

Running Head: Outdoor Warning System Activation Criteria
for the Burleson Fire Department

Evaluating Outdoor Warning System Activation Criteria for
Severe Weather Events affecting the City of Burleson

Brent Batla

Burleson Fire Department, Burleson, Texas

CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, and where language of other is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

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Abstract

The problem to be addressed by this Applied Research Project (ARP) was that the City of Burleson has adopted an Outdoor Warning System (OWS) activation policy for severe weather events that has led to frequent activation of the OWS system. Frequent activation may negatively impact public perception of the reliability and accuracy of the OWS system. The purpose of this Applied Research Project (ARP) was to identify the impact the OWS policy has on Citizens in the City of Burleson. Descriptive research methodology was used to complete this task. Four research questions were developed to drive the research: (a) What effect does frequent OWS siren activation for severe weather have upon citizens? (b) What is the threat perception of citizens once the sirens stop sounding? (c) When should the OWS be activated for severe thunderstorms? (d) What influence could different OWS warning tones/messages have upon residents? Two procedures were used for this research: A citizen/workforce survey and personal interviews with emergency management staff, policy makers, and stakeholders. The results of the research revealed several policy suggestions that should be included and/or changed in the current OWS policy. It was recommended that the City of Burleson revise the current

OWS activation guidelines for severe weather by;(a) narrowing the "alert zone" to the city limits only, (b) consider selected activation by area instead of activating the entire system, (c) attempt to limit false alarms by having a standard deemed acceptable by policy makers, (d) begin a public education campaign to educate the public on the use of the OWS system.

Evaluating Outdoor Warning System Activation Criteria for
Severe Weather Events affecting the City of Burlleson

The decision to activate Outdoor Warning Systems (OWS) because of severe weather is a difficult and often controversial topic. On one side of the fence, sirens that are perceived by the public to be activated too early, too often, or without a visually confirmed tornado, are likened to "crying wolf" (National Weather Service, 2011a, p.8) which can lead to complacency and public distrust in message reliability (National Weather Service, 2011a). On the other side of the fence, a preemptive policy of OWS activation that provides for early warning can significantly increase the chance of survival because citizens have more opportunity to take appropriate actions. (National Weather Service, 2011b).

The problem was that the City of Burlleson has adopted an Outdoor Warning System (OWS) activation policy for severe weather events that has lead to frequent activation of the OWS system. Frequent activation may negatively impact public perception of the reliability and accuracy of the OWS system. The purpose of this Applied Research Project (ARP) was to identify the impact the OWS policy has on Citizens in the City of Burlleson.

Descriptive research methodology was used to answer the following questions: (a) What effect does frequent OWS siren activation for severe weather have upon citizens? (b) What is the threat perception of citizens once the sirens stop sounding? (c) When should the OWS be activated for severe thunderstorms? (d) What influence could different OWS warning tones/messages have upon residents?

Background and Significance

The City of Burleson is primarily a suburban bedroom community of approximately 36,000 residents located in the Dallas/Fort Worth metroplex area (United States Census, 2010). Burleson is located in an area of the country that frequently experiences severe weather (National Climactic Data Center, n.d.). Burleson experiences an average of 14 severe thunderstorms per year (National Climactic Data Center, n.d.). Notably, over the past five years, severe thunderstorm frequency has increased to an average of 27 per year (National Climactic Data Center, n.d.). Burleson is also located in an area of the country that has one of the highest averages of annual tornado reports in the country, averaging 5-10 per year per 10,000 square miles (National Oceanic & Atmospheric Administration, 2011); (ClimateMaps, 2011). This fact has significant impact on this ARP because severe weather events have been identified

as the leading cause of death from natural and manmade disasters (Center for Research on the Epidemiology of Disasters, 2000; Effective Disaster Warnings, 2000).

The City of Burleson maintains nine OWS sirens located throughout the city that provide audible outdoor warnings to approximately 80% of the population (G. Wisdom, personal communication, January 2011). The sirens are capable of both voice and tonal messages. A thirty second tone followed by the message, severe thunderstorm warning, seek shelter immediately, is given when the NWS issues a severe thunderstorm warning that meets the activation criteria for the Burleson area. A different, three-minute tone followed by the message, Tornado Warning, seek shelter immediately is utilized when the NWS issues a tornado warning for the Burleson area (City of Burleson, 2011b). The sirens can be activated in several ways. The primary activation point is from the Burleson Emergency Operations Center (EOC). The City of Burleson staffs a "duty officer" position that is responsible for weather monitoring and OWS siren activation. The duty officer position rotates between police and fire command staff and provides round-the-clock coverage every day of the year. OWS activation is also redundant, if the duty officer cannot activate the sirens, Burleson dispatch can also activate the system. Finally,

OWS activation can be accomplished remotely through two radios carried by Burleson Emergency Management personnel. (City of Burleson, 2011a).

In April 2008, the southern portion of the City of Burleson was hit by an EF1 tornado that damaged or destroyed 36 residential, commercial, and industrial structures (National Oceanic & Atmospheric Administration 2011; City of Burleson, 2008a). Again in April 2008, an EF1 tornado touched down just west of Burleson City limits damaging or destroying 10 residential structures (National Oceanic & Atmospheric Administration, 2011; City of Burleson, 2008a). Both of the tornado progressions occurred very rapidly and lasted a very short period. The tornadoes were not immediately detected because they occurred between the NWS WSR-88D radar scans, therefore advanced tornado warnings were not received and, based off of previous activation policy, the OWS system was not activated during these two events (A.Ponder, personal communication, April, 2008). The two events caused the City of Burleson to reevaluate the severe weather OWS activation policy (G. Wisdom, Personal communication, January, 2012). Prior to these two events, the City of Burleson followed a policy of activating the OWS for severe storms based off of visual confirmation of a tornado touchdown by a credible

source. The policy also did not require OWS activation for severe thunderstorm warnings (City of Burleson, 2007). This policy helped to reduce frequent activation by requiring visual confirmation (S. Singleton, personal communication, January, 2012). After the two tornado events in 2008, the City of Burleson adopted a more conservative policy of OWS activation based off of National Weather Service warnings instead of delaying activation until visual confirmation of a tornado could be made (City of Burleson, 2008b). In February 2009, the entire North Central Texas Council of Governments (NCTCOG) region, an area comprised of sixteen counties representing a total population of over 6.7 million, adopted a regional standard of siren activation guidelines (North Central Texas Council of Governments, 2009). This helped to standardize OWS activation criteria for severe weather events, instead of having different standards for every city in the DFW Metroplex. The City of Burleson adopted this standard in 2009 (City of Burleson, 2009). The adoption of this standard by the City of Burleson has caused a significant increase in OWS usage to over 15 times per year on average from a previous average of >1 (City of Burleson, 2011). The City of Burleson has received numerous citizen complaints about "crying wolf" with perceived overuse of the OWS (G. Wisdom personal

communications, January, 2011). However, Burleson has also received many citizen compliments about using the OWS system proactively. The City of Burleson would like to explore policy options that will accomplish both early proactive warning and fewer OWS activations (G. Wisdom, personal communications, January, 2011).

This Applied Research Project (ARP) addressed the risk challenges that effect the City of Burleson by providing insight on how to better prepare for naturally occurring risk that affect the community on a regular basis. This focus was the goal of the *Executive Analysis of Community Risk Reduction* (EACRR) course (Federal Emergency Management Agency, 2011, p. SM 3). Furthermore, this ARP helped to "Reduce risk at the local level through prevention and mitigation" as well as "Improve local planning and preparedness" which are two of the operational objectives established by the United States Fire Administration (USFA) (United States Fire Administration, 2010, p. 13).

Literature Review

The issue of when to warn the public is extremely important because, "inadequate warnings are one of the primary factors contributing to the number of deaths and injuries caused by hazard events such as tornadoes" (Rodriguez, Diaz, and Aguirre, 2004, p.12). Additionally, "effective dissemination of warnings provides a way to reduce disaster losses" (Effective Disaster Warnings, 2000, p.6). However, they are only effective if "they are accurate and result in appropriate action" (Effective Disaster Warnings, 2000 p.18).

While there is an abundance of literature that contributes to jurisdictional Outdoor Warning System (OWS) decision-making and activation criteria for severe weather, no National standard was found to exist. However, the National Weather Service (NWS), through assessments of many major tornadic events, has compiled many findings and recommendations pertaining to OWS usage that significantly contribute to the research literature (National Weather Service, 2011; National Weather Service, 2009).

Most citizens receive their first risk signal indicating a severe weather threat via local community outdoor warning systems and local news sources, but many of them fail to take action until receiving additional

information (National Weather Service, July 2011a; Hammer & Schmidlin, 2002). The failure of citizens to take action until receiving multiple points of credible information is also supported by the research literature of Rogers & Sorensen (1989); Seddig (2009); Mileti & Sorensen (1990). Sorenson (2000) explains that people will often delay a response to a perceived threat because they will first seek out additional information in order to substantiate the threat. Bankoff 2007, also suggested that normalized responses toward severe events or situations are much more likely to occur in groups frequently exposed to hazardous weather. National Weather Service(July 2011b)findings support this by indicating that residents that live in areas that are frequently prone to severe weather become desensitized to the risk. This issue is significant because Rodriguez, Diaz, and Aguirre (2004) find that if people do not perceive an event as a threat, they will not take corresponding action. This may warrant significant review of a policy that requires frequent OWS activation because frequent activation may normalize the threat to the point that the message is no longer received as a threat. The NWS (2011b), suggests that, "Perceived frequency of siren activation not only reflect normalization of threat and/or desensitization to sirens and warnings, but they also

establish that initial siren activation has lost a degree of credibility for many residents" (p. iii). Rodriguez, Diaz, and Aguirre (2004) suggested that the issue of a loss of credibility by frequent false alarms is a very significant issue because credibility is one of the most valuable characteristics of effective risk communication. Rodriguez, Diaz, and Aguirre (2004) also suggest that "Even if the public understands weather forecasts, their trust in the reliability and accuracy of weather forecasts and in the sources that provide such information may significantly impact their behavior and response" (p.4). Slovic (2000) points out that if there is a lack of trust, it will limit the effectiveness of risk-communication efforts and that no form or process of communication will be satisfactory. The combination of a lack of perceived risk and a lack of public trust, coupled with a loss of OWS siren credibility, can foster a degree of complacency (National Weather Service, July, 2011b;(Slovic, 2000; Rodriguez, Diaz, and Aguirre, 2004).

Tinney (n.d.) found that a majority of citizens understood what they should do when they are alerted by the OWS system, but a significant percentage of them fail to act. Notably, the findings of Tinney were from a jurisdiction near the City of Burleson located in a similar

weather hazard area. Seddig (2009) showed similar findings in that only 42.7% of surveyed respondents reported that they would seek shelter if the storm sirens were activated.

In order to mitigate user complacency to these issues, Several recommendations have been offered: (1) provide a "non-routine warning mechanism that prompts people to take immediate life-saving action in extreme events like strong to violent tornadoes" such as a different OWS tone (National Weather Service, July, 2011b). (2) Provide multiple warning sources to help residents process the threat (National Weather Service, April, 2011a; Rogers & Sorensen (1989); Seddig (2009); Mileti & Sorensen (1990); Sorenson (2000); Hammer & Schmidlin, (2002). Mileti and Sorenson (1990) suggested that people will people go through a series of cognitive steps that involve the processing of warning information in order to make decisions associated with warnings, and that multiple warning sources may help people through this cognitive step process in order to perceive a threat in a timelier manner. (3) Communities should "examine policies associated with watches and warnings to maximize the degree that information is understood, confirmed, believed, and personalized" (National Weather Service, April, 2011a, p. 31). The policy should provide a clear, consistent, and

accurate message (Fischer, 1994; Mileti, 1999). 4) Agencies should seek to "diminish the perception of false alarms and their impacts on warning credibility and response"

(National Weather Service, July, 2011 p. 30). However, no clear guidance is given on how to diminish the perception of false alarms. The NWS cautions against changing policy in order to reduce false alarms; "NWS has no information as to what level of false alarm reduction would lead to a meaningful improvement in public response" and, "A reduction of false alarms would likely come with an increase in unwarned events, depriving people of the opportunity to assess and act"(National Weather Service, April, 2011, p. 34). Seddig (2009) suggested that the activation policy should "limit the activation of sirens to the minimum number sirens, within a geographic area at risk during a tornado whenever possible" (p.37), which would help reduce false alarm perception. This same conclusion was issued by the Natural Disaster Information Systems Subcommittee on Natural Disaster Reduction: "Warnings are most effective when delivered to just the people at risk" (Effective Disaster Warnings, 2000, p. 18). False alarms significantly reduce the credibility of the message and therefore citizen response to the message (Rodriguez, Diaz, & Aguirre (2004). Nationally, 76% of all NWS Tornado

Warnings are false alarms (National Weather Service, July, 2011, pg. 29). This further compounds the issue of reduced risk perception by residents. However, it should be noted that the literature indicates that Tornado prediction accuracy has increased from 43% in 1993 to 74% in 2004. (Effective Disaster Warnings, 2000 P. 17).

Conversely, Mileti and Sorensen (1990) suggested not to diminish warnings because they serve to increase awareness and motivate people to assess their personal.

The NWS noted several issues that cause confusion when utilizing OWS systems. Citizens have experienced confusion when mixed signals were given between local jurisdictions and the NWS when the OWS systems are not used in conjunction with NWS warnings; "significant ambiguity associated with the first alert regarding the magnitude of the risk, the seriousness of the warning, and its potential impact" can occur (National Weather Service, July, 2011, pg. 29). Therefore, the NWS recommends that local warning system siren strategies should work "in conjunction with NWS warnings rather than independent from them" (National Weather Service, July, 2011, pg. 30). The NWS found that many residents expressed confusion regarding the OWS alert, thinking that the threat was over once the sirens had ceased. Sirens activated very far in advance of the actual

event also affected the perception of risk (National Weather Service, July, 2011, pg. 5). Further confusion has been created because of varying OWS siren policies between adjoining local jurisdictions. In order to solve this issue, the NWS suggested the development of uniform OWS siren policies between jurisdictions (National Weather Service, April 2011, pg. 31). Finally, The NWS has found that many citizens inaccurately believe that the siren system is designed to warn people who are indoors.

(National Weather Service, March, 2009, P.24)

North Central Texas Council of Governments (NCTCOG) severe weather activation guidelines advise that OWS systems should be activated when the "National Weather Service (NWS) issues a Tornado Warning for your immediate area"(North Central Texas Council of Governments, 2009, pg. 1). Additionally, OWS systems should be activated for NWS issued Severe Thunderstorm Warnings with the phrase "destructive winds in excess of 70 mph (or higher)" and/or "reported hail of 1.25 inches in diameter or greater"

(North Central Texas Council of Governments, 2009, pg. 1). The City of Burleson has adopted OWS activation guidelines to match the NCTCOG criteria. (City of Burleson, 2009).

As noted previously, Burleson experiences an average of 14 severe thunderstorms per year, and an average of 2

tornado warnings per year are issued for the Burleson area (National Climactic Data Center, n.d.), (City of Burleson, 2011). Since the adoption of new activation criteria in 2008 The City of Burleson activated the OWS 25 times for severe thunderstorm warnings and 6 times for tornado warnings (City of Burleson, 2011).

The literature was almost silent when it came to providing direction on very specific, unambiguous activation criteria. Rather, most literature offers suggestions only in broad generalities. For example, Rodriguez, Diaz, and Aguirre (2004) suggested that;

“In order for weather forecast and warnings to be useful to individuals and communities, they must be understood, must meet their needs, and must provide accurate and reliable information as well as sufficient lead time to allow them to take appropriate action” (p.4).

The authors also explain that clarity of message, consistency and frequency, and accuracy of past warnings has significant impact (Rodriguez, Diaz, and Aguirre 2004). Mileti 2008, suggested that the message should answer “what, when, where, why, and who” (p. 4). He also explains that the message should be clear, specific, accurate, certain, and follow a consistent style (Miletti, 2008). The

NWS suggested providing a Non-standard message such as "tornado emergency" and a different sonic alert that works in conjunction with NWS warnings to gain additional attention (National Weather Service, July, 2011, p. 30). These suggestions help to create content and procedural structure of emergency warnings but do not provide decision-making criteria.

Procedures

Descriptive methodology was used to provide the necessary data to inform this research. Two procedures were used for this research: A citizen/workforce survey (Appendix A) and personal interviews with emergency management staff, policy makers, and stakeholders (Appendix D, E). The purpose of the personal interviews was to provide policy guidance and input to help identify whether or not improvements need to be made to the current policy. The purpose of the citizen and workforce survey was to provide data to, (a) determine if frequent siren activation within the City of Burleson leads to complacency, desensitization and/or decreased risk perception of citizens of Burleson, (b) determine if citizens perceive that the severe weather threat is over once the OWS sirens stop sounding, (c) determine if the OWS should be activated for severe thunderstorms, and (d)

determine whether or not different OWS tones/messages cause confusion to residents.

In order to inform this research, a three-part, sixteen question citizen survey was developed to provide data for research questions A, B, C, and D (Appendix A). The survey was developed in three formats. The first format was a hard copy (paper). The second format was made available to respondents via the iPad survey application "Formz" (Tapps, 2012). The third format was developed utilizing the online survey tool, Survey Monkey (Survermonkey.com, n.d.). In order to ensure validity about perceived OWS activation specific to the City of Burleson, it was determined that the respondents should, (a) either live or work in Burleson, and (b) have an awareness that the OWS system exist. Therefore, questions 1, 2, and 3 of the survey were utilized as qualifying questions. Respondents had to answer "yes" to either question 1) "Do you live in the City of Burleson, or 2) Do you work in the City of Burleson, in order to be added to the sample (S). Respondents that answered "No" to both questions were disqualified on the grounds that they may base their opinions off of other cities activation criteria and history. Respondents also had to answer "yes" to question number 3, "Are you aware that the City of Burleson has an

Outdoor Warning System?" Respondents answering "no" to question number 3 were filtered out of the sample (S), on the grounds that if they did not know that the system exists, their answers to the rest of the survey would not be informed answers and therefore could not be considered valid. Part two of the survey included survey questions four through fourteen. These questions were developed in order to provide data for research questions A, B, C, and D. Part three included questions fifteen and sixteen, which provided general demographic information (Appendix A).

According to the latest U.S. census, the City of Burleson has a population of 36,690 (United States Census, 2010). In order to ensure a 95 percent confidence level based on the May 2010, EFOP Applied Research Self-Study Course-Student Guide, figure 5 (p.37), a sample size (S) of 380 valid surveys was determined to be required from a population (N) of 40,000.

Distribution of the survey began January 18, 2011. Hard copies of the survey were passed out at Burleson City Hall, Public Works, Senior Citizen Center, and the Fire Department. Two Hundred surveys were passed out to Burleson High School students and parents as part of an assignment for a civics class. Citizens were interviewed at the City of Burleson Recreational Facility and data was collected on

the iPad survey application *Formz* (Appendix A). The survey description and online survey link was sent by the City of Burleson Public Information Officer to all of the City Newsletter subscribers, approximately 1500. The Burleson area Chamber of Commerce also sent the survey link and description to their email list of approximately 1500 as well. These efforts resulted in 436 completed surveys, the last of which was received on February 27, 2012. The total response is enough to assure a 95 percent confidence level. Therefore, the data received can be considered a valid sample. The second procedure involved interviewing Policy Makers, Emergency Management staff, and Administrative staff to gather data on their current OWS perceptions and policy views (Appendix D). A total of five interviews were conducted between February 1, 2012 and March 2, 2012 (Appendix E).

Assumptions and Limitations

One limitation to this ARP is that it assumed that respondents understood the questions and answered truthfully. Additionally, the survey was not taken during an active storm season. Responses could vary from an off-season survey compared to a survey conducted during an active storm season. Finally, many of the questions relate

to risk perception, which could vary by age group, experience.

Results

Research question (a) asked: What effect does frequent OWS siren activation for severe weather have upon citizens?

Table 1

Survey question 5: What do you do when the Outdoor Warning System is sounded for a Tornado Warning?

Answer Options	Response Percent	Total
Take No Action	4.7%	18
Seek More information	60.5%	231
Seek Shelter Immediately	30.4%	116
Other	4.5%	17

Many people will seek more information instead of seeking shelter immediately once the OWS is activated. The survey data indicates that the same type of warning response is prevalent in Burleson. 60.5% of the respondents indicated that they would seek more information if the OWS were sounded for a Tornado Warning, instead of seeking shelter immediately. Only 30.4% of the respondents indicated that they would seek shelter immediately. 4.7% indicated that they would take no action at all. 4.5% reported "Other". These responses were varied and included answers like "listen to the weather radio", or "follow company procedures" (Appendix C). All responses are provided in

Appendix C. A total of 382 responses were received for this question with two respondents not answering.

Table 2

Survey question 6: What do you do when the Outdoor Warning System is sounded for a Severe Thunderstorm Warning?

Answer Options	Response Percent	Total
Take No Action	13.8%	53
Seek More information	66.4%	255
Seek Shelter Immediately	15.4%	59
Other	4.4%	17

As noted in survey question 5, many people will seek more information instead of seeking shelter immediately once the OWS is activated. The survey data indicates that the same type of warning response is prevalent in Burleson. 66.4% of the respondents indicated that they would seek more information if the OWS were sounded for a Severe Thunderstorm Warning, instead of seeking shelter immediately. Only 15.4% of the respondents indicated that they would seek shelter immediately. 13.8% indicated that they would take no action at all. 4.4% reported "Other". These responses were varied and included answers like "listen to the weather radio", or "follow company procedures" (Appendix C). All responses are provided in Appendix C. Added together, 84.6% of the respondents indicated that they would not seek shelter for a Severe

Thunderstorm Warning from the OWS system. All 384 respondents answered this question.

Table 3

Survey question 7: Would you believe that there was an imminent threat of tornado if the Outdoor Warning System was sounded?

Answer Options	Response Percent	Total
Yes	67.1%	255
Seek More information	32.9%	125

67.1% of the respondents answered "yes" to survey question 7, indicating that they would believe that there was a threat if the OWS was activated while 32.9% answered "no". Four respondents skipped this question (Appendix B).

Research question (b) asked: What is the threat perception of citizens once the sirens stop sounding?

Table 4

Survey question 8: When the sirens stop sounding, does that mean that the threat is over?

Answer Options	Response Percent	Total
Yes	12.1%	46
No	64.8%	247
Unknown	23.1%	88

Twelve point one percent (12.1%) of the respondents answered "yes" to survey question 8, indicating that they

believe that the threat of severe weather is over once the OWS stops sounding. 23.1% of the respondents indicated that they did not know whether or not the severe weather threat was over once the OWS stopped sounding. Added together, 35.2% of the respondents indicated an inaccurate perception of the current OWS use by selecting "Yes" or "Unknown". 64.8% of the respondents indicated that they believed that the severe weather threat was not over if the sirens stopped sounding. A total of 381 respondents answered this question and three respondents skipped the question (Appendix B).

Research question (c) asked: When should the OWS be activated for severe thunderstorms?

Table 5

Question 14: Please select a policy for outdoor warning.

Answer Options	Response Percent	Total
Set off storm sirens when there is a warning. Even though it will create more false alarms, it will give citizens more time to react.	69.5%	265
Do not set off the sirens until a tornado is actually spotted. This will reduce false alarms and "crying wolf", but it will give citizens less time to react.	28.3%	108

Neither

2.4%

9

382 respondents answered survey question 14 and two skipped the question. 69.4% of the respondents indicated that an OWS activation policy should require that the system be activated when there is a warning, even if it created more false alarms. 28.3% favored an OWS activation policy that only allowed the system to be activated if a tornado was visually confirmed. 2.4% of the respondents selected "neither". Respondents that indicated "neither" were required to input a response. These responses are listed in Appendix C.

Table 6

Question 12: Are you aware that most cities in the Metroplex use the same storm siren activation criteria?

Answer Options	Response Percent	Total
Yes	47.7%	183
No	52.3%	201

All 384 respondents answered survey question 12. 47.7% of the respondents indicated that they were aware that most cities in the Metroplex use the same storm siren activation criteria while 52.3% indicated that they were not aware of the standard (Appendix B).

Table 7

Question 13: Sirens are activated during a severe thunderstorm if winds are 70+ mph and/or 1 ½" hail is detected. Do you agree or disagree that sirens should be activated for this criterion?

Answer Options	Response Percent	Total
Agree	93.0%	356
Disagree	7%	27

383 respondents answered survey question 13 and one skipped the question. 93.0% of the respondents indicated that they agreed to the current criteria of OWS activations for Severe Thunderstorms and the remaining 7% indicated that they disagreed with the criteria. Respondents that indicated that they disagreed were required to input a response on why they disagreed. These responses are listed in Appendix C.

Research question (d) asked: What influence could different OWS warning tones/messages have upon residents?

Table 8

Question 4: Are you aware that the City of Burleson uses two different tones for severe weather? One tone indicates a Severe Thunderstorm Warning and a different tone indicates a Tornado Warning.

Answer Options	Response Percent	Total
Yes	35.4%	136
Yes, I don't know what the difference is between the tones	33.9%	130
No	30.7%	118

The survey data indicates that a significant percentage of the population, 30.7%, does not know that there are two different warning signals and an additional 33.9% of the population did not know the difference between the tones. Added together, 64.6% of the population indicated a misunderstanding of the OWS system usage. All 384 respondents answered this question.

Table 9

Question 9: What form of emergency notification do you believe provides the best warning of a potential emergency?

Answer Options	Response Percent	Total
Outdoor Warning System	20.7%	79
Emergency notifications sent to phone	3.1%	12
A combination of OWS and notifications sent to phone	71.4%	272
No notifications necessary, the news is sufficient	2.4%	9
Other	2.4%	9

381 respondents answered question 9 and 3 skipped the question. 20.7% indicated that the OWS provided the best warning for a potential emergency. 3.1% reported that notifications sent to phone were the best warning, and 71.4% indicated that a combination of OWS and phone messages provided the best warning methodology. 2.4% indicated that no notification was necessary because the news provided sufficient warning, and an additional 2.4% indicated "Other". Responses for "Other" can be found in Appendix C.

Table 10

Question 10: Do you own a weather radio?

Answer Options	Response Percent	Total
Yes	30%	115
No	70%	268

383 respondents answered survey question 10 and 1 respondent skipped the question. 30% answered "Yes" indicating that they owned a weather radio leaving the additional 70% indicating that they did not own a weather radio (Appendix B).

Table 11

Question 11: If so, do you use the weather radio during storms?

Answer Options	Response Percent	Total
Yes	25.9%	98
No	9.8%	37
Not Applicable	64.4%	244

379 respondents answered survey question 11 and 5 respondent skipped the question. Question 11 provided for follow up information to question 10. If the respondent did own a weather radio, did they actually use it? 64.4% indicated that the question was not applicable because they did not own a weather radio. The remaining 25.9% answered "Yes" indicating that they use the weather radio to provide warning and information during storms. 9.8% indicated that they did not utilize their weather radio. When the "not applicable" answer is filtered, the survey shows that 85.2% of the respondents that owned a weather radio utilized them during storms (Appendix B).

Qualifying question results included survey question one, two, and three:

Table 12

Question 1: Do you live in the City of Burlison?

Answer Options	Response Percent	Total
Yes	79.4%	304
No	20.6%	79

79.4% of the survey respondents reported living in the City of Burleson. One respondent skipped this question. A total of 383 answers were received.

Table 13

Question 2: Do you work in the City of Burleson?

Answer Options	Response Percent	Total
Yes	58.3%	304
No	41.7%	159

58.3% of the survey respondents reported living in the City of Burleson. Three respondents skipped this question. A total of 381 answers were received.

Table 14

Question 3: Are you aware that the City of Burleson has an Outdoor Warning System?

Answer Options	Response Percent	Total
Yes	91.4%	384
No	8.6%	36

A total of 420 answers were received. All thirty-six respondents that answered "No" to this question were filtered from all other results. This left a valid pool of 384 respondents.

Demographic results of survey included gender and age grouping:

Table 15

Question 15: Gender

Answer Options	Response Percent	Total
Male	49.2%	187
Female	50.8%	193

380 respondents answered survey question 15 and four skipped the question. Question 15 shows a relatively even gender distribution between the respondents with 49.2% male and 50.8% female.

Table 16

Question 16: Age

Answer Options	Response Percent	Total
Less than 20	18.8%	72
21 - 50	52.4%	200
More than 50	28.8%	110

382 respondents answered survey question 16 and two skipped the question. Question 15 indicates that 18.8% of the respondents were less than 20, 52.4% of the respondents were between 21-50, and 28.8% were more than 50.

Personal interviews indicated that the majority of interviewees 4 of 5 indicated that the current OWS activation policy created too many false alarms, and that

the current policy may create a sense of complacency (Appendix E). Policy suggestions are included in the discussion section below.

Discussion

Interviews with Policy Makers, Emergency Management staff, and Administrative staff indicated support for a two-tone system, one tone indicating a severe thunderstorm warning, and a separate tone for a Tornado warning (Appendix E). However, the survey data (see Table 4) indicated that a significant percentage (S) = 64.6% of the population does not differentiate between the two different tones for severe thunderstorm and/or tornado warnings (Appendix B). The data indicates that different OWS warning tones/messages may either cause confusion to residents or that residents do not perceive a difference in the tones/messages from the OWS system. This finding informs research question (d), What influence could different OWS warning tones/messages have upon residents? These findings are significant because they have implications related to false alarm perception. The majority of the population may view all 31 previous activations since 2008, City of Burleson, (2011), regardless of type, as false alarms. As evidenced in the literature review, increased perception of false alarms can lead to complacency, desensitization

and/or decreased risk perception, and a lack of credibility (Trumbo, Craig, McComas, 2003), (Rodriguez, Diaz, and Aguirre, 2004), (National Weather Service, July, 2011, p. iii). A lack of risk perception is evidenced in survey question five (see Table 5) and six (see Table 6) results, which show that a significant percent of the population does not seek shelter immediately when they hear the OWS. Three interviewees indicated that they were concerned that the current City of Burleson OWS activation policy not only created too many false alarms, but also may increase citizen complacency (Appendix E). Additionally, 32.9% of the respondents indicated that they would not believe that there was an imminent threat of tornado if the OWS was sounded (see Table 7), (Appendix B). Therefore, data from both the literature review and the survey inform research question (a) by indicating that frequent OWS siren activation for severe weather does in fact lead to complacency, desensitization and/or decreased risk perception. However, it must be noted that simply living in an area prone to severe weather events, such as Burleson, may also contribute these same behaviors (Bankoff, 2007), (National Weather Service, July, 2011).

The research data from questions five (see Table 5) and six (see Table 6) also indicated that residents and

workforce in the City of Burlison respond to a threat warning from an OWS in a similar manner to other populations (Seddig, 2009), (National Weather Service, July 2011), (Tinney, 2011). Both the research data (see Table 5 and 6), and the literature review showed that residents will delay taking action until they can substantiate the threat by attempting to get more information (Rogers & Sorensen, 1989), (Mileti & Sorensen, 1990), (Hammer & Schmidlin, 2002), (National Weather Service, 2009), (Seddig, 2009), (National Weather Service, July 2011), (Tinney, 2011).

The literature review indicated that multiple points of information will assist people through the threat perception process more rapidly (National Weather Service, April, 2011), (Rogers & Sorensen, 1989), (Seddig, 2009), (Mileti & Sorensen, 1990), (Sorenson, 2000), and (Hammer & Schmidlin, 2002). The survey data found that 71.4% (see Table 9) of the respondents indicated that a combination of OWS and notifications sent to phone, multiple points of information, would provide the best warning of a potential emergency (Appendix B). Therefore, both the literature review and the research results indicate that OWS systems should not be relied on as the only method of emergency notification. Additionally, Only 30% (see Table 10 and 11)

of the respondents indicated owning and using a weather radio. Therefore, a weather notification plan that includes a reliance on citizens receiving additional warning messages via weather radio does not affect a high percentage of the population.

The issue of whether or not to activate OWS for a severe thunderstorm, research question (c), was addressed in several ways. First, survey questions 6, 7, 12, and 13 provided data to inform the research question. In question 6 (see Table 6) respondents indicated that only 15.4% would seek shelter for a severe thunderstorm warning (Appendix B). However, a majority, (66.4%) reported that the OWS system would cause them to seek more information. In question 7, 67.1% of the respondents indicated that they would believe that there was an imminent threat of tornado if the OWS was sounded (see Table 7), (Appendix B). In question 12, respondents indicated that less than half, (47.7%) of the population were aware that most cities in our area utilize the same storm siren activation criteria, which requires OWS activation for severe thunderstorms producing winds 70+ mph and/or 1 ½" hail (see Table 12), (Appendix B). However, when asked directly if storm sirens should be activated for Severe Thunderstorms producing winds 70+ mph and/or 1 ½" hail, 93% of the respondents

answered yes (see table 13), (Appendix B). Additionally, 69.4% of the respondents preferred an activation policy that created more false alarms if it gave citizens more time to react (see Table 14), (Appendix B). Three of the interviewees believed that the OWS should not be sounded for current severe thunderstorm criteria. Conversely, 2 interviewees indicated that the siren should be sounded under the current criteria (Appendix E). Information found during the literature review primarily supports the current position of OWS activation for certain severe thunderstorm criteria. Rodriguez, Diaz, and Aguirre, (2004, p.12) and (Effective Disaster Warnings, 2000, p.6) discuss the importance of adequate warnings. However, the authors stop short of specifically suggesting OWS activation should occur for severe thunderstorms. Collectively, this data has two significant research implications; First, it suggested that even if OWS systems are used more frequently to notify of severe thunderstorms, it will cause the majority of the population to seek additional information if they hear them. Second, activating the sirens for the current City of Burleson criteria is clearly supported by an overwhelming majority (City of Burleson, 2011), (Appendix B). Finally, both the survey data and literature review inform research question (b), What is the threat perception of

citizens once the sirens stop sounding? Research data from the survey indicates that up to 35.2% (see Table 8) of the population may consider a severe weather threat to be over once the OWS stops sounding (Appendix B). Information garnered during the literature review also shows that populations may perceive that the threat is over once the sirens stop sounding, which directly supports these findings (National Weather Service, July, 2011, pg. 5).

Recommendations

Several recommendations will be offered as a result of the research findings.

Recommendation 1

The City of Burlison should continue to utilize a two-tone and voice message OWS weather alert. One tone and voice message should be used to indicate a severe thunderstorm warning, and another separate tone and voice message should be used to indicate a tornado warning. However, the tones and messages should be distinct and significantly different from each other. Although this policy may cause some confusion and increase "crying wolf" or false alarm perception, the majority of residents are still prompted to seek additional, possibly life saving information.

Recommendation 2

A significant public education/public information campaign should be conducted specifically to inform citizens of the difference between a tornado-warning message and a severe thunderstorm warning message from the Outdoor Warning System as well as when and why the OWS is activated.

Recommendation 3

The City of Burleson should continue to use the current OWS activation criteria for severe thunderstorm warnings. As indicated previously, this criterion requires OWS activation with a Severe Thunderstorm Warning message if 70+mph winds and/or 1 ½" hail is reported. However, the policy should consider a lower standard for outdoor vent areas. An OWS activation policy should attempt to limit false alarms by having a standard deemed acceptable by policy makers, which, in the Case of the City of Burleson, is the current standard.

Recommendation 4

A comprehensive emergency warning plan should include the utilization and provision of multiple points of information such as OWS activation, coupled with phone notification technologies, social media messaging, etc. This will not only provide citizens with several different sources of

credible information, but it will also add to redundancy in the event that one methodology fails.

Recommendation 5

A policy that requires OWS activation very far in advance may be confusing to citizens. Citizens may perceive the threat to be over with by the time the storm approaches. The current City of Burleson alert zone should be narrowed down to the city limits to avoid this issue of early activation. This will allow for reaction time, but not so far in advance that the threat is forgotten. The policy should also allow OWS activation multiple times if necessary.

Recommendation 6

Uniform OWS activation policies should be adopted between jurisdictions in order to reduce ambiguity from varying standards.

Recommendation 7

Activation of the OWS system should only occur in applicable areas of the city. The ability to selectively activate OWS sirens should be included in the policy, instead of activating all sirens across the entire city.

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Appendix A

Citizen and Workforce Survey

Part 1

1) Do you live in the City of Burleson?

Yes

No

2) Do you work in the city of Burleson?

Yes

No

3) Are you aware that the City of Burleson has an Outdoor
Warning System?

Yes

No

Part 2

4) Are you aware that the City of Burleson uses two
different tones for severe weather? One indicating Severe
Thunderstorm and a different tone indicates a Tornado
Warning.

Yes

Yes but I don't know what the difference is between the two

No

5) What do you do when the OWS system is sounded for a
Tornado Warning?

- a) Take No Action
 - b) Seek more information before taking action; news, walk outside to look, etc.
 - c) Seek shelter immediately
 - d) Other (please specify)
-
-
-

6) What do you do when the Outdoor Warning System is sounded for a Severe Thunderstorm Warning?

- a) Take No Action
 - b) Seek more information before taking action; news, walk outside, etc.
 - c) Seek shelter immediately
 - d) Other (please specify)
-
-

7) Would you believe that there was an imminent threat of tornado if the Outdoor Warning System was sounded.

Yes

No

8) When the sirens stop sounding, does that mean that the threat is over?

Yes

No

Unknown

9) What form of emergency notification do you believe provides the best warning of a potential emergency?

a) Outdoor Warning System

b) Emergency notifications sent to phone

c) A combination of Outdoor Warning System and phone calls

d) No notification necessary, the news is sufficient

e) Phone Calls only

e) Other (please specify)

10) Do you own a weather radio?

a) Yes

b) No

11) If so, do you use it during storms?

a) Yes

b) No

c) Not Applicable

12) Are you aware that most cities in the Metroplex use the same storm siren activation criteria?

a) Yes

b) No

13) Sirens are activated during a severe thunderstorm if winds are 70+ mph and/or 1½' hail is detected. Do you agree or disagree that the sirens should be activated for this criteria?

a) Agree

b) Disagree (please explain)

14) Please select a policy for outdoor warning.

a) Set off the storm sirens when there is a warning. Even though it will create more false alarms it will give citizens more time to react.

b) Do not set off the sirens until a tornado is physically spotted. This will reduce false alarms and "crying wolf".

c) Neither (please explain)

Part 3

Demographic Info:

15) Gender

A) Male

B) Female

16) Age

A) Less than 20

B) 21-50



C) More than 50



Appendix B



Citizen and Workforce Survey Results

Outdoor Warning System Study



1. Do you live in the City of Burleson?			
		Response Percent	Response Count
Yes		80.0%	336
No		20.0%	84
answered question			420
skipped question			1




2. Do you work in the City of Burleson?			
		Response Percent	Response Count
Yes		55.5%	232
No		44.5%	186
answered question			418
skipped question			3

3. Are you aware that the City of Burleson has an Outdoor Warning System?			
		Response Percent	Response Count
Yes		91.4%	384
No		8.6%	36
answered question			420
skipped question			1





Appendix B

Citizen and Workforce Survey Results

4. Are you aware that the City of Burleson uses two different tones for severe weather? One tone indicates a Severe Thunderstorm Warning and a different tone indicates a Tornado Warning.




		Response Percent	Response Count
Yes		33.5%	141
Yes, I don't know what the difference is between the two tones		34.9%	147
No		31.6%	133
answered question			421
skipped question			0






5. What do you do when the Outdoor Warning System is sounded for a Tornado Warning?

		Response Percent	Response Count
Take no action		5.3%	22
Seek more information before taking action; news, walk outside to look, etc.		58.9%	247
Seek shelter immediately		31.3%	131
Other (please specify)		4.5%	19
answered question			419
skipped question			2

Appendix B



Citizen and Workforce Survey Results




8. When the sirens stop sounding, does that mean that the threat is over?			
		Response Percent	Response Count
Yes		12.7%	53
No		62.9%	263
Unknown		24.4%	102
answered question			418
skipped question			3

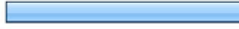

9. What form of emergency notification do you believe provides the best warning of a potential emergency?			
		Response Percent	Response Count
Outdoor Warning System		21.3%	89
Emergency notifications sent to phone		3.1%	13
A combination of Outdoor Warning System and notifications sent to phone		70.3%	294
No notification necessary, the news is sufficient		3.1%	13
Other (please specify)		2.2%	9
answered question			418
skipped question			3

Appendix B

Citizen and Workforce Survey Results



10. Do you own a weather radio?			
		Response Percent	Response Count
Yes		29.3%	123
No		70.7%	297
answered question			420
skipped question			1




11. If so, do you use the weather radio during storms?			
		Response Percent	Response Count
Yes		25.2%	105
No		10.6%	44
Not Applicable		64.2%	267
answered question			416
skipped question			5

12. Are you aware that most cities in the Metroplex use the same storm siren activation criteria?			
		Response Percent	Response Count
Yes		47.0%	198
No		53.0%	223
answered question			421
skipped question			0

Appendix B

Citizen and Workforce Survey Results

13. Sirens are activated during a severe thunderstorm if winds are 70+ mph and/or 1 1/2" hail is detected. Do you agree or disagree that sirens should be activated for this criteria?			
		Response Percent	Response Count
Agree		93.1%	391
Disagree (please explain)		6.9%	29
answered question			420
skipped question			1

14. Please select a policy for outdoor warning.			
		Response Percent	Response Count
Set off storm sirens when there is a warning. Even though it will create more false alarms, it will give citizens more time to react.		67.5%	283
Do not set off the sirens until a tornado is actually spotted. This will reduce false alarms and "crying wolf", but it will give citizens less time to react.		30.1%	126
Neither (please explain)		2.4%	10
answered question			419
skipped question			2

Appendix B

Citizen and Workforce Survey Results

15. Gender			
		Response Percent	Response Count
Male		51.6%	215
Female		48.4%	202
answered question			417
skipped question			4

16. Age			
		Response Percent	Response Count
Less than 20		23.4%	98
21-50		50.1%	210
More than 50		26.5%	111
answered question			419
skipped question			2

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 5:

Q1. What do you do when the Outdoor Warning System is sounded for a Tornado Warning?		
1	Seek Shelter and grab weather radio	Feb 26, 2012 7:28 AM
2	Seek Shelter and Seek more info	Feb 26, 2012 7:27 AM
3	call work	Feb 26, 2012 7:23 AM
4	Seek Shelter and Seek more info	Feb 26, 2012 7:15 AM
5	check news and get to a safe area	Feb 26, 2012 7:09 AM
6	cant hear siren from house	Feb 26, 2012 6:08 AM
7	wait for parent	Feb 26, 2012 6:07 AM
8	BHS Procedures	Feb 26, 2012 5:47 AM
9	Go outside to listen to the warning	Feb 9, 2012 8:09 AM
10	follow management instructions	Feb 9, 2012 6:22 AM
11	don't know what it sounds like	Feb 9, 2012 4:23 AM
12	Go outside and listen but when the weather is bad, it goes off several times and we don't know what to believe. It is also hard to hear at night when it's pouring rain.	Feb 8, 2012 9:13 PM
13	i think that the city wasted my tax dollars on this stupid, pointless weather alert system. everyone has a cell phone and a radio. we KNOW when there is severe weather. i recommend discontinuing this equipment as soon as possible.	Feb 8, 2012 8:10 PM
14	Seek more information, but prepare everyone to be in "seeking shelter" mode.	Feb 8, 2012 5:33 PM
15	go outside to hear what it's saying, but can't understand it	Feb 8, 2012 5:05 PM
16	go to my safe place	Jan 27, 2012 4:49 PM
17	I can rarely hear these	Jan 26, 2012 6:37 AM
18	since I can't really hear the sirens inside my house and I don't know the difference, I usually take shelter when I get the call and stay tuned to the radio.	Jan 25, 2012 7:04 PM
19	I don't know the difference between the tones, so I check on-line to find out if it is for a tornado or a thunderstorm. I move to an interior room in the case of a tornado and I do nothing in the case of a thunderstorm.	Jan 25, 2012 3:42 PM

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 6:

Q1. What do you do when the Outdoor Warning System is sounded for a Severe Thunderstorm Warning?		
1	Seek Shelter and Seek more info	Feb 26, 2012 7:27 AM
2	call work	Feb 26, 2012 7:23 AM
3	Depends how bad it is	Feb 26, 2012 7:12 AM
4	stay indoors	Feb 26, 2012 6:06 AM
5	other	Feb 26, 2012 6:02 AM
6	BHS Procedures	Feb 26, 2012 5:47 AM
7	Turn off plugged in devices	Feb 26, 2012 4:52 AM
8	Seek shelter, but also keep the TV going for info	Feb 9, 2012 12:20 PM
9	turn on TV for radar	Feb 9, 2012 11:36 AM
10	Look outside and turn on the radio for more info	Feb 9, 2012 8:09 AM
11	follow management instructions	Feb 9, 2012 6:22 AM
12	don't know the sound	Feb 9, 2012 4:23 AM
13	Same as tornado siren	Feb 8, 2012 9:13 PM
14	i've already taken the appropriate action by the time the severe weather alert system noises off and interrupts the day or night.	Feb 8, 2012 8:10 PM
15	Same as above	Feb 8, 2012 5:33 PM
16	was not aware there is a different sound for both	Feb 8, 2012 5:05 PM
17	Usually no action because it sounds even if there is a thunderstorm in west texas	Feb 8, 2012 1:55 PM
18	I can rarely hear these	Jan 26, 2012 6:37 AM
19	same as my previous answer	Jan 25, 2012 7:04 PM
20	I get text messages about 5 to 7 minutes before the system sounds so i am already looking into what is happening.	Jan 25, 2012 4:00 PM

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 9:

Q1. What form of emergency notification do you believe provides the best warning of a potential emergency?		
1	Phone Calls Only	Feb 26, 2012 6:20 AM
2	Phone Calls only	Feb 26, 2012 5:18 AM
3	Outdoor Warning System AND being aware of local weather	Feb 9, 2012 12:20 PM
4	Sirens,radio,tv,phones. All.	Feb 9, 2012 8:09 AM
5	outdoor warning abd news	Feb 8, 2012 5:05 PM
6	Very, VERY judical use of the outdoor and phone system	Feb 8, 2012 2:25 PM
7	Only warn if really dangerous & need to take shelter. Then notify the coast is clear to come out of shelter!	Jan 31, 2012 11:53 AM
8	The Outdoor Warning System is wonderful if only used for tornadoes.	Jan 25, 2012 3:42 PM
9	love both warnings just wish there was only a siren for tornados not severe storms	Jan 25, 2012 3:34 PM

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 13:

Q1. Sirens are activated during a severe thunderstorm if winds are 70+ mph and/or 1 1/2" hail is detected. Do you agree or disagree that sirens should be activated for this criteria?		
1	disagree	Feb 26, 2012 7:37 AM
2	Already aware of the situation	Feb 26, 2012 5:47 AM
3	Tornado or 1 1/2" hail only	Feb 9, 2012 2:21 PM
4	used too frequently- no one pays attention now	Feb 9, 2012 1:16 PM
5	Should be lower threshold	Feb 8, 2012 9:19 PM
6	everyone has a cell phone and a radio. we do not need a severe weather notification from a big beehive speaker shoved onto a telephone pole.	Feb 8, 2012 8:10 PM
7	I think somebody needs to make sure the weather is actually headed our way before blowing the damned horn	Feb 8, 2012 2:25 PM
8	only if it is eminent	Feb 8, 2012 1:55 PM
9	Should only be used for tornadoes	Feb 8, 2012 12:07 PM
10	False alarm over half the time it is sounded	Feb 8, 2012 11:57 AM
11	70+ is a str. criteria for this region, shouldn't be used for warning of danger; smaller hail can cause sig. damage	Feb 8, 2012 11:55 AM
12	Disagree	Feb 2, 2012 2:09 PM
13	Disagree	Feb 2, 2012 12:06 PM
14	Disagree	Feb 2, 2012 12:03 PM
15	Disagree	Feb 2, 2012 12:00 PM
16	Disagree	Feb 2, 2012 11:56 AM
17	Disagree	Feb 2, 2012 11:51 AM
18	Disagree	Feb 2, 2012 11:45 AM
19	Sirens should go offwhen tornado is spotted.	Jan 27, 2012 6:07 PM
20	Most of the time it turns out to be heavy rain and most of the time I'm asleep in my bed so shelter is all ready taken	Jan 27, 2012 5:57 AM
21	When they are far away we are inundated with false alarms	Jan 27, 2012 5:46 AM
22	No because then I won't pay attention to it in a tornado	Jan 27, 2012 5:11 AM
23	Should only be for tornado. The city sounds them to much and have cried wolf to much. They have gone off before when not even raining.	Jan 26, 2012 6:44 PM
24	the more often sirens sound, the less likely ppl are to pay attention	Jan 26, 2012 6:37 AM

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 13:

Q1. Sirens are activated during a severe thunderstorm if winds are 70+ mph and/or 1 1/2" hail is detected. Do you agree or disagree that sirens should be activated for this criteria?		
25	i think it should be activated for smaller hail	Jan 25, 2012 6:07 PM
26	Thunderstorms are just a part of living in our area and they sound their own siren, "thunder" that prompts me to go online to check the severity of the storm. I feel like the siren is "crying wolf" for a tornado every time it sounds.	Jan 25, 2012 3:42 PM
27	i believe sirens should just go off for tornados.	Jan 25, 2012 3:34 PM
28	It's common sense if the weather is bad. Citizens should know how to turn on the tv and pay attention to the sky, or there's a weather app. for that for your smart phone	Jan 25, 2012 9:15 AM
29	activate at lower wind speed and 1" hail	Jan 25, 2012 8:42 AM

Appendix C

Citizen and Workforce Survey Feedback

Feedback Responses to Survey Question 14:

Q1. Please select a policy for outdoor warning.		
1	Burleson Only	Feb 26, 2012 7:22 AM
2	2 sirens needed, 1 for spotted, 1 for possible	Feb 26, 2012 6:31 AM
3	neither	Feb 26, 2012 5:55 AM
4	A "Warning" means a tornado is spotted. Question is redundant. However, I'd choose option 1.	Feb 9, 2012 12:20 PM
5	get rid of this system, please!!! ask the taxpaying voters their opinion!!!	Feb 8, 2012 8:10 PM
6	unfortunately the system has become a huge 'crying wolf' program in the eyes (and ears) of most citizens	Feb 8, 2012 2:25 PM
7	Phone notifications for severe thunderstorm-text or email option would be good. Sirens for tornado only. This way notification is given for both and "false alarm" perception is dealt with.	Feb 8, 2012 2:19 PM
8	Right now there is too much crying wolf....I suggest a more clear distinction in the alarms for severe thunderstorms, and tornados.	Feb 8, 2012 12:25 PM
9	Tornado warning only, not storm	Feb 8, 2012 11:57 AM
10	set off for tornado warning for county	Feb 8, 2012 11:55 AM

Appendix D

Personal Interview Questions

- 1.) Do you feel that the current City of Burleson OWS activation policy creates too many false alarms?

- 2.) Do you feel that the City of Burleson Activation policy has made citizens complacent?

- 3.) Do you feel that OWS systems should be activated for Severe Thunderstorms?

- 4.) Do you feel that early activation of sirens well in advance of a storm can create confusion to citizens if there is no active storm present?

- 5.) Do you feel that the City of Burleson should continue to use a two-tone and voice message system for the OWS system?

- 6.) Do you feel that issuing public warnings via ows and connect-cty is beneficial, or does it add to false alarm perception?

- 7.) Should the OWS system be activated multiple times for approaching storms?

- 8.) Should an "All Clear" OWS tone and message be added to the OWS usage policy?

Appendix E

Personal Interview Answers

1.) Do you feel that the current City of Burleson OWS activation policy creates too many false alarms?

Respondent 1) Yes

Respondent 2) Yes

Respondent 3) No

Respondent 4) Yes

2.) Do you feel that the City of Burleson Activation policy has made citizens complacent?

Respondent 1) Not as alarmed

Respondent 2) Yes

Respondent 3) No

Respondent 4) Somewhat

3.) Do you feel that OWS systems should be activated for Severe Thunderstorms?

Respondent 1) No

Respondent 2) Yes, in this area it is necessary

Respondent 3) Yes, but with strict criteria

Respondent 4) No

4.) Do you feel that early activation of sirens well in advance of a storm can create confusion to citizens if there is no active storm present?

Respondent 1) Yes

Respondent 2) Yes

Respondent 3) Yes

Respondent 4) Yes

5.) Do you feel that the City of Burleson should continue to use a two-tone and voice message system for the OWS system?

Respondent 1) Yes

Respondent 2) Yes, If both are continued

Respondent 3) Yes, but more public education is needed

Respondent 4) Yes

6.) Do you feel that issuing public warnings via ows and connect-cty is beneficial, or does it add to false alarm perception?

Respondent 1) Yes

Respondent 2) Yes, it also adds redundancy

Respondent 3) Adds to false alarm perception

Respondent 3) Adds to false alarm perception

7.) Should the OWS system be activated multiple times for approaching storms?

Respondent 1) Yes, if necessary

Respondent 2) Yes

Respondent 3) No

Respondent 4) Yes

8.) Should an "All Clear" OWS tone and message be added to the OWS usage policy?

Respondent 1) No

Respondent 2) No

Respondent 3) No

Respondent 4) No

Appendix F

City of Burleson Outdoor Warning System Activation
Guidelines**CITY OF BURLESON
EMERGENCY MANAGEMENT
STANDARD OPERATING PROCEDURES**

Title: Outdoor Warning System (OWS)
Subject: Public Warning
Number: OEM-002

Effective: March 1, 2012

Replaces: Previous SOP

Purpose: To establish procedures for activating the City of Burleson Outdoor Warning System.

Definitions:

1. **Outdoor Warning System.** A group of electrically operated sirens designed to alert the public that an emergency exists which are strategically placed throughout the City of Burleson. The sirens are an **OUTDOOR** warning system not designed to be heard indoors.
2. **Reliable Source.** For purposes of this policy, a reliable source is defined as the National Weather Service (NWS), RACES Storm Spotter, city personnel trained in Skywarn, or the EOC.

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3. COG Criteria. A Severe Thunderstorm producing winds in excess of 70 mph and/or 1 ½" hail.

 4. Alert Zone. The alert zone refers to the boundaries of the siren activation. When a severe weather warning is received that meets activation criteria, it must fall within the alert zone for the OWS system to be activated. Warnings received outside of the alert zone will not require OWS activation. The alert zone is the city limits.

OWS General Description:

1. There are nine (10) electronically operated sirens in the Burleson Outdoor Warning System. All sirens are activated simultaneously by radio. There is the capability to activate a single siren or group of sirens in a particular part of the city.

2. The sirens are an **OUTDOOR** warning system and may not be heard indoors or in a noisy area. The system is the primary form to alert citizens engaged in outdoor activities to go inside and get additional information via weather radio or local TV and radio stations.

3. The Outdoor Warning System is tested at 1300 hours on the first Wednesday of each month; however the system is not tested on holidays or during periods of inclement weather.

4. A silent test is conducted weekly. The system deficiencies are reported to the system maintenance contractor.
5. The system can be activated from:
 - a. The Emergency Operations Center
 - b. Burluson Police Department Dispatch Center
 - c. Emergency Management Handheld Radios

OWS Activation:

A. Conditions for Activation:

1. Tornado Warning by the National Weather Service
2. Tornado Sighting by a Reliable Source
3. Severe Thunderstorm Warning issued by the National Weather Service meeting COG criteria.
4. Homeland Security/Attack
5. Hazardous Material Emergency
6. Special Circumstances per the Incident Commander or EOC

B. Authority to Activate:

1. Mayor (Emergency Management Director)

2. City Manager
3. Deputy City Manager(s)
4. Emergency Management Officer
5. Police Chief or Designees
6. Fire Chief or Designees (Director of
Emergency Management)
7. Incident Commander
8. On-Call EOC Duty Officer
9. PIO

C. Alert Types:

1. Tornado Alert - Siren Alert with voice
message following, 3 minutes
 - a. The Tornado Alert will be activated when
the National Weather Service (NWS) has
issued a Tornado Warning that includes
any portion of the alert zone.
 - b. In the absence of NWS Warning, the alert
will be activated when tornado activity
has been reported and verified, by a
reliable source, within the alert zone.

2. Severe Weather Alert - Discontinuous Electronic Horn with voice message following, 30 seconds

a. The Severe Weather Alert will be activated when the National Weather Service (NWS) has issued a Severe Thunderstorm Warning that meets COG criteria AND falls within the alert zone.

3. A Hazardous Materials Emergency Alert as requested by the Incident Commander.

D. Alert Area:

4. Tornado Alert: ALL sirens will be activated for a validated tornado warning

5. Severe Thunderstorm Alert: Sirens may be activated selectively by area of expected storm impact. EOC staff will have the authority to make selection.

Weather Activation Matrix

