Cabinet Office

Mobile Alerting Trials: Project Report

FINAL
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Executive Summary

During emergencies alert systems can provide a crucial way of conveying important, potentially life saving information to members of the public. The Government is committed to evaluating how our existing alert systems can be improved.[1] The Cabinet Office has been working to fulfil this commitment and in February 2012 completed a trial to extend the scope of the Environment Agency's Floodline Warnings Direct service. Following consultation with emergency responders in the summer of the 2012 the Cabinet Office decided that the improvements this would provide would not justify the high cost and effort required for implementation.[2] As such it was recommended that efforts focus instead on developing a capability to issue alerts to mobile devices in defined areas instead.

In 2013 a project was launched to complete a series of trials in partnership with three of the UK's Mobile Network Operators (MNOs) and emergency responders to assess different methods of achieving this. Three different trials took place between September and November, during which 35,000 messages were sent to the public. National and local communications campaigns were held to ensure people in the participating areas were aware of the nature and purpose of the trials. This report sets out the findings of the evaluation which was conducted against three perspectives:

- Which of the **technical approaches** would provide the best solution;
- What **responders** thought about the system; how it could assist them in issuing alerts and what challenges there would be for implementation; and
- Views of **members of the public** about the efficacy of such a system and the acceptability of being targeted with alerts in this manner.

Trial Findings

The key findings from the trials are set out below with detail provided in the full project report.

Responders remain very keen to see the implementation of a national mobile alert system. A series of workshops were held to develop the '*Alert Activation Protocols'* which set out how such a system could be used on a day to day basis. The workshops proposed ideas on the scope of use, trigger points (linked to the definition of an emergency in the Civil Contingencies Act) and access to the system (based at police control rooms).

[1] Strategic Defence and Security Review (2010)

[2] www.gov.uk/government/uploads/system/uploads/attachment_data/file/85943/EFWD-report-summary.pdf

Views from the public were gathered via focus groups and an online survey. A separate UK omnibus survey was also completed. Findings suggest that **the majority of people (85%) felt that a mobile alert system was a good idea**.

Location-based SMS is the preferred solution following a detailed technology comparison using evidence obtained from the trials and consultation with the MNOs. The main reasons for this was that location-based SMS makes better use of existing MNO infrastructure (and therefore offers better value for money); and unlike Cell Broadcasting it does not require handset configuration to allow messages to be received. This was not unanimous however, with some MNOs not wishing to give a preference either way. As such, Cell Broadcasting cannot be ruled out at this stage.

Public views on 'intended compliance with advice' issued in sample alert messages was also high (81%). This suggests that the system would be an effective **way of getting people to take specific protective action during an emergency**. The content of messages would require careful attention to ensure that advice is understood and can be followed by those that receive the messages.

Whilst a significant challenge, there was consensus that it was possible to issue alerts to the public within 15 minutes of a decision being made. This timeframe is imperative for incidents involving contaminants of a Chemical, Biological or Radiation nature where seeking shelter in that time frame would significantly reduce harm impacts.

Potential future work- what we might do next

The report fulfils the Government commitment set out in the Strategic Defence and Security review (2010) to 'evaluate options for an improved public alerting system'. The investigation identified that there are gaps in the alert capability - particularly with regards to contacting a high proportion of people quickly in the vicinity of an incident. The evidence collated to date concludes that alerting people's mobile devices would achieve a step change in capability.

However, whilst the trials have answered questions about the technologies, they have also posed new ones. If Government decides to develop this capability, we would need to do the following:

1. **Run a further pilot to test location-based SMS in one urban area with all four UK networks**: to allow for further development of this capability.
2. **Further develop and test alert messages** with emergency responders and members of the public to produce guidance for responders on effective message construction to ensure compliance and action;
3. **Prototype the 'Front End' of the system:** to allow responders to easily define the alert content and target area before passing this information over to MNOs. Understanding how existing messaging applications could integrate with any solution is also of interest.

4. **Change Impact Assessment with MNOs:** Further work must be undertaken to understand effort and costs required to deliver a solution.
5. **Conduct laboratory based Cell Broadcast testing:** as Cell Broadcasting has not yet been ruled out, this would allow some small-scale work to continue whilst reducing the workload on MNOs.

There will be a number of less technical work packages that would need to be completed alongside those above. These are:

1. Agreeing a procurement and funding strategy for delivery of the system;
2. Developing responder training packages around use of the system and to raise awareness around likely public reaction;
3. Progressing work to define a 'standard alerting schema' which would allow multiple alert channels (i.e. TV, Radio, mobile) and applications to issue alert messages at the same time;
4. Scoping a public awareness campaign;
5. Continuing to review privacy issues and protection legislation with the ICO; and
6. Maintaining relationships already established with countries that have rolled out mobile based alerting systems to continue to learn from good practice.

Contents

1. Introduction

1.1 Background

The ability to warn and inform the public when responding to the wide range of disruptive challenges that the UK faces is a key component of any response. This is reflected in the statutory duty for category 1 responders in the Civil Contingencies Act (2004), "*to maintain arrangements to warn and inform the public in times of emergency*". Public alerting is one crucial part of overall public communications; timely dissemination of alert messages enables recipients to take protective action in an emergency. This project aims to enhance the way that this is currently done.

The Strategic Defence and Security Review (2010) set out the Government's commitment to 'evaluate options for an improved public alert system.' The Cabinet Office have since been working to understand where the current gaps in the UK's alerting capability are and how they could be addressed.

Since the siren system was decommissioned in the 1990s following the end of the Cold War, there has been no national alerting system in place. Current arrangements are maintained locally and make use of a wide variety of methods including 'on site' sirens (with no national link up), loudhailers and the deployment of officers to the scene. Consultation with responders[3] identified that arrangements for high hazard areas such as COMAH and REPPIR sites met requirements; however two major gaps were identified:

i. The difficulty of contacting people 'on the go.' These may be people who are travelling in the area or they may be visitors, unfamiliar with the geography and local alert systems in place.

ii. The ability to get effective messages out quickly to all those impacted, ideally within the first 15 minutes of an emergency.

We understand that no one single form of alerting will ever reach 100% of the population, and we are not seeking to replace other aspects of the wider emergency response. For any situation a variety of communications mediums must be used to reach as many people as possible. Despite this, improvements can still be made and by exploring new technologies that address the gaps now identified, it is hoped that more of the at-risk population will be immediately contactable.

1.2 Current arrangements

Existing arrangements in some areas such as sirens (commonly used on fixed hazardous sites e.g. chemical plants) may notify those in the immediate area that

[3] Civil Alerting Workshops: Summary Report, August 2012, Cabinet Office; https://www.gov.uk/resilient-communications#public-emergency-alerts

something has happened. However, often the impacted area may spread further than the siren is audible and the required action that this is meant to trigger is not understood. Other barriers to alerting noted by responders were the fast-paced changes to technologies and the impact this can have on keeping alerting processes 'up-to-date'. There are also issues around the lack of consistent approaches across differing risks in geographic areas and general public apathy plus lack of awareness about emergency preparedness.

One option considered for improving UK alerting was an expansion of the Environment Agency's Floodline Warning Direct (FWD) service, for risks other than flooding. A trial was conducted[4], using this service to target landlines in order to test how effective FWD could be for alerting residents around a high hazard area. The trial demonstrated that the system was able to deliver a high number of messages in a reasonable timeframe (5,700 within 30 minutes) and messages were well received by both the public and emergency responder recipients. In particular, the level of detail in the messages and the tone was regarded positively.

Despite these successes, it was felt that an extension of the FWD system – which automatically registers properties with landlines in pre-defined areas, would miss a significant proportion of the affected population. It was because of this that the Cabinet Office concluded an extension of the service would not provide the significant step change in capability required to warrant the necessary investment.

1.3 Future improvements

The growing reliance on mobile phones and the fact that the vast majority of people now own them (91% of the UK population)[5] makes them a highly effective way to communicate with people who may not have or be near a residential landline, or have their television or radio switched on. Sending messages via mobile phones would allow short instructions and links to further information to be relayed - unlike sirens. The Defence Science Technology Laboratory (DSTL)[6] has supported the use of mobile alerting with research studies demonstrating that it is the optimum medium for sending messages to members of the public.

Consultation with a sample of Local Resilience Forums[7] (LRFs) and colleagues in equivalent organisations within the Devolved Administrations identified that this

[4] Extended Floodlines Warning Direct Trial, May 2012, Cabinet Office; https://www.gov.uk/resilient-communications#public-emergency-alerts

[5] UK adults' Media Literacy Survey, OFCOM, 2011

[6] Defence Science Technology Laboratory, Civil Alerts Literature Review 2012

[7] Local Resilience Forums are the groups which bring together all the category 1 and 2 responders within a police force area for the purpose of facilitating co-operation in fulfilment of their duties under the Civil Contingencies Act. 'Category 1' responders are those organisations listed in Part 1 of Schedule 1 to the Civil Contingencies Act. These bodies are likely to be at the core of the response to most emergencies. As such, they are subject to the full range of civil protection duties in the Act. Category 2 responders are those listed in Part 3 of Schedule 1 to the Civil Contingencies Act. These are co-operating responders who are less likely to be involved in the heart of multi-agency planning

capability was the most widely endorsed option amongst responders as it would address the headline requirement to send messages within 15 minutes (of a decision being made to issue an alert) to all people in a defined impact area. Work so far has shown that mobile alerting has the most potential to improve current arrangements.

1.4 What makes the mobile networks suitable for alerting?

The mobile phone network is composed of a number of 'cells', typically with a mast at the centre. These cells range in size depending on where you are in the country and the population density in the area. The concept of Mobile Alerting involves the selection of a cell or cells covering the area impacted by the emergency, then sending alert messages to every active[8] handset within that area. Two approaches capable of achieving this are in use around the world, these are outlined below:

Location-based SMS: In order to successfully route a call or text to a mobile phone, the mobile phone network needs to know its approximate location. This is facilitated via a secure database managed by the mobile phone network which contains the mobile phone numbers of its customers in any given area. This option also provides the capability for location-based SMS services, whereby the operator could identify a geo-fence around a particular area and use the information about location of handsets (of its customers)to send alerts to those handsets in the specified area. As this data is stored in the mobile operator's database, it would not require people to sign up to such a service.

Cell Broadcast: Is the transmission of a text-type message that is slightly different in appearance to a standard SMS in that it is displayed on the home screen. Cell Broadcast operates on a different channel to voice and SMS (texts) and therefore this solution does not suffer from nor contribute to network congestion. Again Cell Broadcast does not require people to sign up to receive alerts, although it does require the handset to be pre-configured to receive messages.

1.5 International approaches to alerting

Internationally, alerting people via their mobile devices is recognised as a viable and useful strategy. Different approaches have been used; Australia has introduced a location-based SMS system called Emergency Alert[9] while the US[10] and the Netherlands[11] have employed cell broadcasting technologies. The UK has developed

work, but will be heavily involved in preparing for incidents affecting their sectors. Regulations made under the Act require them to co-operate and share information with other Category 1 and 2 responders.

[8] An 'active' handset is defined as a mobile device that is switched on and has cell coverage so that it is capable of receiving standard calls and text messages.

[9] http://www.emergencyalert.gov.au/

[10] Http://www.ready.gov/alerts

[11] www.nl-alert.nl

close working relationships with many international partners so that lessons learned from these implementations can be incorporated.

2. Project Management

2.1 Aims and Objectives

There are mixed views about which of the technical methods outlined in section 1.4 would provide the optimal approach to mobile alerting. As such this project was designed to test both cell broadcasting and location-based SMS and compare and contrast the two. While DSTL studies show that both approaches are capable of sending alert messages to mobile devices, until recently, this technology had not yet been tested in the UK for the purpose of alerting. As such there were some 'unknowns' about how it might work in practice. Therefore the objectives of this project were to:

- Work with the Mobile Network Operators (MNOs) and local responders (in the trial areas) to test cell broadcasting and location-based SMS in three areas.
- Conduct an evaluation of the trials to cover:
  - views of the MNOs including a technical assessment of system performance in the trial and on impact on networks, customers, machine to machine devices etc;
  - public views on alert message content, method of delivery and resulting behaviours; and
  - responder views on activation protocols, scope of the system (i.e. when it should/should not be used) and impact on existing command and control structures.
- Produce a report detailing the findings of the trials, comparing the approaches and recommending a way forward to Ministers for mobile alerting.

2.2 Scope

The project was set up to:

- Conduct three live trials in different geographic locations;
- Select areas to assist with the delivery of the trials;
- Create appropriate messages to be sent out as part of the trials; and
- Evaluate the approach.

2.2.1 Out of Scope

- Wider warning and informing policy;
- The tests were limited to the three live trial areas;
- The trials did not test the technical means of passing approved; and authorised messages from emergency responders to the mobile operators. This issue will be considered separately. It was assumed for the trials that message content and target areas were defined in advance.

2.3 Dependencies and Constraints

The following assumptions were made which were integral to the smooth running and delivery of the project:

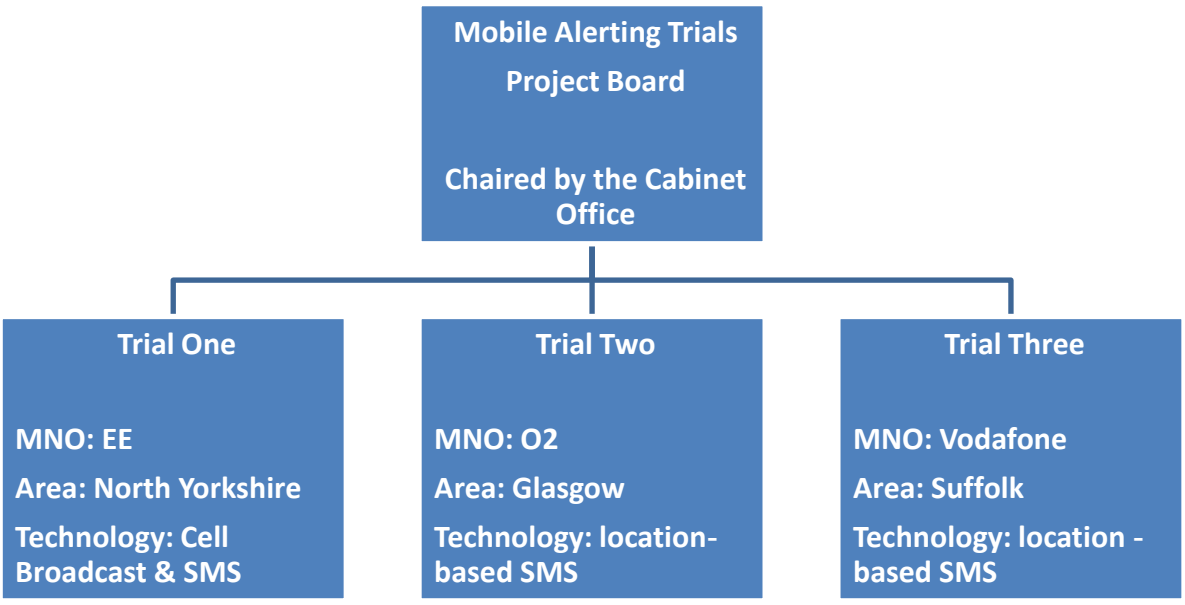
- That the entire process for sign off of key documentation by project stakeholders would take no longer than five working days (so as not to delay the timeline of the project); and
- That MNOs would need the final alert message and defined geographic area no more than two weeks before their respective live trial dates.

2.4 Resources

The project formed part of the Resilient Telecommunications Programme (RTP) of the Civil Contingencies Secretariat and complied with the project management principles set out in PRINCE2.

The Mobile Network Operators covered all costs incurred as part of the trials. A limited budget was made available to cover any communications costs for trial areas (i.e. printing of leaflets), however this was not required as the communications channels used to tell the public about the trials (social media, local websites/radio/TV) were adopted at no cost.

2.5 Governance & Structure



The project board was chaired by the SRO (Senior Responsible Owner) of the project, the Deputy Director of the Civil Contingencies Secretariat. This board met three times over the course of the project to monitor progress and ensure timeframes for delivery were being met.

3. Trial Design

3.1 Trial locations and details

The sub-sections below describe the trials conducted within each individual area. For all trials the sender of the message was configured to display as 'UKAlertTest' to distinguish it from other contacts in the individuals' handsets. Across all trials, messages would have been received by customers of Mobile Virtual Network Operators[12] in the areas impacted. A decision was also made not to send trial messages to international roamers.

3.1.1 Trial One: North Yorkshire

The first trial held on the 18th September 2013 paired the MNO EE with North Yorkshire LRF and tested Cell Broadcasting across the 2G network in the vicinity of the Emergency Planning College (EPC). Whilst the public network was utilised, EE believed that message recipients were limited to those who had been issued with handsets specially configured to receive the messages. A total of 26 handsets were distributed to volunteers at the EPC who were asked to note down when and what messages they received. A series of standard SMS messages were also sent to a pre-defined list of numbers to simulate the impact of a large number of messages being sent in a localised area. The timeline below sets out the activities undertaken:

Serial	Time	Trial activity description
1	12:00	Team gathers at EPC trial site for pre trial brief.
2	13:00	Trial begins, first cell broadcast message sent.
3	13:15	Second cell broadcast message sent.
4	13:30	Third cell broadcast message sent.
5	13:45	Last cell broadcast message sent.
6	14:00	First SMS message sent.
7	14:15	Second SMS message sent.
8	14:30	Third SMS message sent.
9	14:45	Fourth SMS message sent.
10	15:00	END OF TRIAL.

[12] Mobile Virtual Network Operators are a communications service provider that does not own the wireless network infrastructure over which it provides its services. Instead an MVNO enters into a business agreement with a MNO to buy access to their network services. MVNO's then use their own customer service, billing, marketing and sales systems. Examples of MVNOs include Tesco mobile (who use O2's network), Virgin mobile (who use EE's network) and Talkmobile (who use Vodafone's network).

The following messages were sent as part of the trial:

Message no	Message content (both Cell broadcast and SMS)
1	North Yorks UkAlertTest. Test 1 of 4. No Action Required www.emergencynorthyorks.gov.uk
2	North Yorks UkAlertTest. Test 2 of 4. No Action Required www.emergencynorthyorks.gov.uk
3	North Yorks UkAlertTest. Test 3 of 4. No Action Required www.emergencynorthyorks.gov.uk
4	North Yorks UkAlertTest. Test 4 of 4. No Action Required www.emergencynorthyorks.gov.uk for more info END OF TRIAL

3.1.2 Trial Two: Glasgow

The trial in Glasgow, held on 3rd October 2013 paired the MNO O2 Telefónica with Glasgow City Council. The trial location was defined using zones selected from the city centre's evacuation plan. The trial used a location-based SMS technology already present within the O2 Telefónica network.

Message recipients included customers of the O2 Telefónica network in the trial area at the time of sending and customers of the O2 Telefónica network who had travelled through the trial area but due to inactivity on the mobile network since were still believed to be in the trial area. The table below sets out the timetable of events:

Serial	Time	Trial activity description
1	11:00-11:30	Trial team gathers at the Glasgow City Chambers.
2	12:00-13:00	Trial pre-brief & final preparations.
4	14:00	Trial begins, first message sent to all message recipients.
6	16:00	Second trial message sent.
7	16:15-17:15	Responder workshop
8	18:00	Third trial message sent.
9	18:30	End of Trial.

The following messages were sent as part of the trial:

Message no	Message content
1	We are conducting a trial of civil alert systems. You may receive messages over the next two hours, but you should not be alarmed. www.glasgow.gov.uk
2	We are conducting a trial of civil alert systems. Do not be alarmed. Give us your views: www.hpa-surveys.org.uk/TakeSurvey.aspx?SurveyID=Glasgow

3	We have been conducting a trial of civil alert systems, which is now complete. Share your views: www.hpa-surveys.org.uk/TakeSurvey.aspx?SurveyID=Glasgow

3.1.3 Trial Three: Suffolk

The third and final trial was held in Suffolk on the 20th November 2013 in partnership with Vodafone, again using a location-based SMS technology. A message was initially sent to the area around Leiston with a second message sent to a larger area that was extended to include Saxmundham. This was to simulate an emergency scenario where the area to be alerted needed to be increased. The timeline of activities is presented below:

Serial	Time	Trial activity description
1	09:00	Trial lead confirms 'trial go ahead' with Vodafone.
2	10:00	Cabinet Office colleagues arrive in Ipswich and proceed to trial area.
2	10:30	Trial pre-brief.
2	11:00	Trial begins, first proxy message sent to initial zone.
3	15:00	Second message sent out to larger zone
4	16:30	Third message sent out to all. Trial close.

The following messages were sent as part of the trial:

Message no	Message content
1	We are testing our ability to communicate to you in an emergency. There is no emergency now. Visit this link for more info www.suffolk.gov.uk/SMS1
2	We are testing our ability to communicate to you in an emergency. There is no emergency now. Visit this link for more info www.suffolk.gov.uk/SMS1
3	We are testing our ability to communicate to you in an emergency. There is no emergency now. Visit this link for more info www.suffolk.gov.uk/SMS1 Thank you for your support - to link direct to the survey visit https://www.hpa-surveys.org.uk/TakeSurvey.aspx?SurveyID=Suffolk

Each time a new message was sent, any existing messages within the device's inbox was overwritten to stop the subscriber from seeing more than one message. The aim here was to replicate a potential emergency situation where responders may only want the most up to date information or alert to be seen.

3.2 Evaluation Methodology

The trials focussed on understanding the views and implications for three main stakeholder groups – the mobile network operators, emergency responders and the public. An evaluation strategy was developed and agreed between all parties to ensure appropriate data and information was collected. The scope and areas of interest against these three strands are set out below.

3.2.1 Strand one - The Mobile Network Operators:

This strand comprised two aspects: the technical performance of each trial and the views of Mobile Network Operators (MNOs) on the potential technology including impact on their network, management of customer relationships and any other points or concerns. Each operator was asked to consider:

- Trial methodology: including an explanation of the technology used, how it might work across other networks and with other forms of current messaging technologies.
- An assessment of the technology including performance against the criteria of an effective alert system: speed, geo-targeting, automatic registration, intrusive, inclusivity, receipting, security and resilience[13].
- Trial performance data including (where possible): speed of message delivery, time from alert approval to sending of message, number of messages sent, received, acknowledged, plus times and numbers of send attempts to the nearest second.
- Detail on handset behaviour during the trial including actual or simulated performance when operating under ACCOLC[14] conditions and at peak capacity.
- The high-level architecture and ballpark costs for potential national roll out.
- Comments on how third party user interfaces might securely link with the system to enable responders to send alert messages.
- Any risks and issues with this approach.
- Details on whether it would be possible for users to opt out of receiving alert messages.

3.2.2 Strand two - Emergency Responders:

Capturing the requirements and views of emergency responders was very important as they would be responsible for issuing emergency alerts. A workshop was held with representatives from emergency responders in each trial area to understand how a future system might work alongside existing alert tools, the challenges and

[13] Full list can be found at: www.gov.uk/resilient-communications#public-emeregency-alerts
[14] ACCOLC – or ACcess Class OverLoad Control – is used by the United Kingdom as part of the Mobile Telecommunications Privileged Access Scheme. See https://www.gov.uk/resilient-communications#privileged-access-schemes for further information.

risks for future roll out and when such a system could be deployed. A semi-structured interview approach was adopted, included at **Annex A**.

3.2.3 Strand three - The public

The views of the public formed the third part of the evaluation. This strand was designed to assess:

- views on the acceptability of being alerted in this manner;
- the content of alert messages and methods of receiving alerts;
- message recall and comprehension of message instructions;
- the effectiveness of any pre-trial communications;
- any diversity implications including the impact on vulnerable people; and
- how alert message content and delivery could impact resulting behaviours.

These aims were achieved through three different approaches:

a. **Online survey**: a link was disseminated via local communications and trial messages to invite interested parties to complete a survey. A total of 445 responses were received with a reasonable spread of demographic groups.

b. **Focus groups**: were held in each of the trial areas to probe views and experiences in greater detail. A total of 102 participants across 17 focus groups contributed their thoughts. The data from this was then transcribed and analysed using inductive thematic analysis.

c. **UK wide (omnibus) survey**: a 1,000 respondent representative survey was completed testing hypotheses developed following analysis from parts a) and b) above.

Parts a) and b) of this strand was undertaken by the Behavioural Sciences team in Public Health England who have extensive experience in the field of emergency communications with the public. Part c) was undertaken by an external market research company, with input from the Public Health England team.

3.2.4 Evaluation Workshop

All project stakeholders were invited to attend an ‘Evaluation Workshop’ held at the Cabinet Office in January 2014. This workshop provided an opportunity for the results from each trial to be presented and for attendees to discuss and validate the emerging conclusions.

4. Trial Results

4.1 Trial One: North Yorkshire

As explained in section 3.1.1, EE supplied 26 handsets that had been configured to receive the Cell Broadcast message sent for the trials. This sample comprised of different models and makes to ensure a wide range were tested. These handsets responded to receipt of messages in a variable way. Some made an audible noise, others did not. A few handsets displayed the message similar to a text message within an inbox, whilst others displayed on the phone's home screen. These findings correlated with previous studies undertaken by the Cabinet Office, and other Governments' experiences internationally. Trial volunteers reported that this would be unacceptable for a future alert system and that a consistent user experience should be secured.

Undertaking both SMS and Cell Broadcast trials enabled comparison of the impacts each technology had on the networks. Results indicated that there was a small increase in the delays to securing radio resources to undertake usual network behaviour whilst SMS messages were being transmitted. No delay in the receipt of Cell Broadcast messages was observed.

Analysis of the movement of EE customers in the trial area was also undertaken. This identified that between 13:00 and 14:00 hours on the day a total of 267 subscribers were in the area at the time. Between 14:00 and 15:00 hours this number was 271; including 106, or 40%, that were in the location over the two-hour period. This figure may have been artificially increased by the presence of the additional test handsets.

4.1.1 ACCOLC findings

Early testing indicated that ACCOLC (Access Overload Control, or as it is now more commonly known, invocation of the Mobile Telephone Privileged Access Scheme-MTPAS) can prevent the reception of SMS for 'barred' SIMs but not the reception of Cell Broadcast messages. This was confirmed by EE based on the test cases below. Location updates were completed in advance of Access Class restrictions being in place.

Handset	Test 1 All ACC class allowed on Cell 309170		Test 2 Barring of ACC class 0-9 ACC class 10-15 allowed		Test 3 Barring of all ACC class	
	SMS	**CB**	**SMS**	**CB**	**SMS**	**CB**
Handset One: Nokia 6120c1- **SIM ACC 15**	Message received	Message received	Message received	Message received	**Message failed**	Message received
Handset Two: Samsung Galaxy S4 – **SIM ACC 0-9**	Message received	Message received	**Message failed**	Message received	**Message failed**	Message received

4.2 Trial Two: Glasgow

The trial in Glasgow was the largest undertaken, reflecting the high daytime population in the city centre. The following numbers of messages were sent:

	Time	Number of SMS
First message	14:00	5,342
Second message	16:00	8,329
Stand down sent	18:00	11,084
TOTAL		24,755

Only 2,230, or 42%, of those who received the first message also received the second highlighting the transient population flow in that area of the city. The table below presents how these were staggered over time.

Time	Delivered	Expired	Rejected	Submitted
14:00 - 15:00	2,116	1,164	5	3,373
15:00 -16:00	1,183	503	4	1,761
16:00 – 17:00	2,520	1,461	7	4,113
17:00 – 18:00	2,914	1,371	11	4,430
18:00 – 19:00	5,936	2,910	16	8,974
19:00 – 20:00	1,706	844	5	2,620
TOTAL	**16,375**	**8,253**	**48**	

The expired and rejected columns relate to incidents where the message validity period was exceeded (60 minutes) or rejected for some other reason. Timings may have been staggered which is why the delivered, expired and rejected columns for each row do not equal the number of messages submitted. For example a message may have been submitted at 14:58 but delivered at 15:03.

4.3 Trial Three: Suffolk

The trial in Suffolk was the second largest trial in terms of messages sent and the largest in terms of the trial area covered:

Time	Messages sent	Delivered <10 seconds	Delivered between 10 & 30 seconds	Delivered >10 minutes
11:00	665	1%	0%	79%
15:00	2,740	82%	7%	6%
16:30	5,041	48%	39%	7%
Failed	719	N/a	N/a	N/a
TOTAL	**9,165**	**N/a**	**N/a**	**N/a**

Almost eight out of ten (79%) of the messages sent at 11:00 were not delivered for over 1 hour. This was due to human error rather than failure of the system, see below. This highlights the risk of having a system that is not fully automated. Aside from this anomaly, the system sent messages out quickly with the majority of messages at 15:00 (82%) and at 16:30 (48%) delivered to handsets in less than 10 seconds. All failures recorded (719) were caused by one of two error types:

- Message expired before being delivered (greater than one hour) possibly because the handset was turned off.
- Tele-Service Not Supported. This was where the device was not able to receive SMS. For instance it may be a Mobile Broadband dongle, a data only SIM in something like a tablet or other device where the subscriber has specifically requested SMS to be barred.

5. Emergency responder evaluation

In order to gather views from emergency responders, workshops were held in each trial area (as set out in section 3.2.2). The same questions were posed at each session and the responses obtained were on the whole, very similar. This indicates a consensus over the three trial areas about how a potential system could work in future. The main points from all workshops are summarised below.

5.1 The scenarios where an alert system could be used

Responders discussed a number of different incidents where mobile alerting could benefit the response. These were wide ranging and included: flooding, air quality incidents, severe weather, explosions, large scale plumes, 'major incidents' or situations requiring evacuation.

Responders agreed that the system would lose its impact if it was used too regularly. It was agreed for example that communications for incidents such as lower level disorder would be dealt with using other channels. It was also felt that the system must not be used for providing general information about emergencies or for reminders of payment for council tax, school closures etc.

There was agreement that the system should only be used in serious situations for example where there is threat to life, risk of harm, or where there is an opportunity for people to take some form of protective action. It was also agreed that the decision on when to use the system should be made locally, as long as this could be justified against a set of agreed 'criteria for use' which should be defined nationally for consistency.

5.2 Who would activate the system?

There was a consensus that the Police would be best placed to activate a mobile alert system. This was due to the 24/7 availability of the command and control room, as well as the fact that in most situations the Police will be responsible for coordination. Responders commented that the other blue light services and all other relevant responder organisations should be made aware if an alert was sent to the public so that public communications could be aligned.

5.3 How would the public be informed about the system?

If a mobile alerting system were to be rolled out, it was felt that a national communications campaign should be used to make members of the public aware of the system. The aim of that campaign would be to promote trust in the system and to convey information about what the public should do if they were to receive a message. A nationally led approach supplemented by local activity as necessary was seen as the most sensible approach.

5.4 Integration with existing warning and informing plans

Responders agreed that it would be fairly straightforward to introduce a new alert capability and that both multi and single-agency plans would need to be updated to reflect adoption of the system. Responders thought that the system would be well adopted if it were written into existing plans. The point was made that the system would not replace existing alert capabilities such as on site sirens but rather would enhance what is currently available to responders.

5.5 Managing public enquiries, caused by the alerts

There were various suggestions about how public enquires should be dealt with. Colleagues in North Yorkshire suggested directing people towards a centrally managed national webpage containing current alert information. Colleagues in Glasgow and Suffolk felt alert message recipients should be pushed to local websites. The need to have up-to-date information on the site was seen as critical, however if alert messages were being sent within 15 minutes of an incident occurring, getting detailed information online would be very difficult. Suggestions to combat this included using ‘dark pages’ with general pre-prepared advice that could be quickly tailored depending on the nature of the incident. Posting the message online may be useful to those who wished to verify the message using a different source. Potential use of help lines was also raised however the difficulties of resourcing this within very tight timeframes were recognised.

5.6 Training needs if the system were to be rolled out nationally

Responders agreed that the user interface for the system must be intuitive and simple. Given the nature of the communications being sent, it was argued that staff with authority to access the system should be required to undertake mandatory training before use. It was felt that the system should be tested and validated at least once a year and that responder training should be refreshed at least every six months.

5.7 Use of alert message templates within the system

It was agreed that the use of message templates would aid responders in drafting alerts. Some felt that templates would provide a useful guide of what to include whereas others felt there should be ‘drop down’ options to limit the extent to which messages could be written with free text. This would help with composing messages ‘on the fly’ particularly within tight timeframes and with the character limits of Cell Broadcast (93 characters) and SMS (160 characters). It was agreed that message content should be simple and that a signpost to where further information could be found should be included. Some responders raised concerns that members of the public could panic if messages were unclear. There was also a concern that members of the public would dial 999 upon receiving a message, and that message

content should dissuade this. It is worth noting that none of the focus group participants involved in the evaluation process indicated that they would dial 999 upon receiving an emergency alert.

5.8 Any other comments to add on alert activation protocols?

Responders were asked to raise any other views that they thought needed further exploration. The following points were made:

- Responders were keen to understand any associated costs that the introduction of an alert system would bring. It was felt that the system should be provided at zero cost to responders.
- For Cell Broadcast, activation and correct configuration of handsets by the public was seen as a barrier.
- The timeline from pushing the button to messages being delivered must be short (15 minutes) to meet the aims of the system.
- The system should be capable of linking up to other alerting systems – e.g. Police DIRECT and the Environment Agency's Floodline Warnings Direct.
- Some colleagues commented on the resilience of the mobile networks and asked whether the networks were capable of handling the delivery of a high number of alert messages.

5.9 Exercise Transmit

As well as canvassing views from responders in the three trial areas, the Cabinet Office also gathered thoughts from Lewisham Borough Resilience Forum.

An exercise was completed in the London Borough of Lewisham to enable the project team to collect views from a variety of different organisations within the borough on mobile alerting. Many of the points reinforced comments already made through our other consultations. In addition, the following points were made:

- There were concerns that members of the public may not understand what is meant by 'take shelter' or 'evacuate now'. Messages must be crystal clear if they require people to take action.
- Issuing 'stand down' messages would be important as it was believed this would be expected by the public.
- Protocols for how alerts will be sent for cross border incidents (of different Local Authorities) must be agreed in advance.
- If social media can be used to track public sentiment about alert messages that have been sent, that could be used to influence the content and tone of follow up messages.
- Mobile alerting may not be the best way to contact vulnerable members of the public, so existing arrangements for contacting these groups should continue.

5.10 Key Benefits

Responders were asked to summarise what benefits they felt a future mobile alert system could bring. They stated that this capability could:

- Allow positive steps to be taken by the public: in incidents where taking individual protective action is of paramount importance. This could provide a very useful way of getting high level information to those impacted by an incident.
- Provide responders with a way to target people 'on the move' away from other alert capabilities that might not reach them (e.g. landline telephones, TVs).
- Be used to enhance existing alerting capabilities and communications plans.
- Provide a quick and direct way of reaching a large number of people.

6. Views from the Public

6.1 Public Health England: Qualitative Findings

Focus group participants and survey respondents were strongly in favour of a mobile alerting system for emergencies, but identified a number of important issues that would need to be addressed if such a system was to be implemented.

Firstly, emergency text messages should be supplemented with other reliable information from sources that people already know and trust. Vulnerability of a mobile alerting system to misuse could undermine its credibility, and real emergency messages would need to be clearly distinguishable from 'spam' messages. Reference to the unfolding incident should be communicated in messages to avoid confusion, allowing recipients to assess the risk and comply with the advice given.

Messages should be action-focused, but avoid confusion as to which action to take. The mobile alerting system should not be used too frequently and only for the most serious of emergencies, or recipients may become complacent. The implementation of a mobile alerting system should be accompanied by a wide-spread communications campaign to raise awareness of the system and its use, which would increase the chances of messages being trusted and message recipients complying with advice.

6.1.1 Research themes

Whilst there is broad public and professional support for the use of mobile alerting in emergencies, further work is needed to develop message content and advice, build trust and credibility in the messages and their source, and to raise public awareness of mobile alerting to ensure that when messages are received they are understood and they encourage appropriate protective actions in emergencies.

The themes and subthemes identified from the research are summarised in the table below.

Theme	Sub-theme	Brief description
Intentions to Comply	Compliance	Participants' intentions to behave in accordance with the advice given in the messages.
	Non-compliance	Participants' intentions to ignore, go against or postpone recommended behaviours given in the messages.
Trust and authenticity	Verifying Authenticity and Credibility	Concerns surrounding the authenticity and credibility of receiving an alert text message and actions taken to verify the sender and content of the message.

Theme	Sub-theme	Brief description
	Trust	The general issue of trust relating to all factors of the message alert system
	Lack of trust and annoyance	Participants' concerns regarding the ability to falsify the messages, and the annoyance related to receiving messages thought to be spam.
Perceptions and Expectations	Negative Perceived Consequences	Outcomes the participants expected if a mobile alerting system was employed, including over-reactions to the messages and costs.
	Vulnerable Users	Concerns surrounding the effectiveness of the messages and delivery to vulnerable populations such as the elderly and children.
	Distorted messaging	Concerns expressed about the potential impact of miscommunication through distorted information and lack of action due to miscommunication, for example "cry wolf" scenario.
	Beliefs about Other People's Reactions	Pre-conceptions about how other people will respond to the messages.
	Target Audience and Commuters/Visitors	Targeting the delivery of the messages in appropriate geographical locations, including commuters and visitors to the area.
	Beliefs and Expectations of the Emergency Services	The expectations participants had regarding how the emergency services will respond during an event.
Communication and information needs	Meaning and Understanding of the Message	The participants' comprehension of the content of the message.
	Required Information and Suggestions	Suggestions put forward for the improvement of the text and delivery system, highlighting areas of missing information.
	Communication of Information	The requirement for additional information sources supporting the message, including media coverage and an information campaign before the system is implemented.
	Type of Incident and Intensity Levels	The participants' feedback relating to the importance of knowing the type and risk intensity of an incident.
	Human Interactions and Social Communication	The spread of the message through social communications and modern social media outlets.

Theme	Sub-theme	Brief description
Practicalities	Speed and Timing	Message delivery logistics concerning the speed and timing of messages.
	Implementation	Whether the participants believe the system should be implemented.
	Receipt of Initial Message	Participants' reactions upon receipt of the messages.
	Technological Implications and Limitations	Concerns expressed by participants with regards to the technology aspects involved in the design and distribution of message alerts.
	Practical Limitations	Concerns raised by the participants with regards to the practical limitations of having a mobile alerting system.
Criticism and compliments for the mobile alerting system	Criticism of SMS and Alert System	Negative viewpoints expressed by participants in relation to the mobile text and overall alerting system.
	Positive feedback on the mobile alerting system	Participants' positive feedback relating to the mobile alerting system.

6.2 Public Health England: Quantitative Findings

In addition to the focus groups, a total of 445 online questionnaires were also completed by those in the trial areas or other interested respondents. The headline findings from this survey were:

- Most of the survey respondents (70%) reported that everyone in an affected area should receive the emergency alert message.
- The majority of respondents reported high levels of trust in the government's ability to use the mobile alert system responsibly; 69% strongly agreed or agreed that they trusted the government.
- Further, this trust carried over to mobile phone companies; 64% strongly agreed or agreed that they trusted their mobile phone provider to use the system appropriately.

6.3 Representative UK Survey

A UK-wide survey of 1,000 people was commissioned to test some of the findings obtained from the local trial areas and ensure that they were representative of the wider population.

Participants were asked a number of questions via a short telephone interview, covering issues such as their mobile phone usage, preferences for receiving emergency information, whom they would trust to give them advice and their

opinions on some draft emergency mobile alert messages. A summary of the findings is provided below.

6.3.1 Reading text messages

- Around seven out of ten respondents who use mobiles would access a text within an hour whether a weekday or weekend.
- If a text is received at night a majority (59%) would view it within an hour of waking up the next day.

6.3.2 Reactions to the first message

Survey participants were read the following message and then asked some questions about it:

'An incident has occurred at the High Street. TAKE SHELTER NOW. Stay inside and tune into 124.0 FM or visit gov.uk/ukalert for info'

- Primary responses given were to take shelter/go inside/shut doors and windows (28%), try and find more information online/on the radio/TV (21%) or follow the web link provided (15%).
- Most would find such a message useful (79%).
- Primary responses to what the incident might be, included terrorist attack or bomb (21%), a bomb (16%) but 18% did not have sufficient information to take any guess.

6.3.3 Reactions to the follow-up message

Survey participants were read a follow up message and then asked some questions about it:

'An incident has occurred at High Street. LEAVE AREA NOW. Stay away and tune into 124.0FM or visit gov.uk/ukalert for info'

- Primary responses given were that they would leave the area (32%), try to find more information online/on the radio/TV (19%), follow the web link provided (13%) or take shelter/go inside/shut doors and windows (9%).
- Again a high proportion (80%) would find the follow-up message useful.

6.3.4 Reactions to the final message

Survey participants were read a final 'stand down' message and then asked some questions about it:

'The incident at High Street has now concluded. This is an ALL CLEAR MESSAGE. Visit gov.uk/ukalert for further info'

- Primary responses given were to trust that the incident is over and return to normal (18%), try to find more information online/on the radio/TV (16%), follow the web link given (15%), do nothing different (13%), ignore it (9%).
- Most (83%) would return to what they had previously been doing.

6.3.5 Acceptability and efficacy of mobile alert messages

- A range of sources would be used to verify the text's information including TV news (78%), friends and relatives (69%), the link provided in the text (68%), radio (63%), Government websites (60%), other news websites (53%), other TV programmes (42%), social media (36%) and local police websites (34%).
- Most (81%) would follow the advice given in the text.
- The agency who people thought should send the message was primarily the police (44%) following by the Government (16%) but 24% did not know.
- A majority would like to receive a text message for terrorist attack (87%), flood (76%), a serious road traffic incident blocking a main road (71%), severe weather conditions (71%) or missing person/child (69%).

6.3.6 Frequency and content of mobile alert messages

- A majority (63%) would only want message updates when there are new developments.
- Most found all possible content helpful but the most helpful (at 67%) were street names where the incident is taking place and at 44% general information about the kind of incident e.g. weather, terrorist, accident etc.

6.3.7 Vulnerable people

- 36% cared for children or other vulnerable people and half (52%) said they use mobiles.
- A majority (67%) whose vulnerable people use mobiles thought they would understand the text messages and primary reactions were thought to be contacting the respondent (28%) or doing as the message advises (26%).

6.3.8 Overall assessment of mobile alerting system

- Most (85%) thought that overall the emergency alert system is a good idea.

6.4 Public findings discussion

This section compares the evaluation findings from the trial areas, completed by Public Health England, and the representative telebus survey, conducted by an

externally sourced organisation on behalf of the Cabinet Office – referred to below as the UK survey.

The UK survey reported that 85% of people used a mobile phone – this is less than the 91% quoted by Ofcom in 2011[15]. The two surveys asked very similar questions: Ofcom asked, 'Do you personally use a mobile phone?', and the UK survey asked 'Do you use a mobile phone?' This discrepancy is considered to have arisen due to a difference in sampling strategies between the two studies.

Over two-thirds (71%) of respondents to the Public Health England survey who had received the alert messages reported that they read them immediately. The UK survey found that during a normal weekday, 31% of recipients would read a message immediately and 38% within an hour. However, the fact that 69% reported they would read the message within the first hour is comparable to 71% in the PHE survey.

In the UK survey, more people (28%) said they would prioritise sheltering behaviour rather than information seeking (21%). By contrast, looking for more information was a more prominent theme from the focus groups compared to compliance with the advice to take shelter. The focus groups may have provided a better opportunity for participants to consider the risks of spam or hoax text messages, which could have persuaded them to look for more information before complying with the advice. In addition, the participants in the focus groups were able to consider the messages in detail and spent time trying to imagine *how* they would comply and whether there was sufficient detail in the message to enable them to comply.

The focus groups found that the desire for "regular updates" was a consistent theme. However, a majority of respondents to the UK survey (63%) said they only wanted updates when there are new developments, compared to the next two popular options; "I wouldn't want updates this way" (12%) and "Every hour" (11%). This suggests that respondents to the UK survey would prefer to receive updates less frequently than focus group participants. This difference probably arose because of the way in which the questions were asked, and the context in which they were posed.

It is well established in scientific literature that the desire for information and updates in acute emergencies is strong, even if there is no new information (Rubin et al, 2012[16]). Without the opportunity to consider an emergency scenario in depth, respondents to the UK survey may have been more likely to give a measured response to the question about the frequency of updates, when compared to those in the focus groups. Focus group participants expressed a desire for regular updates, albeit without specifying the time interval for these.

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[15] OFCOM (2011). UK Adults' Media Literacy Survey.

[16] Rubin G.J., Chowdhury A.K. & Amlôt R. (2012). How to communicate with the public about chemical, biological, radiological, or nuclear terrorism: a systematic review of the literature. Biosecurity and Bioterror, 10 (4), pp. 383-95.

Respondents to the UK survey also had the option of not having the updates via text as well as response options that specified precise time frames for updates. The relatively short time frames, such as “Every 5 minutes”, may have caused concern about the number of messages they would receive if an incident occurred.

The UK survey found that the most helpful information in an alert message would be a street name (67%), with the type of incident (44%) the second most helpful piece of information. In the focus groups the most prominent aspect within the sub-theme of “Required Information and Suggestions” was the ‘type of incident’. However, the location of the incident and where to go was also mentioned frequently.

Both studies indicated high levels of acceptance for the mobile alerting system (85% in the UK survey report and 96% in the PHE online survey). This difference may be due to many of the PHE survey respondents having participated in focus groups, therefore having had the opportunity to consider the advantages and disadvantages of the system.

7. Comparative Technology Analysis

The Mobile Alerting Trials (MATs) have provided the mobile industry, emergency responders and government the opportunity to review the characteristics of what has been established to be an 'effective alert system'. The table below revisits these properties and proposes requirement statements under these headings. These requirements are prioritised according to the '*must have, should have, could have*' convention. These requirements will be taken into account when designing the features of the system alongside other considerations, including technological capabilities.

An assessment of each technology's ability to meet the statement is presented using a Red, Red-Amber, Amber-Green and Green rating system. Justification for this is presented in the adjacent column and the assessment is made following analysis of trial data, expert input from the mobile operators and international experiences.

The tables below summarise the assessment of system criteria and requirements for the two technologies. The second table takes into account the weightings of the 'must have' (M) 'should have' (S) 'could have' (C) criteria.

Both tables indicate that **Location-Based SMS** is the preferred technical solution for a national mobile alert system. It is important to note however, that there are still a number of questions to address before any potential roll out could be implemented. These include ensuring a consistent experience is achieved across all networks, that value for money is achieved and that clear protocols are in place about how the system will be used by the responder community.

It is important to note that all conclusions set out below are based on the evidence obtained from the three mobile alerting trials. The caveat here is that the MNOs have not tested all available technologies across all networks and so there are still some questions to answer about the efficacy of each approach.

	Green	Amber-Green	Red-Amber	Red
SMS	9	6	1	3
Cell Broadcast	7	4	4	4

	Green			Green-Amber			Amber - Red			Red		
	M	S	C	M	S	C	M	S	C	M	S	C
SMS	7	1	1	3	2	1	1				2	1
Cell Broadcast	6		1	4			1	2	1		3	1

URN	System Criteria and requirements	Must/Should /Could have	SMS rating	Cell B rating	Comments & Actions
Speed					
001	The system shall issue messages within 15 minutes of a responder accessing the system.	Must	Meets	Meets	This is the working assumption, although it is noted from conversations with MNOs that the timeframe is ambitious. There are a number of challenges in meeting this timeframe including size of message area and number of handsets within the area.
Targeted					
002	The system shall deliver alerts to a geographically specific section of the public, ranging from a small area (single mobile phone cell), to the whole of the UK.	Must	Meets	Meets	Both are capable of this. SMS is more prone to messages being received by handsets a distance away from the incident location with people moving in and out of the target area and no location update being prompted. However SMS provides knowledge of who you are actually sending messages to, whereas this is less clear for Cell Broadcast.
003	A minimum of 75% of messages shall be delivered to handsets in the defined area within 15 minutes of message transmission.	Must	Meets	Meets	Both technologies are capable of meeting this however; it can not be measured for Cell Broadcast. Further, there are significant handset compatibility issues with Cell Broadcasting which would improve over time but would have impact from day 1. (Discussed further in requirement 007). For SMS, network congestion will impact this figure. Evidence from the trials and the Australian system has demonstrated successful delivery of 90% of SMS messages to handsets within 5 minutes. (5% being devices such as ATMs that connect to the network but are not capable of receiving a text message).
004	To independently transmit messages for different campaigns across multiple locations within minutes of sending	Must	Meets	Meets	This would cover an east coast flood type of incident where lots of messages may need to be sent to multiple locations for an incident spanning a wide area. Both technologies would be capable of this.

URN	System Criteria and requirements	Must/Should /Could have	SMS rating	Cell B rating	Comments & Actions
005	Alert messages shall be received by a handset in a no coverage area (i.e. a not spot).	Should have	Does not meet	Does not meet	Both technologies are currently unable to meet this. With SMS, messages would be re-tried which may allow the alert to be received once the phone has come into an area with coverage, unless the SMS has been marked as invalid due to the length of time since the alert was raised. MNOs are working to increase coverage across the UK.
Activities required by members of the public					
006	The citizen shall not be required to complete a registration process in order to receive messages.	Must have	Meets	Meets	Both technologies meet this criterion in that they do not require foreknowledge of individual numbers in order to deliver messages. There is ongoing work with the ICO to ensure that any concerns around privacy are addressed.
007	The citizen shall not be required to complete any handset configuration in order to be able to receive alert messages.	Should have	Meets	Does not meet	Legacy devices require users to activate Cell Broadcast on their handset to receive messages. Following the example of the US and the NL, settings could be activated at point of sale for new devices although this would require a period of transition. MNOs believe this could be resolved to a high percentage of subscribers within 2 years due to standard phone replacement behaviour.
008	The citizen shall be capable of opting out of receiving alert messages.	Should have	Meets	Meets	Both technologies can meet this. For SMS people can opt out of receiving messages although this will introduce delay in to the timeframe of requirement 001. MNOs have indicated that providing an opt-out service would incur additional cost. For CB people can alter their device settings to opt out of messages, this would not incur administrative costs.
009	The public are agreeable to being alerted in such a manner.	Should have	Meets	Meets	The majority of the public view the system positively. There may be a small minority of the population who object to the system on privacy issues or other grounds.
Intrusive					

URN	System Criteria and requirements	Must/Should /Could have	SMS rating	Cell B rating	Comments & Actions
010	The handset will have a unique tone/vibration to capture the attention of message recipients.	Could have	Does not meet	Partially meets	The PWS 3GPP standard defines a unique tone and appearance for alerts in that it displays on the home screen and with a tone that is different to a normal text tone. However this differs dramatically from handset to handset and is vendor dependent.
Inclusivity					
011	Messages shall be received and understood by **ALL** citizens.	Should/Could have	Does not meet	Does not meet	Neither system is capable of delivering a message that will be received/understood by 100% of the population - e.g. the visually impaired (although there are devices capable of converting messages from text to speech) or the illiterate (although this is less than 1% of the UK population). Some people may not have a phone or may not have it with them at the time of an emergency. A mobile alert system would not be a catch all; instead it would provide another tool in the toolbox and should be used in conjunction with existing alert capabilities.
Support for additional languages					
012	Citizens shall receive messages in languages other than English.	Could have	Meets	Meets	CB may have the potential for users to define what language they wish to receive messages in. For roamers into the UK the message can be translated into the appropriate language. Responders will technically be able to send messages in other languages via SMS, although this will be sent to all recipients.
Comprehension					
013	Messages shall be easily understood and interpreted by recipients.	Must have	Meets	Meets	Both technologies meet this- CB has fewer characters (93) than SMS (160). Both SMS and CB messages can be concatenated, however there is a possibility that messages may arrive out of sync.
Receipting					
014	The system shall be capable of providing data on system performance.	Could have	Meets	Does not meet	Far greater performance information is possible with SMS with the capability to report on number of messages sent and received. For Cell Broadcast, performance information is very limited.
Security and Resilience					

URN	System Criteria and requirements	Must/Should /Could have	SMS rating	Cell B rating	Comments & Actions
015	The system shall be secure and resilient against hacking and attempts to send malicious alerts or misinformation to members of the public.	Must have	Meets	Meets	Security of any potential future system is a key concern across the public and all networks. Best practice techniques for Information Assurance would be necessary and roles and responsibilities for this defined.
016	Alert messages shall not be spoofed by others.	Must have	Partially meets	Meets	Appropriate security measures will be considered.
Cost					
017	The system shall demonstrate value for money against other options presented.	Must have	Meets	Partially meets	MNOs have indicated that SMS would provide the better value for money option (out of the two) as much of the infrastructure is already in place within the networks. However it would still require investment. More work is needed to investigate costs of implementation and system operation for the options available. MNOs will work with operators in other countries to share learning on system performance of similar systems and also on costs of implementation and operation.
Time to implement					
018	The system shall be operational no more than two years from the point where a decision is made to roll out.	Should have	Meets	Partially meets	MNOs have indicated that an SMS solution would be quicker to implement due to the significant changes that would need to be made to accommodate a Cell Broadcast system. Collaboration and centralisation of the solution shared by all MNOs will be important to this requirement.
Preference of MNOS					
019	Views of MNOs	Should have	Meets	Partially meets	As detailed against 017 and 018 above.

8. Alert Activation Protocols

The following section considers how a potential future alerting system might work in practice. This is subject to review and further consultation with MNOs, responders and emergency services. There are also a number of issues which have not been addressed in this paper that will require further exploration, prior to any plans being developed for system implementation. These include:

a. **Service level Agreements**. The percentage of the population that we expect to receive messages and over what timeframe.

b. **Non-delivery Protocols**. A protocol to address circumstances in which alert messages are not sent/received for any reason.

c. **Regulatory framework.** Privacy and regulatory issues specific to Cell broadcast and location-based SMS will be considered with the Information Commissioner's Office and Ofcom.

The purpose of the system is to enhance existing alert capabilities, and ultimately to enable members of the public to take action following onset of an emergency with the specific aims of:

- preserving life;
- preventing harm; and
- protecting property.

8.1 Defining an alert 'Activation' and a 'Campaign'

A single 'activation' can be defined as one unique message being sent to a group of people. Any further messages, even for the same incident, would be counted as a second 'activation.' For example, if an incident at a COMAH site (Control of Major Accident Hazards, i.e. a chemical plant) requires members of the public in the immediate area to be issued with alerts to stay inside, this would be counted as one activation. Following this, if the incident changed, for example a hazardous plume was now travelling in a different direction and further alerts needed to be sent, these would be counted as a separate activation. A stand down message, issued once the incident had concluded would count as a third activation.

A 'campaign' is defined as the number of single activations pertaining to a specific incident. This would begin with the sending of the first message, and conclude when the final stand down message had been sent. In the example above, one campaign consisted of three activations.

8.2 Trigger points for use & Emergency Scenarios

The following criteria could act as trigger points for considering the activation of an alert system:

- A risk to human health of those in the vicinity of the incident.
- A threat of severe damage to property and belongings.
- An opportunity for the public to take action to minimise their exposure to harm.
- The need to issue 'stand down' messages to members of the public who have been called to take action.

There are four types of incident where it is believed issuing an alert message would benefit the response:

a. **Rising tide events**: e.g. severe weather where their onset can be predicted. In these cases, the LRF/ Strategic Co-ordinating Group (SCG)[17] shall approve alert messages to be sent.

b. **No notice hazardous site incidents**: e.g. a chemical spill at a COMAH site. Public communication plans will be in place and specific arrangements can be defined within them.

c. **No notice incidents**: e.g. an explosion in a city centre. Activation of the system here would be a judgement call based on available information and would be at the discretion of the Incident Commander.

d. **A severe flood warning**: initial discussions with the Environment Agency indicate that use of the system could be triggered by a severe flood warning.

8.3 Alert authorisation

Alerts for no notice incidents could be authorised by the Force Incident Manager within the Police Command and Control infrastructure. It is likely that the Local Resilience Forum (LRF) - or the Resilience Partnership (RP) in Scotland – would agree a process on how requests from other responder organisations for alerts to be issued will be considered. The LRF - or RP in Scotland – could consider how to document and approve the process for activation, linking to existing warning and informing plans and how the police Gold Commander will be informed of this decision, where consultation has not taken place in advance.

For incidents that cross over into different areas or boundaries, the response would continue to be coordinated as is currently the case. Protocols for how disagreements

[17] Strategic Co-ordinating Group (SCG): Multi-agency body responsible for co-ordinating the joint response to an emergency at the local strategic level. In Scotland Strategic Co-ordinating Groups are the principal local forum for multi-agency cooperation in civil protection. The groups have a role in both preparation and response to emergencies.

between two different areas over the need to send an alert message should be considered.

For every ‘alert activation’ a notification could be sent to a designated point of contact in the Civil Contingencies Secretariat, and in the Department for Communities and Local Government (RED) or relevant Devolved Administration. There may be other Government departments who would wish to be added to this notification list. Further work would be needed to specify the requirements for this.

8.4 Frequency of Messaging

It is important that clear expectations are set for regularity of system use. This is perhaps the most difficult aspect to define. Our study suggests that decisions are taken locally as to whether it is appropriate or not to use the system, as long as it can be evidenced that activations were in line with the trigger points.

When a campaign is started for an incident, the issuing officer could ensure that members of the public are updated regularly (at least once every 2 hours or more regularly if there is a change that may require new action to be taken) until alternative arrangements can be put in place – which would be expected to be around 4 hours following the incident. If a further activation is made within 60 minutes, it should be considered whether it is still appropriate to send messages remaining from the previous set. This is to meet public expectations around the need for further information, particularly if the incident requires protective action to be taken. After four hours it is reasonable to assume that more established warning and informing arrangements will be in place.

8.5 Embedding the Alert Activation Protocol

All three blue light services may want to consider how this capability could be built into single and multi-agency plans. The use of an alerting system would form another part of public communications and warning and informing plans (and not operate in isolation). Reference could be also be made in plans for specific sites where they exist. It may be that appropriate communications teams/officers will want to be made aware of system activations (including the 15 minute target timeframe) so that they are in a position to respond to any subsequent public enquiries and stand up additional warning and informing capabilities.

When alert messages are sent, the public may seek to verify the information via a number of different sources. Evidence obtained in the public evaluation of the trials suggests that a Government website would provide a useful place to provide further information for the public in an emergency. Having one centrally managed page rather than numerous local pages could also make the process of providing up to date information easier, however more work is needed to define exactly how this would work.

8.6 Considering your target audience

There are a number of factors that alert authorisers will need to take into account when making the decision to issue a message. These include the time of day (and impact this would have on behaviour/attitude towards an alert message), vulnerable groups in the area, desire of individuals to opt out (how this might be achieved needs further exploration) and the potential invocation of MTPAS. Should roll out of the system occur, these issues will be addressed in further detail in the user guide.

8.7 System Access

Access to the system will be obtained via a secure login. Cabinet Office will have responsibility for providing each LRF or RP with a sufficient number of role based accounts. Current assessment suggests that three role based log-ins and two training log-ins would be appropriate, although this will require consultation to ensure this is sufficient.

Responsibility for managing local access would reside with a nominated role on behalf of the LRF or RP. The assumption is that the system will be accessible primarily from the Police control room.

The working assumption is that any future live service will involve a user interface in which target alert areas can be defined through the use of a basic Geographic Information System (GIS) application. This will allow for a set of 'operational rules' to be defined and incorporate an audit trail to ensure records are kept for any subsequent inquiries and aid in the identification of lessons from system use.

The front end of the system must be intuitive. There are a host of suppliers who already deliver similar online alert activation capabilities. The Cabinet Office recognises that further work is required to explore how such systems, where taken up by agencies, can be linked to the system and potentially to other alert systems, including the Environment Agency's Floodline Warnings Direct system.

8.8 Testing & Exercising

Test messages could be sent to members of the public **at least annually** in order to ensure that people are aware of and familiar with the system. This could be set nationally to make best use of media coverage and coincide with other emergency preparedness events as appropriate.

Further work will be conducted to consider the training requirements for personnel with responsibility or for accessing the system. This may involve periodic testing of local processes and operational staff as defined by the LRF/RP Alerting Procedures.

In order to measure success of the system - and to identify any improvements - Government will have access to management information with regards to the performance and use of the system. This should be automatic, without the need for input from local areas.

The frequency of system access by operational personnel, local testing arrangements and training schedules will also be provided to ensure operational effectiveness. If possible, management of this will be assisted by the system.

8.9 Activation Timeline

The working proposal for sending alerts is that from the time a decision is made to activate the system, the system should be capable of sending out messages to the public within 15 minutes.

8.10 System Security

Locally approved messages will be submitted via electronic means to a centralised hub or broker that could verify the request to issue an alert is from a genuine and approved source. Whilst specifics are yet to be defined, the working assumption is that the system will operate on the basis of secure IP-addresses. The hub will include a resilient disaster recovery site, which will pass requests for alerts to be issued to Mobile Network Operators (MNOs). The bearer for passing the request to issue alerts from the authorised party to the MNOs is to be determined and may be via terrestrial cabling or via satellite.

9. Factors to consider for implementation

The mobile alerting trials have considerably enhanced understanding of the potential challenges to implement such a system. It has also raised some areas that require more detailed investigation and these are presented below.

9.1 Privacy Regulations

Some have asked whether an alert system might be affected by the protections to individuals afforded by data protection legislation, including the Privacy and Electronic Communications (EC Directive) Regulations 2003. The Cabinet Office and other participating organisations will continue to work with the Information Commissioner's Office (ICO) to ensure that appropriate safeguards are in place.

9.2 Communications Act requirements

The 'General Conditions of Entitlement'[18] issued by Ofcom under Part 2 of the Communications Act 2003 apply to anyone who provides an electronic communication service or an electronic communications network, including the Mobile Network Operators. Of these, General Condition 5 requires that, on request, communication providers make arrangements for the provision of communications services as are practical and may reasonably be required in disasters. This request must come from an emergency organisation and a department of central or local government as specified by Ofcom.

The condition currently allows for MNOs to recover costs of implementing such arrangements.

9.3 Standardising Alert Messages: Common Alert Protocol

Testing possible interfaces for emergency responders to activate such a system was deliberately excluded from the scope of this project. The comments from the public collated throughout the project have reiterated that alert messages should be accessible through a number of different channels. Standardising the way in which messages are formatted would enable this.

The Common Alert Protocol[19] is a standard that has been internationally adopted to provide this interface between alert originators and alert distributors. It would potentially enable alert messages to be issued from a number of different

[18] http://stakeholders.ofcom.org.uk/telecoms/ga-scheme/general-conditions/general-conditions-guidelines/

[19] Common Alert Protocol, OASIS (Organisation for the Advancement of Structured Information Standards), version 1.2, July 2010 http://docs.oasis-open.org/emergency/cap/v1.2/CAP-v1.2-os.html

applications. A proposal regarding this issue has been posted on the Open Standards website (http://standards.data.gov.uk) and should this work progress, then efforts to agree a version for the UK will be embarked upon.

9.4 Providing Alternative Alert Platforms for Verification

Public research has highlighted the need for alert messages to be verified from alternative sources. The Gov.uk website provides a potential option for this. Ensuring the media were also informed would provide further opportunity for people to check that the alert they have received is authentic. This would have the added benefit of managing possible unavailability of any mobile based alert system.

10. Conclusions & recommendations

10.1 Key Conclusions

Feedback from trial areas demonstrates that emergency responders are still very keen to see the implementation of a national mobile alert system. Views from members of the public also suggest that the vast majority of people (85%) felt that a mobile alert system was a good idea. Public views on 'intended compliance with advice' issued in the sample alert messages was also high (81%). This suggests that not only would alerts be seen as a useful service by the public but that it would also be an effective way of getting people to take specific protective action during an emergency.

The technology comparison undertaken in section 0 above concludes that location-based SMS is the preferred solution. This is because the technology makes better use of existing MNO infrastructure (and therefore offers better value for money); and unlike Cell broadcasting this solution does not require handsets to be configured by the public in order for messages to be received. This means that messages sent via SMS are more likely to be received by a far higher percentage of the population at launch.

It is important however, to reiterate that this technology has been selected on the basis of the evidence obtained in the trials which, as identified in the body of the report, have posed new questions about both technologies that would benefit from further exploration. Not all MNOs have tested both technologies, although it has been indicated that doing so would be useful.

Responders were able to identify a number of situations in which they thought such a system would provide significant benefit. The proposals set out in the '*Alert Activation Protocols'* (see Section 0) provide working definitions on how a mobile alert system could work in practice. If a system were to be rolled out nationally, a detailed user guide could provide specific information on particular aspects of system operation such as the definition of target areas and feedback for message senders.

The trials saw 35,000 messages delivered to the public across three areas. A dedicated inbox was set up by the Cabinet Office so that members of the public could get in touch with any questions about the trials. Very few emails were received, no more than 20 in total, four of which were negative. Two of the four referred to not receiving trial messages, this is believed to be due to a lack of coverage. The other two emails which were both from the same individual, expressed concern about how numbers were obtained. It is recognised that if a system were to be rolled out nationally then some form of public communications about the system may be advisable this could be supplemented by locally led activities and annual testing. While this campaign will require time and resource (depending on the scale of the approach) public reaction is not a perceived barrier to implementation.

10.2 Recommendations

It is recognised that while the trials have answered questions about the technologies, they have also posed new ones. If the decision were to be made that this capability should be taken forward then we recommend further exploration of the options available. Specifically, the Cabinet Office recommends the following work takes place:

10.2.1 Run a pilot to test location-based SMS in one area

This pilot would ideally take place in an urban area across all four networks at the same time. This would allow for further necessary exploration of this capability, including impact of network congestion, speed of message delivery and the current levels of capability across MNOs to deliver alerts using this method.

10.2.2 Prototype the 'Front End' of the system

A location-based SMS pilot would provide the opportunity to test the potential 'front end' for this system, where responders would be able to log in, define the alert message area and content and then simulate sending a message. Understanding how existing messaging applications could integrate with a solution would also be useful.

10.2.3 Change Impact Assessment with MNOs

In order to understand the level of change needed to each network's infrastructure, further work is needed to understand effort and costs required to deliver a solution. Again information for this could be obtained through the running of an SMS pilot but also via internal work conducted by MNOs to assess their own level of capability against requirements.

10.2.4 Work with international partners to utilise lessons learned

Cabinet Office officials have built good working relationships with a number of international colleagues who are looking at similar alerting systems. Further work could be conducted to meet requests from MNOs who are keen to learn with their global counterparts in order to share good practice and identify what has and has not worked elsewhere.

10.2.5 Conduct Laboratory based Cell Broadcast testing

While the focus of the next work packages is on location-based SMS, MNOs have asked officials not to discount completely the Cell Broadcast solution. It would be useful to conduct some further lab-based testing of Cell Broadcast to explore issues such a handset configuration and operation over 3G and 4G.

10.2.6 Identify a standard to exchange alert messages

More work needs to be done to identify and agree a standards based method of exchanging alert messages between operators and responders to allow multiple alert channels and competing applications to issue alert messages. Officials have already begun to explore the option of implementing Common Alerting Protocol in the UK, which is a standard that has been adopted in other countries across the world.

10.2.7 Other work areas

In addition to the technical recommendations set out above, a number of other policy work packages could be completed in parallel to that above. This includes the agreement of procurement and funding strategies for delivery of the system; the development of responder training packages, a review of potential alert message content and a public awareness campaign.

The mobile alerting trials have shown that the introduction of a national mobile alert system could provide a significant step change in the UK's alerting capability. Now that the trials have identified a preferred solution, further work is recommended to explore this capability further. If a decision is made to progress with this work, the trials have given us a clear evidence base on which this view was formed.

Annex A: Responder Workshop Questionnaire

Mobile Alerting Trial:

Date: Wednesday 18th September

Attendees:

Objectives:

- To understand the benefits and challenges that introducing a mobile alerting system would bring for responders in North Yorkshire LRF.
- To map out current alert arrangements and understand how a national mobile alerting system could be incorporated into this.
- To identify the thresholds at which such a mechanism might be employed.
- To discuss potential future public communications strategies/training for staff that would be necessary for the introduction of a new national alerting system.

Questions for discussion:

1. What scenarios/ emergency situations do you think this system should be used for and which should it not be used for?
2. What criteria/ trigger points should be reached before the system should be used?
3. Who would activate the system (i.e. which organisation) and where from?
4. What are the main training needs that you envision for this system?
5. What are the main communications issues you can see in raising awareness locally about use of the system?
6. How would enquires raised by alert messages be dealt with locally?
7. Would alert message templates be used? How would these be drafted/stored/circulated?
8. Do you have any other comments to make relating to the trials/ roll out of a potential system?