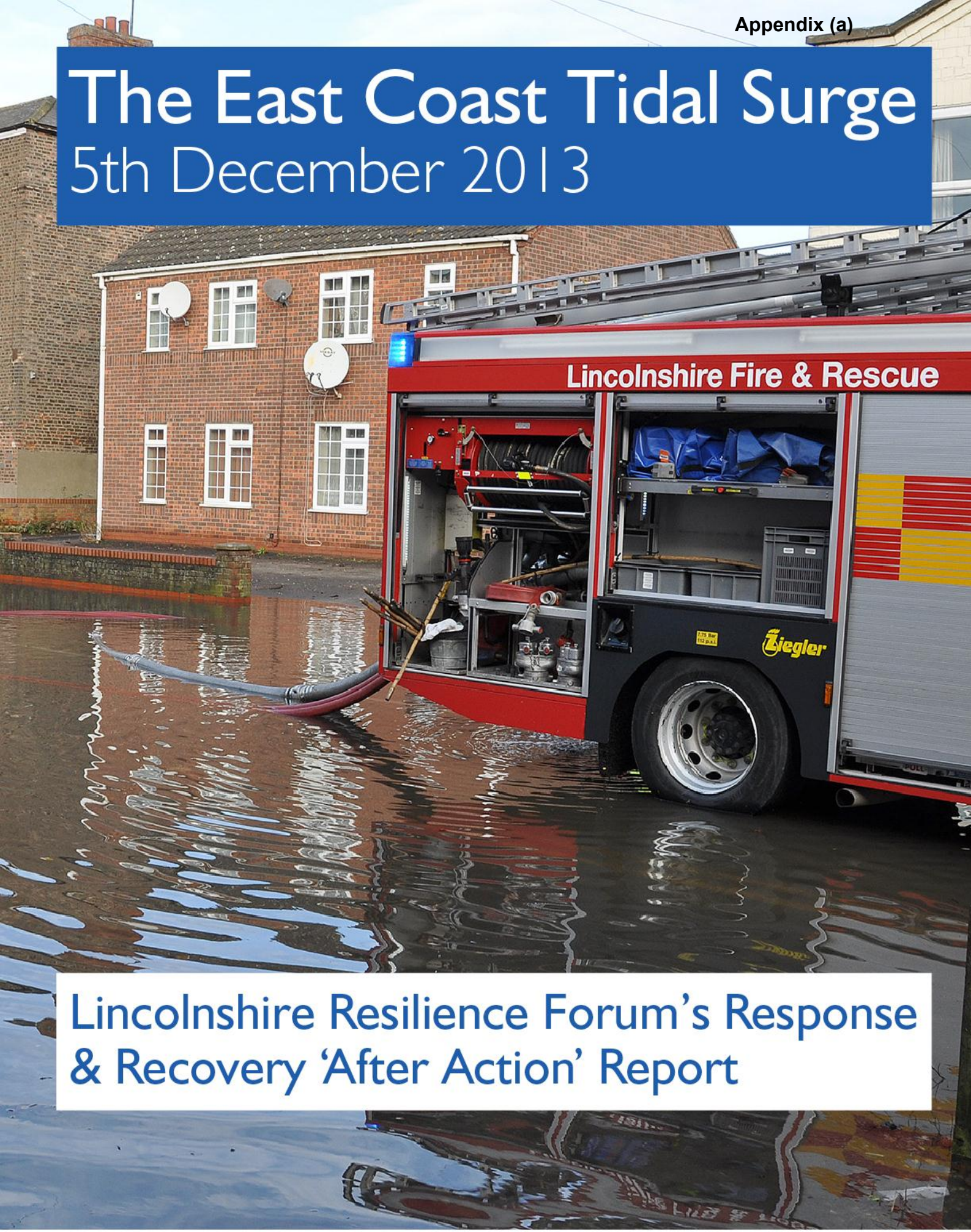
Appendix (a)

The East Coast Tidal Surge
5th December 2013



Lincolnshire Resilience Forum's Response & Recovery 'After Action' Report

Lincolnshire's Resilience Forum
PREPARING FOR EMERGENCIES

Lincolnshire COUNTY COUNCIL
Working for a better future

Foreword

On Thursday 5th December 2013 a deepening pressure system combined with high astronomical tides and strong to gale force 'north westerly' winds to generate a coastal surge along the whole of the east coast of England, the largest surge since the 'great storm' of 1953.

Due to advances in surge forecasting, flood prediction and contingency planning at national, sub-national and local levels we were able to 'get ahead' of the storm. From Tuesday 3rd December partners began deploying one of the largest multi-agency emergency response and recovery operations ever conducted in Lincolnshire. This included the most significant evacuation operation in recent memory, the rescue of a number of people who became isolated by floodwaters, and work to ensure critical services were maintained and damaged infrastructure quickly repaired.

Thankfully there were only three (relatively minor) casualties as a result of the surge, but more than 720 residential and commercial properties were inundated from the resultant overtopping and breach of defences. I would like to pass on my sympathy and support to those whose households and businesses flooded. We continue to work to support a full community recovery, and I commend the work of colleagues at Boston Borough Council who have led this work.

In the circumstances this was a very good, forecast-led response and recovery effort. But we must recognise that we were lucky. The wind direction was predominantly 'off-shore' and less strong than in 1953, so there were less damaging wave conditions. We also did not experience the heavy rain and standing water to exacerbate conditions, as has happened during subsequent storms to hit the southwest of England throughout December and into early February 2014.

Because of these factors, and investments in sea defences, this was not for us an event on the scale of the 1953 storm, but it was a useful and timely reminder. Given the significance of the coastal flood risk it is important that the partnership identifies lessons from the operation and takes the necessary action to ensure we are best prepared in the future. I welcome this report and will work with partners to ensure all necessary steps are taken.

Finally, I would like to pass on my personal thanks to all of those who worked so hard to ensure we did all we could to minimise the impacts from the surge. From those in command of operations and partners who worked long and hard hours in various roles, including the voluntary sector, to the contingency planners who ensured we were as ready as we could be.

I reserve a special thanks to the many unsung heroes, members of the public who simply 'rolled up their sleeves' to help friends and neighbours, strangers, or their local community.

Chief Constable Neil Rhodes
Chair of the Lincolnshire Resilience Forum

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Executive Summary

From early December through to February 2014 the UK experienced a spell of extreme weather as a series of major winter storms brought widespread impacts to the UK. This sequence of storms was caused by a powerful jet stream driving a succession of low-pressure systems across the Atlantic.
On Thursday 5th December 2013, the first of these deepening pressure systems combined with high astronomical tides and strong to gale force north westerly winds, to generate a coastal surge along the whole of the east coast of England, the largest surge since the 'great storm' of 1953.

The forecast likelihood of significant impacts to our coastline remained lower than in areas of the east coast to our north and south (largely due to the offshore winds) until much later when the threat increased, dramatically, as concerns of a higher surge developed. This presented us with challenges in delivering an appropriate, proportionate response against relatively low certainty of what would happen, and a much reduced time period.

Partners were also faced with the additional challenge of managing commitments to the Lincoln Christmas Market, which attracted an additional 200,000 visitors to the city over the same period, and a major power cut impacting most of Lincoln, including both the market and the County Emergency Centre (CEC) at the height of surge response operations on the 6th December.

In the end, impacts were largely consistent with flood predictions first made by the Environment Agency (EA) as early as the Wednesday. The response and subsequent flooding provided a significant test of partners' capabilities and capacity together with the resilience and preparedness of affected communities.

Between 18-20 km of flood defences overtopped, causing four breach locations. A number of buildings, including significant sites, were damaged, such as the historic St Botolph's Church ('Boston Stump') and Gibraltar Point Visitor Centre. An estimated 1,700 hectares of agricultural land was inundated, and £8.1m[1] worth of damage caused to infrastructure in the county. A total of 607[2] residential properties, the majority in Boston, plus a further 121 businesses were flooded. Approximately 350 tonnes of flood-contaminated waste was safely collected and disposed of in the days following the flooding.

Identifying the lessons

This report covers all aspects of the coordinated multi-agency response to, and recovery from, the coastal surge of 5th December through to February 2014 when the initial recovery phase came to an end. It will also cover on-going contingency arrangements during subsequent high tides over the New Year and early February, following concerns about compromised flood defences in Boston.

It presents a chronology of key events, the decisions made and the coordinated actions of partners, and an analysis of the event which together with partner debriefs, is used to identify both **'strengths'** in the way partners coordinated efforts, as well as **'areas for improvement'**.

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[1] Information from the Environment Agency

[2] Information accurate as of 10th March 2014

These are presented within five themes:

1. Early warning, threat assessment and contingency planning
2. Coordination at national, sub-national and local levels
3. Local multi-agency coordination of response and recovery
4. Achieving common objectives & response strategies
5. Achieving recovery objectives and initial community recovery

These will be used as the basis for an LRF Action Plan to ensure lessons are learned and, where necessary, procedures changed.

The report demonstrates we were **better protected** than ever before. By and large, the sea defences did their job having been severely tested protecting 103,000 homes and businesses, and 220,000 hectares of land. The drainage system in Boston worked well and, together with high volume pumping, dispersed all standing water within 48 hours enabling a quicker recovery.

We were certainly **better prepared** and were able to 'get ahead' of this storm through three key strategies:

- We pre-deployed sufficient staff and equipment to support the largest operation (including the ability to rescue people) conducted in recent decades creating two 'multi-agency surge task forces' in Boston and Louth. We are grateful for the efforts of all those involved, including colleagues from other counties who provided mutual aid and specialist support.
- Removing people from danger; ranging from timely public safety and flood warning messages to road closures and planning for the evacuation of up to 18,000 properties. In the end, within a very limited time, we achieved a safe assisted evacuation of 203 people from the properties at immediate risk. Many more self-evacuated without assistance.
- Protecting the infrastructure; including the ability to manage the flood defences and other assets, and threats to the Port of Boston, Boston Pilgrim Hospital and HMP North Sea Camp.

Households, businesses and key partners were **better informed**, with more than 30,300 properties receiving flood warnings from the EA, supported by the proactive use of social media for the first time during an emergency in the county, and a key role (unique to Lincolnshire) played by BBC Radio Lincolnshire who were embedded in the CEC. Most people followed the advice and warnings. However, too many did not, and were reckless with their own safety (and potentially that of responders) by insisting on visiting potential flood areas (a scene repeated throughout the UK).

Boston suffered the largest number of flooded residential properties. Community recovery was well led and structured by Boston Borough Council, supported by partners, with a clear focus on doing as much as possible to support those whose homes and businesses had flooded and getting the community back on its feet. As with the response phase, the recovery saw a great partnership effort. It was also pleasing to see members of the local community coming together to help in the immediate clear-up and longer-term support.

However, the report also shows that our capacity to respond to such wide-area emergencies depends on accessing mutual aid and national specialist assets, and also on improving the way we plan for and manage the welfare impacts of prolonged

deployments of responders in all roles (command and operational). It reinforces a need to invest in secure, web-based, information-sharing technology and improve communication of key information amongst partners, including those 'on the ground' and with the neighbouring EA Area.

Identifying and supporting those people who are, or who may become, vulnerable during such emergencies remains a priority for all partners. Working with a widening range of public and private health & social care providers, and with utility companies and social landlords, to target evacuation, welfare and medical support will be a continuing programme of work for the LRF.

Better ways of working with local community volunteers to properly integrate them into wider response and recovery activities are also required as is learning why people still ignore flood warnings and advice.

Finally, these findings are used to form the basis for recommendations to the LRF so lessons can be applied and procedures changed to continue to deliver effective coordination of multi-agency responses to, and recovery from, emergencies in Lincolnshire.

Figure 1: In total, 71 severe flood warnings were issued in England & Wales with more than 160, 000 warning messages sent directly to homes and businesses

1. Background

The anatomy of a coastal surge

The greatest risk of coastal flooding comes from a combination of high tides, a tidal surge caused by low depression, strong 'north easterly' winds and high waves. Tidal surges of more than two metres in height are not uncommon but if they occur with higher astronomical tides and on-shore winds, they cause potentially dangerous sea conditions.

High tides and onshore winds and waves bring the risk of overtopping of the sea defences with some accumulations of seawater on land (particularly in low-lying areas), and flooding within tidal-locked rivers (such as the Trent, Witham, Haven and Nene). With severe overtopping there will be a significant risk of damage and breaches in the defences. Whilst it is possible to predict when these risk conditions might occur, it is not possible to predict precisely where along the Lincolnshire coast breaches in sea defences might occur (if at all).

Forecasting a coastal surge, and predicting flood extent & impacts

The Flood Forecasting Centre (FFC), a working partnership between the Met Office and the EA, was established in the aftermath of the 2007 UK floods and brings together forecasters and hydrologists to improve the science of forecasting and flood prediction. Key to this partnership is the issuing to contingency planners and responders of the five-day Flood Guidance Statement (FGS) which provides a risk matrix based on comparison between the 'likelihood' of (any) flooding event and the potential 'impacts'.

The EA is responsible for local predictions of flood extent and impacts based on hazard mapping, assessments of local conditions and catchment and defence monitoring. The agency has completed a lot of work in recent years to develop flood hazard mapping for Lincolnshire showing flood depth, velocity and extent for both defence overtopping and defence breach (the latter based on modelling of breaches along the coastline) for 1:200yr and 1:1000yr incidents.

This mapping has been invaluable to contingency planners, both in visualising the threat and providing reference points (together with historic flood extent mapping) during incidents, and in assessing the potential impacts (*see below*).

Reasonable worse-case scenario (multiple breaches of defences)

Vulnerable Profile	Local Infrastructure
80,500 properties at risk	6 fire/police/ambulance stations
3 hospitals	176km of road
29 schools	30 bridges
32 care homes	11.8km of rail
1 prison	6 major hazard sites
20 fatalities	32 electricity sub-stations
300 casualties	63 water pumping
50,000 evacuees	15 sewage works

Reasonable worse-case scenario (overtopping only)

1:200 (0.5%) annual chance tide levels	1:1000 (0.1%) annual chance tide levels
4,383 residential properties at risk – of which approximately 900 are in high risk low lying areas where flooding from overtopping would be >0.5m	9,129 residential properties at risk
229 commercial premises	431 commercial premises
85 'socially vulnerable' premises	122 'socially vulnerable' premises
Total = 4,697 properties	**Total = 9,682 properties**

Figure 2: planning assumptions for 'reasonable worse-case scenarios' for multiple breaches of defences and overtopping.

Dealing with uncertainties

Though potential tidal surges can be forecast up to five days in advance, the accuracy of forecasts and impacts up to 36-12 hours before high tide can be relatively low. The threat of coastal flooding typically will also have levels of uncertainty in:

- Forecasts of expected water levels, timelines, overtopping or defence breaches, and flood extent;
- Effectiveness of measures such as communication, traffic management and decision-making

Although preventive measures can reduce the probability of flooding, such measures cannot completely eliminate the risk. Evacuation has the potential to save lives, but it can be costly with respect to time, money and credibility. The success of evacuation depends on the combination of the 'available time' period (period between detection of threat and onset of flooding) and the 'required time' period (based on chosen strategies and local circumstances). There may simply be insufficient time to implement preventive evacuation, in which case it is essential to have a 'go to' strategy such as rescue and 'assistance in situ' for people who become isolated by floodwater. Either way, both strategies require the pre-deployment of considerable resources to ensure effective implementation.

Planning for coastal flooding

As a 'tier one' risk to UK national security, coastal flooding provides a compelling backdrop to the challenges of coordinating effective resilience responses at local, sub-national and national levels. Much work has been undertaken in recent years to raise the profile of the coastal flood threat. Lincolnshire has been at the forefront of this work through effective contingency planning collaborations with colleagues from other coastal areas, lead Government departments, particularly Department for Environment, Food & Rural Affairs (DEFRA) and Department for Communities & Local Government (DCLG) and other national bodies such as the FFC and EA.

This led to two significant planning frameworks, both published during 2013, which shaped our response to the December surge:

'East Coast Flood Group Emergency Response Framework' (Jan 13): Sets out processes to coordinate three key strategies at national, sub-national and

local level of (i) pre-deployment of national specialist assets (such as flood rescue) and mutual aid, (ii) removing people from danger, and (iii) protecting critical infrastructure. The framework clarifies the linkages for national and local decision-making and prioritisation of asset deployments in support of East Coast LRFs. The ECFG framework also sets guidance for local contingency planning.

HM Government Coastal Flood Group; Interim Response & Recovery Guide (July 2013): The purpose of this guide is to provide an overview of the phased central Government response to a wide area coastal flood event (including associated trigger points), help build the capacity required to respond above that needed for lower impact flood events set out in the relevant plans of Local Resilience Forums, and to set out the role of Central Government in supporting the local operational response to, and recovery from, a wide area coastal flood.

Forerunners to the surge

Two 'severe weather' events happened during October 2013 that proved to be informative precursors to the surge, and helped shape our response:

1. **North Sea Storm Surge – 10th October 2013**[3]

   From the first forecasts of this event, there were no indications that severe disruption was possible along the east coast of England. The timings of the storm surge were outside the largest tides of the spring-neap cycle. The potential for a weather system to generate a coastal surge was identified by FFC as "**very low"**.

   A surge of approximately 1 metre was seen on 10th October 2013, with waves of up to 4 to 5 metres and near gale-force winds. However, even on the worst-case scenarios for the forecast, there were no signals of severe disruption.

   This contrasts with 1953, when a surge of greater than 2 metres with waves of up to 8 metres and storm force 10 to violent storm 11 winds delivered the devastating impacts when sea defences were weaker.

   The FFC assessment of overall flood risk on the actual day was **'Low'** and proved accurate. On this occasion, the LRF continued to monitor the situation but did not activate local plans.

2. **The 'St Jude Storm'; Severe Weather**[4];

   An unprecedented and early forecast of this deepening pressure storm over the Atlantic was made on 24th October (with expected landfall on 28th). The Met Office gave early indications of a **'Yellow Alert'** for both rain and strong winds over the Sunday evening into Monday morning, with strongest winds to the south. Structural damage and disruption to travel (especially during Monday 'rush-hour') were predicted.

[3] Based on Flood Forecasting Centre report dated 22.10.13

[4] Based on LRF debrief report

The threat was raised on the 25th and 26th to **'Amber Alert'** for strong winds (60-80mph) likely to impact on areas to the north including Lincolnshire, but the predicted track of the storm again shifted back towards the south of England as late as the Sunday (27th).

Due to the uncertainty in the forecast partners activated a precautionary response, coordinating activities from the CEC.

The storm passed lower to the south and little impact was experienced in Lincolnshire. Nonetheless, partners agreed the LRF responded in an appropriate and timely manner to the information available at the time, including the activation of the CEC. We used this event to improve partner communication when using remote technologies such as teleconferencing, and explored different ways of engaging with local authorities at district level.

2. Overview of the Coastal Surge of 5th December 2013 and its impacts

The storm of 5th December saw Scotland's rail network shut down, 100,000 homes without power, flight cancellations at Glasgow, Edinburgh and Aberdeen, fallen trees, traffic accidents and two fatalities. During the morning of the 5th concerns increased regarding coastal flooding mainly affecting eastern England due to a storm surge[5].

Several hundred homes were flooded on parts of the east coast of England (for example at Boston, Lincolnshire) and many thousands of residents were evacuated from vulnerable areas. At Hemsby (Norfolk) cliff erosion resulted in several properties collapsing into the sea, while in North Wales, Rhyl (Denbighshire) was badly affected by coastal flooding.

There was further stormy weather with heavy rain and strong winds on 26 to 27 December, and again around 30 to 31 December, the latter coinciding with high tides creating concerns about already weakened or compromised defences. Thankfully these tides did not coincide with surge conditions.

Overall the December and January storms resulted in around seven fatalities and 1,700 properties flooded across England.

5th to 6th December

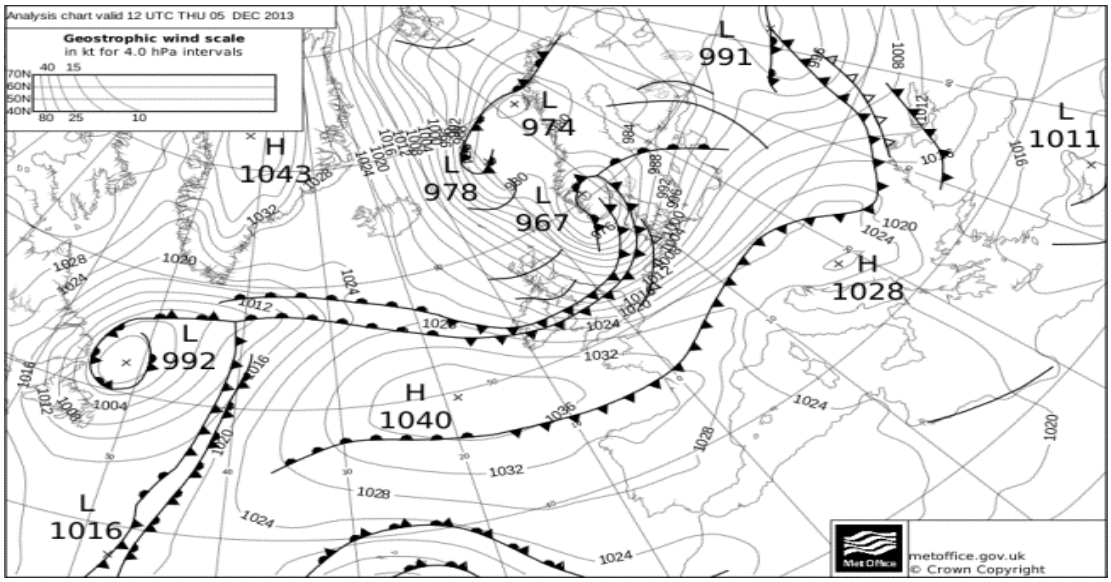

Figure 3: Synoptic situation at 1200 UTC 5 December 2013, showing a deep area of low pressure to the north-east of the UK bringing strong winds to the north and east, with a storm surge affecting both North Sea coasts and the North Wales coast.

The combination of low pressure and strong winds led to a significant storm surge affecting North Sea coasts, although the north coast of Wales was also affected. The surge was 2metres above predicted high water and coincided with high tide. Winds were 'north westerly', so the surge moved along the shore (as opposed to 'on-shore'). Winds gusted widely across Scotland with the mountain station at Aonach Mor recording a gust of 142 mph. Gusts also exceeded 69 mph along the North Sea.

[5] Information provided by Met Office

Surge predictions along the east coast were for levels at, or higher than, in 1953. The predicted (4.12.13) surge height for Immingham (Lincolnshire's nearest monitoring point) was **4.9 metres**. In actual fact (5.12.13) the **surge reached 5.2 metres**[6], 70cm **higher than in 1953**. The 'highest absolute levels' were experienced at King's Lynn (6.02 metres), and the highest surge was 3.02 metres at Sheerness, Kent.

Predictions for Lincolnshire

The EA Northern Area was first notified on Sunday 1st December that a surge could pass down the North Sea later in the week. There was low confidence on the size of the surge, but partners were informed on the Monday morning.

By Wednesday 4th December, confidence in the forecast had increased and during the morning of Thursday 5th December the EA issued Flood Warnings to advise people that flooding was expected and to take action. This escalated to the issuing of Severe Flood Warnings later that afternoon.

The issuing of tidal Flood Warnings is based on forecasts as opposed to *actual* tide levels. Ensemble forecasts provide an early indication, through computer models, of the range of likely water levels. It was not until the 4th December that the ensemble spread narrowed to provide reasonable confidence of warning thresholds being exceeded.

The deterministic forecast comes into play at tide -36 hours and generally provides a more robust assessment. This was also forecasting that we would reach the Flood Warning threshold. Of greatest significance in the forecasting timeline was the rise in deterministic forecast between midnight on Wednesday 4th (5.7m) and the 0500 forecast on Thursday 5th (5.9m). The increase was significant both in terms of actual rise in predicted levels but also in terms of potential impact given its critical proximity to the height of the defences at 6.0m.

Overall, the weather patterns at the time of the tidal surge were a result of the atmosphere being particularly chaotic. This was evident in the large range inherent within the ensemble forecast and the late shift in deterministic forecast.

Impacts & consequences

The impacts of the resultant surge in Greater Lincolnshire included the overtopping of 18-20 km of flood defences, causing a large area of scour (*e.g.* Mablethorpe) and 4 breach locations at Boston Haven, Gibraltar Point (Bull Dog Bank), Tetney Marsh and Friskney, inundating an estimated 1,700 hectares of agricultural land.

A further 100+ industrial and commercial sites were damaged, including 'Boston Stump' and local infrastructure such as the access road to the Boston Landfill Site, Civic Amenity Site and County Council Waste Transfer Station. Approximately 90 metres of floodwall at Skegness (between the pier and lifeboat station) failed during the surge. Three of the five main pumps at Black Sluice Gate were damaged by flooding and inoperable, requiring a decision on the future of the pumping station.

Significant flooding occurred in the Skirbeck/York Street (Maud Foster Drain), and High Street/London Road, Central Park and Wyberton areas of Boston (River

6 *e.g.* Total water level, including tide plus the surge

Haven). More 'localised' property flooding was also experienced in Sutton Road, Trusthorpe (East Lindsey) and Butterworth Road & East Ferry Road, Susworth (West Lindsey).

Caption: The flooded Boston Stump.
Photo courtesy of the Boston Standard.

In total:

- 607 residential properties flooded, the majority in Boston (where only 50% of households had flood insurance) and in Trusthorpe and Susworth
- 121 businesses flooded in the county
- 44 persons and 2 pets were rescued from flood waters
- 203 persons received assistance to evacuate
- 350 tonnes of waste was collected from flooded properties and safely disposed
- 1,700 hectares of agricultural land inundated
- Damage to the natural environment, especially at Gibraltar Point
- An estimated £8.1m worth of damage to flood defences and infrastructure

Lincolnshire Wildlife Trust confirmed defence overtopping and flood damage to Gibraltar Point Visitor centre and Wash Study Centre. Preventive action at Donna Nook allowed seals to seek refuge on higher ground in dunes. Thankfully, seal mortalities appear to have been low.

3. Chronology and operational responses (key events, decisions and actions)

Early warning phase – Monday 2nd to Tuesday 3rd

Monday 10.30am

FFC issued a '**Yellow**' Flood Guidance Statement (FGS)[7] indicating a ***"very low likelihood of significant coastal impacts on the east coast of England"*** as a result of *"gale force winds and large waves … later on Thursday and through Friday. If these combine with a large positive surge, significant coastal flooding could result. The likelihood … is currently very low, however there is the potential to increase the likelihood if confidence improves."*

Coincidentally, the LRF's East Coast Inundation Group (ECIG) was already meeting to discuss national and local planning & policy for coastal inundation. The EA, lead responder for coastal flooding, was able to provide timings and details of expected high tides for the Thursday and Friday (8pm and 8am respectively). At this point 'ensemble' forecast models indicated the potential for an east coast surge reaching 'flood alert'[8] threshold heights (EA Floodline Warning Direct system) for the Thursday, with the possibility of 'flood warning'[9] levels for Friday. More 'deterministic forecasts' were expected to be available from Wednesday 4th December.

A coastal flooding seminar in the Humber, arranged by the UK East Coast Flood Group (ECFG) was cancelled to allow responders to concentrate on the developing situation. Offline discussions with both DEFRA (lead Government Department for flooding) and DCLG Resilience Emergencies Division (RED), confirmed the appropriateness of continuing to monitor the forecast and arrangements for national coordination.

5.30pm

DCLG RED, in line with UK Government Coastal Flooding Response & Recovery guidelines, issued a calling notice for all east coast LRFs (from Northumbria to Kent) to participate in a 'precautionary response co-ordinating group' teleconference at 1pm on Tuesday 3rd December to *'discuss the risk of significant impacts following a tidal surge along the east coast'.*

Tuesday 10.30am

The FGS issued at **10.30am** on Tuesday 3rd December reaffirmed the forecast and ***'low overall risk'.*** An email alert was sent to all LRF partners notifying them of the current levels of monitoring and participation in the DCLG teleconference of the LRF Chair (Chief Constable), Head of the Joint Emergency Management Service (JEMS) and Assistant Chief Fire Officer (representing the LRF deputy Chair).

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[7] All responding agencies and partners in Lincolnshire receive FGS either directly or by 'automatic forward-rule' via the Joint Emergency Management Service (JEMS)

[8] Flood Alert – 'flooding is possible, be prepared'

[9] Flood Warning – 'flooding is expected, immediate action required'

1pm Met Office issued a **'Yellow Alert'**[10] for ***"strong west to north-westerly winds on Thursday*** *… in northern halves of Derbyshire & Nottinghamshire, together with all of Lincolnshire lying north of The Wash".* (Note; westerly to north westerly winds are 'off-shore' in Lincolnshire).

The DCLG teleconference (also at 1pm) received updated information from both FFC and Met Office, which helped to develop a common understanding of the current assessment amongst coastal responders. DCLG confirmed communication and liaison arrangements, and encouraged LRFs to consider previous experiences of *"significant impacts of previous floods despite the overall risk being low".* All east coast LRFs confirmed they had alerted partners and were continuing to monitor the FGS and forecasts, with most indicating that a worsening of the forecast, and in particular an increase to 'Amber' FGS, would determine the point at which responses would be activated. All agreed the significance of the next FGS due on 4th December.

2pm A **'precautionary Strategic Coordinating Group (SCG)'** of core partners and lead responders comprising: Police, Fire & Rescue Service (FRS), Environment Agency (EA), County Council (LCC) and the three coastal District/Borough Councils of East Lindsey (ELDC), Boston (Boston BC) and South Holland (SHDC) was briefed by the Head of JEMS. The EA informed the group the situation was *"(the wind) … generally improving"* but raised *"concern about pre-identified flood defence seepage in Boston"*.

The impacts, both on and from the Lincoln Christmas Market (Thursday 5th to Sunday 8th) were discussed, especially pre-existing multi-agency commitments for both command & control and event safety.

2. Threat assessment & preparation phase; Wednesday 4th to Thursday 5th

Wed 7.30am FGS remained **'Yellow' (low risk) for Lincolnshire**, but now indicated **'Amber'** risk to the coastal areas to our north (Northumbria to Humber) and immediately to our south (North Norfolk) indicating *"a medium likelihood of significant coastal impacts along the whole of the north-east of England and on the north coast of Norfolk on Thursday and Friday, giving a medium overall flood risk. Elsewhere for coastal parts of … eastern England* (*e.g.* including Lincolnshire) *there is a LOW overall flood risk".*

The FGS also, for the first time, indicated a *"**very low likelihood** of significant impacts for the lower tidal reaches of the **River Trent** in Nottinghamshire".*

The variation in threat levels along the coast appeared to be due to wind direction with parts of the north-east and north Norfolk coastlines being more exposed than Lincolnshire's to 'north to north-westerly' winds. This presented the LRF with a difficult decision, especially given the absence

[10] Met Office Severe Weather Warnings system; Yellow Alert – 'be aware', Amber Alert – 'be prepared', Red Alert – 'take action'

of any specific overtopping or breach of defences threats, and the reducing timeframe for coordinated planning (the remaining 'available time' compared with the 'required time' to achieve certain responses such as preventive evacuation), possible late shifts in forecasting and the additional impacts on the Lincoln Christmas Market from high winds.

Following consultation between Police, FRS, LCC leads and Head of JEMS, it was agreed the LRF should *anticipate* 'Amber' FGS for Lincolnshire and proceed to plan 'flexible and dynamic responses, proportionate to the threat' which appeared to centre on Boston, with potential for spray overtopping along the rest of the coastline. A number of common objectives were agreed and a 'working strategy' established in line with national and local coastal flood contingency planning which emphasised:

- The pre-deployment of assets (including preservation of assets at risk from flooding)
- Removing people from danger (ranging from public safety messaging to evacuation if required)
- Protecting the infrastructure and essential services

Contingency planning meetings were held during the day to develop the working strategy and create multi-agency response **'surge task forces'** (consisting predominantly of Police, FRS flood rescue and pumping teams, East Midlands Ambulance Service, and County Council Highways teams) to provide a flexible response to any developing threats. A full 'precautionary SCG' meeting was arranged.

Western Power and Anglian Water deployed additional measures to protect critical local infrastructure in 'at risk' areas. Contingencies were discussed in relation to Boston Pilgrim Hospital, the Waste Disposal Plant in Boston, the Black Sluice Pumping Station and impacts on shipping in and out of the Port of Boston. Contact was also made via Lincolnshire Wildlife Trust, with the Gibraltar Point Visitor Centre & the Seal Sanctuary at Donna Nook in regards to public visitors. Network Rail also fed in information about potential route restrictions planned by train operating companies.

12.45pm **Met Office** upgraded its weather warning to '**Amber Alert'** of ***"medium likelihood of medium impacts"*** from the intensifying low pressure expecting to move eastwards. Winds were assessed to be *"strong enough to cause structural damage"* with particular vulnerabilities including *"stalls set up for Christmas markets and along the coast"*.

1pm DCLG RED held a second **multi-SCG response coordinating group** teleconference which confirmed most LRFs had now activated planning responses, including Norfolk who were considering precautionary evacuations (on the basis of their 'Amber' FGS and local threat assessment). DCLG undertook to liaise with other Government Departments, and to coordinate media and 'top lines' briefings to ensure consistency of public messaging.

2pm Lincolnshire held its first **full precautionary SCG** meeting. A police chair was agreed and partners received a full threat assessment from the EA.

The (favourable) north to north-westerly winds, surge and tides were likely to create conditions for 'overtopping and spray' along the open coastline close to the thresholds for issuing 'flood warnings' but not assessed to generate particular threat. A 'positive' (prolonged) surge pushing up the tidal River Haven was predicted to reach heights of 5.72 metres. Current defence levels in Boston are 6 metres.

High tides were due at 8pm on Thursday 5th and 8am on Friday 6th December.

The EA confirmed contractors had been monitoring defences in Boston and had deployed additional measures to strengthen a 45-metre stretch in St Anne's Lane. Comparisons were made with flooding in the same area of Boston during 1978. The EA continued to be concerned about potential 'seepage' through both the ground and defences in Boston where **approximately 500 properties could be at risk**. The issuing of 'Flood Alerts' ('be aware') was discussed, with agreement that the SCG would be consulted re timing.

A potential 'worse-case scenario' of higher than predicted surge levels and significant breach to defences (based on 1978 flooding extents and simulated breach modelling already available) was used to identify a further 18,000 properties that might be 'at risk' in Boston. This allowed contingency planners to also consider escalation planning.

6pm **'Flood Alert'** issued for *'tidal flooding of area near the Lincolnshire coastline'*

The **precautionary SCG** activated multi-agency coordinated response structures with continued contingency planning, escalation processes, and arrangements to open the **County Emergency Centre (CEC)** at 8am on the morning of December 5th with appropriate command support functions commensurate with the current threat. A police chair for the **Tactical Coordinating Group (TCG)** was identified.

Earlier activation of the CEC and overnight planning options were discussed but decided against, however contingency planners were already tasked with identifying vulnerable premises & assets, and 'known' vulnerable people based on the flood warning zones in Boston identified by the EA, and in case evacuation became a necessary option. Western Power Distribution (WPD) used this information to take proactive steps to defend some of its local assets and prepare engineers.

Thursday 5.30am EA's Area Strategic Manager notified Head of JEMS that the 7.30am FGS would raise the threat for Lincolnshire to **'Amber'** following a worsening in the forecast scenario in the county for later in the day and at high tide that evening. As a result military liaison in the CEC was requested, and the LRF's memorandum of understanding with the voluntary sector activated (enabling the co-ordination of voluntary sector responses in the county in support of emergency services).

6am EA Area & Catchment Flood Incident Room opened. Patrols close the coastal floodgates in preparation for high tides.

7.30am FGS raised the level to **'Amber'** for the **whole of the north east coast**

of England including Lincolnshire, and also extending to Essex on Thursday, and to include Kent for Friday, giving a *"highest overall flood risk* (of) ***medium*** *… There is a* ***medium likelihood of significant coastal flooding impacts*** *along much of the east coast of England today and all of the coast tomorrow"*

The statement reiterated there was *"****very low likelihood of significant*** *impacts from coastal flooding along the lower reaches of the* ***River Trent in Nottinghamshire*** *today."*

8am Full **SCG** meets, and receives the updated briefing on threat from EA confirming Boston remained the focus for the high tide periods. The SCG authorised detailed evacuation planning to commence and the creation of 3 multi-agency 'surge task forces' – one at Boston, one at Louth (to respond to any developments along the coastline) and, if achievable, one in reserve[11].

8.50am **Flood Warnings** ('be prepared') issued by EA to 30,300 properties, including waterside properties between Town Bridge and Haven Bridge, Grand Sluice and the Docks in Boston, plus surrounding areas to north, east and south) and selected areas 'near to sea defences' from Gibraltar Point to Sutton Bridge.

9am The first full meeting of the **Tactical Coordination Group (TCG)** identified 'forward' bases of operations for the multi-agency 'surge task force', extended the command support functions to support evacuation planning and any health/social impacts. A 'battle rhythm' (pace of planning meetings and reporting) was established for the remainder of the day.

FRS, Police and EMAS 'Bronze' commanders tasked with creating multi-agency risk assessments for all staff deployed to risk areas. FRS Bronze nominated to take the 'coordinating lead' for the surge task force.

Caption: (L-R) Sharon Edwards from BBC Radio Lincolnshire with Lincolnshire Police's Gold Commander Detective Superintendant Sean West

[11] A 3rd 'reserve' task force was not achieved.

Command support structures extended to include operations cell, intelligence cell, evacuation cell, warning & informing cell (with BBC Radio Lincolnshire and Lincs FM 'embedded' in the CEC from this time), and later, Health, Social Care & Education cell.

Black Sluice IDB activated their Emergency Flood Response Plan and made arrangements for staffing overnight and pumping equipment, *etc*.

1. Impact phase: Thursday 5th to Friday 6th

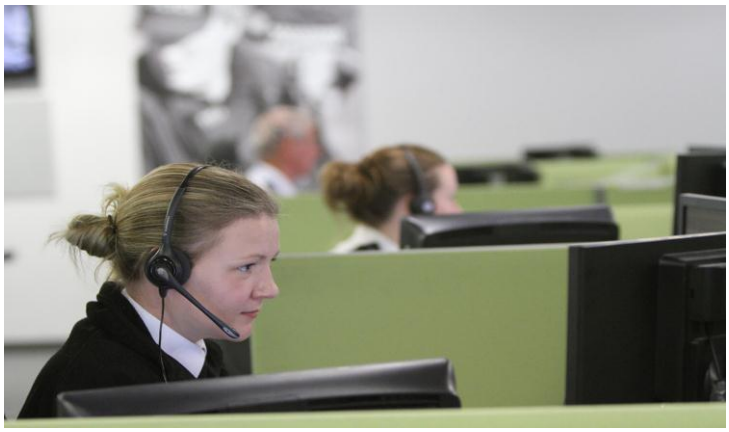
Thursday 10am — All LRF partners (including those not directly affected) in the county updated on the situation and informed the CEC now in operation.

10.30am — FGS repeated the **'Amber'** threat level for Lincolnshire, but raised the threat to Norfolk, Suffolk and Essex to **'Red' (Highest Risk).**

Also at 10.30am, the TCG confirmed evacuation planning based on 3 scenarios i) 'most likely' affecting 600 properties, ii) 'potential breach' affecting 6,000 and iii) 'worse case scenario' 38,000 properties with an assumption that 15% of affected households may require assistance / alternative accommodation. An evacuation hub and forward base of operations to be established at the Princess Royal Sports Arena (PRSA) in Boston. FRS confirmed they had sufficient flood rescue boat teams capability at this time to complete 240 rescues an hour. Water pumping assistance was requested from the Internal Drainage Boards (IDB), and the voluntary sector (represented by the British Red Cross) confirmed availability to support evacuation.

NHS partners completed a scoping exercise to identify premises potentially at risk, and GPs and pharmacies are informed of situation.

11am — Northern Power Grid declares an organisation 'Major Incident' as a consequence of significant network damage caused by gale force winds across the region (particularly north east, Yorkshire and north Lincolnshire).



Caption: Lincolnshire Police's control room starts to get reports from the public of weather related incidents

Lincolnshire Police record eight weather/wind related incidents in Lincoln and West Lindsey area in quick succession, and continue to receive a high volume of weather related calls throughout the day.

The second SCG of the day received an update on the common operating picture (COP) and discussed resource requirements and safety considerations for public and responders. At 11.05am the SCG declared **'emergency',** as defined by the Civil Contingencies Act, due to the potential impacts on communities and the environment.

Tactical response planning aimed at achieving the objectives set by SCG continued throughout the morning and afternoon, particularly prioritising the potential for evacuation of up to 600 properties. Key infrastructure assets (*e.g.* electricity sub-stations, water pumping, *etc*) and known vulnerable people continued to be identified within possible affected areas. Both Lincolnshire Police (traffic management, evacuation support and public safety) and FRS (flood rescue and high volume pumping) activated mutual aid and 'specialist asset' requests in line with national guidelines.

Procurement Lincolnshire support was requested to help with logistical planning for an anticipated evacuation operation. Early school closures were requested in order to facilitate the extra transport required for evacuation. Self-evacuation of vulnerable premises (including relocation of some vulnerable elderly residents to care homes) initiated. Port of Boston confirmed the cancellation of shipping movements on The Haven during the evening high tide period (6-9pm). Boston BC make a clear policy decision not to deploy sandbags.

ELDC send filled sandbags to strategic locations along the coast, stored on vehicles for rapid deployment.

11.30am Military Liaison Officer tasked with scoping the potential use of Prince William of Gloucester (PWOG) Barracks as an additional large-scale evacuation centre for the higher planning scenarios.

12noon East Midlands Ambulance Service (EMAS) activate 'REAP 4' (Resource Escalatory Action Plan), and deploy Hazardous Area Response Team (HART) to join the multi-agency 'surge task force' at Boston.

ELDC make arrangements to maintain staffing levels and extended operating times throughout 5th & 6th. They deploy empty sandbags to Skegness and Mablethorpe.

1pm DCLG RED teleconference confirmed higher than previously predicted surge levels now forecast. Most LRFs now in impact phase of response. Immediate decision to grant a request for Military Assistance to Civil Authorities (MACA) to access MOD facilities (PWOG) to support evacuation in Lincolnshire.

County Council Highways teams begin dealing with reports throughout afternoon of fallen trees in various areas of the county (including Sutton St James, Long Sutton, Spalding, Pinchbeck, Whaplode, Glenside North, Holbeach).

Second multi-agency 'surge task force' established at Louth. Lincolnshire Police deploy mutual aid from east midlands forces (5 x mobile Beat Duty Units each consisting of 25 staff – 3 deployed to Boston and 2 to Louth).

1.30pm Evacuation of known vulnerable people in predicted flood zone in Boston begins.

2pm Neighbouring LRFs (Northamptonshire, Leicestershire and Nottinghamshire) alerted to developing situation and *potential* for evacuation support in line with pre-planned regional ('worse-case scenario') mass evacuation arrangements. Evacuation centres in Melton Mowbray and Rutland placed on 'stand-by'.

2.30pm FGS raises the threat level for Lincolnshire (and North Lincolnshire on the South Humber) to **'Red' (Highest Risk)** – ***"the coastal flood risk is now high (Red) for Lincolnshire****, East Anglia and Essex coast later today and into tomorrow".*

3.10pm The EA issue **'Severe Flood Warnings'** to 12,300 properties in Boston and surrounding areas, including Wyberton, and Gibraltar Point to Freiston Shore.

Boston multi-agency 'surge task force' now established at PRSA. Police deployments consisting of 1 x BDU (later supplemented by mutual aid including Nottinghamshire police's Underwater Search Unit consisting of 13 staff and boat); FRS deployed 6 x type B flood rescue boat teams plus support rafts, 7 x fire appliances and personnel to Boston; EMAS deploy a HART to Boston.

FRS also deploys 2 x type B boat flood rescue teams, plus support rafts to Louth.

3.30pm 'Strategic' (large scale) evacuation centres at PGL Caythorpe and Prince William of Gloucester Barracks, Grantham, plus an evacuation processing hub at Princess Royal Sports Arena, Boston opened. Meridian Centre, Louth, also opened for any evacuees from the East Lindsey coastline.
Large scale transport operation in place. Procurement operation begins to source support equipment, bedding and food. Mutual aid received from Northants County Council ref evacuation centre management at PWOG.

4pm 35,000 properties to north of Lincolnshire without power.

5pm Lincolnshire Police report further rise in calls from members of public seeking advice re evacuation, and offers of assistance.

County Council Highways re-deploying teams for potential sandbag and gulley emptying operations.

5.15pm Northumbria LRF reports (via DCLG) water levels peaked at 20cm above predicted levels at high tide.

5.30pm West Lindsey District Council (WLDC) monitoring the EA Midlands Area information indicating potential flooding from tidal River Trent, and deploy sandbags for community use at East Ferry. Hull Flood Barrier in

operation. *This information is not shared with the SCG by the EA Midlands.*

5.45pm EA advising partners to prepare for possible breaches to defences in Boston at the point of high tide due to higher than expected surge heights being experienced in areas to our north. Forward multi-agency 'Bronze' relocated to Kirton Fire Station (outside the widest risk area). Evacuation process fully under-way.

Boston Pilgrim Hospital takes decision to cancel elective and outpatient activity for the 6th, holds mutual aid discussion with Nottinghamshire Trusts ref potential relocation of patients, and continues to work on evacuation planning (including 'vertical' evacuation and alternative power supply).

EA confirms forecasts for the following morning's high tide (6th) will be lower than today.

6pm Lincolnshire Community Health Services (LCHS) deploys GPs to support evacuation at PGL, Caythorpe. At 6.30pm consultation between Health partners leads to a lifting of a temporary divert of ambulances approaching Boston Pilgrim Hospital.

Police start to receive a number of reports from officers and public re flooding impacts along the coast, starting in Skegness (*e.g.* flood extending up to the Clock Tower). Deployments to Skegness, Mablethorpe, and Chapel St Leonards to assist with road closures, any evacuations and warning & informing. (Airwave Solutions report communication systems capacity issues in Boston due to 'radio traffic' - later reaches 100% capacity at 6.25pm).

Police re-deployed to Skegness seafront where members of public ignore requests to stay away creating safety concerns.

6.10pm FRS receives first call re flooding on Church Street, Boston and continues to experience a dramatic rise in calls, which lasts for 3 hours. FRS (supported by EMAS HART) effecting a number of rescues and assistance to residents who become isolated by floodwater.

"There was a real spirit of community: the Police, EMAS and other agencies all worked well together. Although we couldn't magically fix everything, just an arm over someone's shoulder or a hand to hold – a little bit of comfort – made all the difference."

Firefighter Tom Patrick, Lincolnshire Fire and Rescue

6.15pm Boston 'surge task force' joint Bronze relocates to Fen Road Depot due to flood threat to Boston Fire station.

Temporary alternative evacuation centre established at Stickney following re-routing of evacuees due to flooding in Boston – good support from local community in providing food, blankets, *etc.* (some of these

evacuees were later found alternative accommodation in Boston rather than going on to PGL).

6.50pm Police receive more than 50 flood-related incident calls in addition to 'on ground' incidents already being dealt with by officers. All available mutual aid and local (Lincolnshire) resources now fully deployed in Boston.

7.15pm Humber LRF colleagues report higher than predicted surge levels.

As high tide approaches, public messaging encourages people in 'at risk' area to seek a 'place of safety' (including vertical evacuation). Responders on the ground to make operational risk assessments in respect of community and responder safety.

Police report unable to get to some addresses due to depth and velocity of floodwater (FRS boat rescue teams assisting).

7.32pm First critical **high tide** at Boston.

Significant flooding in residential waterside properties in Boston reported by Boston BC (monitored by CCTV). Water entering business premises on Slippery Gowt Lane (*not known by responders at this time*).

Police Gold authorises deployment of National Police Air Service (NPAS helicopter) to provide overhead visual intelligence of flood extent (deploys by 8.30pm having picked up Police Search Advisor).

WLDC receives reports of flooding to roads in Susworth, East Ferry and Wildsworth (passable with care). Later report of flooding to single property at Susworth (elderly occupants) and local resources despatched to assist. It becomes apparent the EA had been 'door-knocking' in these areas without the knowledge of local authorities.

8.10pm FRS requests national mutual aid for additional 5 x type B flood rescue boat teams and High Volume Pumping (HVP) for resilience and coverage overnight and into 6th. Surge Task Force at Louth stands down.

"We were working flat out. The crews were out and the police need our help. It was difficult, but everyone was extremely professional and kept a cool head."

Watch Command Support Nick Morris, Lincolnshire Fire and Rescue

8.30pm Between 8pm and 9pm, a sudden and unexpected rise in the Black Sluice Internal Drainage dyke system noted, with IDB staff noting rise in water levels at the Wyberton Marsh Pumping Station indicating a potential breach of tidal banks.

9pm Approximately 220 evacuees requiring assistance being transported from Princess Royal Sports Arena to PGL and PWOG. Only 1 casualty (asthma attack) known at this stage. Impacts on water pumping stations (not critical), road closures. FRS deploying pumping operation in Fen Road area.

9.15pm FGS extends the 'Red' Alert to *"include North Yorkshire and East Riding of Yorkshire and continues to be* ***high (red) for Lincolnshire****, East Anglia and Essex coast this evening and into Friday".* (The overall risk to River Trent remains **'very low'**).

9.30pm Impacts extensive but in line with original threat assessment from EA. Priority for responders set as searching flood affected areas for 'at risk' occupants and providing continuing assistance where required. Overnight resourcing of operation and monitoring of potential for freezing conditions. Two IDB high volume pumps deployed to Boston, but unable to operate due to insufficient hose lengths and couplings.

10pm FRS provides HVP assistance to WPD to help protect Mount Bridge Primary Electricity sub-station.

11pm Overnight staffing in CEC, at the evacuation centres and on the ground continue operations and monitoring the situation / assessing impacts from the flooding. Meridian Centre (ELDC) stood-down as no coastal evacuations required.

Operational staffing rotation on ground (initial mutual aid released to be replaced by further incoming support from neighbouring counties). Continuous impact assessments completed overnight and in advance of next high tide. Police prepare for house-to-house visits to establish flood extent and assess needs.

Friday 2am-6am Impact assessments continue to be collated. Several areas in Boston adjacent to river flooded mainly due to overtopping (water level at 6.1m). Damage sustained to the top 50cm of a 10 metres low floodwall. At this time approx. 350 properties estimated to have flooded.

Caption: River Haven burst its banks flooding the neighbouring streets.
Image courtesy of Boston Standard.

Caption: River Haven burst its banks flooding the neighbouring streets.
Image courtesy of Boston Standard.

No power losses reported, flood threat to Boston Pilgrim Hospital receded, but concerns re the road bridge over River Haven leads to closure during morning rush hour coinciding with next high tide (8am). Evacuees at PWOG now being moved to PGL as a single, consolidated centre. No public health issues reported at this time.

5am FRS deploying 5 x type B flood rescue teams, plus rafts, 1 x HVP and a further 8 fire appliances and personnel to Boston throughout Friday 6th.

Caption: One of Lincolnshire Fire and Rescue's appliances removing floodwater in Boston

SCG meets to discuss overnight situation reports and planning for high tide at 8am. Discussions with DCLG re value of aerial reconnaissance to impact assessments. Discussion also held ref planning the transition from 'response' into 'recovery'. Confirmed that Boston BC would lead the community recovery with priorities being the pumping away of floodwater, re-opening of the Waste Disposal Site, clear-up and assistance in 'drying-out' of homes. Agreed that Boston would be assisted by county council, ELDC, SHDC, and supported by JEMS.

7am FGS confirms on-going high **'Red'** risk for today for the majority of the east coast of England and a developing coastal flood risk to North Wales.

7.30am Second critical **high tide.**

8am ELDC deploys housing teams to all coastal areas to complete assessments of flooding and damage.

9am First local recovery meeting held at Boston BC between council and police to discuss impacts and way forward.

10am Prince William of Gloucester Barracks (PWOG), Grantham confirmed closed for evacuation purposes and returned to normal use.

Transport support provided to evacuees at PGL wishing to either view the flood damage and/or return to their homes, with a continuing offer from PGL to support displaced residents for a further 24 hours if required. Alternative medium term housing provision planning in support of Boston BC.

Second NPAS helicopter over-flight confirms floodwaters are receding.

10.15am Total assisted evacuees confirmed as 263 (all from Boston area) with 40 vulnerable persons being relocated into care homes for immediate care and support. Casualties (not serious) confirmed at 3 people, all from the previous evening and including a firefighter. Power failures reported to have affected approximately 322 properties. Flooding also confirmed

between Huttoft and Mablethorpe.

12noon EA assessment identified 40m breach of defences at Slippery Gowt affected Boston Landfill Site, Civic Amenity Site and Lincolnshire County Council Waste Transfer Station. An Acoustic Radio Controlled Boat was used to map the extent of damage. Estimated 500 acres of agricultural land (prime sprout growing) flooded due to 2 breaches at privately owned Jubilee Bank, near Gibraltar Point.

DCLG teleconference updated on Lincolnshire situation. Weather improving throughout the day. Clear the surge had been higher than predicted in areas to the north of the county, **but not as high in Lincolnshire**. Effective mutual aid arrangements in place between national power companies (although noted that we had not been as badly affected as other areas suffering widespread power loss).

1pm FGS maintained Lincolnshire at **high 'Red' levels**, but notable that areas to the north reducing down to 'Yellow' levels.

1.30pm As the SCG was meeting to progress planning for the transition toward recovery efforts at Boston, concerns raised by EA in respect of an apparent breach of River Haven and secondary defences at Wyberton Marsh (same area as the waste management site), possibly further compromised by shipping movements which had restarted after initial high tides. This could present a risk at the next high tide at 8pm. A total of 1,800 residential properties identified as potentially 'at risk'. Decision taken to refocus resources and effort on this developing situation and a further evacuation operation if required. An offer of military assistance to repair breach to be examined.

3.30pm Further threat assessments completed and Military Aid to Civil Authorities (MACA) suggested at 3.58pm for helicopter support to help deliver temporary repair to secondary defence breach in advance of high tide.

FGS now showed Lincolnshire and south of Humber Bank as **medium 'Amber' risk** – with every other east coast county to our north and our south at 'Yellow' risk. Rationale for this difference explained as; ***"some defences still require inspection and others remain damaged following recent severe weather and therefore severe flooding remains possible".***

5pm Police assist in collection of aggregate for repairs to breach at Wyberton and in warning & informing residents in area.

5.20pm A failure of the feed from National Grid into a local bulk supply point led to a power cut affecting **95,000 properties** across a wide area of Lincoln (particularly city centre and to the south of the city) and which lasted for approx. 40 minutes. This power loss affected both the **Christmas Market** and also the **County Emergency Centre** (although alternative power supply provided as part of CEC business continuity planning minimised disruption, and market stall generators provided sufficient lighting to ensure a basic safety level). This was immediately followed by a fire alarm leading to the temporary evacuation of the CEC, but again with minimum disruption to response planning.

5.30pm The offer of military aid and specific threat assessment for the Wyberton breach were revisited by SCG Chair and EA and a decision made to confirm the request for MOD assistance to attempt a secondary defence repair in order to contain flooding and minimise risk to life. Clarity on flood extent in event of water reaching the secondary defence discussed and a limited precautionary evacuation operation requested by SCG as it became clear disruption to residents may be very localised and possibly contained.

6pm 20 evacuees from Boston seeking alternative accommodation support had returned to PGL after home inspections. Overnight hotel accommodation found for all and liaison with Boston BC reference longer-term arrangements.

ELDC confirms that 9 properties flooded in Trusthorpe (no assistance required from partners, residents self evacuated to a local pub) and assesses floodwater damage to be limited to between Trusthorpe and Mablethorpe.

High tide passes without causing any further significant flooding at Wyberton or elsewhere.

8.30pm Shipping resumed. MOD helicopter re-tasked. IDBs and EMAS stood down. All evacuees relocated from PGL and the last of the evacuation centres closes at 10pm. Arrangements made with Boston BC and health partners re 'self-presenters' requiring assistance overnight.

9pm **Severe Flood Warnings** removed.

10pm **SCG** informed by EA they are beginning to 'downgrade' their flood warnings/alerts and confirm weather improving. A total of 20 residents evacuated as a precaution from the Wyberton area now safely back in their homes. Health & Social care services report no specific additional pressures. Impact phase appears to be coming to an end.

10.30pm **SCG** declares the 'Emergency' response phase to be completed. Due to welfare impacts on operational and command support resources, arrangements to complete overnight situational reporting, and formal handover from response to recovery phase to take place in morning.

12mn The CEC was formally closed.

Response handover to recovery, and community impact assessment phase; Saturday 7th to Monday 9th December.

Saturday 10am Final **SCG** meeting confirms no overnight remaining threats. No further evacuees 'self-presenting' for assistance. Immediate repairs to damaged defences underway and pumping operation to remove standing water will continue today. Continuing speed restrictions at high tides being managed by Port of Boston.

ELDC confirms Meridian Centre not required for evacuation, but housing support being provided for small number of households. Damage confirmed to seafront and kiosks in Skegness, but no further assistance required.

SCG chair confirmed the environment to be essentially 'safe' and transfer of command to recovery chair agreed. Transfer of operational response information, continuing multi-agency assistance and recovery command support from JEMS agreed. SCG formally stands down.

10.30am FGS provides '**Yellow' risks to Lincolnshire** and north Norfolk (only) – ***"Low likelihood of significant coastal impacts – due to known and potential damage to flood defences"***

Saturday to Sunday Community impact and flood extent assessments conducted over the Saturday and Sunday, with a focus on public health messages and identifying any vulnerable residents in need of assistance and making contact with residents who may have self-evacuated or remained in situ. Additional resources provided for extensive door-to-door enquiries provided by Police, FRS and British Red Cross in support of Boston BC staff. ELDC and SHDC continuing to provide local authority mutual aid and waste collection operation mounted.

Contact made with local community volunteers and a self-help Facebook group 'Get Boston Back on its Feet' in an attempt to coordinate community self-recovery support activities. Translation service and interpreters used as affected community has high numbers of residents where English not first language.

Caption: Aftermath of the flooding in Boston

Recovery objectives and structure for **Recovery Coordination Group (RCG)** agreed with Deputy Chief Executive (RCG Chair). Recovery priorities set as;

- Repairs to defences and infrastructure
- Safe disposal of contaminated waste from properties
- Alternative accommodation provision, where required
- Work with residents and insurers to assist in reoccupation
- Understanding community and business recovery needs
- Delivery of health and social care support
- Maintain communication with affected communities

2. Recovery phase – Monday 9th December 2013 to Tuesday 4th February 2014

Monday 9th Dec

First full RCG meeting held at Boston BC, with advisors and recovery cell chairs.

Situation update; EA confirmed 2 defence failures in Boston, a garden wall collapse and the erosion of defences at the Slippery Gowt Lane (Wyberton) and action to repair underway prior to next series of high tides (due over Christmas period).

More than 700 properties had been visited over the weekend and to date 400 were confirmed as having been flooded – although it was apparent this figure was likely to increase in coming days as more people returned to flooded homes.

Recovery Cell updates were received as follows:

Community resilience – a questionnaire to establish extent of flooding and assistance required, and a 'needs' rating system designed over the weekend was working well and helping prioritise support. Boston BC also engages a well-known community flood consultant to help identify community support and needs.

Health, Social Care & Education – Director of Public Health confirmed no public health impacts, service disruptions or safeguarding issues resulting from the flooding. Several schools had closed on Friday (some damage caused) but only Boston Grammar remained closed. Proactive use of media and leaflets to provide hygiene advice to residents.

Waste & Environment – local arrangements with SHDC for diversion of waste and limited access to waste disposal site due to damage to access road and flooding. Priority for County Council to get the disposal site operational as soon as practicable to assist the clear-up operations. Impacts of insurance loss adjustor requirements likely to lead to delays in residents' ability to dispose factored into planning. Collection vehicles and waste skips deployed into affected areas. More than 300 'white goods' already collected for disposal. Mechanical sweep of Boston Grammar playground arranged to eliminate contamination.

Housing – work with Housing Associations to relocate flood-affected families, clear advice to residents re disposal procedures of insured contents and identification of non-insured households. Some residents and evacuees initially wanting to stay in homes, understandably finding situation intolerable and seeking assistance. Support processes in place.

Finance – HM Government's Bellwin Scheme for cost recovery discussed.

RCG Chair sets a daily meeting schedule for recovery cells to report on progress.

2pm EA Area & Catchment Flood Incident Room closed

Week one Key Recovery Issues:

- EA completing threat assessments for next high tides (18th Dec)
- Assessing the damage to the natural environment becomes an additional recovery priority
- GPs identified as the most appropriate way of meeting any psychological support. British Red Cross (BRC) Fire Support teams have also been on the ground in affected areas
- Waste collection operating daily with more than 100 tonnes of waste already disposed of
- County Council confirms repairs to the waste disposal site access road will begin on 11th December and site reopening on 17th
- Highways complete safety inspections of all infrastructure (manhole covers, *etc*), minor repairs to kerbs and gulley cleansing
- 250 properties required safety checks following power failures, with 100 properties requiring repairs (completed)
- Re-housing support and assessment of needs continuing in collaboration with Housing Associations and residents
- Assistance received from Association of British Insurers
- Comprehensive guidance provided to households in respect of hygiene, disposal of insured goods, competent 'gas safe' and electricians lists provided and advice reference drying out and health management
- Homelessness prevention payments and financial support offered
- Voluntary donation (goods) collection point established and run by volunteers at Zion Methodist Church, Boston
- Community concerns focused on the timescales for completion of a proposed Boston Barrier (flood defence)

10th Dec Lincolnshire Wildlife Trust confirmed defence overtopping and flood damage to Gibraltar Point Visitor centre and Wash Study Centre. Preventive action at Donna Nook allowed seals to seek refuge on higher ground in dunes. Seal mortalities appear to have been low.

12th Dec First debrief of coastal surge completed by East Coast Flood Group. Support for establishment by DCLG of a multi-LRF Recovery Coordinating Group to ensure key issues identified to lead Government departments.

13th Dec Confirmation of flood damage within IDB areas:

- Breach of sea defences at North Fritties (north of Tetney Haven)
- Inundation of Saltfleet Pumping Station
- Trusthorpe Point and A52 flooding
- Burgh Sluice (near Gibraltar Point) flood walls overtopped causing damage to compound
- Overtopping along coastline at numerous points in Witham 4th

District and a major breach of a private sea defence at Friskney
- Minor breaches at Springfields Sluice and at the Fosdyke Pub. Level of water reached just 6 inches away from Sutton Bridge Dock.

EA also confirms approx. 90 metre of floodwall at Skegness (between pier and lifeboat station) failed during surge events. Three of the five main pumps at Black Sluice Gate (and EA asset) damaged by flooding and inoperable, requiring a longer term decision re future of the pumping station.

17th Dec LRF partners receive a briefing update on Boston recovery progress and East Coast debrief learning points.

18th Dec DCLG hosts first multi-LRF recovery coordination conference call and receives comprehensive briefing from Boston BC and County Council re flood impacts:
- By this time 529 residential properties known to have flooded
- Estimated 50% were uninsured
- 114 families in need of alternative accommodation
- 300 tonnes of waste collected
- No public health issues
- Significant damage to natural environment (including Gibraltar Point and Wildlife Trust properties) plus large acreage of agricultural land inundated

Clear that Boston had the largest number of properties affected by flooding from the December surge events.

18th Dec EA identifies concerns reference potential compromise of flood defence at Gibraltar Point and in the White Horse Lane area of Boston and update on plans to deploy temporary, demountable flood defences at the site. JEMS takes lead in preparing contingency plans (including evacuation) for the next high tide period.

19th Dec DCLG confirms the 'Bellwin scheme of emergency financial assistance to local authorities' will be made available for affected authorities.

20th Dec LRF holds a series of 'hot' debriefs to capture 'lessons learned'.

23rd Dec Director of Public Health reports that enhanced monitoring by Public Health England has not revealed any increases on communicable or diarrhoeal diseases in affected communities.

28th Dec DCLG writes to Local Authority Chief Executives reference preparedness for next period of high tides (including 'out of hours' arrangements).

2015 As progress is made on recovery objectives, RCG Chair sets a weekly meeting schedule for recovery cells.

Key recovery issues during first weeks of the New Year:
- Further media work to reinforce messages about waste disposal and insurance adjustor requirements
- Resources (including local volunteers) for revisits to affected

properties as part of on-going assessment of needs
- Flood investigation arrangements (role of the county council)
- Reporting arrangements for local authority scrutiny committee processes
- Cost recovery via the Bellwin Scheme

3rd Jan — FGS issued on 3.1.14 and on 4.1.14 gives **'Yellow' alert for Lincolnshire** and Humber Bank based on weaknesses to defences in Boston (and Humber South bank). ***"There is also a low likelihood of significant impacts from tidal flooding around the south bank of the Humber and Boston in Lincolnshire where defences have previously been damaged."***

EA lowers threshold and issues 'flood alerts' for the White Horse Lane area of Boston. Partners concerned about confusion in public messaging about the 'alert'.

4th Jan — High tides pass without further incident.

8th Jan — EA identifies additional weaknesses in defence between Black Sluice Gate and Boston Stump (later confirmed to be a stretch of banking beneath defences at Jakeman's Slippage).

14th Jan — DCLG multi-LRF recovery coordination teleconference held for affected local authorities. Main items discussed include impacts on households, businesses, infrastructure damage (particularly flood defences) and funding.

15th Jan — LRF partners provided with briefing and updates on progress of Recovery and flood threat to elsewhere in UK.

28th Jan — LRF threat assessment conference call to discuss the high tides for 31st Jan – 3rd Feb. Partners agreed the risk was low but pre-existing contingency planning and monitoring of forecast in place.

Flood Investigation (under Flood & Water Management Act) commences.
Arrangements made for **Recovery de-brief (10.2.14)**

4th Feb — RCG meets and formal agreement to stand-down formal LRF Recovery coordination processes as RCG Chair and all cells confirm remaining objectives can be achieved through 'normal' business processes.

10th Feb — Recovery De-brief held at Boston BC offices.

End of the LRF multi-agency coordinated response & recovery to the surge of December 2013.

4. Multi-agency coordination of the response & recovery in Lincolnshire

Analysis of the above chronology, and of partner debriefs and operational reports, has been used to identify the key **'strengths'**, as well as **'areas for improvement'**,

in the way partners coordinated efforts during this emergency. These are now presented within five themes:

Theme 1; **'**Early warning', threat assessment and contingency planning
Theme 2; National, sub-national and local coordination
Theme 3; Local multi-agency coordination of response & recovery
Theme 4; Achieving common objectives & response strategies
Theme 5; Recovery

Theme 1: 'Early warning', threat assessment and contingency planning

To understand how the response to the threat of a coastal surge in December 2013 was triggered, it is important to understand the definitions of 'likelihood' and 'impacts' used within the Flood Guidance Statement (FGS) risk matrix;

Likelihood bands;	**Impacts bands;**
Very low (<20% certainty)	Minimal
Low (20-40% certainty)	Minor
Medium (40-60% certainty)	Significant*
High (60% certainty, or greater)	Severe

**'*Significant impacts'* are defined as 'flooding affecting properties and parts of communities, damage to buildings/structures is possible, danger to life due to fast flowing/deep water/wave overtopping and inundation, disruption to key sites identified in flood plans and to travel is expected'

The combination of likelihood and impacts provides an overall flood risk rating of 'Very Low', 'Low', 'Medium' and 'High' (see *figure* * below).

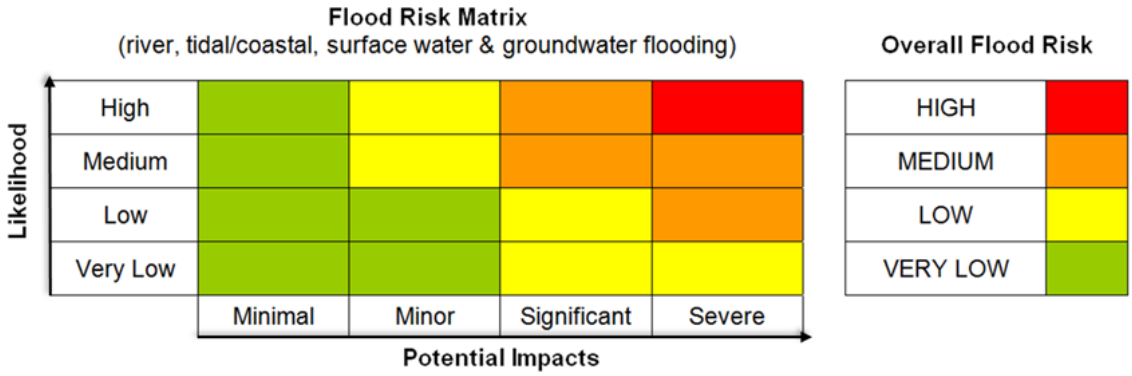


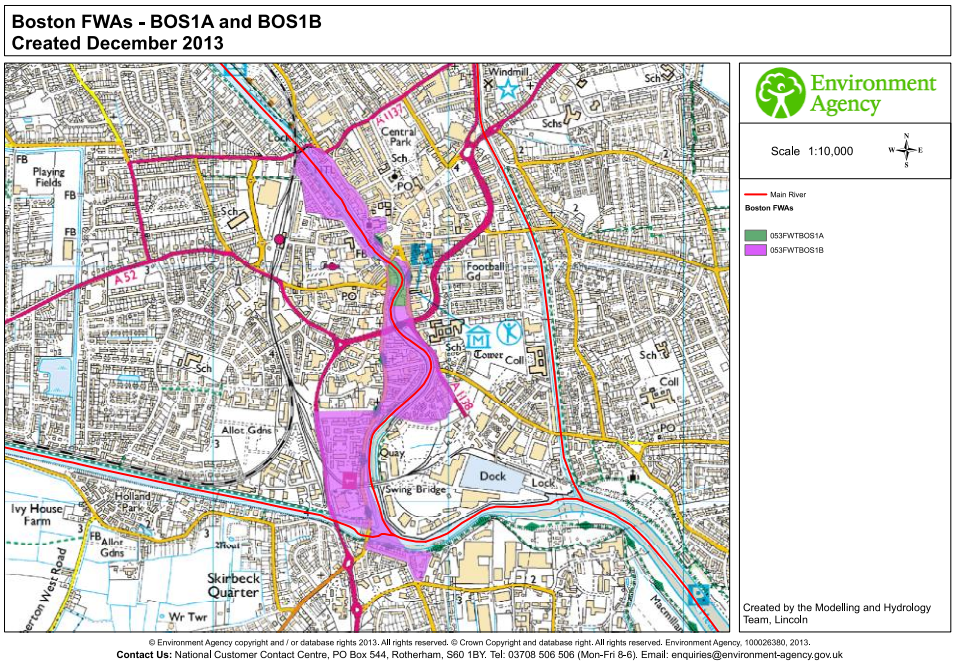
Figure 5: Flood risk matrix used within the FGS to provide and 'overall flood risk'

In Lincolnshire, for the period **up to 12 hours before the surge hit** our coastline at high tide (8pm on Thursday 5th December), the FGS overall flood risk assessment remained '**Low'** (Yellow) combining 'low' (*e.g.* <20-40%) likelihood of 'significant' impacts. Just 12 hours before the surge hit the overall risk assessment suddenly increased through **'Medium'** ('Amber' *e.g.* 40-60%) at 7.30am to **'High'** ('Red' *e.g.* >60%) at 2.30pm. In effect, this meant we only reached a reasonable level degree of certainty **12 hours** before the surge.

In comparison, areas to our north (Humber) and south (Norfolk) received **'Medium'** overall assessments (40-60% likelihood) at 7.30am on Wednesday 4th, a full **36 hours before the surge**.

Earliest assessments from the EA were for wave over-topping and spray. The initial concern on the Wednesday for Boston remained around the lower probability of breaching of the defences. The possibility of significant overtopping became more likely and the risk of breaches increased during Thursday 5th December.

The risk was concentrated on 2 flood warning areas referred to as 'Boston1A' (waterside properties between Town Bridge & Haven Bridge) and 'Boston 1B' (Wider waterside properties between Grand Sluice and the Docks). In total, these areas consisted of approx. 770 properties, 60% of which were registered to receive the EA's automated flood alerts, flood warnings and severe flood warnings. The EA also shared flood extent maps from historical flooding in the same area in 1978. As can be seen from the maps below, the actual flooding closely matched these two identified areas.



Figures 6: Map showing the flood warning areas in Boston (1A and 1B)

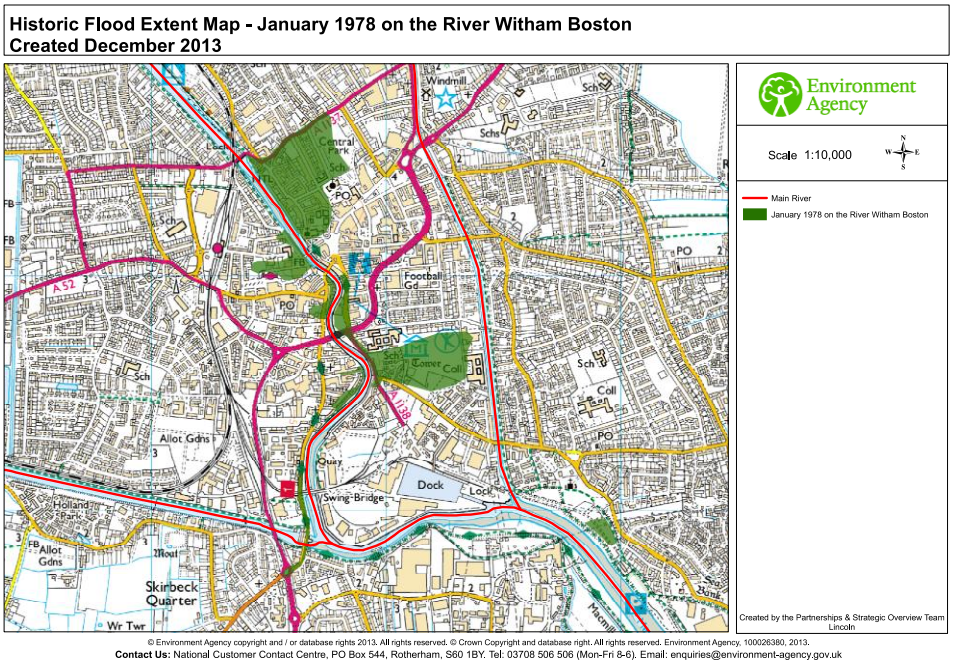


Figure 7: Map showing historical flooding in the same area from 1978.

For the remainder of the coastline the EA was confident in surge height levels and assessed a limited risk of overtopping. This information would prove vital in prioritising response actions – especially preventive evacuation. Based on these predictions the LRF was able to deploy its main efforts in Boston, but also maintained a more flexible reserve 'surge task force' approach for the East Lindsey area.

This mapping also allowed partners to pre-identify vulnerable premises and assets (care facilities and other infrastructure) and known vulnerable people in order to prioritise action to protect those assets and prioritise evacuation.

A less effective threat assessment process was followed in respect of a potential risk of secondary flooding from a breach in defences (believed to have occurred on 5th but not immediately identified) at Wyberton, due to conflicting impact assessments from risk management authorities. As can be seen from the chronology, this threat created a major diversion of partner resources and efforts, to the cost of recovery planning, during the afternoon and evening of the 6th December.

A combination of factors contributed, mainly the failure to fully assess all available intelligence (including information from the ground), in particular comparisons of predicted high tide heights and likely flood extents with the previous evenings' breach impacts. Protecting public safety was prioritised by TCG Chair, reinforced by SCG and a precautionary evacuation and defence repairs authorised.

Strengths & Areas for Improvement – Early Warning, *etc*
• **Strengths:** extensive flood hazard mapping and threat assessments completed by the EA – both before and during the event (including overtopping and breach modelling) – and the relative accuracy of the EA's predictions • **Strengths:** completion of timely partnership advisory conferences and pre-

planning during the 'early warning' and 'pre-planning' phases

- **Strengths:** flexibility and proportionality of the response, reflecting a late developing threat level
- **Strengths:** partnership maximised the 'available' time by responding early, including the decision to anticipate an 'Amber' FGS well beforehand
- **Area for Improvement:** Common understanding of the 'likelihood' and 'impacts' definitions within the FGS
- **Area for improvement:** compatibility of EA hazard maps with LCC GIS system used in CEC
- **Area for improvement:** ability to share GIS mapping beyond the CEC
- **Area for improvement:** reaching consensus amongst risk management authorities on impact assessments through better use of 'on the ground' intelligence / local knowledge / subject matter experts

Theme 2: National, sub-national and local co-ordination

DCLG Resilience Emergency Division's (RED) decision to call an early precautionary 'multi-SCG' teleconference call on Tuesday 3rd ensured effective *communication* of resilience responses at national, sub-national and local levels. It facilitated the interpretation of the FGS, and helped to develop a common understanding of the situation. As the threat developed it allowed LRFs to share their preparations and led to dynamic updates as the surge travelled down the east coast, with each LRF able to update those to the south of its height and early impacts.

In Lincolnshire it also enabled an instant decision from the MOD to support access to Prince William of Gloucester barracks as a strategic evacuation centre. This process might otherwise have taken much longer, slowing down planning. Both the 'multi-SCG' coordination process and permission to scope the use of MOD facilities for evacuation purposes, proved the value of recently published Govt. Coastal Flood Response & Recovery guidance.

There was also clear consistency amongst East Coast Flood Group LRFs in how they activated and managed responses to the coastal surge, including specific trigger points based on the FGS. Most followed the planning principles set in the East Coast Flood Framework, and this gave the overall response a sense of coherency. There was consensus as to the need for a secure web-based information-sharing platform (similar to the US 'web-based EOD') to allow responders to share sensitive information and operational updates.

Coordination and communication with neighbouring inland LRFs (with whom we have mass evacuation alliances), and with bodies such as Highways Agency and Utilities was more problematical, made difficult by the pressures on planning and command resources in the CEC, and the absence of a common information-sharing platform (as mentioned above).

A lack of cross boundary communication meant we were not focused on the threat and developing flooding from the tidal Trent, which crosses a number of county boundaries and local authority borders, including West Lindsey in Lincolnshire. The EA Midlands Area is responsible for the Trent, but we were not invited to participate in any partner advisory teleconferences or updates meaning we were unaware of an EA 'door-knocking' operation, or the flooding that affected 4 households in Susworth, until after the event.

We believe the original concept for DCLG 'multi-SCG' *coordination* based on pre-established geographical clusters, and the physical presence of a Government Liaison Officer (GLO) within the SCG, may have greatly assisted us in communication with those neighbours / agencies on whom we rely for support.

The establishment of similar DCLG coordination processes for the recovery ('multi-RCGs') was also welcomed by the LRF. Although we would have preferred this to start a week earlier, these teleconferences again allowed us to get a sense of the scale of impacts, and areas of common concern with other affected LRFs in respect of support to communities, business and the impacts on infrastructure. Again this allowed for effective sharing of information by Recovery Chairs, and in some part (together with other wide area flooding events elsewhere in the UK in the following weeks), led to the release of additional central funds to help local authorities and partners with the recovery effort. This eventually included the relaxation of Bellwin Scheme grant rates and thresholds, which was particularly welcomed by Boston Borough Council.

A number of Category 1 Responders and Utility Companies (water & power) operate on a much wider 'footprint' and will always be stretched by such wider-area emergencies. However, as a result of lessons learned from recent exercises, the cooperation from all NHS Health partners (including EMAS), Anglian Water and Western Power Distribution was effective, with appropriate representation at strategic and tactical meetings.

Strengths & Areas for Improvement – National, sub-national coordination, *etc*

- **Strength:** DCLG 'multi-SCG' and 'multi-RCG' coordination processes
- **Strength:** Government Coastal Flood Group interim response and recovery guidance
- **Strength:** Strategic and tactical representation and communication from/with Health partners and Utilities with a wider 'footprint' than Lincolnshire
- **Area for Improvement:** Effective coordination between EA Midlands & Northern Regions in relation to communicating flood threats from the River Trent to affected LRFs
- **Area for Improvement:** Consideration of geographical 'clusters' for DCLG 'multi-SCG' coordination, and/or the physical presence of a nominated GLO
- **Area for improvement:** Timely dissemination of 'top lines' briefings (the LRF did not receive any of the earlier TLBs)

Theme 3: Local multi-agency coordination (including activation, facilities, mutual aid and welfare, *etc*)

The coincidental meeting of the LRF's East Coast inundation Group on the day the FGS first identified a potential surge, reflects well on the LRF's preparations and planning for the coastal flooding risk. The early warning, on-going monitoring of the threat, and activation of precautionary (and then full) coordination structures allowed us to 'get ahead' of the storm and maximise the time available to us, a key principle of our contingency planning.

Participation of the LRF Chair and Secretariat in the first DCLG teleconference, and subsequent chief officer consultation with FRS, County Council, EA and the three coastal district/borough councils, ensured the partnership agreed a command structure and set a 'working strategy' for contingency planners from the earliest point. This led on to the activation of agreed coordination structures at strategic and tactical levels with appropriate command support at the County Emergency Centre (CEC) based at Fire & Rescue Headquarters in Lincoln.

The response in Lincolnshire was entirely based on the East Coast Flood Group Response & Recovery Framework.

The initial planning and mobilisation of command support functions reflected a relatively low and localised threat to Boston, but the *anticipation* of the FGS for Lincolnshire increasing to 'Amber' allowed for an early escalation in the response. A handover from contingency planning to tactical phase took place on the evening of 4th December. This included discussions on whether to open the CEC overnight, with TCG chair reluctantly accepting advice against doing so, based mainly on proportionality and welfare arguments. Reassurance was provided that work to identify vulnerable people and vulnerable assets had been tasked.

Escalation became necessary on the 5th when at 5.30am the EA notified the Head of JEMS of a significant increase in the threat. Military liaison and voluntary sector coordination was immediately activated, and tactical planning and command support functions were strengthened. However partners, in hindsight, feel earlier mobilisation (even if just an earlier than planned start time) would have improved our response, especially evacuation planning.

The purpose of the Strategic Coordination Group (SCG) was to take overall responsibility for the multi-agency management of an emergency and establish the policy and strategic framework within which lower tier command and coordinating groups will work. In recent years, the LRF has invested in partner relationship building through training and exercising, including Exercises Watermark (an 'award winning' coastal flooding exercise), Georgiana (major transport accident) and Lazarus (a coastal flood recovery exercise, conducted just one month before the surge). The value of strong relationships between partners at all levels, the 'socialisation' of response & recovery processes through regular training and exercising, and the colocation of SCG, TCG and all command support functions in the CEC remain key strengths of Lincolnshire's Resilience Forum.

Lessons learned from exercises and the response to St Jude storm were applied during this response and recovery, including the better articulation of objectives and critical decision-making, and representation from non-county based organisations, all

supported by better use of technology, teleconference protocols and comprehensive audio recording of all SCG meetings.

Coordination between local providers, Public Health, Public Health England and NHS England, appears to have worked well following on-going work to define roles and responsibilities. This included initial representation by senior managers from Clinical Commissioning Group (CCG), EMAS and Public Health during the early phases with wider, national coordination and reporting through NHS England. As the threat increased a health command support cell (later combined, as 'good practice' as a 'health & social care' cell) provided scoping of threats to NHS premises, identification of vulnerable people, deployment of GPs to the evacuation centres, and dynamic problem solving (*e.g*. business continuity planning for flooding to Boston Pilgrim Hospital and A&E, and liaison with Police re allowing access through cordons to staff and ambulances). PHE supported the response and recovery through proactive public health messages and monitoring of health effects through routine surveillance.

An early decision for the three coastal districts' strategic and tactical representatives to operate remotely from the CEC minimised the impact on their own resilience and allowed them to remain within affected communities. Mutual aid amongst the districts, including from unaffected inland districts, was managed by local agreement by Boston BC. Mostly, these arrangements appear to have worked well with offers of support and good cooperation between waste management and customer contact services. But there were also examples of poor communication flow causing frustration for Boston BC (at a tactical level) and for inland districts desirous of situation updates or clarity re mutual aid arrangements. Again, a secure web-based information-sharing platform and extended telephone & video-conferencing facilities within the TCG are required to resolve these issues.

This was a particular problem for West Lindsey who, although they had received the LRF notifications and activated their own incident team, felt they experienced a lack of communication from the bordering EA Area (Midlands) and with the CEC.

The SCG was very well led and generally well resourced, with good participation from all relevant responders. Clear strategic 'common objectives' were set and managed throughout the response, and the declaration of an 'Emergency' was appropriately made at 11.05am on the 5th, when the probable impacts of the surge became clear. Observations have been made (both during debriefs and previous exercises) as to the potential value of selecting Chairs for both SCG and TCG meetings who are not also their own organisational 'Gold' commander.

The 'command support functions' (specific thematic cells appropriate to each emergency) and the role of 'command support manager' (CSM) continue to perform well. However, this event more than any previous exercise, has demonstrated the need for the lead command support roles (TCG Chair, CSM and Cell Chairs) to focus on ensuring effective communication within the CEC, and the development of the Common Operating Picture (COP). Command support cell members felt the CSM should not be abstracted to brief SCG (this can be done by TCG chair alone), and that a regular 'CEC' briefing slot would ensure more coherent implementation of SCG decisions. This point was well illustrated by an apparent delay in initiating the decision made to evacuate 'at risk' areas in Boston on Thursday afternoon. A specific 'one-off' whole-room announcement was required to resolve confusion about whether the order had been given.

The failure to display a shared 'live incident log' (normally arranged, maintained and displayed within the CEC) was commented upon by most partners. This was an

oversight at the activation phase, compounded by pressures on JEMS and Business Support staffing.

Better appreciation of the cultural differences and operating styles of emergency and non-emergency services should be a 'learning outcome' for future training and exercising for command support functions. A broader understanding of the purpose of the more dynamic 'bird table' meetings (attended by TCG and Cell Chairs) and specific Cell Chair training needs, were identified by partners in debriefs. Ensuring effective communication within the CEC and between the various cells remains a challenge. A number of partners commented on a tendency by Police to take unilateral action and not always consult with other subject matter experts.

The County Council's GIS mapping system was used throughout the response (and recovery), allowing partners to interrogate the various infrastructure layers for 'at risk' areas (based on EA flood warning zones) including site specific risk information, bridges, utility assets, and also vulnerable premises such as care homes. As the event unfolded attempts were made to capture the flooding extent, road closures and key deployments (including the helicopter landing site) and to generate the COP. Post event, GIS mapping from geo-coding was also used to analyse the impacts from the flood and used extensively during the recovery phase.

The mapping facility is vital and needs further development by the partnership. In particular, direct access to EA hazard mapping, improvements to vulnerable people data compatibility and rotation of qualified staff. A secure mechanism to share mapping with operational resources is also critical. However, there are significant technology issues to overcome first (*e.g.* data format and security and storage capacity).

Probably the most common learning point raised by almost all partners was the welfare & resilience of staff in all roles (CEC and operational) throughout the emergency. For a variety of reasons, the most common of which was individual dedication, responders worked incredibly hard but also over extended hours, some exceeding safe working periods. All partners will be asked to urgently review their call-out, welfare monitoring and rotation arrangements.

This may require further negotiations amongst local authorities in particular in respect of mutual aid (especially at 'command' levels) and contractual issues. In addition, JEMS will explore options for welfare & refreshment breaks to be taken off-site, and for a formal 'booking-in' process in the CEC which will remind strategic leads and staff of relevant 'duty of care' issues.

Strengths & Areas for Improvement – Local co-ordination, *etc*

- **Strength:** Local partner relationships and familiarity of LRF processes through training & exercising
- **Strength:** The early activation of an effective LRF response, maximising the time available to achieve clear strategic objectives set by a well-led SCG
- **Strength:** The ability of partners to cope with this event at the same time as the Lincoln Christmas Market
- **Strength:** East Coast Flood Group Response & Recovery Framework and

local Coastal Flood planning

- **Strength:** Effective escalation of coordination early on 5th December leading to the clear and timely declaration of an 'emergency', (as defined by the CCA[12]).

- **Strength:** The Memorandum of Understanding (MOU) between the LRF and Voluntary Sector for effective coordination during emergencies

- **Strength:** The ability to collocate all multi-agency coordination functions, and general facilities at, the CEC (including effective business continuity arrangements tested during the power cut)

- **Areas for Improvement:** Welfare and 'duty of care' of all responders, including rotation of shifts (at all levels)

- **Areas for Improvement:** For all future wide-area or coastal flooding events, consider including representation of all local authorities at SCG to ensure effective communication and coordination of mutual aid

- **Area for Improvement:** Secure web-based information-sharing platform for all partners (including GIS mapping), and extending teleconference facilities in TCG to improve partnership communication and coordination

- **Area for improvement:** Better understanding of the cultural differences, and operating styles of emergency and non-emergency services should be a 'learning outcome' for future training and exercising of the CSM and command support functions.

- **Area for improvement**: Interoperability and multi-agency Bronze (operational) training (already identified during Exercise Georgiana).

Theme 4: Achieving common objectives & response strategies

A central issue for the partnership is whether we achieved the common objectives set for the multi-agency coordinated response, and the effectiveness of three pre-planned strategies in doing so.

From the 'precautionary phase', the SCG agreed a number of objectives for the response:

- Save and protect human life
- Minimise human suffering
- Protect health & safety of responding personnel
- Provide public & businesses with warnings, advice & information (with an emphasis on diverse language needs within affected communities)
- Maintain critical activities and infrastructure
- Work effectively as a partnership
- Facilitate recovery (if required)

[12] Civil Contingencies Act, 2004

- Protection of property

As a result of pre-planning at national and local levels for East Coast flooding, three key strategies designed to achieve these objectives were implemented:

- Pre-deployment of assets
- Removing people from danger
- Protecting the infrastructure and essential services

We were **better protected** than we've ever been. By and large the sea defences did their job, having been severely tested, protecting 103,000 homes and businesses, and 220,200 hectares of land from flooding. Until the LLFA flood investigation is complete, it is difficult to say whether any more could have been done to protect or mitigate flood impacts on the 720+ households and businesses that did suffer flooding. A clear and early policy decision taken by Boston BC not to deploy sandbags to homes in Boston was supported by partners as working against the priority objectives of evacuation.

We were certainly **better prepared** and were able to 'get ahead' of this storm through three key strategies:

- We pre-deployed sufficient responders and equipment to support the largest operation (including the ability to rescue people) conducted in recent decades. This included the 'multi-agency surge task forces' – flexible response model for all severe weather.
- Removing people from danger. This ranged from timely public safety and flood warning messages, to road closures and the potential evacuation of up to 18,000 properties. In the end, and within a very limited time 'available', we achieved a safe preventive evacuation of 203 people within the properties at immediate risk from flooding in Boston and elsewhere. The emergency evacuation operation, based on two 'super' rest centres, gave us the capacity for >2,000 evacuees, with neighbouring counties on stand-by to assist with further numbers had that been necessary. Considerable investment in our flood rescue capability increased our ability to deploy sufficient teams to both task forces, supplemented through agreed national asset coordination. As per local agreement, FRS took the lead in coordinating flood rescue operations. These operations were effective in removing people from flooded properties.
- Protecting the infrastructure, including the ability to manage the flood defences and other assets important to the way we manage flood risk, to secure utilities, and threats to the Port of Boston, Boston Pilgrim Hospital and HMP North Sea Camp. We also had to deal with a major power cut at the height of the response operations impacting on both the CEC and Lincoln Christmas Market.

Households, businesses and key partners were **better informed**, with more than 30,300 receiving flood warnings direct from the EA (includes 60% of affected areas of Boston), supported by the proactive use of social media[13] (used proactively for the first time during an emergency in the county) and a key role (unique to Lincolnshire) played by BBC Radio Lincolnshire who were embedded in the County Emergency

[13] There were 9,687 unique visitors to the LRF webpages (hosted on LCC's website) during 5th and 6th December 2013. This compares with previous total visits between 1st Jan and 30th September 2013 equalling 4,760. It is believed partners directly reached 26,000 twitter accounts during the surge events, with LCC Facebook page also receiving 500 'likes'.

Centre (working with the 'warning & informing' command support cell). During this emergency we also welcomed a local community radio station LincsFM into the CEC. Translation services and interpreters were used to communicate key messages to residents whose first language is not English (a significant issue in the 'at risk' areas).

Most people followed the advice and warnings. However, too many did not, and were reckless with their own safety (and potentially that of responders) by insisting on visiting potential flood areas (a scene repeated throughout the UK).

Evacuation operations:

A total of 203 residents from 78 households within the flood warning areas were registered as receiving assistance during the evacuation operation. Evacuees came from a wide range of single occupancy and multiple occupancy households, the highest occupancy level being 9 people from the same address. This represents 13.5% of the 577 residential properties that flooded, roughly matching initial planning assumptions that 15% of affected households would require assistance. Reports suggest 44 people and 2 pets were rescued from flooded areas in the immediate aftermath of the flooding.

Numerous people self-evacuated. We do not know at this point how many additional people remained 'in-situ', although there is anecdotal evidence that some people ignored the flood warnings. We believe there would be value in follow-up research to establish these additional figures before being able to fully assess the effectiveness of the warning & informing and evacuation operations.

The emergency evacuation operation was well managed through the Evacuation and Health & Social Care command support cells, assisted by LCC Procurement and Transport Officers and the Voluntary Sector. An effective transport operation, supported by early closure of some schools and a good response from local transport companies, released sufficient coaches and taxis. A total of 30 coaches were available over the two days to support evacuation and shuttle operations.

An initial evacuation hub (assessment centre) established at Boston's Princess Royal Sports Arena (PRSA), supported by two large-scale evacuation centres at Caythorpe Court (PGL), and Prince William of Gloucester Barracks (Grantham) provided excellent facilities and sufficient capacity for the operation, initially scoped for 600 evacuees. In accordance with national agreement with MOD, the barracks were identified as a 'last resort' option and closed as soon as it became clear evacuee numbers would not be excessive. In hindsight, planners questioned whether it might be better to use one centre as a primary site, whilst preparing a secondary site as 'stand-by'.

The mobilisation of GPs and volunteers to assist with medical needs, evacuee registration and welfare support worked well, as did our procurement arrangements which quickly sourced sufficient bedding, clothing, food and even extra toilet facilities. In these times of constraint where we no longer have the luxury of stockpiling equipment to support such operations, this was a vital first test of a developing 'emergency procurement framework' managed by Lincolnshire County Council.

This also links into effective and early contact with care providers by Adult Care Contract management team ensured suitable arrangements at residential care homes and domiciliary care (including moving people in care needing specialist

equipment to an alternative location where 10 intermediate care beds were available).

Pleasingly, responders have also reported on positive experiences with help from members of the public and local businesses at the PRSA evacuation hub at Boston, and a temporary evacuation centre established at Stickney to support evacuees with specific medication support needs. This ranged from people giving up their bookings at PRSA, to schools and ASDA donating food, and a local vendor offering to cook for free. The PRSA centre eventually closed on the Thursday evening when the potential for wider flooding impacting on safe access became clear.

Liaison between the evacuation cell in the CEC and both PGL and PWOG worked well, with the sites adopting a 'can do' approach to most of the challenges thrown at them. Staff at both PGL and PWOG reported positive experiences working with responders and volunteers. However, due to resourcing difficulties and a lack of local agreement, a single senior emergency planning officer from JEMS attempted to manage across both sites assisted by other team members, a resource deployed by South Kesteven District Council, and colleagues from Northamptonshire. Together with some confusion and duplication within the evacuee registration and tracking processes, these are policy issues we must address as a matter of urgency.

LCC will work with PGL to understand future opportunities to use the site as an evacuation centre. As a commercial operation, they have expressed a clear preference for their own staff to manage evacuees, with liaison and support offered through a smaller number of responders. Given the nature of the site this makes absolute sense and reduces the burden on responding agencies.

Evacuees were also well supported with transportation to view their flooded homes on the Friday, with on-going support and alternative accommodation being provided where requested (again the Procurement team worked well with Boston BC to ensure everyone evacuated had either returned to their homes by choice, or had been provided with alternative accommodation, mainly hotel based, by the end of Friday 6th).

Supporting vulnerable people is dependent upon good information sharing and clear advice to responders engaged in evacuation warning 'door knocking' as to how assistance, where required, can be provided.

Planners were able to access data from some health and social care sources and, to a more limited degree, from utility companies. However, there are still gaps in our ability to support vulnerable people through other data holders, such as social housing providers & housing associations, and home care providers. Whilst there is evidence of good support for evacuees, both in leaving the area and at the evacuation centres, this should be balanced by feedback from some individuals who felt they were left to their own devices. The evacuation process debrief also identified the need to clarify access to prescribed drug treatment and mental health service support within generic evacuation centres.

Strengths & Areas for Improvement – Achieving objectives

- **Strength:** The LRF proved its ability to coordinate a multi-agency response to a coastal surge (largest risk to Lincolnshire) designed to meet a defined set of common objectives

- **Strength:** The 3 x pre-planned key strategies for East Coast Flooding were also proved
- **Strength:** The concept of multi-agency task forces able to deploy flexibly to developing scenarios worked well, and provides a good model for any severe weather emergency
- **Strength:** Investment in flood rescue boat capability and coordinating role of FRS
- **Strength:** mutual aid arrangements amongst emergency and non-emergency service partners, especially specialist national assets such as flood rescue and police BDUs, and local authority arrangements at district level
- **Strength:** Evacuation and Health & Social Care command support cells worked well
- **Strength:** Emergency evacuation operation worked well;
- **Strength:** LCC 'emergency procurement framework'
- **Area for Improvement:** Failure to prevent sightseer's / effective cordons / more proactive approach to safety
- **Area for improvement:** Support offered to VP/elderly who needed help to evacuate
- **Area for improvement:** Evacuation centre management responsibilities (including PGL preference for using own staffing and managers) and communications / coordination between responders and volunteers – and back to CEC
- **Area for improvement:** Provision of mental health support at evacuation centres needs clarifying

Theme 5: Recovery

In line with established guidance, the SCG started to consider initial community recovery as early as 7am on the morning of Friday 6th once it was confirmed the morning's high tide would be lower than the previous evening, and would be led by Boston Borough Council. However recovery planning was deflected by the threat of secondary flooding from the Wyberton breach.

By the time this threat had been dealt with the decision was made to declare the emergency over, stand down the command support cells, and close the CEC at midnight. Although the SCG reconvened the next morning to complete the formal hand-over at 10am, the command support cells were not required to reconvene or complete a formal handover of information collated during response. This was a mistake. A better handover of information collated during response and required for recovery would have improved Boston's ability to complete initial 'impact assessments'.

The most urgent challenge for recovery was the assessment of critical structures, in particular flood defences, and affected areas (completed by LCC Highways on the Friday), immediate clean up and salvage, and completion of detailed analysis of flooded areas and identification of flooded properties. Police planners created very effective street survey and (post event) 'door knocking' operation, including occupant questionnaires. These were critical to establishing priorities for immediate assistance to affected households (and later, businesses). The operation was well supported by additional staff from Police, FRS and British Red Cross (BRC).

Thankfully, problems with standing water were minimised by what appears to have been effective drainage, and by localised pumping operations by FRS. However, the flooding created an immediate challenge of waste management, compounded by the damage caused by flooding to the town's only waste disposal site at Wyberton (included a collapsed access road). This was eventually resolved by a combination of effective mutual aid amongst local authorities and expedited repairs to the site, which was operational again within 7 days.

Most importantly, the recovery operation remained flexible and appropriate to Boston BC's operational style, and remained proportionate and appropriate to community needs.

Offers of help from the general public were overwhelming in terms of on-site attendance and donations. A lack of understanding by some, and no agreed structure to manage the convergent volunteers became a challenge in itself. The local authority is tasked with co-ordinating the volunteer effort during recovery and the British Red Cross supported the Council and emergency services. However development of a local authority structure/process/guide to improve clarity and give direction should be drafted and referenced in the LRF Memorandum of Understanding with the Voluntary Sector where appropriate.

Throughout the recovery operation, threats emerged to defences compromised by the early December surge at Slippery Gowt Lane, White Horse Lane and Jakeman's Slippage in Boston – and additionally at Gibraltar Point. These were assessed and then managed by the EA, supported by contingency planners who prepared emergency plans in the event of further flooding. This included ensuring appropriate staffing arrangements over Bank Holiday and high tide periods. All subsequent high tides passed without further incident and the actions taken by the EA to strengthen weakened defences worked well.

As with the SCG, the Recovery Coordinating Group (RCG) was well led individually by the Deputy Chief Executive and Boston BC. It was well structured and supported by partners with a clear focus on doing as much as possible to support those whose homes and businesses had flooded and getting the community back on its feet. This has been the most significant recovery operation in the county, which was fortuitously preceded by the testing of LRF Recovery Plans through Exercise Lazarus, and credit should go to the JEMS recovery lead. The recovery objectives, structures and reporting processes were clearly established by Monday 9th December. By 4th February 2014, sufficient progress had been made in achieving the recovery objectives that partners agreed the formal LRF coordination could come to an end, with remaining support to affected communities delivered by Boston BC.

Strengths & Areas for Improvement - Recovery

- **Strengths:** Work recently completed on LRF recovery planning, including Exercise Lazarus
- **Strengths:** A very effective and well-led Recovery Coordination Group (RCG) based at Boston Borough Council, supported by all partners delivering clear recovery objectives, proportionate to the needs of affected communities
- **Strengths:** Effective contingency planning for emerging threats as a result of compromised flood defences
- **Strengths:** Positive relations between Boston BC, JEMS staff and other partners quickly overcame tensions created by a less effective handover from response
- **Area for Improvement:** Transition from response to recovery phase, and in particular the collation of response data management required for impact assessments
- **Area for improvement:** The management and coordination of 'convergent' or 'emergent' volunteers (including social media community support groups)
- **Area for improvement:** The effectiveness of the LRF MOU with the Voluntary Sector for the recovery phase

5. Conclusions and recommendations

A year that started with events to mark the 60th anniversary of the 'Great Storm' of 1953 and ended with the largest coastal surge faced by partners since that date, demonstrates the value of recent contingency planning and collaborations at local, sub-national and national levels.

Due to advances in forecasting and flood prediction we were able to 'get ahead' of the storm, deploying one of the biggest multi-agency emergency response and recovery operations we have ever conducted in Lincolnshire. The subsequent flooding provided a significant test of our capabilities and capacity, and of the preparedness of affected communities. Partners must ensure we retain sufficient resilience in the county to respond to this, our most significant community risk.

We will always face a degree of uncertainty with this type of severe weather event, which demonstrates the need for further discussions about how to portray and understand this uncertainty in the context of response decision-making. It is not possible to completely defend against the power of nature. For these reasons it is vital we continuously evolve our contingency planning and apply the lessons we learn from such tests as presented in December.

It also demonstrates the need for ongoing investment in protection from flooding and vulnerability reduction. The LRF must continue its contribution to national response developments and to the county's Drainage & Flood Risk Strategy group to help influence this agenda.

Overall this was a good, forecast-led, response and recovery effort. But, we were lucky. The wind direction was predominantly 'off-shore' and less strong than in 1953, so there were less damaging wave conditions. We also did not experience the heavy rain to exacerbate conditions as has happened during subsequent storms to hit the south west of England throughout December and into early February 2014. Due to these factors, and investments in defences, this was not an event on the scale of 1953 but nonetheless, a valuable and timely reminder for contingency planners and responders.

We will now consider how best to consult on our findings and ensure lessons learned are applied, including making any necessary changes required to local coordination frameworks and policy.

David Powell
Head of the Joint Emergency Management Service
Lincolnshire County Council

March 2014

Recommendations:

1. Partners must ensure we retain sufficient capacity to deliver the capability to respond to this, our most significant, community risk.

2. The LRF should continue work with flood risk authorities to secure on-going investment in protection from flooding and vulnerability reduction.

3. The LRF should, together with colleagues from the ECFG, review the 'trigger points' for activating multi-agency responses to tidal surge threats.

4. The LRF should contribute to any review by DCLG of the multi-response SCG coordination arrangements.

5. The LRF should identify an accessible and secure web-based information-sharing platform for all partners to use during response and recovery, improve access to CCTV, and extend teleconference and audio recording facilities to TCG meetings.

6. LCC and EA should ensure flood hazard maps are available for 'live use' in the CEC, preferably in formats that are compatible with GIS systems used to create a COP.

7. The LRF should ensure effective liaison and communication with the EA in relation to 'cross border' flood threats from the River Trent

8. The LRF should extend the current Joint Emergency Services Interoperability Project (JESIP) and national decision model training to include non-emergency services.

9. Improve appreciation of the cultural differences and operating styles of emergency and non-emergency services (as a specific 'learning outcome' for future training and exercising).

10. The LRF should examine the benefits of selecting dedicated SCG/TCG meeting 'Chairs' (*e.g.* individuals not also performing organisation role of 'Gold' command).

11. All non-emergency partners should ensure the resilience of command, operational resources and services (including more effective mutual aid arrangements where appropriate).

12. LRF training & exercising group should expedite 'Command Support' training (to include training for command support cell chairs).

13. The welfare, 'duty of care' and shift rotation should be the specific responsibility of each responder organisation's lead 'Gold' supported by JEMS (in the CEC).

14. JEMS to explore the provision of welfare & refreshment breaks to be taken away from the CEC.

15. LRF and LLFA should expedite work to assess the High Volume Pumping capacity in the county.

16. Local authorities and BRC should clarify responsibility for the management and coordination of 'convergent' or 'emergent' volunteers.

17. The LRF should cooperate with DEFRA's convergent volunteer project (includes a proposed Boston case study).

18. LCC should review the effectiveness of the LRF MOU with the Voluntary Sector for the recovery phase of emergencies.

19. JEMS should expedite the identification of a cadre of appropriate evacuation centre managers, clarify roles and responsibilities, and complete emergency evacuation centre training.

20. JEMS should design a single evacuation registration and tracking form, available in different languages, in line with national guidance.

21. JEMS should create a single countywide Flood Victim Impact Assessment questionnaire based on learning from Boston recovery process.

22. Creation of a countywide Flood Victim Pack containing all appropriate post flooding advice (*e.g.* hygiene, disposal of contaminated goods, insurance & loss adjusting, clarification for households re electric safety checks and responsibilities, housing and financial support).

23. The LRF should consider funding for research to ascertain actions of people receiving flood warnings (*e.g.* how many self-evacuated, how many ignored warnings and reasons why).

24. Partners should work together to enhance the sharing of data to identify known vulnerable people, and improve the support available to assist such persons who may need additional help during evacuation.

References

Planning frameworks

East Coast Flood Group Emergency Response Framework, published January 2013:

HM Government Coastal Flood Group; Interim Response & Recovery Guide, published July 2013:

Organisation operational reports

NHS England

Environment Agency

Lincolnshire County Council

Voluntary Sector report (submitted by British Red Cross)

Lincolnshire Fire & Rescue Service

Lincolnshire Police

Lincolnshire Internal Drainage Boards

East Lindsey District Council

Boston Borough Council

West Lindsey District Council

Operational debrief reports

East Coast Flood Group debrief (12.12.13)

West Lindsey District Council debrief – (17.12.13)

Strategic Coordination Group debrief (20.12.13)

Command Support & Tactical debrief (20.12.13)

Evacuation process debrief (24.1.14)

Boston Recovery debrief (10.2.14)

Glossary

BDU	Beat Deployment Unit
BRC	British Red Cross
CEC	County Emergency Centre
COP	Common Operating Picture
CSM	Command Support Officer
DCLG	Department for Communities & Local Government
DEFRA	Department for Environment, Food & Rural Affairs
EA	Environment Agency
ECFG	East Coast Flood Group (England)
ECIG	East Coast Inundation Group (Lincolnshire)
ELDC	East Lindsey District Council
EMAS	East Midlands Ambulance Service
FFC	Flood Forecasting Centre
FGS	Flood Guidance Statement
FRS	Fire & Rescue Service
FWD	Flood Warning Direct
HVP	High Volume Pumping
IDB	Internal Drainage Board
JEMS	Joint Emergency Management Service
LCC	Lincolnshire County Council
LCHS	Lincolnshire Community Health Service
LRF	Local Resilience Forum
MACA	Military Assistance to Civil Authorities
MOD	Ministry of Defence
NPAS	National Police Air Service
PGL	Parents Get Lost
PHE	Public Health England
PRSA	Princess Royal Sports Arena
PWOG	Prince William of Gloucester (barracks)
SCG	Strategic Coordinating Group
SHDC	South Holland District Council
RCG	Recovery Coordinating Group
TCG	Tactical Coordinating Group
WLDC	West Lindsey District Council
WPD	Western Power Distribution