be accurately predicted.



On Saturday 9<sup>th</sup> August 2014 a Yellow weather warning was issued for the next day Sunday 10<sup>th</sup> August.



(Source: Natural Hazards Partnerships)

The following statement was issued with the weather warning, *“The Met Office is forecasting depression, containing some of the warm, moist air derived from the remnants of Hurricane Bertha, to continue to move north eastwards across the UK, becoming an unseasonably intense feature across the North Sea this evening and overnight. Some heavy rain is expected times over Northern Ireland today (Sunday), and combined with strong winds and large waves, may lead to localised flooding.”*

The first flooding incidents resulted from a rainfall event that peaked between 03.30hrs and 04.30hrs on Sunday 20<sup>th</sup> July. The areas affected were some properties internally flooded in Humberston and Central Grimsby. Because of the time of the rainfall, a number of residents woke up to find to find flooding of their properties to varying levels ranging from wetting of carpets etc. to a few inches of flood water.

On Friday 8<sup>th</sup> August the rainfall was at its most intense in the early afternoon and affected the most westerly part of Grimsby including the Wybers Wood and Willows Estates and Laceby by-pass. Some properties in St. Nicholas Drive internally flooded but elsewhere it was external flooding that caused some minor disruption.

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The third flooding incident resulted from a rainfall event that peaked between 11.15hrs and 12.15hrs on Sunday 10<sup>th</sup> August. Some properties in Waltham were affected but the internally flooded properties were in central Grimsby and on the Wybers Wood estate.

It should be noted that throughout the summer of 2014 regular weather warnings were received that related to heavy rainfall and the potential for surface water flooding. The Flood Forecasting Centre has confirmed that 74% of these warnings in 2013/14 resulted in no flooding at all.



## Rainfall

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Anglian Water reported that their rain gauge at Chelmsford Avenue wasn't working during the flooding events. However, rainfall figures were obtained from two local private weather stations. One of these, Welholme, is 600 metres to the east of Ainslie Street and the other, Laceby Acres, is 3.5 km to the west. It should be noted that these rainfall figures have been obtained from Wundermap which is a commercial weather service. The Environment Agency have a rain gauge at Beelsby which is in the south west part of the Borough.

For the event on 20<sup>th</sup> July the readings indicated the following approximate annual probabilities for the rainfall:

- Welholme indicated a storm event with an annual likelihood of occurring of 5% (1 in 20 annual probability).
- Laceby Acres indicated an annual likelihood of occurring of just under 20% (1 in 5 annual probability).
- The readings at Beelsby indicated an annual likelihood of occurring of 2% (1 in 50 annual probability).

For the event on 10<sup>th</sup> August the readings indicated the following approximate annual probabilities for rainfall:

- Welholme indicated an annual likelihood of occurring of 10% (1 in 10 annual probability).
- Laceby Acres indicated an annual likelihood of occurring of 2% (1 in 50 annual probability).

One issue that some affected residents referred to was the time of the rainfall event on 20<sup>th</sup> July which peaked between 03.30hrs and 04.30hrs. The majority were asleep waking either during or after the event by which time the water had usually already entered the property.

In the days after the rainfall event residents and businesses affected reported areas of internal and external flooding which triggered the need for investigations under Section 19 of the Flood and Water Management Act 2010. In widespread flooding events there are always residents who don't report that their properties have flooded but whilst the true total number of properties affected may not be known, the Council are confident that this report covers the areas of the Borough affected.

# **Flood locations – Investigation, Actions Implemented, Conclusions and Recommendations**

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## **Area 1 – Wybers and Willows Estates Grimsby, North East Lincolnshire**

20<sup>th</sup> July, 8<sup>th</sup> & 10<sup>th</sup> August 2014

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### **Flood Locations**

**Greyfriars, Grimsby – 5 properties externally flooded on July 20<sup>th</sup>, 1 property internally flooded and 4 properties externally flooded on August 10<sup>th</sup>.**

On both occasions the main source of the flood water was coming directly from the surcharging main trunk sewer at the rear of the properties. The water pressure forced the manhole lid off, and due to the flood embankment, the water wasn't able to drain towards the New Cut Drain, and instead backed up towards the properties.

**Grasby Crescent, Grimsby - 4 properties externally flooded on July 20<sup>th</sup>, 4 properties externally flooded on August 10<sup>th</sup>.**

The source of the flood water was the surcharging main trunk sewer which has a manhole located in the footpath on the junction of Anderby Drive and Grasby Crescent. The lie of the land caused the flood water to drain down towards the New Cut Drain behind the properties but because of the new sheet piling flood defence it was unable to get into the New Cut Drain.

**Anderby Drive, Grimsby - 3 properties externally flooded on July 20<sup>th</sup>, 9 properties externally flooded on August 10<sup>th</sup>.**

Part of Anderby Drive was affected similarly to Grasby Crescent. The other half of Anderby Drive, towards the Wingate Road junction suffered external flooding which was surcharging out of the highway gullies and the manholes around the new mini roundabout on Wingate Road.

**St. Nicholas Drive, Grimsby - 16 properties internally flooded and 9 properties externally flooded on August 10<sup>th</sup>.**

The main source of the flooding for St Nicholas Drive was the main sewer surcharging out of the highway gullies. The land falls down towards the fields behind the houses, and the water ran across the footpath, down the driveways and into the garages and into the houses.

**Mayfair Drive West, Grimsby – 1 property internally flooded and 1 property externally flooded on August 10<sup>th</sup>.**

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The main source of the flood water affecting Mayfair Drive West came through from Timberley Drive at the rear of the properties. Mayfair Drive is slightly lower than Timberley Drive so the water collected in the low spot.

### **Timberley Drive, Grimsby - 1 property externally flooded on August 10<sup>th</sup>**

The source of the flood water at Timberley Drive was due to the sewers being overwhelmed and surcharging out of the highway gullies and the manholes.

### **Barmouth Drive, Grimsby – Stratford House (sheltered housing) and The Willows (residential care home) externally flooded on August 10<sup>th</sup>**

Barmouth Drive flooded in the same way as Anderby Drive, with the water surcharging out of the gullies and manholes around the new mini roundabout on Wingate Road.

### **Cromwell Road, Grimsby - Chatteris House (sheltered housing) and Cromwell House (disabled children care home) externally flooded on August 10<sup>th</sup>**

This area of Cromwell Road is in a low spot, which allowed the water in the main trunk sewer to back up and come out of the gullies and manholes in this area.

All the locations above are indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability surface water flooding maps as being at risk of surface water flooding.

The other main impact of the flooding was from the main trunk sewer running from the higher land on the Laceby Acres estate and running under the footway through Town's Holt alongside Wybers Wood. The surcharge pressures were so high from these manholes along the footway that manhole covers and top slabs were blown off and the footway severely damaged.

## **Investigations**

Initial contact by Council Drainage Engineers with residents affected by flooding was made within a few day of the first rainfall event. Other site meetings with residents followed. A site investigation followed with level surveys (where required) and sewer inspections undertaken.

## **Drainage Systems**

The condition of the road gullies was assessed and no blockages were found. Where access could be gained into the public sewer systems in the public highway the pipework was jetted and then a CCTV survey was carried out. The main aspects and findings of the investigations are outlined below:

- Meetings and communication with affected residents revealed that surcharging of the sewers at some locations such as St. Nicholas Drive and Anderby Drive occurs more frequently than the Council has been made aware of. One affected resident described sewer flooding of the house driveway as occurring twice a year.

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- The land drainage arrangements alongside the new sheet piled flood defence to the rear of Anderby Drive and Grasby Crescent were inspected and assessed for adequacy.
- The above meetings and other site inspections revealed a number of relief channels hand dug by residents to get flood water away from their properties and onto the Freshney flood plain.
- Overall, there were only a few problems found relating to siltation levels, general cleanliness and structural condition. The following matters were passed onto Anglian Water for further action:
  1. 20% siltation levels in a section of the St Nicholas Drive sewer
  2. displaced joint and some aggregate in the Defender Drive sewer
  3. the Barmouth Drive sewer was found to be heavily silted and required jetting
- During an intense rainfall event there are extreme surcharge pressures induced in some parts of the trunk sewer running from Laceby Acres. This causes the frequent sewer surcharging experienced by residents in St Nicholas Drive. During the 10<sup>th</sup> August event this surcharging also caused the extensive damage to the footpath running above the trunk sewer from Laceby Acres as described above. The difference in ground levels will be a contributing factor with the upstream Laceby Acres having ground levels up to 8 metres higher than Wybers Wood. This difference in head will exacerbate the effects of the surcharging in the trunk sewer.

### **Actions Implemented**

The findings of the on-site investigations were passed to Anglian Water who is responsible for the management and maintenance of the public sewerage network. Meetings have been held with both the Environment Agency and Anglian Water.

A number of quick fix mitigation works have been put into place and these include:

- Improvements to the land drain installed by the Environment Agency to the rear of the sheet piled flood defence wall between the New Cut Drain and the rear of Anderby Drive and Grasby Crescent. This land drain was installed to drain the area that originally ran off into the New Cut Drain. During the flooding of July and August 2014 residents in the adjacent properties in Anderby Drive and Grasby Crescent dug drainage channels to the land drain to help alleviate the flooding around their properties. The improvement work included fully exposing the stone drainage medium in the pipe trench plus the installation of two road type gullies. Both actions will assist drainage in a similar flood event resulting from extreme rainfall.
- The slight realignment of the flood embankment to the rear of Greyfriars and alteration to one of the manhole covers that was removed from its frame by surcharge pressures within the sewerage system. When surcharge flow exits the sewer system at this manhole cover it causes flooding around properties in Greyfriars and the mitigation works will ensure that flow from the manhole during a future surcharging event will be directed away from the Greyfriars' properties.

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- Drainage channels, or swales, cut by residents at the rear of some St. Nicholas Drive properties have been improved and made into features that walkers and cyclists can negotiate.
- The feasibility of providing an overflow to the sewerage system at the south end of St Nicholas Drive is currently being looked at. This was the location of a number of internally flooded properties and the condition of the piped ditch to the rear of these properties will be assessed for its suitability to receive the overflow connection from the sewer. Any consent requirements will also be established.
- At the meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. Further details of the proposal are provided in the main Conclusions section at the end of the report. If successful, this work would greatly benefit Wybers Wood and the Willows as Pyewipe is only 2 to 3 kilometres downstream.

## **Conclusions**

The primary cause of the flooding was the intensity of the rainfall overwhelming the public sewerage system and this problem is covered in more detail in the main Conclusions section at the end of the report.

The sewerage systems in Freshney Ward serving the Willows and Wybers Wood estates are 40 to 50 years old and are generally in a reasonable condition. When they were constructed there may not have been a full appreciation as to what future development allowances needed to be built into the sewerage systems, hence the resultant tendency for parts of the system to surcharge. This surcharging could be exacerbated by the difference in head (ground level) between the upstream end of the system at Laceby Acres and the lower lying parts of the system around the Wybers and Willows Estates. Detailed hydraulic modelling could analyse this further.

However, for a number of years now, through the planning process, greenfield and brownfield development in North East Lincolnshire have had drainage requirements imposed to ensure there is no further loading to the existing public sewerage network. Further details are provided in the main Conclusions section at the end of the report.

Another issue that has become increasingly apparent especially after these most recent floods is the reluctance of the majority of affected residents to report the flooding of their property to the provider of drainage to their properties. This issue and its ramifications are covered in more detail in the main Conclusions section at the end of the report.

Any increase in outfall capacity at the Terminal Pumping Station during times of extreme rainfall will lessen the extent of surcharging in the public sewer system.

In the meantime the two flooding mitigation measures available are regular maintenance of the existing systems and property level flood protection. It is not widely realised or accepted that responsibility for the protection of private property from flooding rests with the property owner. Property level protection ranges from the basic sand bag, whose effectiveness is variable dependant on the installation, to the full flood barrier installation on all openings into a property.

## **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. This doesn't seem as much as an issue on the Wybers Wood and Willows Estates but it shouldn't be ignored and future maintenance ought to be planned.

Further progression should be done on the feasibility of the overflow at the south end of St. Nicholas Drive. There may also be further "quick fix" work that can be done in the locations where surcharging from the main sewers is an issue. This will be explored further in conjunction with Anglian Water, if necessary.

The Council as the Lead Local Flood Authority should explore what support could be given to Anglian Water in resolving the issue with pump commissioning at Pyewipe.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. As explained in the conclusions section there are different approaches to property level protection but fundamental to this approach is both the willingness of the resident of the at-risk property to consider this approach plus their financial position in terms of being able to afford it.

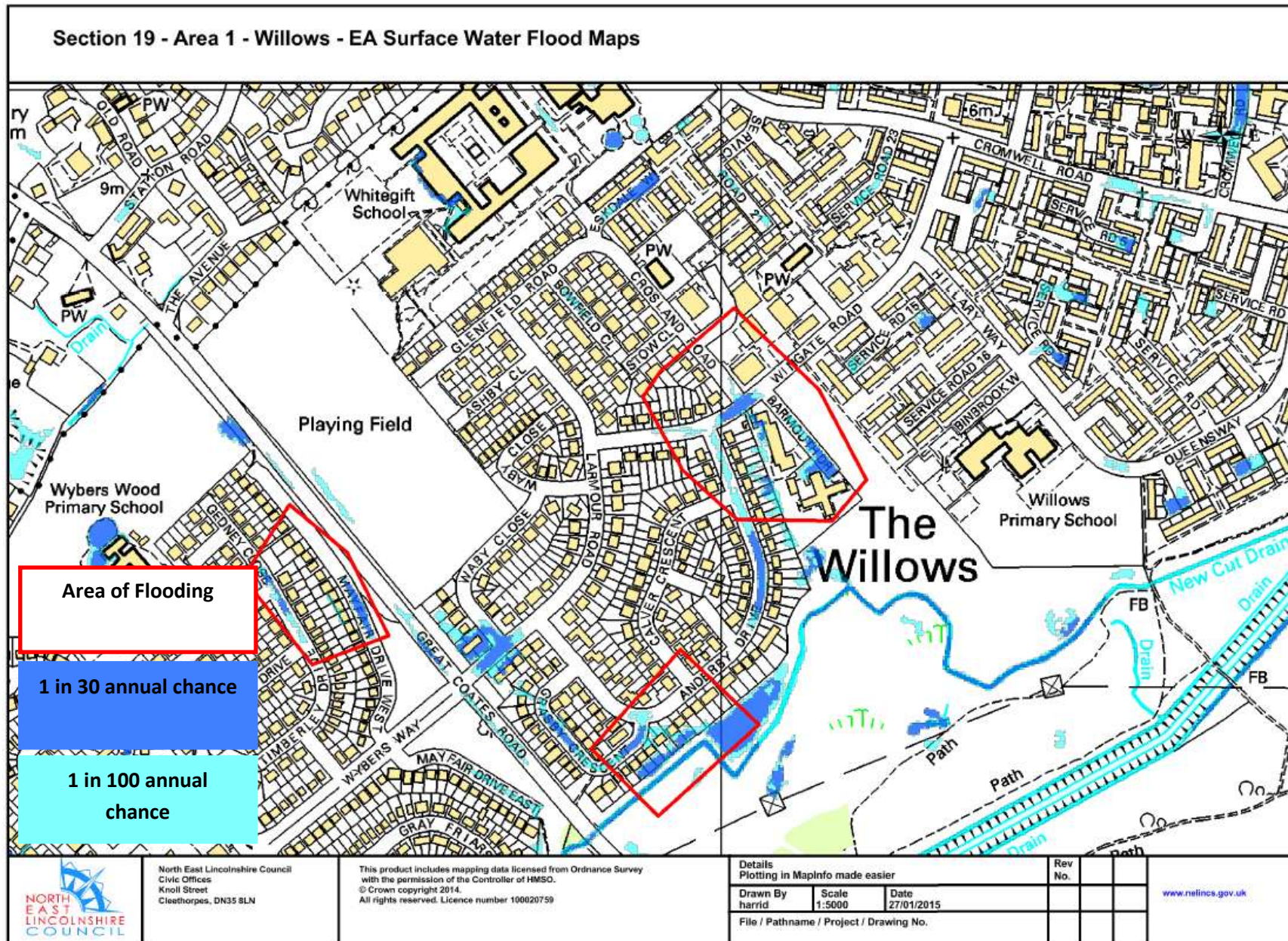


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## Area 2 – Broadway West, Grimsby

8<sup>th</sup> and 10<sup>th</sup> August 2014

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### **Flood Locations**

**Broadway, Grimsby – 1 property internally flooded, several more externally flooded on 8<sup>th</sup> and 10th August.**

The residents informed us that they had flooded on three occasions over the weekend between Friday 8<sup>th</sup> and Sunday 10<sup>th</sup> August. On all three occasions, the flooding was a result of the combined sewer surcharging out of the manhole at the front of their property and from the manhole cover on the Broadway main sewer.

Historically this area is susceptible to flooding, and the combined sewer has surcharged on numerous occasions in the past, but never before has it entered the property.

The location above is indicated on the Environment Agency 1 in 30 annual probability flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flooded locations was made within 2 weeks of the rainfall event by Council Drainage Engineers. A site meeting took place in early September with a level survey and sewer inspections following on shortly afterwards.

### **Drainage Systems**

The condition of the road gullies was checked and no problems were found. The following issues were found by the investigation into the sewer system:

- Mass roots were found in the combined system in the 25 metres upstream of the property that internally flooded although this wouldn't have had a direct effect on the flooding.
- The manhole on the main sewer in the middle of the road had been welded shut.

### **Actions Implemented**

The mass root ingress location was passed to Anglian Water who will confirm when maintenance work has been carried out.

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The fact that the manhole cover on the main sewer was welded shut was also passed through. However, Anglian Water would have carried out the welding to counteract the surcharging from the chamber that the residents have reported as having occurred on a number of occasions.

During the site meeting there was a discussion about the possibility of excavating a relief channel/swale through the back garden to the rear boundary ditch to prevent flood waters from entering the property. A day or two later a survey was carried out and this proved that the channel proposal was feasible. Within 2 weeks the on-site works were complete and the risk of internal flooding at this and the neighbouring properties was greatly reduced.

At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. If successful, this work may be of some benefit to the location discussed in this report but the outfall is approximately 4 kilometres away meaning the benefits during an intense relatively short event would be limited.

## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations

This area of Grimsby was constructed in the period between the mid 1930's into the early 1940's and historically the sewer system doesn't exhibit significant siltation build ups or significant structural issues. However during the site investigations access into the sewer system was limited so there is little current information on silt levels within and structural condition of the system. The welding of the manhole cover on the main sewer suggests there is a history of surcharging.

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system but the effect at this location may be limited.

## **Recommendations**

Following the site investigation for Broadway, Grimsby it has been recommended that:

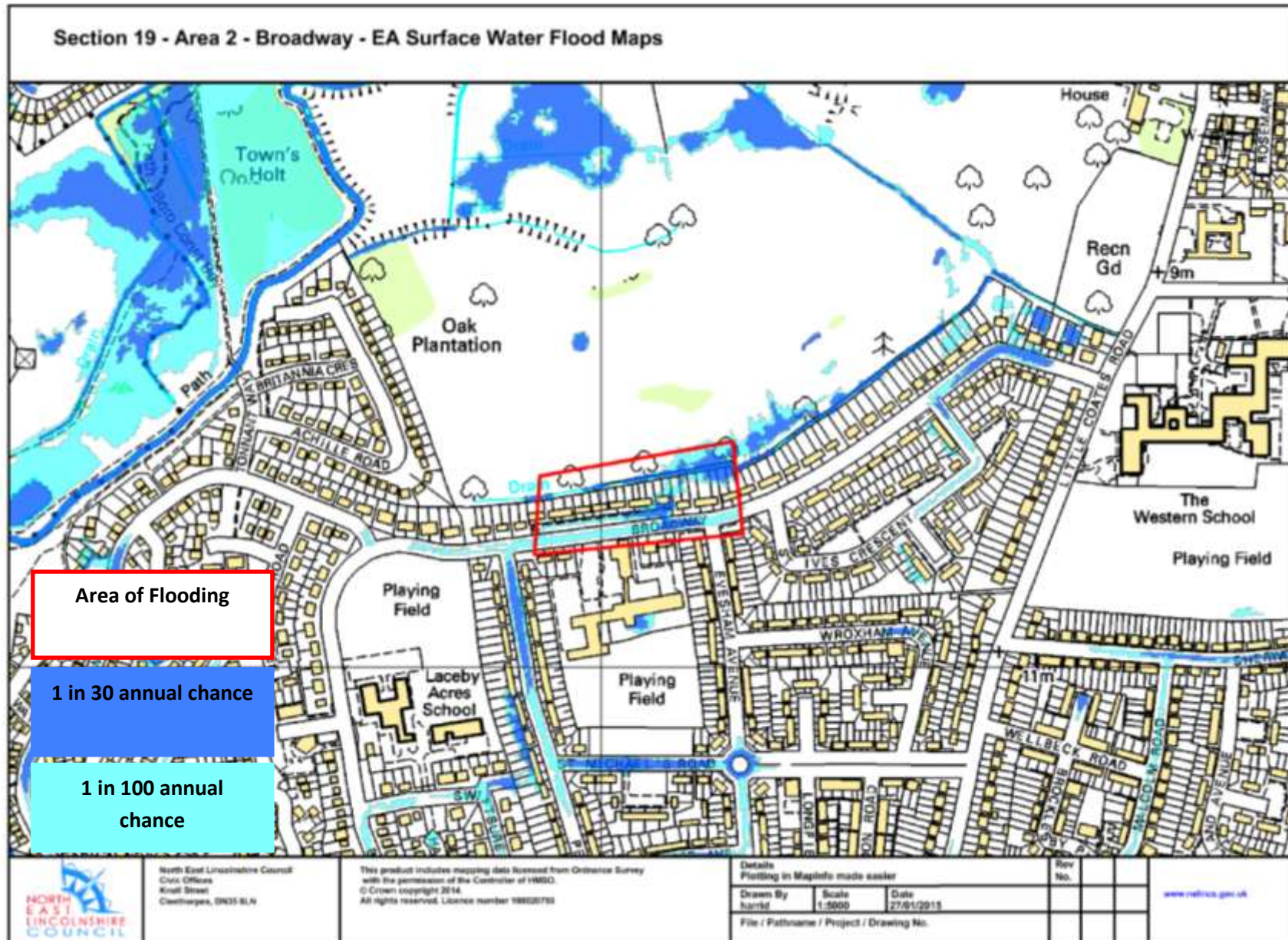
- Detailed modelling of the catchment and flow rates through the sewers is carried out to ensure that the sewer is of sufficient size, as this area is prone to surcharge.
- Investigate the feasibility of installing non-return valves on the sewer running along the footpath which could prevent the surcharge from backing up from the main sewer in to this branch line.
- Investigate the feasibility of restricting flow rates upstream of Broadway.

Modelling of this part of the sewer system could be carried out to see if the cause of the surcharging can be identified and to see what mitigation measures are available.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the main Conclusions section of the report.

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## Area 3 – Little Coates Road & Broadway, Grimsby

10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Little Coates Road, Grimsby – 4 Properties internally flooded**

The residents reported that the two gullies in the low spot in the road was the source of the surcharging water. Due to the topography of the land, it then ran across the footpath and into the gardens and houses of Little Coates Road.

The residents said they didn't witness any surcharging from the manhole in the garden of 10 Little Coates Road, where the surcharge alleviation pumps had been installed.

#### **Broadway, Grimsby – 4 Properties internally flooded**

The residents reported that they were internally flooded on the 10<sup>th</sup> August, and that a small amount of water entered into the porch. The water was surcharging out of the highway gullies and flooding the highway, and eventually the gardens and into the houses.

The locations above are indicated on the Environment Agency 1 In 30 annual probability flooding map as being at risk of surface water flooding.

### **Investigations**

The site survey carried out to assess the flooding around Little Coates Road, and Broadway found that:

- The main combined sewer has a good flow on it, and from what could be seen, there wasn't much silt in the sewer.
- The two gullies in the low spot in the road outside 10 Little Coates Road have broken and cracked pipework.
- The pumped system is in good condition.
- The cover on manhole 4302 on Broadway is corroded and has seized and will need to be replaced.
- The land at Broadway generally falls towards the open ditch in the golf course, but the bank behind the rear boundary fence is approximately 300mm higher than the garden levels, and 100mm above the threshold level for the properties.

## **Actions Implemented**

The findings of the on-site investigations were passed to Anglian Water who is responsible for the management and maintenance of the public sewerage network. These included locations of manholes that were seized thereby preventing access into the main public sewer system.

At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. If successful, this work may be of some benefit to the location discussed in this report but the outfall is approximately 4 kilometres away meaning the benefits during an intense relatively short event would be limited.

## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system although the effect may be limited at this location.

In the meantime the two flooding mitigation measures available are regular maintenance of the existing systems and property level flood protection. It is not widely realised or accepted that responsibility for the protection of private property from flooding rests with the property owner. Property level protection ranges from the basic sand bag, whose effectiveness is variable dependant on the installation, to the full flood barrier installation on all openings into a property.

## **Recommendations**

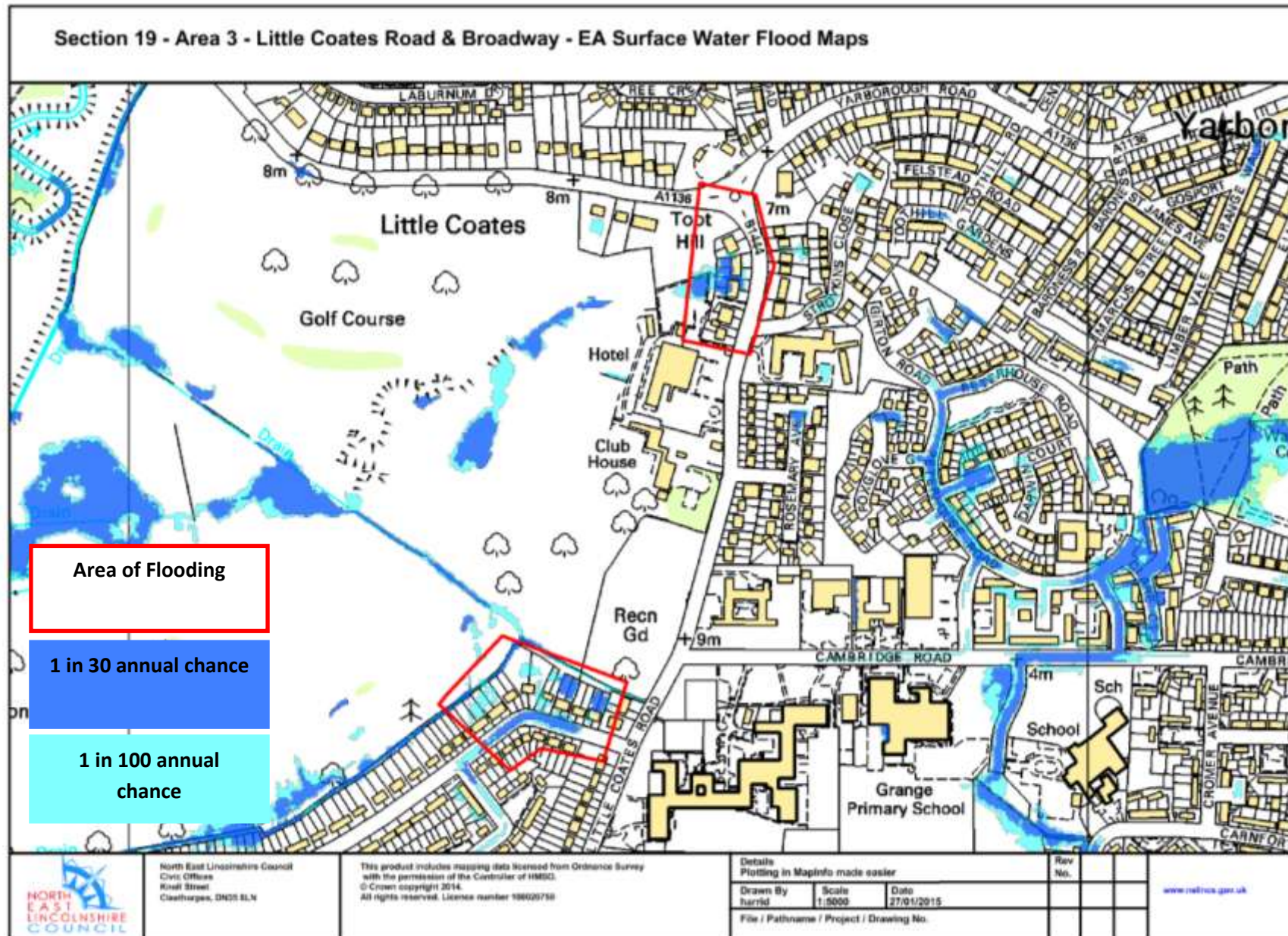
Following the site investigation for Little Coates Road & Broadway it has been recommended that:

- Anglian Water to replace the seized manhole covers to allow access and maintenance of the combined sewer.
- The two gullies outside 10 Little Coates Road to have the pipework repaired, and to be fitted with a non-return valve to prevent the sewer from backing up out of these gullies. Discussions with Anglian Water on the valve fitting will be necessary.
- Further investigations to be carried out to see whether or not the surface water sewer from Bradley discharges into Capes Rec, or is connected into the combined sewer.
- The raised bank to the rear of Broadway could be lowered to allow the flood water to drain into the open watercourse, reducing the risk of the flood water levels raising high enough to enter the houses.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the Main Conclusions section of the report.



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## Area 4 – Grimsby Leisure Centre and Auditorium

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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### **Flood Locations**

Internal flooding occurred at a total of 2 community facilities at the location off Cromwell Road, Grimsby.

#### **Grimsby Leisure Centre, Grimsby – 1 Community Facility internally flooded**

The management of the leisure centre reported that flood water containing raw sewerage had surcharged through toilets, manholes and drains within the building. The extent of flooding that occurred affected the building in localised areas such as the toilets, changing rooms and corridors.

#### **Grimsby Auditorium, Grimsby – 1 Community Facility internally flooded**

The management of the auditorium reported that flood water containing raw sewerage had surcharged through toilets within the building and from a number of manholes around the side. The extent of flooding that occurred affected the building in localised areas such as the toilets and foyer.

This location is indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability flooding maps as being at risk of surface water flooding.

### **Investigations**

The site investigation carried out by Ajet to check the drainage at the Auditorium found that:

- The split channel drainage in front of the auditorium was blocked.
- The main surface water drain from the site is partially silted and holding back water.

Due to the nature of the flooding inside the Auditorium, it is unlikely that the issues above were much of a contributing factor to the flooding. The main cause of the flooding was the combined sewer surcharging out of the lowest points (the toilet inside the auditorium). The blocked surface water drainage to the front of the auditorium potentially lessened the extent of the flooding due to keeping the water out of the combined sewer.

We were unable to carry out a site investigation with Ajet at the Leisure Centre due to on-going construction works. However, it was established that:

- There were mass roots in the majority of the Leisure Centre drainage systems.
- Grass cuttings from the golf centre, Swing Time, upstream of the leisure centre are getting into the drainage system.
- There was significant low spot in the pipework from the Leisure Centre to the main sewer.

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These issues are due to be resolved as a result of the construction works on site with the replacement of the pipework to remove the low spot and the diversion of some existing drainage into the new drainage system for the new swimming pool.

### **Actions Implemented**

The issues highlighted at the auditorium were passed through to the Council's Asset Management team which is responsible for looking after the buildings and the need to organise the maintenance of the surface water drainage on site was stressed. They have confirmed that recommendations for improvement works have been made and maintenance works are being arranged.

The issue with the low spot in the pipework from the Leisure Centre was passed through to Anglian Water, since this section of pipework would have been transferred to their ownership on October 2011. They have since been in and re-laid this section of sewer.

At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. Any improvements at the outfall would benefit the drainage at this location.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations

Slack gradients associated with low lying flat areas like the majority of north and central Grimsby increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. A subsided pipe was part of the problem at this location.

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system and will be beneficial at this location.

More frequent maintenance of the drainage systems serving the Auditorium and Leisure Centre is needed and this has been reported to Asset Management

### **Recommendations**

Following the site investigation for Grimsby Leisure Centre and the Auditorium it is recommended that:

- Routine maintenance of the private drains are carried out on a yearly basis to ensure that they are running efficiently and that any defects such as siltation and root ingress can be resolved. This may prevent some areas such as the down pipes from flooding inside the leisure centre.
- Anglian Water to investigate how the grass cuttings are getting into the sewer
- The construction works at the Leisure Centre should resolve many of the problems with the drainage there.



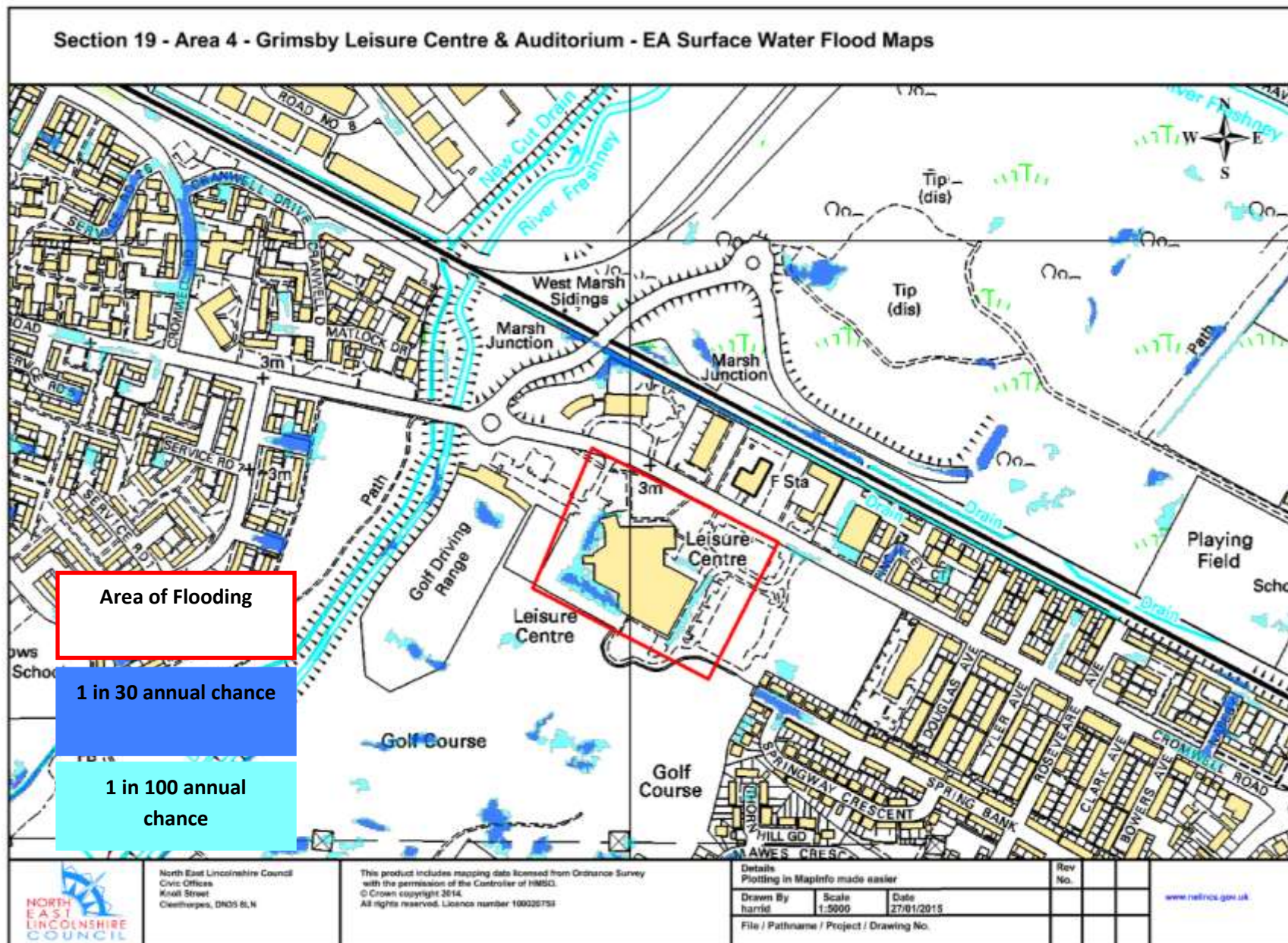
## **Section 19 Flood Investigation Report**

Flood and Water Management Act 2010

- There is an option of installing non-return valves between the Leisure Centre/ Auditorium and the combined sewer. This would prevent any surcharge from the main sewer from backing up into the facilities in the future.

## Section 19 Flood Investigation Report

Flood and Water Management Act 2010



## Area 5 – Carson Avenue

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Carson Avenue, Grimsby – 1 Property internally flooded on the 10<sup>th</sup> August**

The residents reported that the flood water initially started to surcharge from the gully in the front garden, flooding around the houses and across the road. The flood water entered one of the properties through the front door and airbricks. The manholes to the rear of the property were also surcharging.

This area has been highlighted on the Environment Agency 1 in 30 annual probability surface water flood map as being at risk of surface water flooding

### **Investigations**

The initial site survey was undertaken to assess the public sewers and whether or not the recent surface dressing reduced the effectiveness of the drainage. Ajet carried out a CCTV survey and found that:

- Approximately 30% siltation and debris in some parts of the main sewer.
- There is a slight back fall on the main sewer which is holding back some of the water, losing some of the spare capacity in the pipework.
- The main sewer down Carson Avenue connects directly into the Haycroft Drain which during the flooding on 10<sup>th</sup> August was at maximum capacity causing surcharging in the Marshall Avenue and Lord Street areas.
- There was no impact on the effectiveness of the drainage brought about by the surface dressing.

### **Actions Implemented**

A level survey was carried out along Carson Avenue to assess the risk of flooding along the street; this involved checking the levels in the main sewer, along with the levels of airbricks or doorsteps of those houses at risk of flooding.

The level survey highlighted that there was a slight backfall in the main sewer between the manholes outside 33 Carson Avenue.

The residents affected by the flooding have installed new air bricks with flood covers to help improve their homes flood resilience.

## **Section 19 Flood Investigation Report**

Flood and Water Management Act 2010

At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. Any improvements at the pumping station would benefit this location.

Details of the significant volumes of land drainage entering the Haycroft Culvert from upstream were passed through to Anglian Water but it was agreed that the Council's Drainage team would initially investigate this.

## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations

Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. These increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. Siltation and possible subsidence is a factor at this location.

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system and will directly benefit the performance of the Haycroft Culvert and the sewer serving this location.

## **Recommendations**

Following on from the site investigations at Carson Avenue, Grimsby it has been recommended that:

- High pressure water jetting of the main sewer is carried out to remove the silt and debris build up.
- An assessment of the feasibility of installing a non-return valve at the junction of Carson Avenue and Littlefield Lane to stop the surcharging of the Haycroft Drain from affecting Carson Avenue. If this were feasible Anglian Water will need to take the lead on this.
- An assessment should be carried out of the feasibility of diverting the Carson Avenue connection away from the Haycroft Drain and into the Littlefield Lane relief sewer to reduce the load within the Haycroft Drain.

The Council as the Lead Local Flood Authority should explore what support could be given to Anglian Water in resolving the issue with pump commissioning at Pyewipe because increased outfall capacity will improve sewer system performance at the locations affected by flooding.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the main Conclusions section of the report.



## Flood and Water Management Act 2010



## **Area 6 – Cromwell Road, Lynton Parade, Wentworth Road, Marshall Avenue**

20<sup>th</sup> July 2014 and 10<sup>th</sup> August 2014

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### **Flood Locations**

Internal flooding occurred at a total of 13 properties/businesses at the locations of Chestnut Avenue, Cromwell Road, Fairfax Road, Lynton Parade, Marshall Avenue & Wentworth Road, Grimsby.

#### **Chestnut Avenue, Grimsby – The same property internally flooded on both 20<sup>th</sup> July and 10<sup>th</sup> August**

The resident reported flood water containing raw sewage had entered the rear and side of the property. From the rear and side it was reported that the flood water was surcharging from the passageway gullies and the drain in their garden. The flooding that occurred affected the rear of the property in the garden, kitchen and utility areas.

#### **Cromwell Road, Grimsby in front of Lynton Parade – external flooding on both 20<sup>th</sup> July and 10<sup>th</sup> August**

Cromwell Road was impassable due to flood water in the low lying section between Marklew Avenue to Wells Street.

#### **Fairfax Road, Grimsby – 1 Property internally flooded on 20<sup>th</sup> July**

The resident reported flood water containing raw sewerage had entered the front door of their property. The flooding affected the road outside initially then affected property as depths increased

#### **Lynton Parade, Grimsby – 5 Businesses internally flooded on both 20<sup>th</sup> July and 10<sup>th</sup> August**

The businesses reported flood water containing raw sewerage had entered the front and rear of their properties. From the front it was reported that the flood water was entering from the build-up of flood water in Cromwell Road. From the rear it was reported that the flood water was entering from a surcharged manhole in the car park to the rear of the business units. The extent of the flooding that occurred affected all the properties throughout the ground floor.

#### **Marshall Avenue, Grimsby – 1 Property internally flooded and 1 Electricity Substation internally flooded on 20<sup>th</sup> July and 2 properties internally flooded and 1 property externally flooded on 10<sup>th</sup> August.**

The resident reported flood water containing raw sewerage had entered the front and rear of the property. From the front it was reported that the flood water was surcharging from the highway gullies. From the rear it was reported that the flood water was collecting from the front garden and flowing to the rear garden. The extent of flooding that occurred affected the property throughout.

The local newspaper reported that the electricity substation located on Marshall Avenue had been internally flooded resulting in a loss of power to a large amount of homes in this area.

## **Section 19 Flood Investigation Report**

Flood and Water Management Act 2010

### **Wentworth Road, Grimsby – 4 Properties Internally Flooded on 20<sup>th</sup> July and 7 properties internally flooded on 10<sup>th</sup> August.**

The residents reported flood water containing raw sewerage had entered the front of the properties. From the front it was reported that the flood water was surcharging from the highway gullies and in some cases the manhole in their front garden. Properties were affected as flooding depths increased on the road.

All the locations above, other than Chestnut Avenue are indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability surface water flooding maps as being at risk of surface water flooding.

## **Investigations**

Initial contact with the residents affected at the flooded locations was made within a week of the rainfall event by Council Drainage Engineers. A site investigation commenced within 10 days when a level survey and sewer inspections were undertaken. The sewer inspections were complete in December as early morning working and temporary traffic lights were required for accessing part of the system.

## **Drainage Systems**

The condition of the road gullies was checked and two blocked gullies and one collapsed gully lead were found. Where access could be gained into the public sewer systems in the public highway the pipework was jetted and a CCTV survey was carried out. The following issues were found:

- An 8 metre long sag in the Wentworth Road 450mm diameter public sewer was found to be holding 50% of water
- This same length of sewer throttles down to 225mm diameter at the point of connection to the Haycroft Drain culvert.
- There is a grill with a 100% blockage in a manhole in Marklew Avenue.
- Intruding connections and high silt levels evident in the Marklew Avenue sewer.
- Very high water levels and damage to the pipe is evident in Shaftsbury Avenue.
- At least 30% of the capacity in the Haycroft Drain culvert is occupied by dry weather flow and land drainage run off.
- A large catchment to the west of the Market Hotel roundabout runs east down Cromwell Road and connects with the public sewer system in front of Lynton Parade, the lowest part of the catchment, which then heads west back up Cromwell Road.

## **Section 19 Flood Investigation Report**

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- Parts of the sewer system east of the Cromwell Road/Yarborough Road roundabout require a full clean due to siltation and grease accumulations. This is between Lidl and Lynton Parade close to the site of the deepest flooding.
- The private drainage serving the car park in Lynton Parade was in very poor condition, was totally blocked and requires extensive maintenance. The surfacing of the car park is breaking up in areas and requires repair.

### **Actions Implemented**

The findings of the on-site investigations were passed to Anglian Water who is responsible for the management and maintenance of the public sewerage network. Further consultation will take place on the following issues:

- Sag and undersized section in Wentworth Road.
- Grill and blockage in Marklew Avenue.

Suggestions were also made to Anglian Water regarding potential opportunities for building resilience into the public sewerage network. These were

- Potential improvements to the sewer arrangement in Cromwell Road which would re-direct significant flows away from Lynton Parade, the lowest lying part of the catchment with the highest risk of flooding.
- Possible sewer arrangement change at Cromwell Road/Haycroft Avenue junction.

It should be stressed that any proposals like the above would need extensive surveying and modelling to assess their feasibility.

At a meeting with Anglian Water they explained that their current priority is to increase discharge rates at the Pyewipe Terminal Pumping Station. If successful, this work would greatly benefit the drainage of Cromwell Road area as Pyewipe is less than 2 kilometres downstream.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The sewerage systems in this area are around 80 years old. Ageing sewerage systems will exhibit a gradual structural deterioration. Another factor that will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby, including the Cromwell Road area. These slack gradients increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. There is evidence of siltation build ups in this location.

One issue that affects sewerage system performance at this location is the capacity of the Haycroft culvert to which all the affected locations, other than Cromwell Road, discharge to. There is evidence that this culvert was surcharging during the flood events. Because of access restrictions siltation levels were unable to be assessed



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and this was brought to the attention of Anglian Water and further feedback was requested. The other aspect of this culvert's serviceability is the amount of land drainage flow entering the system at three different locations to the south of the catchment. The area of land entering the system could be in excess of 300 hectares which undoubtedly decreases available capacity for the urban area served by the culvert. This issue is a legacy of the Haycroft Culvert having been a land drain prior to the area's development.

### **Recommendations**

Where sewerage systems are prone to siltation build ups as well as deposits of fat and grease then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. The Council as the Lead Local Flood authority will consult Anglian Water further on the subject of maintenance programmes. Examples of the types of regular maintenance operations are:

- Anglian Water undertakes regular high pressure water jetting in Cromwell Road between Wells Street and Yarborough Road.
- Anglian Water undertakes regular high pressure water jetting in the area to the south of Cromwell Road, including Marklew Avenue and Marshall Avenue and the area between.
- Every 3 years, or when jetting operations indicate a problem, a CCTV survey of the sewer system is undertaken to ensure structural integrity and satisfactory serviceability.

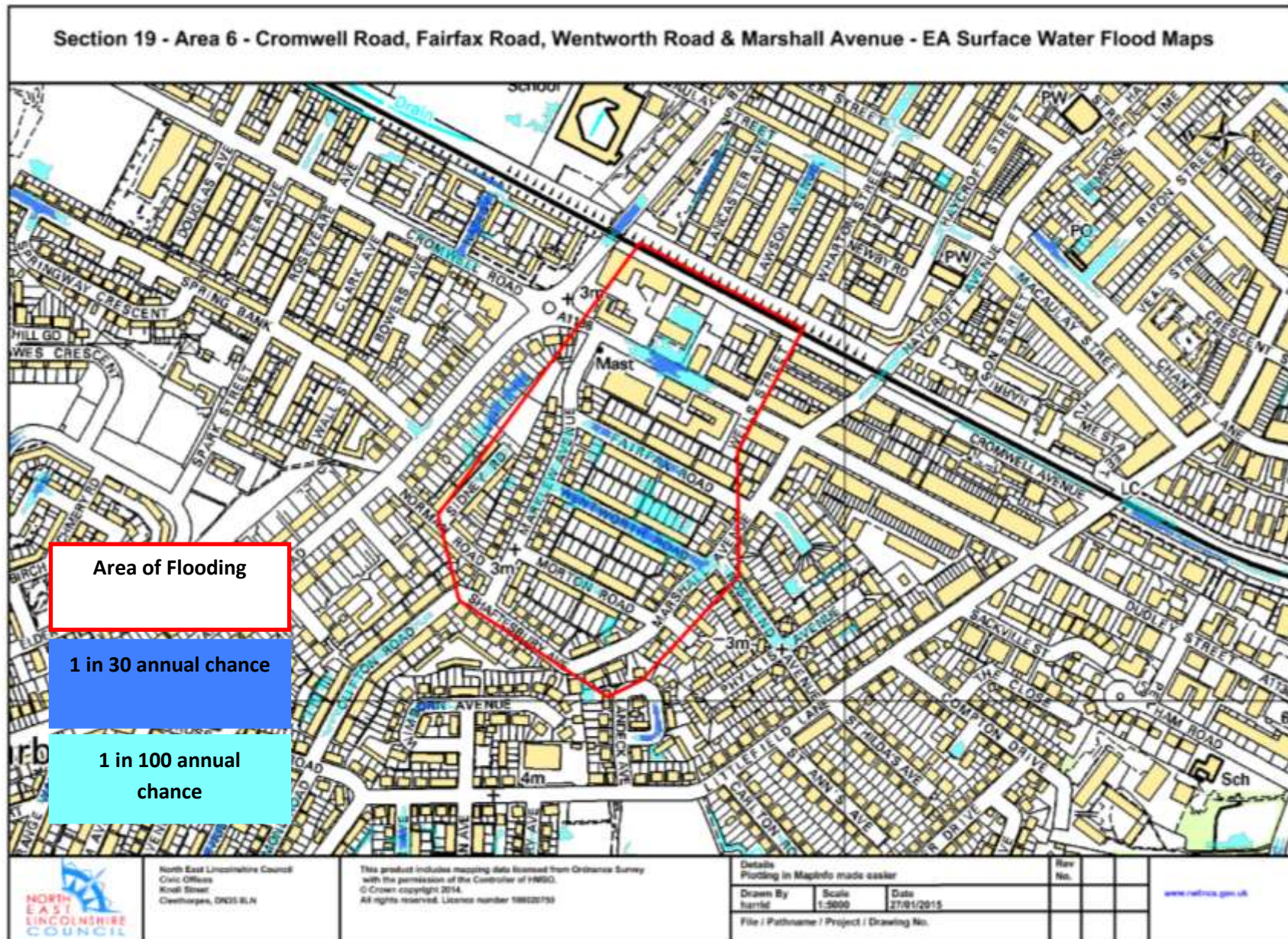
Further negotiation will be needed with Anglian Water to establish the likelihood of being able to increase maintenance operations using a risk based approach in those areas that are vulnerable to siltation and grease accumulations. Also there will be further dialogue with Anglian Water regarding the mitigation measures suggested to establish whether they are worthy of further consideration.

The effect of the land drainage flows on system performance should be assessed but any proposed mitigation measures for this issue would be very challenging, involving catchment management practices.

The mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the main Conclusions section of the report.

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## Area 7 – Lawrence St, Lister St, Henry St

20<sup>th</sup> July 2014 & 10<sup>th</sup> August 2014

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### **Flood Locations**

Internal flooding occurred at a total of 16 properties at the locations of Henry Street, Lawrence Street & Lister Street, Grimsby. A date and street breakdown is detailed below:

**Henry Street, Grimsby – 5 Properties internally flooded on 20<sup>th</sup> July. 6 Properties internally flooded on 10<sup>th</sup> August.**

The flooding along Henry Street came through surcharging of the main sewer, which backed up out of the highway gullies and footway gullies in the alleyway. The sewers in Henry Street connect directly into the Haycroft Drain, which was surcharging due to being overwhelmed by the intensity of the rainfall.

**Lawrence Street, Grimsby – 7 Properties internally flooded on 20<sup>th</sup> July and 10<sup>th</sup> August.**

Lawrence Street is a low lying area which allowed the surcharging sewers to back up out of the highway gullies along Lawrence Street, and there was additional run off from the higher levels along Boulevard Avenue. Lawrence Street is indirectly connected into the Haycroft Drain via James Street.

**Lister Street, Grimsby – 3 Properties internally flooded on 20<sup>th</sup> July.**

The main source of the flooding for Lister Street came from the alleyway and rear gardens. Due to the construction of the house, the kitchens are at a lower level than the rest of the house, and resulted in the rear of the houses flooding.

All the locations above are indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability surface water flooding maps as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood locations was made within a fortnight of the rainfall events by Council Drainage Engineers. In response to resident's concerns Council Gully Cleansing Wagon also visited this location to check the highway gullies. The gullies were found to be in a satisfactory condition. A site investigation followed within two weeks of the second flooding event where a level survey and sewer inspections were undertaken.

The site investigation noted that:

- There were silt accumulations in Lawrence Street and Lister Street.
- Parts of the sewer system in James Street and Henry Street were inaccessible because of seized manhole covers.



## **Section 19 Flood Investigation Report**

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- There was a dry weather flow in the Haycroft culvert trunk sewer estimated at no less than 30% of the capacity.
- The sewer system consisted of a grid system consisting of mainly 225/300mm diameter pipework which is likely to be hydraulically undersized if analysed using current day modelling software.
- The lowest lying part of the catchment is Lawrence Street and the majority of the properties either internally flooded or came very close. The low lying position is exacerbated by the high level of Boulevard Avenue directly to the west and this is probably as a result of it being a railway embankment prior to housing being built there.
- The number of road gullies requires further assessment.

### **Actions Already Completed**

The following findings were passed to Anglian Water:

- Details of silt accumulations.
- Details of seized manhole covers. The presence of these suggests lack of maintenance in certain locations.
- During January 2015 Anglian Water confirmed that the sewer jetting had been undertaken and the issue of seized manhole covers was being looked at.
- At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. If successful, this work would benefit the Lawrence Street, Henry Street and Lister Street area as Pyewipe is only just over a kilometre downstream.
- The issue land drainage run off entering the system was raised with Anglian Water and an initial assessment of the issue will be made by Council Drainage Engineers.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

Henry Street, Lawrence Street and Lister Street were constructed in the period between 1910 and 1930 and there may well have been differing future development allowances built into the sewerage systems at the time they were constructed. Also, the change in future rainfall patterns would not have been known.

It should be noted that ageing sewerage systems will exhibit a gradual structural deterioration. The slack sewer system gradients associated with low lying flat areas like the majority of north and central Grimsby increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas.

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Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system and benefit sewer system performance in this location.

### **Recommendations**

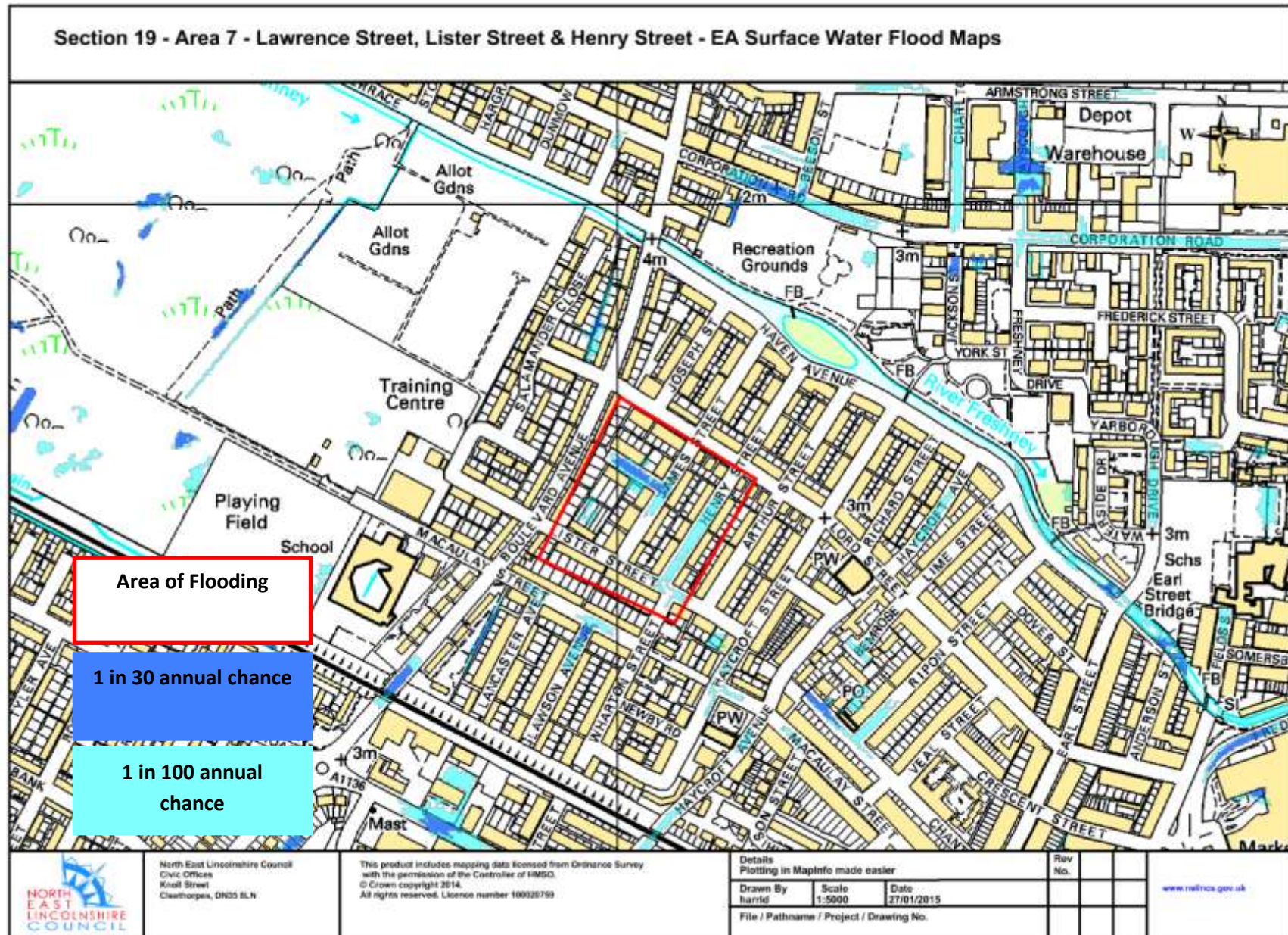
Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall.

The assessment of road gullies has provisionally identified the need for additional gullies although this will only assist drainage up to a certain point. Once a sewer system starts to surcharge because of intense rainfall no amount of additional gullies would provide any mitigation at all.

The issue of land drainage will be looked at in more detail but this flow is being received from agricultural land adjacent to the urban area so any source control measures will involve catchment management practices.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the Main Conclusions section of the report.

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## Area 8 – Fildes Street

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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### **Flood Locations**

**Fildes Street, Grimsby – 4 Properties internally flooded on 20<sup>th</sup> July and 3 Properties internally flooded on 10<sup>th</sup> August**

The residents reported flood water containing raw sewerage had entered the front and in three cases the rear of the property. From the rear it was reported that the flood water was surcharging from the manholes and drains in their gardens. From the front it was reported that the flood water was surcharging from the highway gullies and flowing across the footpath towards the properties. The extent of flooding that occurred affected the properties throughout the majority of the ground floors.

The area of Fildes Street that flooded is indicated on the Environment Agency 1 in 100 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

The condition of the highway gullies was assessed and no blockages were found. Where access could be gained into the public sewer systems in the public highway a CCTV survey was carried out. The following issues were found:

- Varying levels of siltation throughout the sewer system.
- An obstruction at a junction from the sewer to the rear of a number of the properties on Fildes Street was found to be restricting the capacity of the sewers discharge.
- Only the main public sewer systems were investigated. The public sewer systems to the rear of property and running down alleyways alongside houses were not investigated at this stage.

### **Actions Implemented**

- The findings of the on-site investigations were passed to Anglian Water who are responsible for the management and maintenance of the public sewerage network. Initial jetting has been carried by Anglian Water whose contractor has recommended further jetting downstream.
- North East Lincolnshire Councils Neighbourhood Services attended the areas to clear debris from highway gullies where accessible.

## **Section 19 Flood Investigation Report**

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- At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. This location would benefit from Pumping Station improvements but to what extent is unknown.

## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

It should be noted that ageing sewerage systems such as that serving Fildes Street will exhibit a gradual structural deterioration. Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. These increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas.

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system. Any outfall improvement would benefit this location but to what extent is unknown.

## **Recommendations**

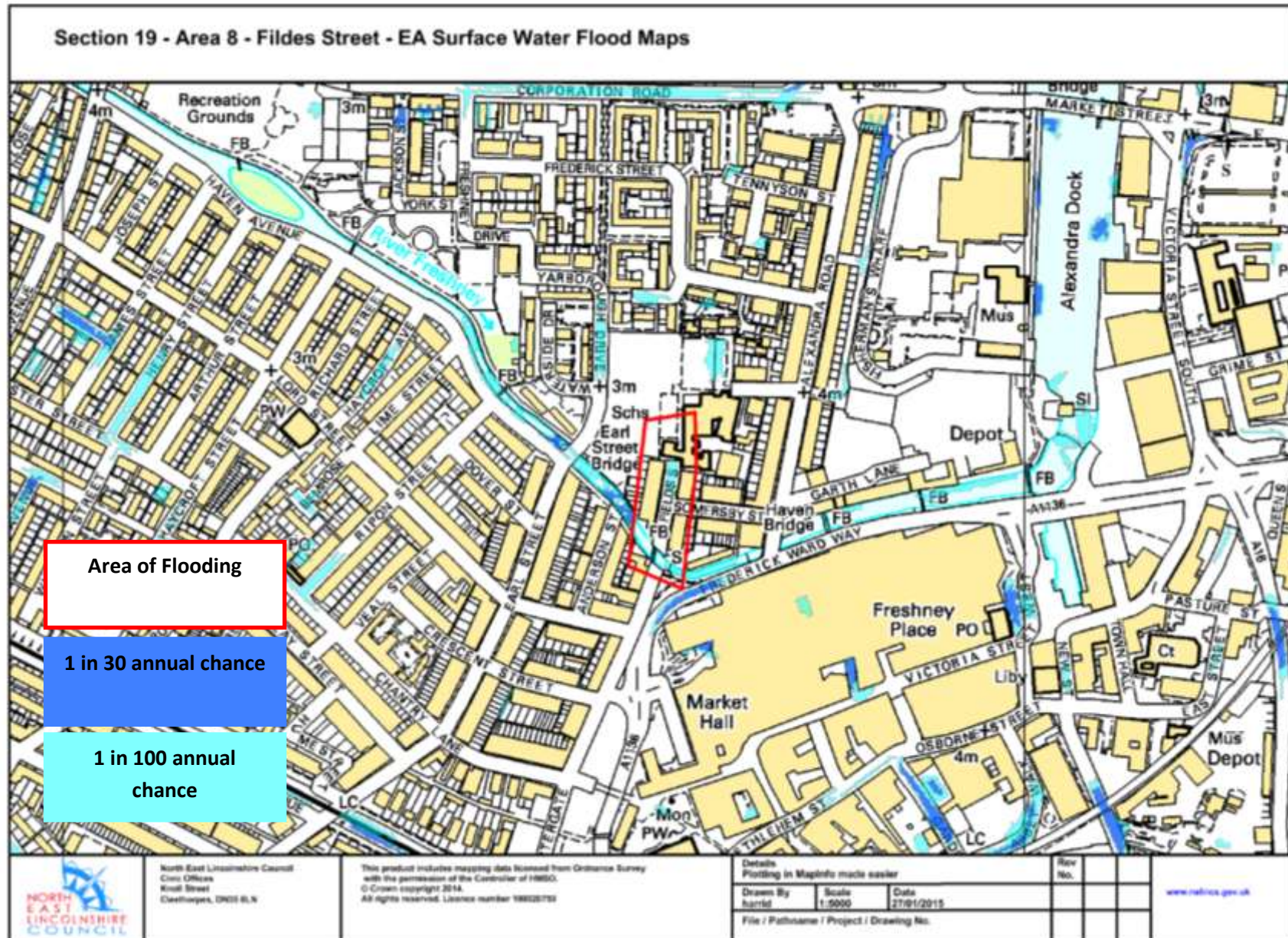
Following the site investigation in the Fildes Street areas it has been recommended that:

- Anglian Water undertake high pressure water jetting in the Fildes Street, Somersby Street & New Cartergate area – some of this jetting work is now complete.
- Anglian Water removes the obstruction at a junction from the sewer to the rear of a number of the properties on Fildes Street which was found to be restricting the capacity of the sewers discharge.
- Anglian Water to undertake regular maintenance to the sewer systems that may be prone to being overwhelmed by intense rainfall.
- Property owners, residents and tenants that are at risk from flooding where possible should consider methods to protect their property. More information on property level protection can be obtained from the Council's Drainage team.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the main Conclusions section of the report.



**Section 19 Flood Investigation Report**  
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## Area 9 – Freshney Place

20<sup>th</sup> July 2014

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### **Flood Locations**

**Freshney Place, Grimsby – 6 Businesses internally flooded, including areas of Precinct internally flooded on 10<sup>th</sup> August**

The local newspaper reported that Freshney Place, Grimsby was affected by internal flooding. This was followed by a report to the Council's Strategic Director for Place.

Freshney Place is Grimsby's main indoor shopping centre and the largest on the Lincolnshire coast.

### **Investigations**

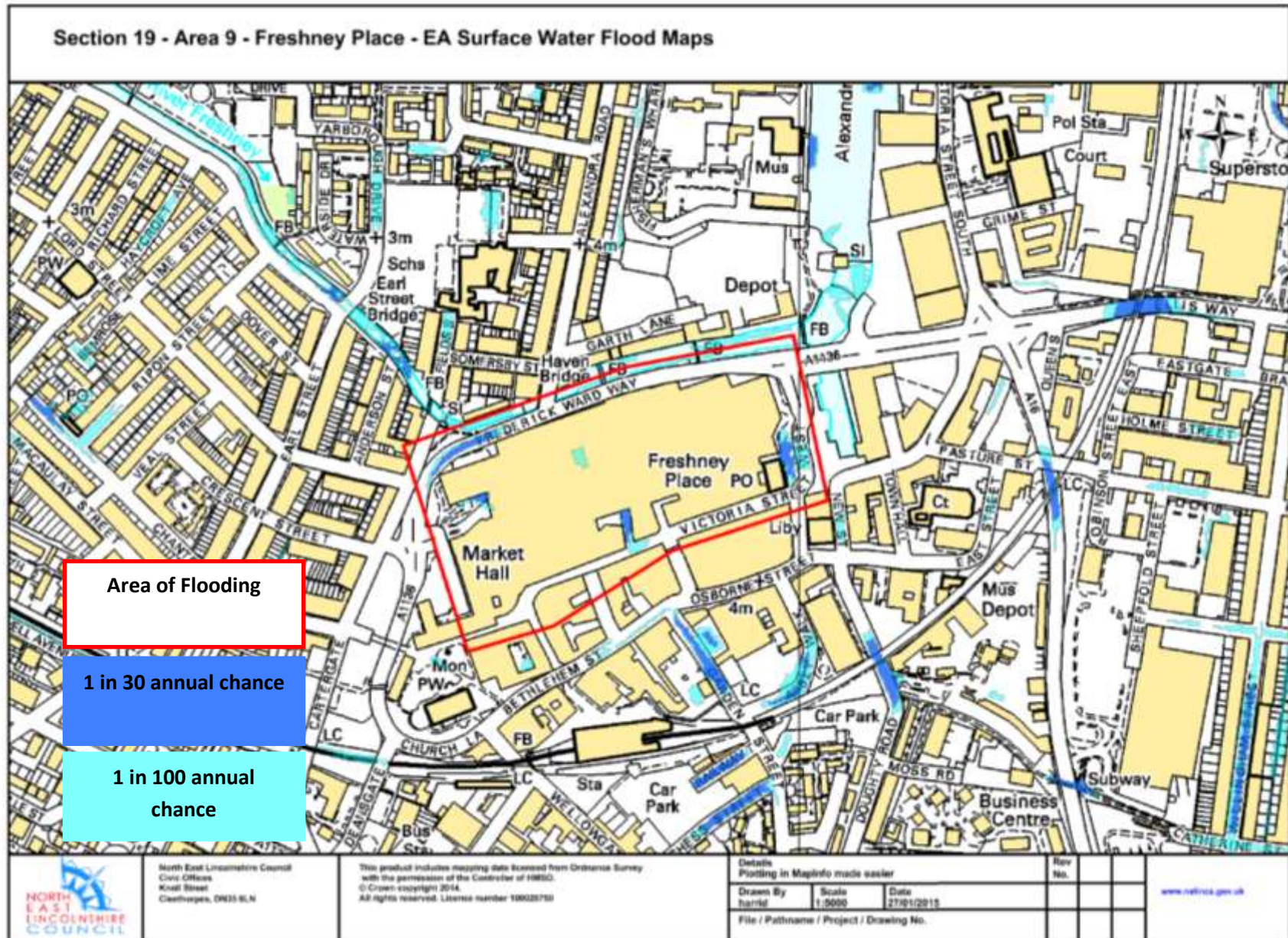
Initial contact with the businesses affected at the flood locations was made by Council Drainage Engineers within a week of the initial report of the flooding appearing in the local newspaper. The businesses affected reported that flood water containing raw sewerage had surcharged through toilets and manholes within the properties. The extent of flooding that occurred affected the businesses in localised areas. However, certain businesses were flooded throughout. The extent of flooding which occurred in the Precinct was located around the toilets and walkways where manhole covers were located. A site investigation followed within a month where a level survey and sewer inspections were undertaken.

The site investigation of the public sewerage system which receives the drainage from Freshney Place found no issues other than a large displaced joint close to the Centre's boundary wall. However, Freshney Place's drainage contractor confirmed that the outfall from the shopping centre goes into a part of the public sewer system where there are no structural or siltation issues and has adequate capacity.

**Freshney Place organised their own investigation into the Centre's internal drainage system. A copy of the report and CCTV survey will be submitted to the Council to update this report when ready.**



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## Area 10 – Welholme Avenue

10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Le Burghdike Close, cul-de-sac off Welholme Avenue - 2 properties externally flooded on 10<sup>th</sup> August**

The extent of the flooding was noted by a Council Engineer in the early afternoon of 10<sup>th</sup> August about an hour after the rainfall event. Both affected properties had flood boards in place plus a pump was being used to level water levels. Without these measures internal flooding would have resulted.

### **Investigations**

Because the Close is lower lying than the adjacent Welholme Avenue and surrounding land there is a history of surface water flooding. As a result, in the past 12 years there has been an additional gully installed and a length of main sewer replaced both outside Le Burghdike Close.

- Residents reported surface water run off coming down Welholme Road, entering Welholme Avenue and adding to the flooding in the Close that was caused by the surcharging main sewer.
- The nearby Peoples Park was extensively flooded from the surcharging trunk sewer running in Welholme Road indicating widespread surcharging of the public sewer system in this location.
- Safe access was not available due to the design of the manhole in Welholme Avenue. This issue is to be passed to Anglian Water.

### **Actions Required**

The low lying elevation of this location has resulted in a high flood risk at the two properties overlooking Welholme Avenue. Both properties already have property level flood measures in place. However, the problem of surface water flow from Welholme Road will be investigated further. Actions required will be:

- Investigation of road gully provision and operation in both Welholme Road and Welholme Avenue.
- Liaise with Anglian Water in investigating the public sewer system serving Le Burghdike Close.

### **Recommendations**

- If an additional gully/gullies are needed then make arrangements for this work.

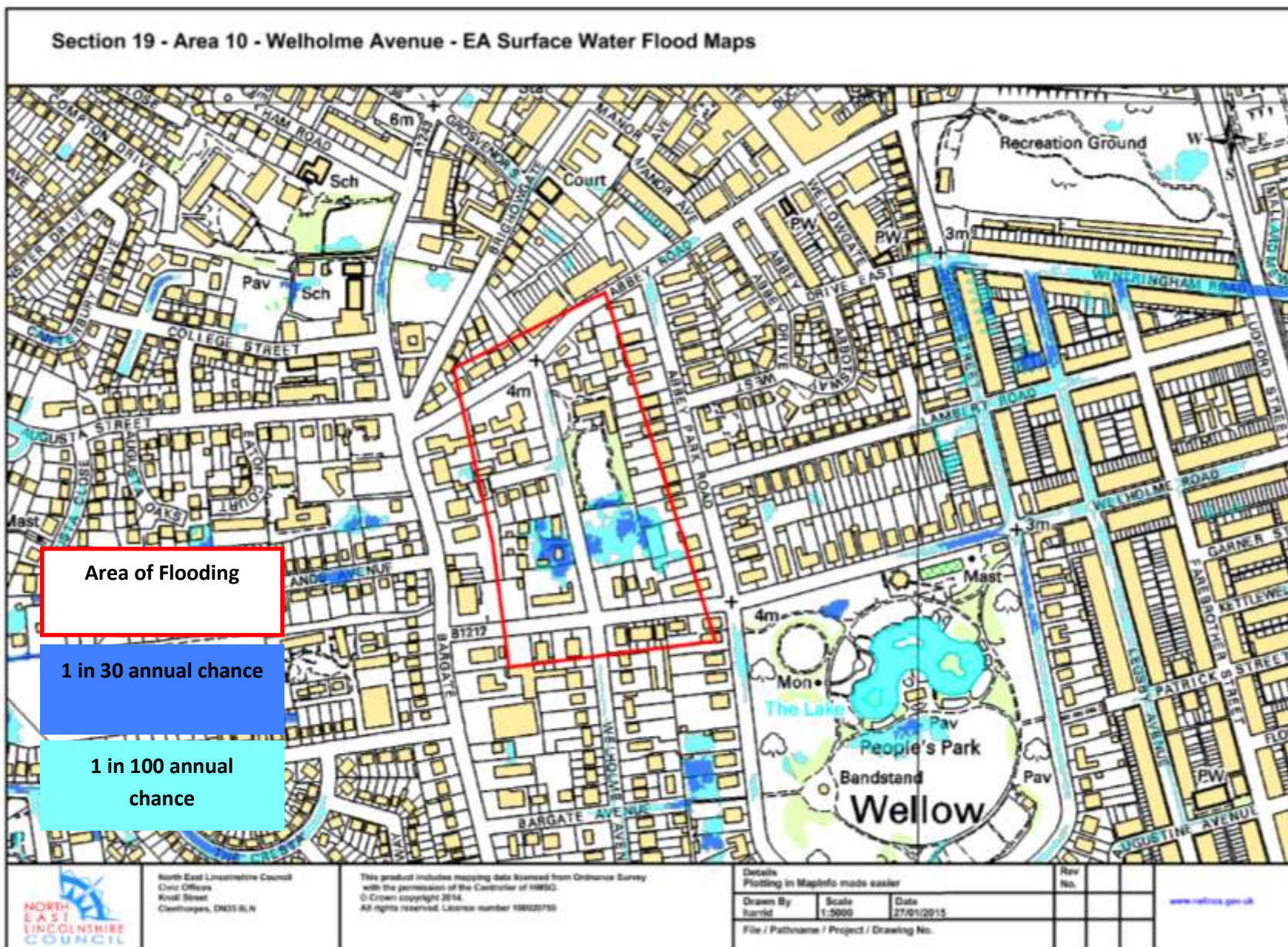
## **Section 19 Flood Investigation Report**

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- Consider the and findings or recommendations from the sewer system survey.



## Flood and Water Management Act 2010



# **Area 11 - Ainslie Street & Wintringham Road, Grimsby, North East Lincolnshire**

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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## **Flood Locations**

### **Ainslie Street, Grimsby – 4 Properties internally flooded on 20<sup>th</sup> July and 7 properties internally flooded on 10<sup>th</sup> August**

Residents reported that the main source of the flood water, containing raw sewage, was from the front of the properties, primarily from the road with surcharging from the main sewers coming from the road gullies which are the lowest part of the street. This flood water then flowed across the footway to the properties which are slightly lower lying than the road.

Properties were also affected from the rear with surcharging from the public sewer systems which are present behind nearly all properties in Ainslie Street and Wintringham Road. As well as door openings and air bricks there was evidence that defective brickwork also provided a means of entry for flood water into some properties.

### **Wintringham Road, Grimsby – 1 internally flooded on 20<sup>th</sup> July**

The resident reported flood water containing raw sewage had entered from the front of their property into the front porch. The threshold of the inner door prevented flood water entering further into the property. It was reported that the flood water was surcharging from the sewer through the highway gullies and flowing across the footway towards the property.

### **Wintringham Road, Grimsby – 1 Property internally flooded on 20<sup>th</sup> July and 10<sup>th</sup> August.**

The resident reported flood water containing raw sewage had entered the property from the rear garden and in the second event the front of the property came close to being breached.

All the locations above are indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability surface water flooding maps as being at risk of surface water flooding.

## **Investigations**

Initial contact with residents affected by flooding was made by Council Drainage Engineers within a week of the first rainfall event. A site investigation followed with level surveys (where required) and sewer inspections undertaken.

The site investigation noted that the sewers on Ainslie Street and Wintringham Road were generally in reasonable condition but there were the issues listed below. The condition of the road gullies was also assessed

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and no blockages were found. Where access could be gained into the public sewer systems in the public highway the pipework was jetted and a CCTV survey was carried out. The following issues were found:

- Varying levels of siltation were found even after jetting.
- Groundwater infiltration observed at one pipe joint. Likely to be more widespread as traditionally the public sewer systems to the rear of the properties are more prone to structural deterioration.
- Large ball of fat and grease occupying approximately 80% of the pipe diameter was found at a location adjacent to some flooded properties in Ainslie Street.
- A discrepancy in the sewer arrangement was found on site as against what the sewer map shows in Abbey Drive East. There was also evidence of a large void or chamber close to the junction with Ainslie Street and this contained large amounts of debris and earth.
- An incoming pipe in Wintringham Road had a constant fast flow suggesting that a land drain may be connected into the system. There is evidence of old watercourses running through this area prior to development and there are also active springs in this area of Grimsby; either of these could be a possible source of the constant flow.
- Only the main public sewer systems were investigated. The public sewer systems to the rear of property and running down alleyways alongside houses were not investigated at this stage.

## **Actions Implemented**

The findings of the on-site investigations were passed to Anglian Water who are responsible for the management and maintenance of the public sewerage network. These included:

- Locations of manholes where access covers were seized thereby preventing access into the main public sewer system. Seized manhole covers tend to be indicative of lack of recent maintenance.
- A suggestion was also made to Anglian Water regarding a potential opportunity for building resilience into the public sewerage network by querying whether the storage tank sewers in the adjacent Ainslie Street could be used for alleviation purposes. A response is still awaited.
- Previous investigations have established that the trunk sewers downstream of Ainslie Street and Wintringham Road have in times past been prone to siltation build ups; this aspect requires further on-site checks – included in recommendations.

## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The sewerage system in Park Ward is well over 100 years old other than the trunk sewer in Welholme Road which is thought to be 40/50 years old. Ageing sewerage systems will exhibit a gradual structural deterioration.

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Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby; these increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. Siltation build ups as well as grease accumulations were found to be present in the sewer systems at this location.

### **Recommendations**

Where sewerage systems are prone to siltation build ups as well as deposits of fat and grease then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. The Council as the Lead Local Flood authority will consult Anglian Water further on the subject of maintenance programmes. Examples of the types of regular maintenance operations are shown below:

- Anglian Water undertake regular high pressure water jetting in Wintringham Road at least as far as the Ainslie Street junction.
- Anglian Water undertake regular high pressure water jetting in Ainslie Street at least as far as the Wintringham Road junction.
- Every 3 years, or when jetting operations indicate a problem, a CCTV survey of the sewer system is undertaken to ensure structural integrity and satisfactory serviceability.

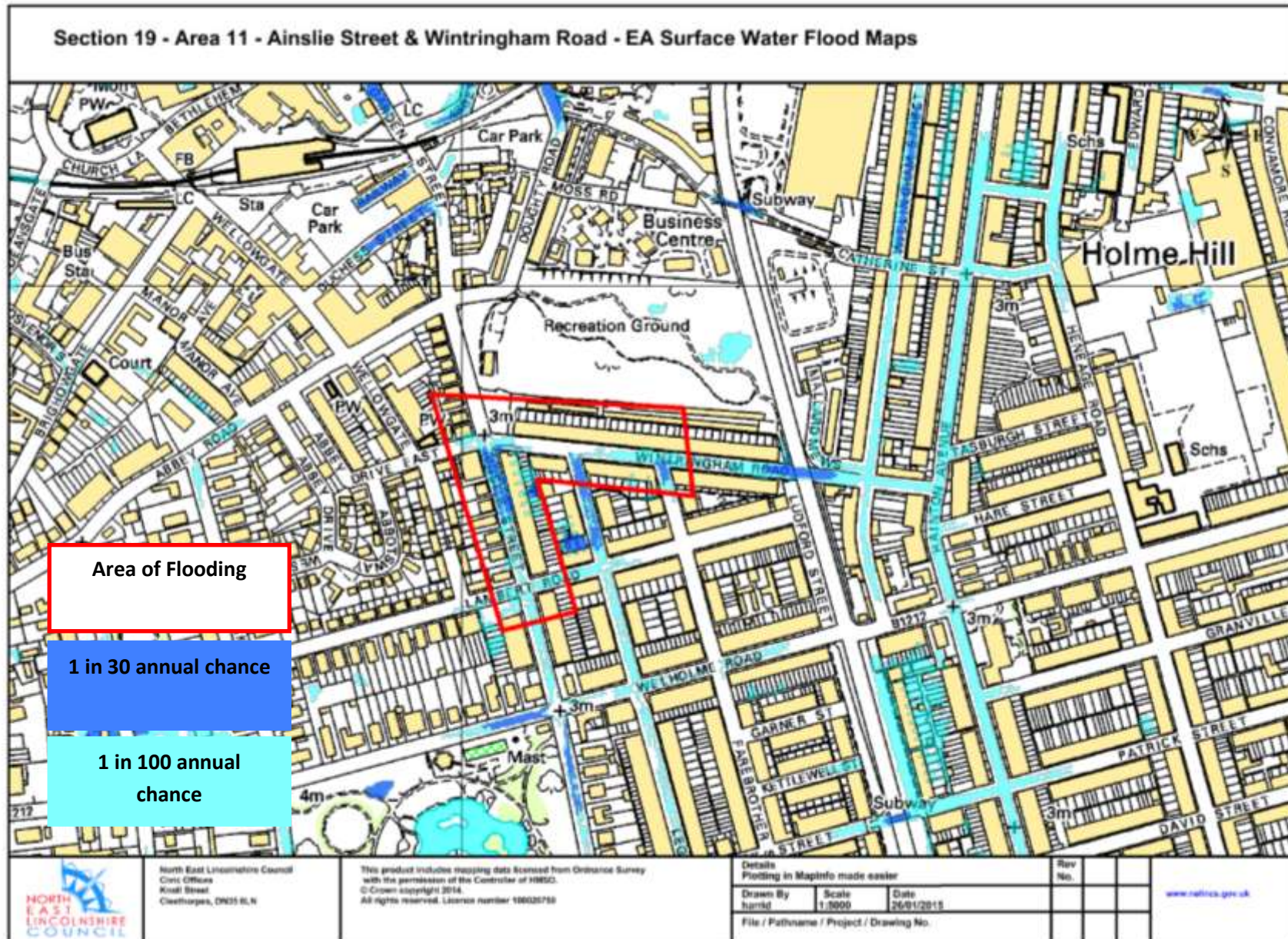
As mentioned in the Actions section further downstream checks in the bigger trunk sewers are strongly recommended.

Further negotiation will be needed with Anglian Water to establish the likelihood of being able to increase maintenance operations in those areas that are vulnerable to siltation and grease accumulations. The mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. As explained in the conclusions section there are different approaches to property level protection but fundamental to this approach is both the willingness of the resident of the at-risk property to consider this approach plus their financial position in terms of being able to afford it.

Wherever possible, consultation will take place with Anglian Water about opportunities to mitigate against flood risk that may be available by relatively small scale alterations to the existing public sewerage system. A suggestion has been made regarding the potential for mitigation at this location and this will be discussed further with Anglian Water. This mitigation suggestion was the use of the large storage pipes in the adjacent Ainslie Street recreation ground. However, what Anglian Water have stressed is that their priority is to improve discharge rates at the Pyewipe Terminal Pumping Station which is the final outfall point for all treated effluent from Grimsby into the Humber Estuary. This is also the point of discharge for storm flows from all of west Grimsby, the location of nearly all properties affected by the floods of summer 2014. However, the storm flows from the Ainslie Street/ Wintringham Road area go out to the Estuary at Riby Street pumping station so further dialogue with Anglian Water will be required, e.g. are similar improvements at Riby Street feasible?



**Section 19 Flood Investigation Report**  
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# Area 12 – Doughty Road, Town Hall and Municipal Offices

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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## **Flood Locations**

### **Doughty Road subway flooded on both 20<sup>th</sup> July and 10<sup>th</sup> August**

The subway was the main location affected on both occasions and this prohibited vehicles entering or leaving the Council Works Depot during the response period of the flooding. The water was surcharging out of a manhole in the entrance to Doughty Road and flooding the underpass. The pumping station wasn't able to lower water levels during the event because the volume of flooding far exceeded the pumping rate of the station.

### **Grimsby Town Hall and Municipal Offices basement**

The flooding at these locations was confined to the basement areas and the source of it was drainage gullies serving these low lying basements. The level of surcharge in the adjacent public sewers caused water to backflow out of the gullies. Once the rainfall had finished then water levels receded. One of the rooms affected in the Town Hall was the boiler room.

Doughty Road subway is indicated on the Environment Agency 1 in 30 annual probability flooding map as being at risk of surface water flooding.

## **Investigations**

Initial attendance was by the pumping station maintenance contractor who attended on both occasions that the subway flooded. Council Drainage Engineers attended within 3 weeks carrying out CCTV and level surveys.

All the road gullies were jetted and one was found to require a repair on a blocked outfall pipe. However, there is ample gully provision so this single blocked gully wouldn't have made the flooding any worse.

As explained above, the pumping station was accessed and fully inspected during both times the subway was flooded. It was found to be working during both events. However, the Doughty Road Council Depot is the route of the main trunk sewer which serves a large area of central Grimsby bounded by Peakes Parkway, Welholme Road, the railway line and the roads off Bargate. This large catchment has a history of surcharging and a £1m scheme in 1994 provided significant additional capacity to lessen the flood risk associated with the catchment. In the flooding being investigated surcharging occurred and a lower lying manhole cover in the depot allowed surcharged flows to escape into the subway. Although continuing to work, the pumping station out fall was into the sewer pipe running under the railway which connected into the manhole which was the source of the

## **Section 19 Flood Investigation Report**

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surcharging and flooding. This meant that the water being pumped from the subway was going round in circles, flooding out of the manhole and back into the subway. A drawing illustrating this is at the end of this section.

This pipe under the railway is 450mm diameter and the relatively small catchment it serves means there is spare capacity in that part of the system.

The sewer to which the pipe under the railway discharges was found to be heavily silted.

The investigation of the pumping station and its outfall arrangements showed that an increase in pumping capacity may be achievable.

Because of the layout of the catchment around the depot and the extra capacity in the nearby Ainslie Street Park added in 1994, further investigations are required to ensure maximum use is being made of this capacity. This involves further investigation into the current arrangement and what modifications could be made.

There were no issues found with the sewers serving the Town Hall and Municipal Offices but the flood water level in the Town Hall boiler room came close to causing the failure of a newly installed boiler.

### **Actions Implemented.**

The findings of the on-site investigations were passed to Anglian Water who are responsible for the management and maintenance of the public sewerage network and feedback on their actions will be sought. Further investigations of silt levels through, and downstream, of the Council depot are required because there is a history of silt build up in this location.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

As alluded to above, this catchment is prone to siltation build ups, the main cause being the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. Siltation can have a significant effect on sewer system performance.

Capacity and siltation issues aside, the low lying manhole adjacent to the subway is the primary cause of the flooding. Other than the manhole chamber at the Doughty Road/ Moss Road junction, this manhole is lower lying than all the other manholes on the main sewer. This means that when the system surcharges this manhole acts as a "release valve" discharging flood water into the subway.

The main flooding mitigation measure at this location would be the monitoring of silt levels and appropriate maintenance. There may be an opportunity to improve the performance of the pumping station but this would only be worthwhile if the surcharging from the low level manhole in the subway could be prevented.

The flooding of the Town Hall boiler room is a concern as extensive damage to a newly installed boiler was narrowly avoided.

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### **Recommendations**

As found in the in the site investigations the sewerage systems are prone to siltation build ups as well as deposits of fat and grease then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. The Council as the Lead Local Flood authority will consult Anglian Water further on the subject of maintenance programmes.

Further investigation into the current arrangements is required with a view to any available measures to alleviate the surcharging into the subway. These could be:

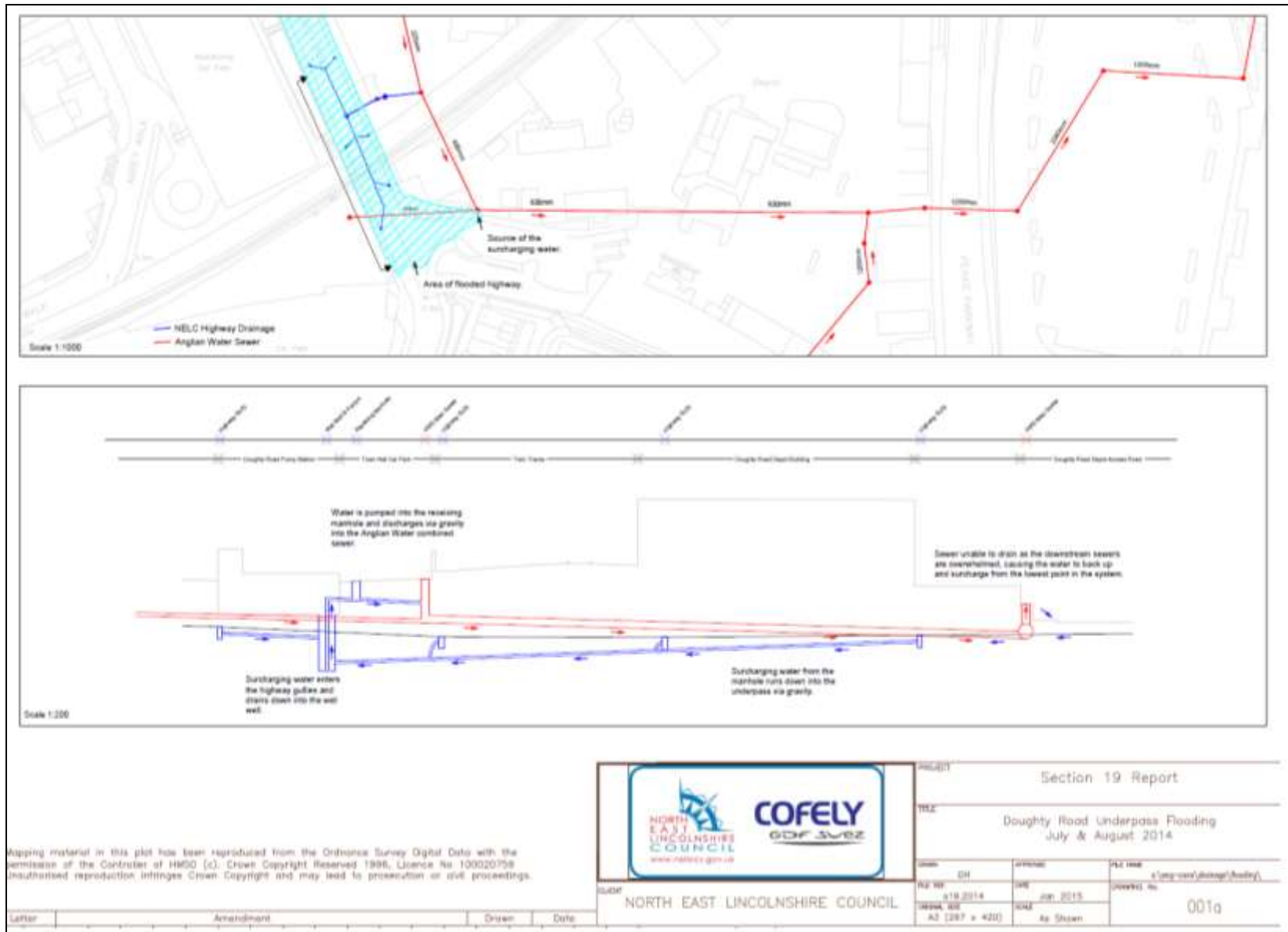
- Raising the level of the low lying manhole adjacent to the subway with the bolting down of the next one upstream at the Doughty Road/Moss Road junction. This would lessen the volume of the surcharged flows discharging into the subway.
- If the above option is feasible then measures for improving the capacity of the pumping station can be developed. Without management of surcharge levels in the main sewer there would be no benefit in increasing pumping capacity.
- Assessing the potential for better utilising any spare capacity there may be in the sewerage system.
- The storm flows from the Doughty Road area go out to the Estuary at Riby Street pumping station so dialogue with Anglian Water will be required. The main Conclusions section at the end of the report explains the potential improvements that could be made at the Pyewipe Terminal Pumping Station; are similar improvements at Riby Street feasible?

An option has been discussed for an alternative location for equipment and plant normally kept at Doughty Road depot and that is needed during a flood event. The Gilbey Road depot is at low risk of surface water flooding and could be an alternative location to be considered if a warning of extreme rainfall is received.

Because of the flood threat to the Town Hall boiler the option of a non-return valve on the gully pipework should be explored. This would prevent flooding of the boiler room during future extreme rainfall events.

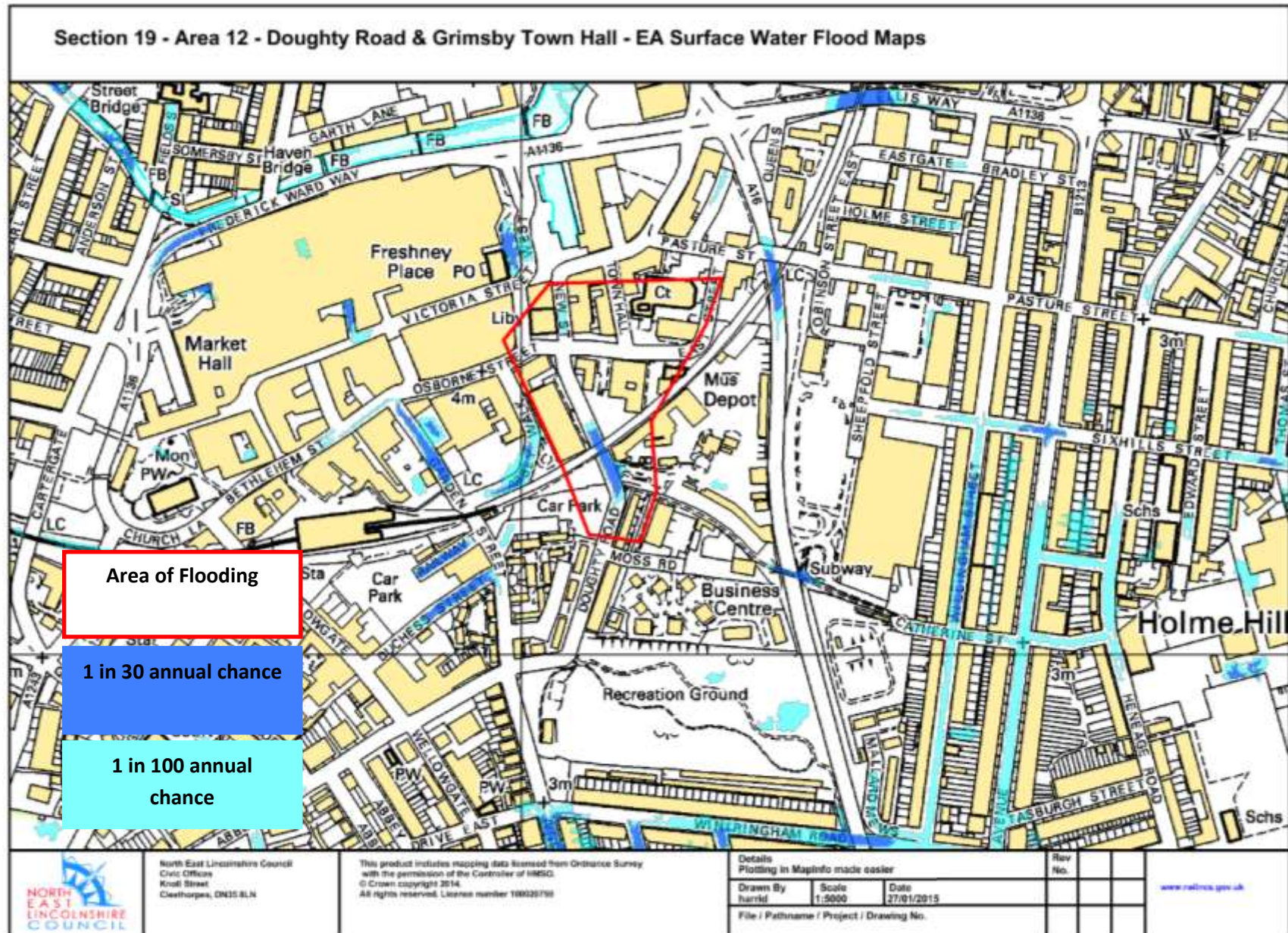
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## Area 13 – Peaks Parkway & Ellis Way

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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### **Flood Locations**

Substantial flooding of the highway occurred at both the Peaks Parkway Underpass (A16) and Ellis Way Underpass (A1136), Grimsby. Details are provided below:

#### **Peaks Parkway Underpass, Grimsby –Substantially Externally Flooded on 20<sup>th</sup> July.**

Flooding during the first event occurred in the underpass of Peaks Parkway, Grimsby. The Peaks Parkway underpass serves the A16, a busy main road which travels north-south through Grimsby. For a short period of time the highway became impassable for traffic as flood water levels were reported to be 600mm at their deepest.

#### **Ellis Way Underpass, Grimsby –Substantially Externally Flooded on 20<sup>th</sup> July & 10<sup>th</sup> August.**

Flooding during both events occurred in the underpass of Ellis Way, Grimsby. The Ellis Way underpass serves a busy main road which travels east-west through Grimsby and provides access from Peaks Parkway and Grimsby Town Centre to and from the Freeman Street area and Asda. For a short period of time the highway became impassable for traffic as flood water levels were reported to be 600mm at their deepest.

### **Investigations**

Initial reports from the affected flood locations were from the Council's Pumping Station Term Maintenance Contractors who maintain the pumping stations at both underpasses. The contractors were called out by an automatic high water level alarm and were on site at the affected locations within 1 hour. The contractors reported that at Peaks Parkway underpass on the 20<sup>th</sup> July the pumps had tripped. These were restarted and no further issues with the pumping station were encountered with pumps running at full capacity.

At Ellis Way the contractors reported that there were no issues with the pumping station on either occasion. However, the combined main sewer that the pumping station connects to was surcharging and full causing the high level float in the tank sewer, that receives the pumped outfall from the subway, to switch the pumps off due to lack of receiving capacity. Drawing no 002A shows the layout and problem spots of the Ellis Way pumping station.

A site investigation followed within three months of the last flooding event when sewer inspections were undertaken. The inspections found that:

- The combined sewer serving Ellis Way had high siltation levels and a defective connection was obscuring the pipework.
- A number of manholes for accessing the combined sewer serving Ellis Way had been surfaced over.

## **Section 19 Flood Investigation Report**

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- The main combined sewer serving Pasture Street was flowing well with little evidence of siltation build up.

### **Actions Implemented**

The following findings have been passed to Anglian Water;

- Details of the combined sewer which has high siltation levels and a defective connection.

The following findings have been passed to Highways;

- Details of manholes which have been covered by recent resurfacing works.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

Ellis Way pumping station was reported to have no faults at the time of flooding, however due to the receiving sewer being prone to surcharge it has a high level overflow cut off built in the system. This causes the pumping station to stop operating when the receiving sewer level is surcharging and too high to receive any more surface water. Once the levels in the sewer subside the pumping station automatically turns back on reducing the flood levels in the underpass. This would have been the situation at Ellis Way on both flooding events.

The problem at Peaks Parkway underpass was the pumps stopping operating due to a fault which caused them to trip. This fault would most likely be the surcharge of the receiving sewer. Once the contractor arrived on site and restarted the pumps and set to automatic operation then flood levels in the underpass subsided.

The high siltation levels observed in the public sewer system serving Ellis Way suggests that maintenance is required to control siltation levels which would have exacerbated the surcharging in the system.

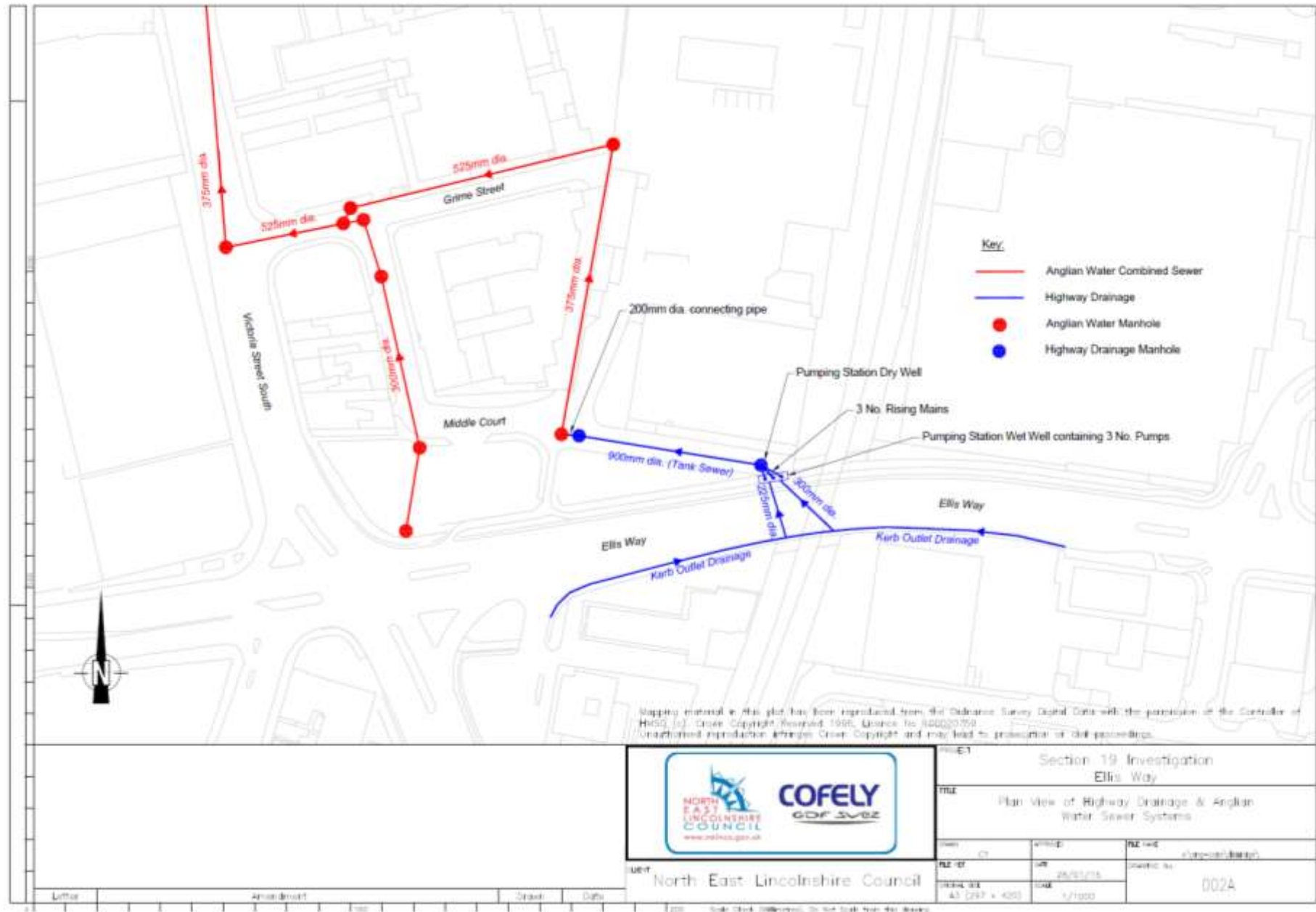
### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. The Council as the Lead Local Flood authority will consult Anglian Water further on the subject of maintenance programmes. Examples of the types of regular maintenance operations are shown below:

- Full cleaning and CCTV survey of the combined sewer serving Ellis Way underpass.
- Further investigation is needed into the capacity of the receiving sewer at Ellis Way and whether any short term, quick fix mitigation measures can be achieved to reduce the impact of the flooding. These could include assessment of the float settings within the wet well and the higher level tank sewer. Also, are there any areas adjacent to the tank sewer which could receive exceedance flows rather than the subway flooding?

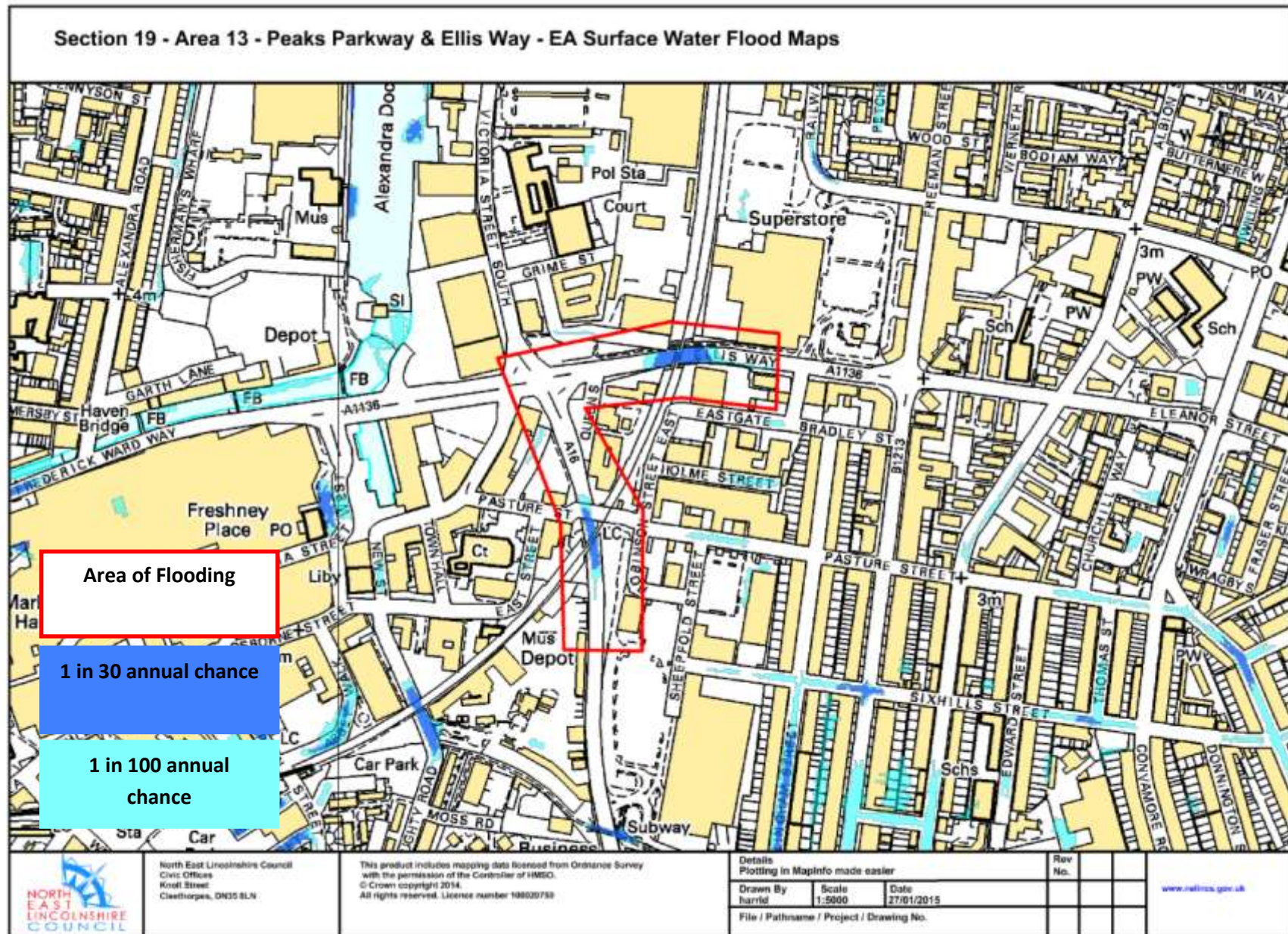
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Flood and Water Management Act 2010





**Section 19 Flood Investigation Report**  
Flood and Water Management Act 2010



## Area 14 – Willingham Street

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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### **Flood Locations**

**Willingham Street – 1 property externally flooded on 20<sup>th</sup> July and 3 properties internally flooded on Sunday 10<sup>th</sup> August.** Because of the topography it is likely that many more properties were affected by external flooding on both dates.

There was extensive flooding of the road in front of the properties. This area is highlighted on the Environment Agency 1 in 30 annual probability surface water flooding map as being at risk of flooding.

One of the affected properties had water through the front door caused by bow waves created by cars moving at inappropriate speeds along the flooded road.

The other properties reported internal flooding with water entering via the brickwork around the front bay window and also via the cavity dividing wall. These properties were internally flooded in 2007 and new concrete floors replaced the original timber floors.

### **Investigations**

Initial contact by Council Drainage Engineers with the residents affected by flooding was made within 10 days of the rainfall event. A previous report after 20<sup>th</sup> July was not received by the Drainage team so residents were not contacted and visited until after the flooding on 10<sup>th</sup> August.

### **Drainage systems**

A site investigation followed and sewer inspections in the adjacent Catherine Street and Willingham Street were undertaken. The condition of the road gullies was assessed and no blockages were found. The following issues were found:

- The large surface water culvert in Catherine Street had silt build ups that required attendance by a large jetting wagon but this system does not receive any surface water discharge from the Willingham Street catchment.
- The local rider sewers, running each side of the surface water culvert, were heavily silted and required jetting.
- A combination of parked cars and very oddly designed manholes meant the Willingham Street sewer could not be accessed.



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- Residents reported that there was significant surface water run-off from the large storage yard at the B&Q premises that runs along the west rear boundary of the properties. This surface water was running off onto the public highway in Catherine Street and falling towards Willingham Street.

### **Actions Implemented**

The findings of the on-site investigations were passed to Anglian Water who are responsible for the management and maintenance of the public sewerage network. This included sending a photograph of the oddly designed manhole referred to above with a recommendation that it be replaced.

B&Q were also written to requesting that the issue of surface water run off onto the public highway be addressed. This issue was dealt with after the floods of 2007 and further action by B&Q is now needed to prevent this run off.

This area was badly affected in 2007 and this has resulted in funding bids to both Anglian Water and the Environment Agency for improvements to the surface water drainage in the area. The bids were successful in securing allocations which will now be subject to detailed bids for a scheme to go ahead provisionally in 2017.

Also after 2007 there were repairs to the existing highway gullies plus a new gully installed.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The sewerage systems serving the older areas of the town such as those in Willingham Street are over 100 years old. The consequence of ageing sewerage systems is a gradual structural deterioration plus potential capacity issues. The Willingham Street manhole that prevented access into the system suggests a historical lack of maintenance in that part of the sewer system.

Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby; these increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas.

Certainly, the history of recent of recent flooding in Willingham Street suggests that measures to manage surface water more effectively are required and funding is available should satisfactory solutions be developed.

### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall. The Council as the Lead Local Flood authority will consult Anglian Water further on the subject of maintenance programmes. Certainly, a replacement manhole is required in Willingham Street to provide access into the public sewerage system for maintenance purposes. Examples of the types of regular maintenance operations are shown below:

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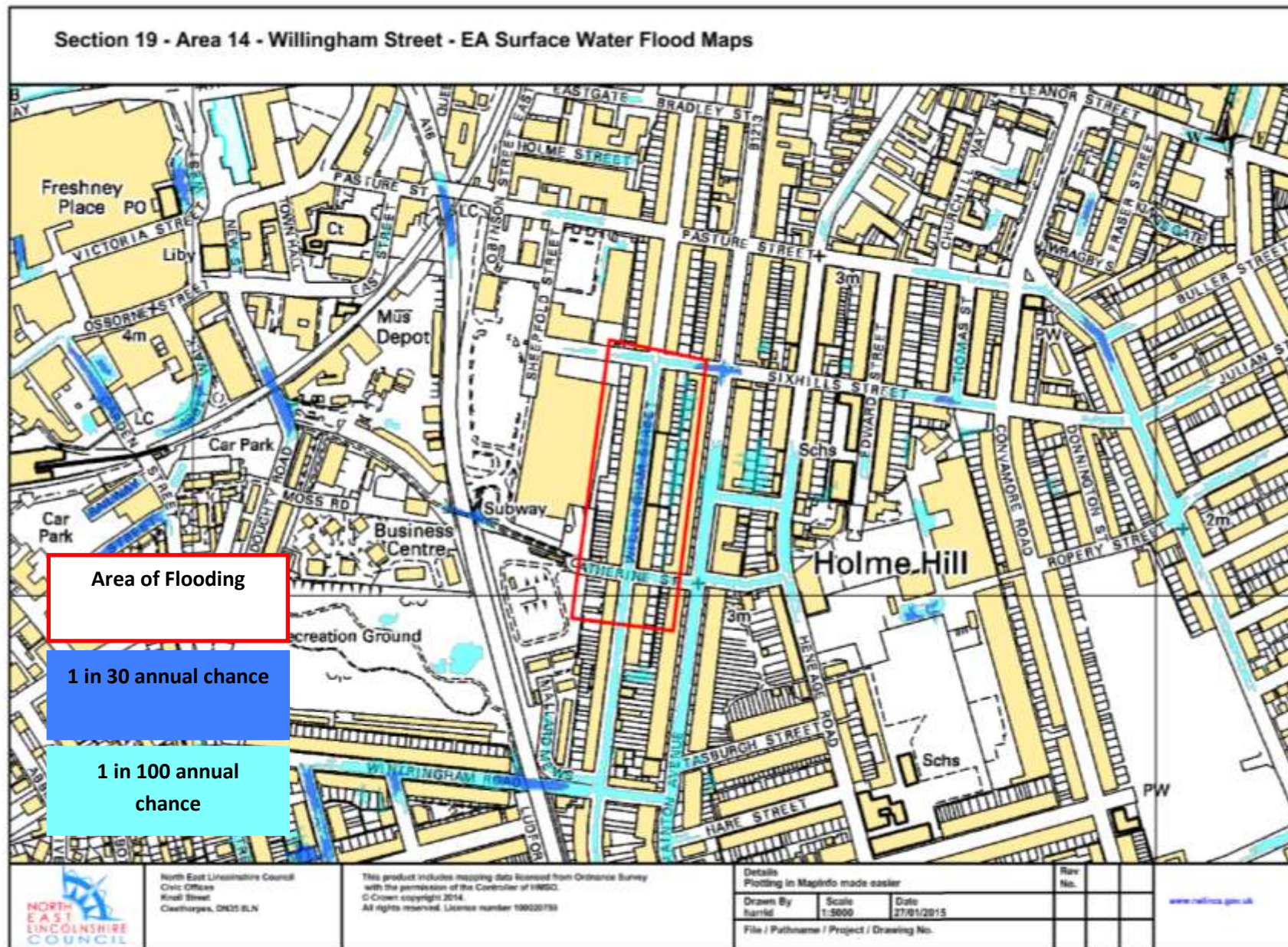
- Full de-silting of the adjacent surface water system in Catherine Street to help prevent surcharging from this large capacity system.
- Full cleaning and CCTV survey of the Willingham Street public sewer.

A full assessment of possible mitigation schemes is to be made in order to prepare a technically sound business case to bid for external funding as outlined above. Options to be looked at include:

- Assessing any capacity availability in the adjacent surface water culvert system.
- Use of adjacent locations to receive exceedance flows from the drainage systems.
- Upgrades to parts of the drainage systems.

The mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the main Conclusions section of the report.

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# Area 15 – Grimsby Business Centre, King Edward St

20<sup>th</sup> July & 10<sup>th</sup> August 2014

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## **Flood Locations**

**Grimsby Business Centre, King Edwards Street, Grimsby – Multiple Business Units within 1 Commercial Property internally flooded on 20<sup>th</sup> July & 10<sup>th</sup> August 2014.**

The flooding to the commercial property on King Edwards Street came through surcharging of the internal drain within the curtilage of the building which backed up out of the domestic manholes in the corridors. The flooding entered multiple business units on the ground floor through the doors off the corridors.

## **Site Investigations**

Initial contact with the business owners affected at the flood locations was made within a month of the flooding being reported to Council Drainage Engineers. A site investigation with a drainage contractor was undertaken. The site investigation found that:

- The downpipes from the roof of the Business Centre are located inside the building along the corridors and it is evident they are surcharging through the internal rodding eyes.
- The drainage for the toilets runs through several of the business units and out of the building at the side of the café. This drain also serves the downpipes so any flooding resulting from surcharging contains raw sewerage. This system then connects to the public sewer via a manhole outside the building.
- The internal drain was found to be heavily silted and a defective connection was found.
- An obstruction was found and removed at the manhole where the internal system connects to the public sewer.
- There was no other flooding of premises in King Edward Street and adjoining streets.

## **Actions Implemented**

The findings of the site investigations were passed through the findings to the Council's Facilities Management team who maintain the Business Centre on behalf of the Council. Recommendations were made about the measures needed to reduce the flood risk in the future.

Facilities Management have since organised for the full drainage network on the site to be jetted to remove any debris in the pipework to allow it to run as efficiently as possible.



## **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The main contributing factor was the condition of the internal drainage system. Its heavily silted condition meant it was unable to cope with the volume of rainfall falling onto the roof and hence the localised surcharging and flooding of just this one commercial property in this street.

The internal downspouts are the main problem with the internal drainage system and suggestions have been made to Facilities Management about improvements that could be made to reduce the risk of flooding.

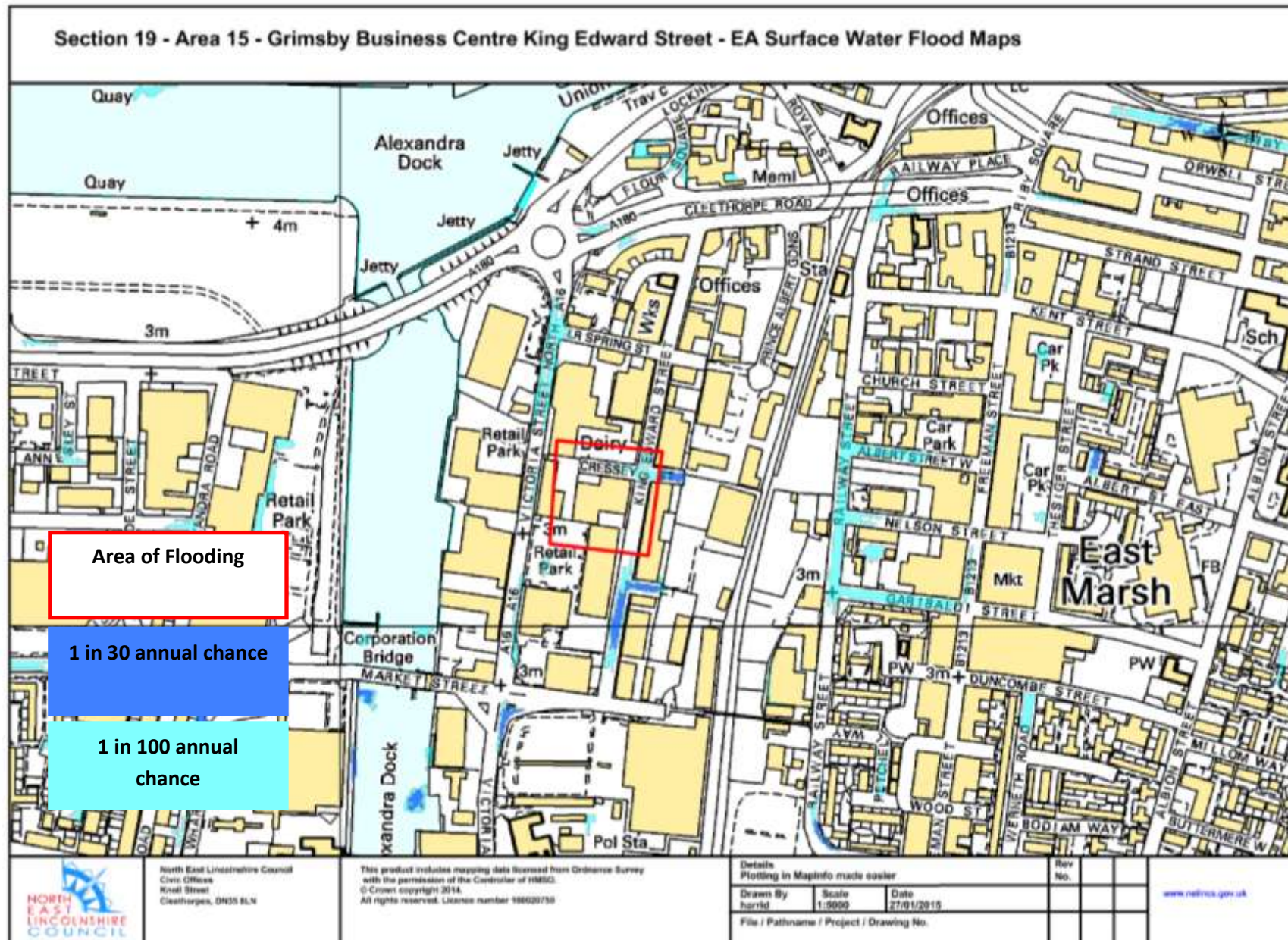
## **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall.

Additionally further investigations to the defective connection are recommended to be undertaken as it may be structurally unsound and prone to collapse in the future.

A further assessment of the roof drainage is also recommended as diverting the flow to the outside of the building would reduce the likelihood of the internal drainage from surcharging during heavy rain.

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## Area 16 – Weelsby Street

20<sup>th</sup> July 2014

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### **Flood Locations**

#### **Weelsby Street, Grimsby – 1 Property Internally Flooded on 20<sup>th</sup> July.**

The flooding to the property on Weelsby Street came through surcharging of the main sewer which backed up out of the highway gullies to the front of the property. The flooding entered the property through the front door which lead to flooding of the porch.

This part of Weelsby Street is indicated on the Environment Agency 1 in 100 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the resident affected at the flood locations was made within a month of the flooding being reported to Council Drainage Engineers. A site investigation followed which noted that:

- The manhole chamber providing access into the combined sewer serving this section of Weelsby Street is at a junction so traffic control measures are required to allow access.
- The threshold level of the property that flooded was only 20 to 30 millimetres lower than the neighbouring properties.
- The length of public sewer adjacent to the flooded property contained silt levels up to 30% but was structurally sound.

### **Actions Implemented**

The findings of the sewer investigation will be passed to Anglian Water for further action.

### **Conclusions**

The threshold of the property that flooded was only 20 to 30 millimetres lower than the neighbouring properties and this small difference allowed water in. It may be that traffic movement through flood water on the road outside contributed to the breaching of the threshold.

The sewerage systems serving the older areas of the town such as the East Marsh Ward are well over 100 years old but there is no evidence of significant structural deterioration and the section downstream was renewed in 1990.

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Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. These increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. There was evidence of siltation levels at this location.

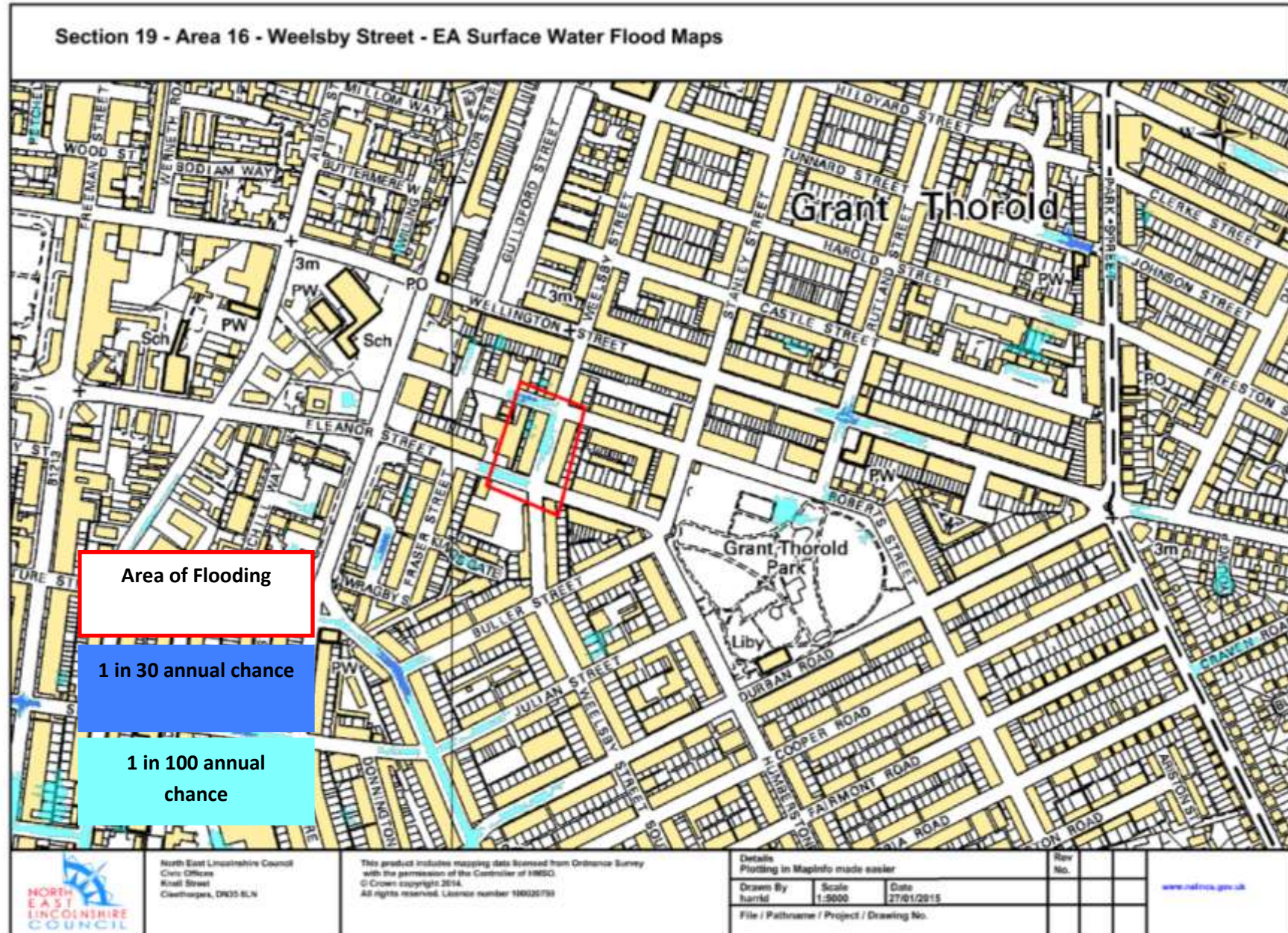
### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall.

Another mitigation measure that can be taken forward is engagement with the affected resident on property level flood protection options. At this location, a small difference in levels allowed flood water into the one affected property but not the neighbouring properties. In this instance, any dialogue on property flood level flood protection should be extended to all the neighbours who could be at risk of flooding in the future.



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## Area 17 – Torbay Drive

10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Torbay Drive, Scartho – 1 property internally flooded on 10<sup>th</sup> August**

The resident reported that the flood water was surcharging out of both the highway gully directly outside the property and the manholes in the road. Due to the property being situated lower than the highway the flood water ran down the drive way and into the property through the front door and through the conservatory to the rear.

### **Investigations**

Initial contact with the resident affected at the flood locations was made within a month of the flooding being reported to Council Drainage Engineers. The Council Gully Cleaning wagon also visited this location to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition however one gully had large amounts of concrete mortar in the pot which was removed. A site investigation followed within a month of the flooding event where sewer inspections were undertaken. The site investigation noted that:

- The highway gullies are all working, with no blockages or collapses found, although there was some silt build up in the pipework.
- The surface water sewers from Torbay Drive through to Boundary Road were heavily silted, with siltation levels at 50% in places.
- A manhole in the surface water sewer located near the junction of Boundary Road and Dawlish Road has several other services running through the chamber which are restricting the flow of water. This surface water sewer is downstream from the surface water sewer serving Torbay Drive.

### **Actions Implemented**

The findings of the on-site investigations involving the public sewer were passed to Anglian Water who are responsible for their management and maintenance.

Details of the manhole which contains the services inhibiting the capacity of flow have also been given to Anglian Water to allow them to carry out works to improve the flow through the obstructions.

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The residents have also carried out some improvement works to their own property, and have constructed a demountable flood board which they can install across their driveway to prevent water from running down their drive.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The surcharging of the surface water sewer would have been exacerbated by the high levels of siltation encountered and the reduced capacity of the downstream manhole in Boundary Road as described above. If the jetting works are carried out and improvement works to the restricted manhole can be carried out then flood risk in Torbay Drive will be reduced. The residents own property flood protection measures will reduce this flood risk even more.

### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall. It is also recommended that Anglian Water carry out modifications to the manhole containing the services to improve the flow rate.



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## Area 18 – Salisbury Avenue

10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Salisbury Avenue, Waltham – 1 Property affected on 10<sup>th</sup> August**

The residents reported that the flood water was surcharging out of the manhole in the grassed area adjacent to their house. The water ran down their driveway and around the house, flooding the back garden as well as entering the utility room at the side of the house. No other residents in the area reported any flooding.

### **Investigations**

Initial contact with the resident affected at the flood location was made within a month of the flooding being reported to Council Drainage Engineers. The Council Gully Cleaning wagon also visited the location to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition. A site investigation followed within three months of the flooding event where sewer inspections were undertaken. The site investigation noted that:

- The manhole reported to be surcharging and causing the flooding is for the foul sewerage system. However upon inspection an incoming pipe into the manhole had a large volume of clean water entering it. It was also observed that there are also lots of roots in the manhole from the nearby tree.
- Upon further investigation it was found that a foul manhole upstream in Cotswold Drive has lots of water entering through the brickwork. This is the source of the water, likely to be a water mains leak.
- The outlet from the ditch which receives surface water from Salisbury Avenue, as well as land drainage from higher up the catchment was heavily blocked with debris and tree branches.
- The resident had sandbagged the door to the utility room thereby minimising flood water entry.

### **Actions Implemented**

The findings of the on-site investigations involving the public sewer were passed to Anglian Water who are responsible for their management and maintenance. Due to the circumstances of the flooding coming predominantly from the foul sewer, it is likely there are multiple cross connections of surface water entering into the foul sewer from many domestic properties in Waltham. Also the water leak entering the foul sewer system was likely to exacerbate the flooding experienced.

Council Drainage Engineers organised the removal of debris and tree branches from the outlet to the ditch which accepts surface water from Salisbury Avenue.

## **Conclusions**

The sewerage system in Waltham was under pressure due to the high intensity of rainfall. However there was no evidence in this location that the surface water sewer was surcharging. The flooding at this location was due to the surcharging foul sewer and this would be as a result of incorrectly connected domestic surface water drains to the foul sewage system as well as the water leak entering the system. The foul sewage system is designed to take waste from toilets, baths, sinks, etc. and not substantial amounts of surface water from storm events.

## **Recommendations**

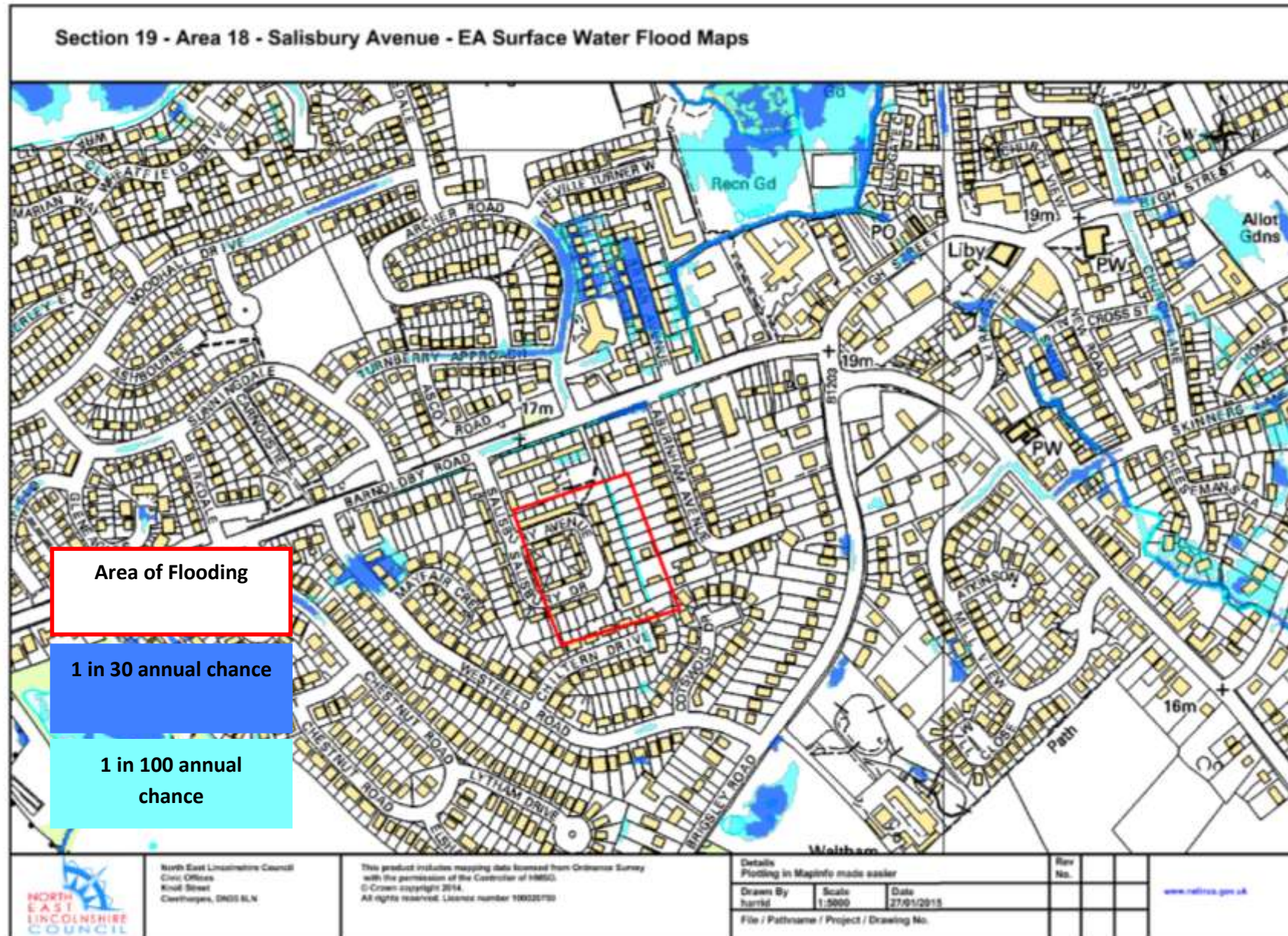
Following the site investigation for Salisbury Avenue it is recommended that Anglian Water fix the mains water leak on Cotswold Drive. This will prevent additional water entering the foul sewerage system.

It is also recommended that Anglian Water remove the root ingress in the foul manhole from which the surcharging took place.

It is further recommended that Anglian Water should investigate the foul sewer to try and establish the extent of the problems of surface water connections to the foul sewer in Waltham.

Where ditches and outlets are prone to blockages which would result in internal flooding of property, Council Drainage Engineers will make regular inspections of these ditches and outlets.

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## Area 19 – Hewson Road & Parker Road

20<sup>th</sup> July 2014

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### **Flood Locations**

#### **Parker Road, Humberston – 2 properties internally flooded on 20<sup>th</sup> July.**

The residents informed us that the main source of the flood water was surcharging through the highway gullies, which are at the lowest part of the highway. As the flood water rose in level, it then flowed down their driveways and into their properties.

As these properties had suffered from flooding previously in 2007, they had installed ACO drains around their houses. Unfortunately since this connects into the same surface water sewer in the road which was surcharging, it was unable to drain the water away.

Several other properties in the location suffered from external flooding to their gardens, but no flood water entered their homes.

#### **Hewson Road, Humberston – 1 Property internally flooded on 20<sup>th</sup> July.**

Similarly to Parker Road, Hewson Road suffered flooding through the same mechanism of the surface water sewers surcharging, and coming up through the highway gullies, over the footpath and into the properties.

At both locations the residents informed us that they could hear the toilets and sinks backing up, and one resident around Hewson Road had to block up the toilet to stop it from flooding. This suggests there are cross connections of surface water entering into the foul sewer in this location.

The locations are indicated on the Environment Agency 1 in 30 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood locations was made within a week of the flooding being reported to Council Drainage Engineers. The Council's Gully Cleaning wagon also visited the areas affected by the flooding events to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition. A site investigation followed within a month of the flooding event where sewer inspections were undertaken. The site investigation noted that:

- The surface water sewers serving Parker Road and Hewson Road contained high levels of siltation.
- Due to the topography on Parker Road the properties are located in low spots which make them susceptible to surcharging sewers.



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- It was established that the surface water sewers all headed north and the outfalls were into boundary ditches at the Cleethorpes Golf Club. Investigations here revealed that the open ditches are in reasonable free running condition. However there is a section of piped ditch where silt levels have built up and also an undersized section in the piped ditch.

### **Actions Implemented**

The findings of the on-site investigations involving the public sewer were passed to Anglian Water who are responsible for their management and maintenance.

Further investigations into the problems with the piped ditch at Cleethorpes Golf club are on-going.

### **Conclusions**

The cause of the flooding was the intensity of the rainfall and there are more details in the Main Conclusions section at the end of the report. The flooding at these locations resulted from the surcharging of the surface water sewer and the site investigation found that it contained high siltation levels which would have exacerbated the flooding.

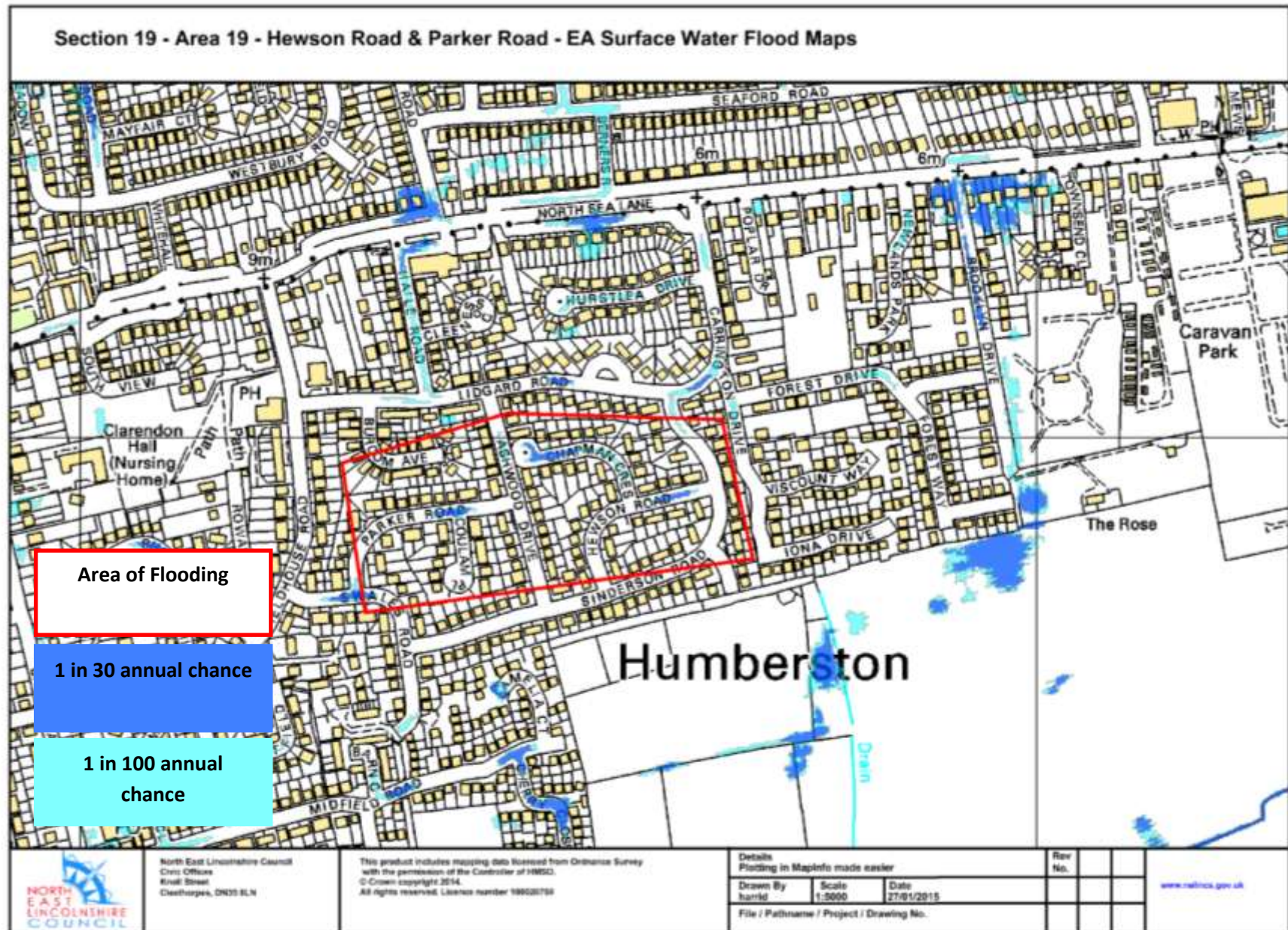
The investigation onto the problems with the section of piped ditch needs concluding and remedial measures will be implemented to ensure that the surface water sewer outfalls are running freely.

### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall.

The investigation and remedial measures at the Cleethorpes Golf club are to be completed within the next 3 months.

**Section 19 Flood Investigation Report**  
Flood and Water Management Act 2010



## Area 20 – North Sea Lane

20<sup>th</sup> July 2014

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### **Flood Locations**

**North Sea Lane, Humberston – 1 property internally flooded and 1 property externally flooded on 20<sup>th</sup> July**

The residents reported that the flood water was collecting from the private road off North Sea Lane and was running through the affected properties garden. This then entered the internally flooded property through the airbricks to the front of the property.

This location is indicated on the Environment Agency 1 in 30 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood locations was made within a fortnight of the flooding being reported to Council Drainage Engineers. A site investigation followed within a month of the flooding event where sewer inspections were undertaken. The site investigation noted that:

- The main surface water sewer serving the properties at this location had a displaced joint which had allowed the ingress of tree roots.
- The smaller surface water sewer serving the affected properties at this location had a number of structural defaults and ingress of tree roots.
- The smaller surface water sewer serves multiple properties and therefore the management and maintenance of this lies with Anglian Water.
- A level survey was carried out to determine the topography of the private road. The level survey found that the properties affected were adjacent to the lowest part of the private road. The private road at this location had no drainage infrastructure. In other sections of the private road there were gullies but these were full of debris and rubble as a result of lack of maintenance and the poor condition of the road surface.

### **Actions Implemented**

The details of the surface water sewers found during the site investigation were passed through to Anglian Water. It was suggested that these surface water sewers would benefit from root cutting and relining to ensure the structural stability.

The affected residents were advised to install additional gullies in the private road.

## **Conclusions**

The surface water sewers at this locality were found to be in poor condition and this contributed to the flooding. In addition the lack of any existing surface water drainage along the private road exacerbated the flooding further.

## **Recommendations**

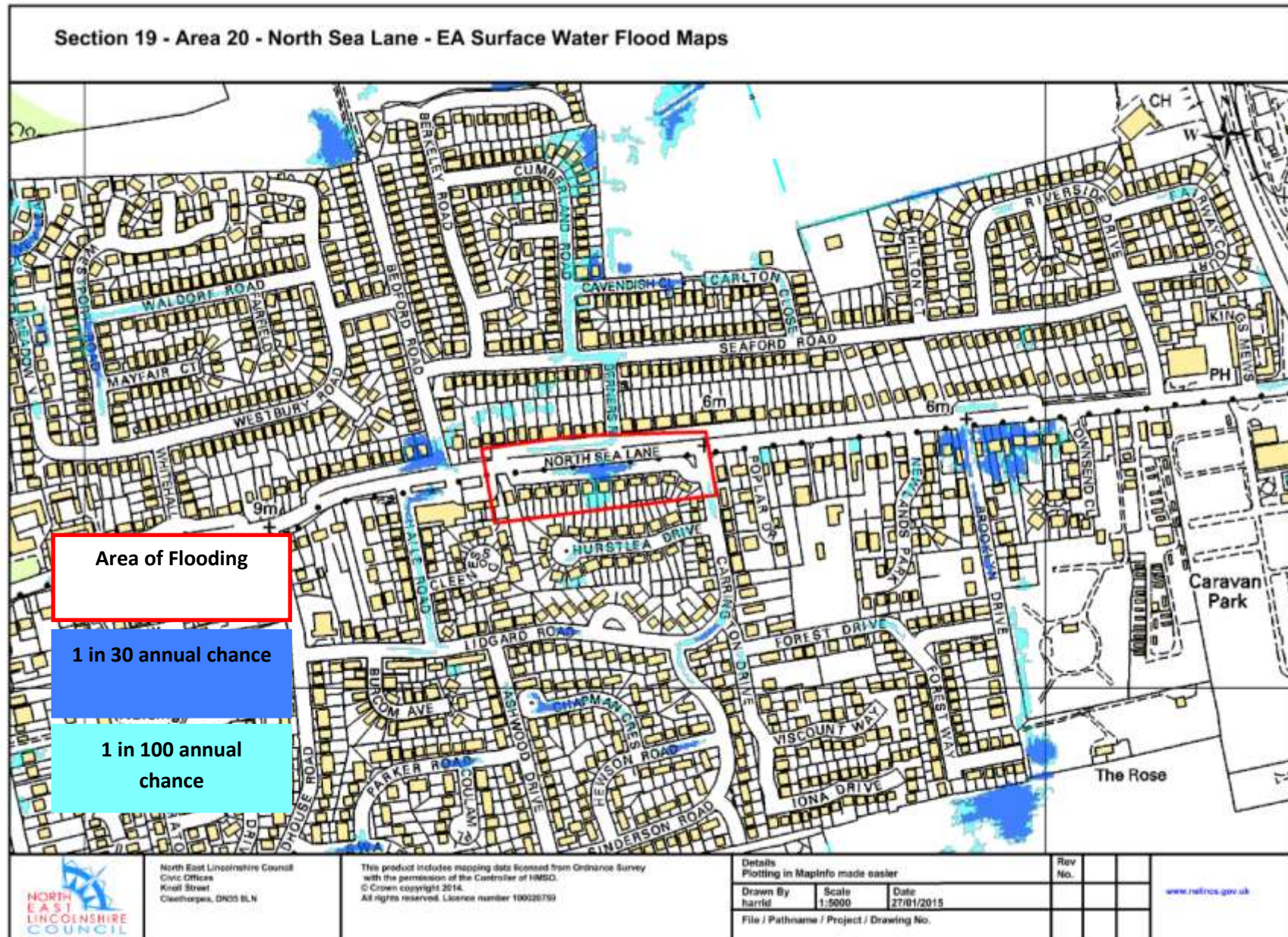
It is recommended that Anglian Water should fully clean out, root cut and re-line the surface water sewer to bring it back up to an appropriate standard. The details have been passed through to Anglian Water to carry out these works.

It has been recommended to the residents on the private road that they install new drainage in the areas affected by the flooding as well as carrying out routine maintenance of the gullies along the private road as many of them are blocked with silt and debris from the deteriorating road surface.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the Main Conclusions section of the report.



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## Area 21 – Cheesemans Close

10<sup>th</sup> August 2014

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### **Flood Locations**

**Cheesemans Close, Waltham – 1 property internally flooded and 1 property externally flooded on 10<sup>th</sup> August**

The residents reported that the flood water was surcharging out of a domestic gully in the driveway of the property affected by internal flooding, and from there the water flooded the front and rear gardens of both the properties, as well as entering the conservatory of the internally flooded property.

The residents reduced the flooding by pouring the flood water down the highway gullies directly outside the affected properties. The gullies connect into the surface water sewer which discharges directly into Buck Beck to the rear of the properties.

This location is indicated on the Environment Agency 1 in 100 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood locations was made within a month of the flooding being reported to Council Drainage Engineers. The Council's Gully Cleaning wagon also visited this location to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition. A site investigation followed within three months of the last flooding event where sewer inspections were undertaken. The site investigation noted that:

- The highway drainage in the cul-de-sac was working to a satisfactory level. However there has been some silt build up in the pipework. These highway gullies connect in to the Anglian Water surface water sewer which runs through Cheesemans Close and outfalls into Buck Beck to the rear of the affected properties.
- Due to the topography of Cheesemans Close there would be some run-off from the higher end of the Close and bypassing two gullies part way down the hill due to their incorrect position in the channel line.
- The gully in the driveway of the internally flooded property has been incorrectly connected to Anglian Water's foul sewer.
- The surcharging from this gully connected to the foul sewer indicates that a number of wrongly connected surface water drains also connect to this sewer.

## **Actions Implemented**

An assessment of silt levels through Buck Beck has been carried out by Council Drainage Engineers to ensure that the beck is flowing efficiently. There were small build ups of silt in the main channel, which have little impact on the water flow. However several obstructions were found, mainly from the bank side vegetation obstructing the channel. Council Drainage Engineers organised contractors to undertake work to remove these obstructions.

The findings of the on-site investigations involving the public sewer were passed to Anglian Water who are responsible for their management and maintenance. This was the issue of the flooding coming predominantly from the domestic gully which was connected to the foul sewer indicating multiple surface water drains wrongly connected to the foul sewer in Waltham.

## **Conclusions**

The sewerage system in Waltham was under pressure due to the high intensity of rainfall. However there was no evidence in this location that the surface water sewer was surcharging. The flooding at this location was due to the surcharging foul sewer and this would be likely to be that many domestic properties in Waltham have incorrectly connected to the foul sewage system. The foul sewage system is designed to take waste from toilets, baths, sinks, etc. and not substantial amounts of surface water from storm events.

## **Recommendations**

Where surcharging from domestic surface water gullies that are connected to the foul sewerage system is present it is recommended that these gullies are connected to the correct system which is the surface water sewer. It is recommended that Anglian Water should investigate the foul sewer to try and establish the extent of the problems of surface water drains wrongly connected in Waltham.

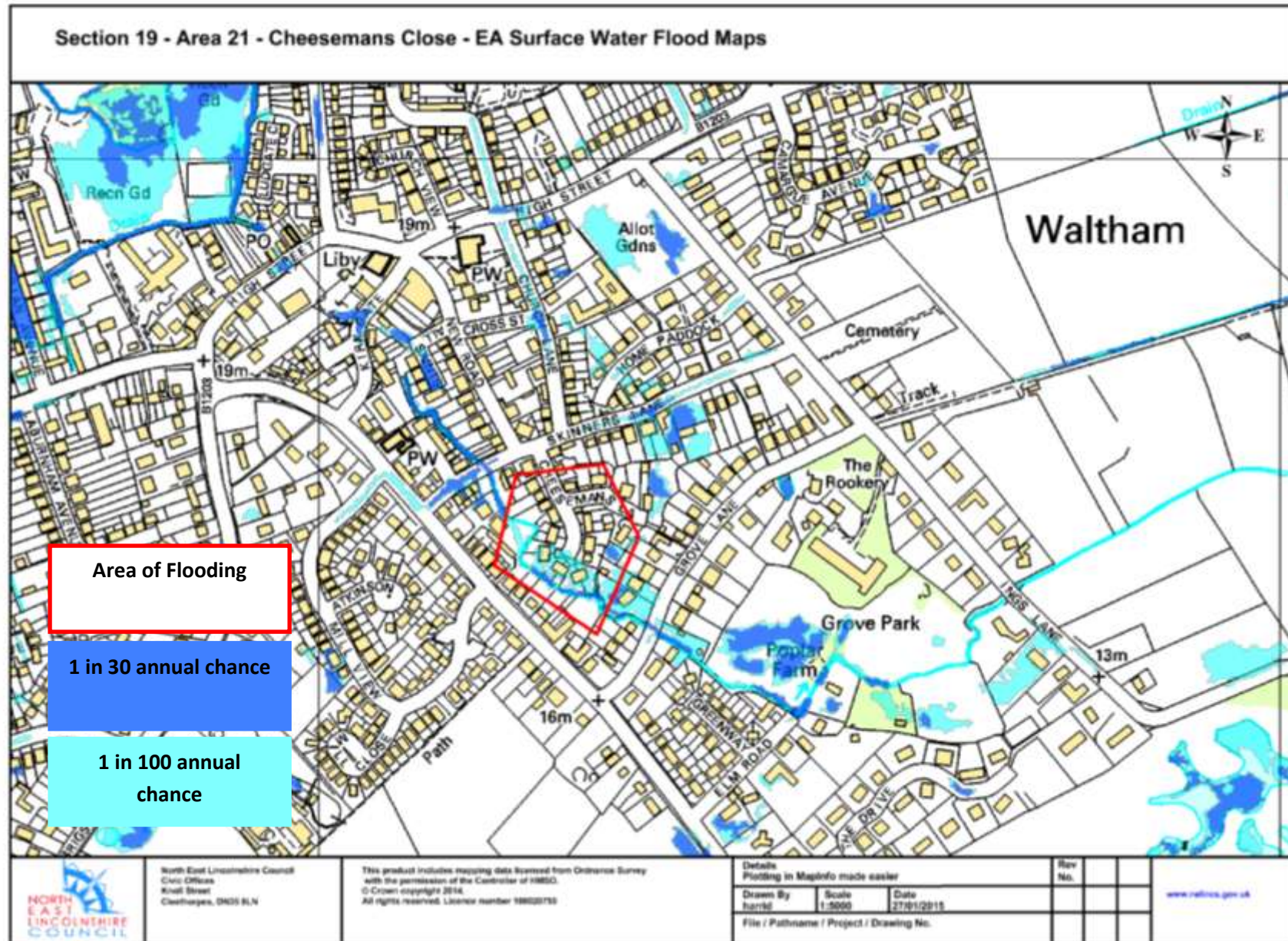
To prevent siltation building up at the outlet of the surface water sewer in to Buck Beck it is recommended that a flap valve is fitted. This will prevent silt from entering the system from Buck Beck and also prevent back flow when Beck water levels are high.

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to being overwhelmed by intense rainfall.



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## Area 22 – Hainton Avenue

10<sup>th</sup> August 2014

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### **Flood Locations**

#### **Hainton Avenue, Grimsby – 1 Property Internally Flooded on 10<sup>th</sup> August.**

The flooding to the property on Hainton Avenue came through surcharging of the main sewer which backed up out of the domestic gullies to the rear of the property. The flooding entered the property through a door to the rear which leads into the utility area of the kitchen. Due to the construction of the house the utility room is lower than the kitchen area causing the flooding to be contained within the utility area. Also due to the property being constructed in a topographical low spot many of the surrounding gardens and paved surfaces drain towards the property exacerbating the flooding.

This location is indicated on the Environment Agency 1in 100 annual probability surface water flooding map as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood location was made within a month of the flooding being reported to Council Drainage Engineers. The Council's Gully Cleaning wagon also visited all areas affected by the flooding events within a month to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition. An investigation found the following:

- The combined sewer serving Hainton Avenue at this location has no accessible manhole chambers to undertake a full inspection of the sewer. This indicates a lack of maintenance to the sewer in this location.

### **Actions Implemented**

The following findings have been passed to Anglian Water:

- Details of the combined sewer which has no access for maintenance and inspection.

### **Conclusions**

The main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The sewerage systems serving the older areas of the town such as the Heneage Ward are well over 100 years old. Ageing sewerage systems will exhibit a gradual structural deterioration. Also, there may have been differing

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future development allowances built into the sewerage systems when they were first constructed. The lack of maintenance into this part of the sewerage system means that maintenance is difficult.

Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. These increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas.

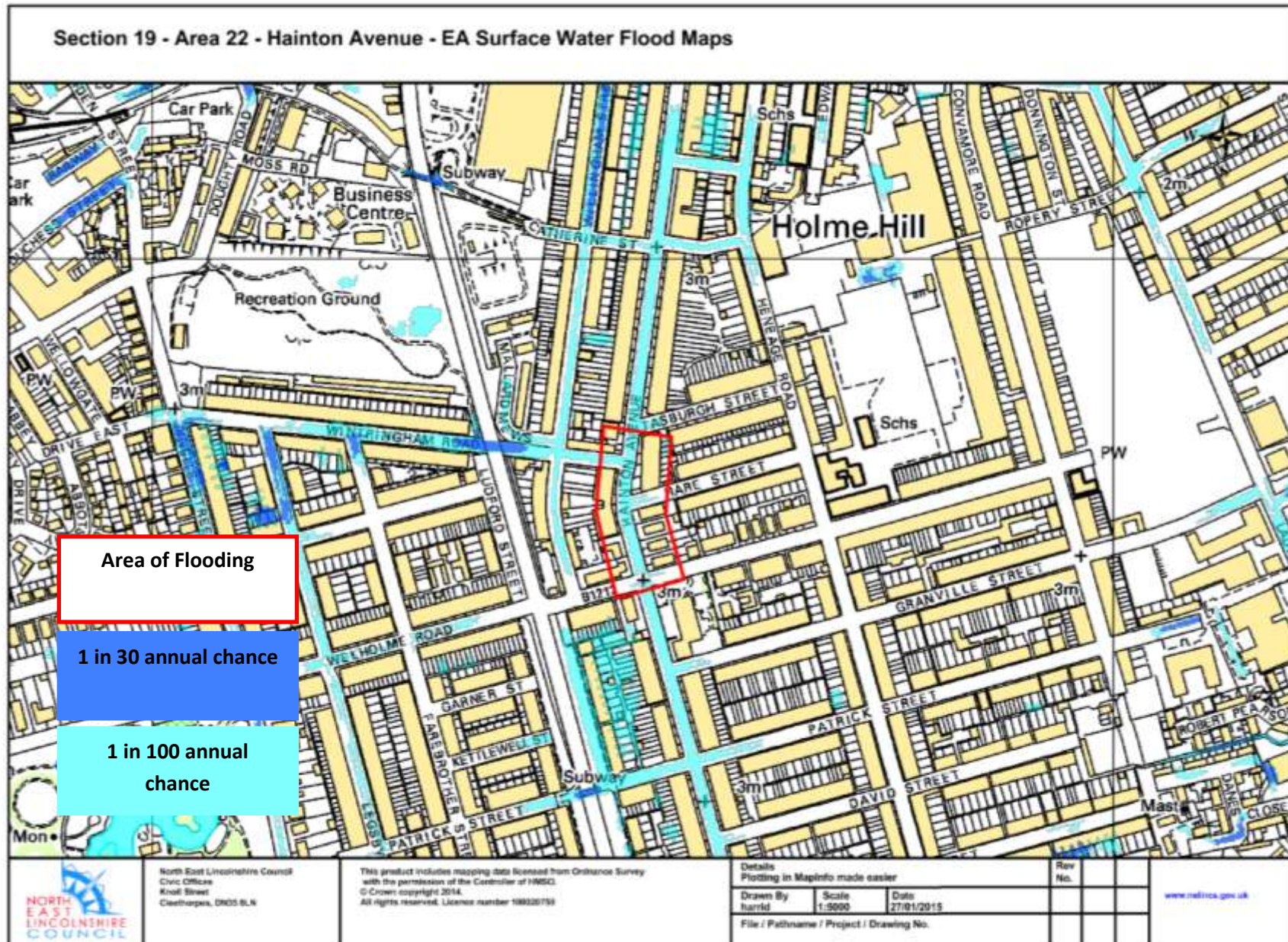
### **Recommendations**

Where sewerage systems are prone to siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall. Sewer access arrangements may need improving at this location.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the Main Conclusions section of the report.

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## Area 23 – Cromwell Road

8<sup>th</sup> August & 10<sup>th</sup> August 2014

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### **Flood Locations**

Substantial external flooding occurred at a total of 3 properties at the locations of Cromwell Road and Ravenscar Road, Grimsby. A large area of public highway also suffered extensive flooding at the locations of Cromwell Road, Service Road 26 and Ravenscar Road, Grimsby. A date and street breakdown is detailed below:

#### **Ravenscar Road, Grimsby – 1 Property externally flooded on 10<sup>th</sup> August.**

The flooding to the property on Ravenscar Road came through surcharging of the main sewer which backed up out of the domestic gullies to the front and rear of the property. Also due to the property being constructed in a low spot many of the surrounding gardens and paved surfaces drain towards the property exacerbating the flooding.

#### **Cromwell Road, Grimsby – 2 Properties externally flooded on 10<sup>th</sup> August.**

The flooding to the properties on Cromwell Road came through surcharging of the main sewer which backed up out of the domestic and highway gullies to the front of the property. This section of Cromwell Road is a low lying area which allowed the surcharging sewers to back up out of the gullies.

#### **Cromwell Road, Service Road 26 and Ravenscar Road, Grimsby – Highways flooded on 8<sup>th</sup> August & 10<sup>th</sup> August.**

The flooding on the highways at Cromwell Road, Service Road 26 and Ravenscar Road on both the 8<sup>th</sup> August & 10<sup>th</sup> August occurred due to the surcharging of the main sewer which backed up out of the highway gullies. The highways in this area are low lying which allowed the surcharging sewers to back up out of the gullies.

Some parts of these locations that flooded are indicated on either the Environment Agency 1 in 30 or 1 in 100 annual probability surface water flooding maps as being at risk of surface water flooding.

### **Investigations**

Initial contact with the residents affected at the flood locations was made within a fortnight of the rainfall events by Council Drainage Engineers. North East Lincolnshire's Council Gully Cleansing Department also visited all areas affected by the flooding events within a month to check and clear the highway gullies. The gullies at these locations were found to be operating in a satisfactory condition. A site investigation followed with four months of the last flooding event where sewer inspections were undertaken. The site investigation noted that:

- The combined sewer serving Ravenscar Road contained large amounts of fat and grease deposits obscuring 30% of the sewer.



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- The outlet from the sewer serving Ravenscar Road which connects to the combined sewer on Cromwell Road had an obstruction obscuring 40% of the sewer.
- Parts of the sewer system on Cromwell Road were inaccessible because of seized and sunken manhole covers.
- On Service Road 26 there was an accumulation of silt and scale causing standing water levels in the sewer to be at 50%.

### **Actions Implemented**

The following findings have been passed to Anglian Water;

- Details of silt, fat, grease and scale accumulations
- Details of seized manhole covers. The presence of these suggest a lack of maintenance in certain locations.
- At a meeting with Anglian Water they explained work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. Further details of the proposal are provided in the main Conclusions section at the end of the report. If successful, this work would benefit the Cromwell Road, Service Road 26 and Ravenscar Road as the Pyewipe Terminal Pumping Station is 2 kilometres downstream.

### **Conclusions**

The Main Conclusions section of the report contains details and issues that apply to all the flooded locations.

The sewerage systems serving the Willows estate are 40 to 50 years old and are generally in a reasonable condition. When they were constructed there may not have been a full appreciation as to what future development allowances needed to be built into the sewerage systems, hence the resultant tendency for parts of the system to surcharge.

Any increase in outfall capacity during times of extreme rainfall will lessen the extent of surcharging in the public sewer system and benefit sewer system performance in this location.

The two flooding mitigation measures available are regular maintenance of the existing systems and property level flood protection. The Action Implemented section of this report has highlighted a number of maintenance issues in the existing sewer systems which have been passed to Anglian Water to rectify. Property level protection ranges from the basic sand bag, whose effectiveness is variable dependant on the installation, to the full flood barrier installation on all openings into a property.

### **Recommendations**

Where sewerage systems are prone to fat, grease and siltation build ups then regular maintenance should be carried out. This will maximise the capacity of a system that may be prone to be overwhelmed by intense rainfall. However, fat and grease accumulations result from drain misuse and behavioural change is also needed

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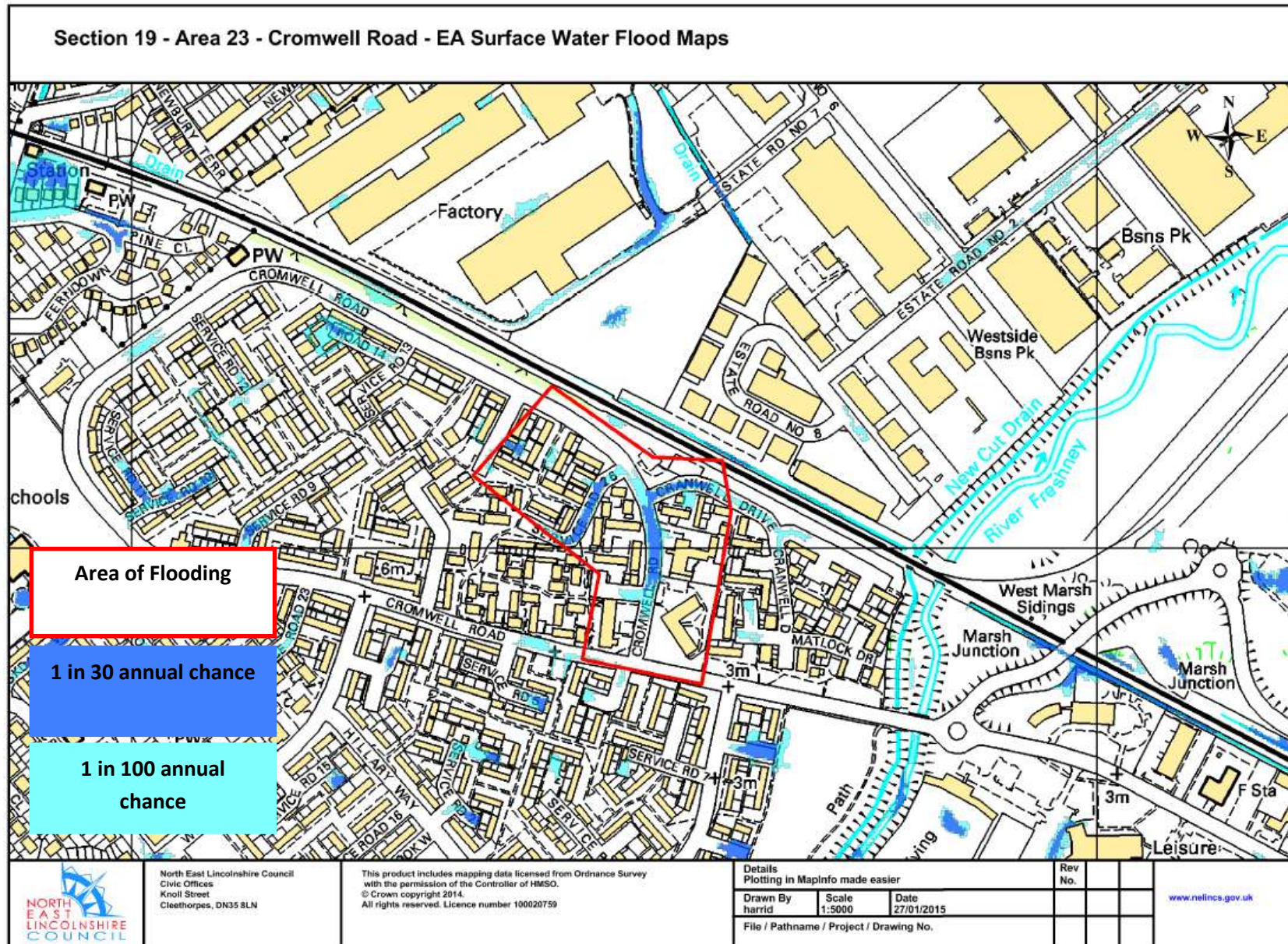
to prevent blockages occurring. Anglian Water's 'Keep it Clear' campaign has been very successful in a number of locations at reducing blockages so this should be also be used in this location.

The Council as the Lead Local Flood Authority should explore what support could be given to Anglian Water in resolving the issue with pump commissioning at Pyewipe because increased outfall capacity will improve sewer system performance at the location affected by flooding.

Another mitigation measure that can be taken forward is engagement with affected residents on property level flood protection options. This is covered further in the Main Conclusions section of the report.

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## Main Conclusions from the Flooding Events

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The primary cause of the flooding was the intensity of the rainfall; the maximum intensity recorded on both 20<sup>th</sup> July and 10<sup>th</sup> August 2014 had only a 2% (1 in 50 year event) chance of occurring annually. Rainfall during intense summer storms of this nature is very variable and current forecasting capabilities cannot identify the specific locations where the most intense rainfall will occur. Therefore Met Office warnings for this type of flood risk usually cover large areas of the country. Tracking both the observed and forecast rainfall radar on the Met Office website can provide a lot better indication of the locations at risk but it certainly cannot identify specific areas of the Borough. The Council will be installing and operating four rain gauges during 2015 which will help track the storms across the borough in more detail.

When rainfall of the type described above falls on the Borough the other main contributory factor is the design capacity of the public sewerage systems in the Borough. The sewerage systems serving most of the areas affected by the flooding are between 70 and 110 years old. Even the relatively “newer” systems serving the Willows and Wybers Wood estates are 40 – 50 years old. As these sewers pre-dated ‘Sewers for Adoption’ (the industry guidance) they were not built to a particular design standard for their capacity. The approach to their design was very much ad-hoc without considering the intensity of storm they would need to drain. The three issues that affect historic sewerage systems are: growth in in urban area; loss of permeable areas such as gardens through house extensions and driveways and the effects of climate change on rainfall patterns. Another consequence of ageing sewerage systems is a gradual structural deterioration as well as potential capacity issues.

There has been increasing awareness of sewer capacity issues so, for a number of years since the floods of the early 2000’s. As a result drainage restrictions have been imposed on new development in the Borough through the planning process. Brownfield developments required a 30% reduction in surface water discharge rates so achieving a betterment in terms of reducing flow in the public sewers. Also, greenfield developments have to provide drainage systems that mimic the surface drainage of the site before it was built upon to avoid increased flows leaving the site which could increase the risk of flooding. Since the floods of 2007 any brownfield site has to achieve a flow rate as close as possible to its original greenfield run off rate. Also any new development has to provide a drainage system that only allows controlled flooding of the site itself during an event with a 1% (1 in 100 annual probability) annual chance of occurring. A 30% allowance for climate change has to be included in the drainage calculations as a factor of safety. The result of the above is significantly reduced flow from brownfield sites and no additional flows above existing flow rates from greenfield sites. Wherever sustainable drainage is feasible then this option will be used so relieving pressure on the public sewer network. This includes rainwater harvesting, discharge into the ground (only possible in some areas of the Borough) and discharge to watercourses or other bodies of water.

During recent years the number of intense rainfall events which cause flooding and disruption seem to be increasing. There have been at least three local events between June 2012 and August 2014 where intensities with a 2% annual chance (1 in 50 annual probability) have been recorded. This aligns with climate change predictions of drier summers but with more intense rainfall. This highlights the importance of a climate change strategy for all elements of drainage and flood risk management infrastructure. In terms of urban surface water flooding the core infrastructure is the public sewer network.



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Another factor which will affect sewerage system performance is the slack gradients associated with low lying flat areas like the majority of north and central Grimsby. These slack gradients increase the chances of siltation building up especially when parts of the system have subsided slightly due to the underlying estuarine subsoil stratas. A risk based assessment of preventative maintenance programmes could be considered for these locations. Following the flooding incidents in 2014, a significant number of lengths of public sewer have been maintained using high power jetting techniques. The main wards where this work has already been undertaken by Anglian Water includes West Marsh, Humberston, Yarborough and Park.

Another issue that has become increasingly apparent especially after these most recent floods is the reluctance of the majority of affected residents to report the flooding of their property to the provider of drainage to their properties, the sewerage undertaker, Anglian Water. Anglian Water maintains a list of properties at risk of flooding from a rainfall event with a 5% annual probability of occurrence in any one year. If properties are not on that list then there is no chance of funding being available for significant sewerage system upgrades. The intensity of the rainfall that caused the properties to flood during summer 2014 was in excess of a 5% annual probability but residents should be encouraged to still report any flooding, especially internal, to Anglian Water. This allows a more accurate assessment of where future investment in the public sewer system may be needed as part of Anglian Water's climate change strategy.

At a meeting with Anglian Water they explained that work was underway to increase pumping capacity at the Pyewipe Terminal Pumping Station. There are additional pumps, yet to be commissioned, that would significantly increase capacity. Any increase in outfall capacity during times of extreme rainfall will, to varying degrees dependant on location, lessen the extent of surcharging in the public sewer system. The Council as the Lead Local Flood Authority will explore what support could be given to Anglian Water to get the pumps at Pyewipe commissioned for use.

Significant sewerage system upgrades are not going to be carried out in the short term as the substantial funding requirements need economic justification, i.e. establishing a sound business case for the upgrade. This type of process can take years. However, discussions with Anglian Water will take place to look at what future upgrades may become necessary. This will include consideration of funding sources and preparation of Business Cases for bids.

In the meantime the two flooding mitigation measures available are risk based regular maintenance of the existing systems, as mentioned above, and property level flood protection. It is not widely realised or accepted that responsibility for the protection of private property from flooding rests with the property owner. Property level protection ranges from the basic sand bag, whose effectiveness is variable dependant on the installation, to the full flood barrier installation on all openings into a property. Fundamental to this approach is both the willingness of the resident of the at-risk property to consider this and how much these options cost.