Development of a pre-scripted Incident Action Plan for road closures

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Certification Statement

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

Signed:_____

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Abstract

The Village of Bolingbrook (VOB) has over three hundred miles of roads and these roads sometimes flood heavily due to flash floods with vehicles becoming stopped and trapped in the flooded roads. The problem is there is no pre-scripted Incident Action Plan (IAP) for road closures when flash flooding occurs in the Village of Bolingbrook. The purpose of the applied research is to develop a pre-scripted IAP for road closures when flash flooding occurs in the VOB. This was action research focusing on developing a pre-scripted IAP to better prepare local government workers. The research questions were the following: a) What are the locations that can be identified as predicted flood areas; b) What are the objectives of the pre-scripted Incident Action Plan; c) What resources are needed during flood incidents; d) What is the action timeline for the pre-scripted Incident Action Plan. The procedures involved reviewing fire department call statistics, interviewing three representatives from the three different departments involved in mitigating flash flood emergencies, and conducting a meeting with all three department representatives to discuss the contents of the pre-scripted IAP. The results identified ten locations with a history of flooding, developed nine operational objectives and four safety awareness messages, identified available resources to assist with closing roads, and a timeline of four hours. A pre-scripted IAP was developed which identified what each of the three departments operational emphasis will be during the four hour timeframe. The recommendations included review and implementation of the pre-scripted IAP from the department directors. Once the pre-scripted IAP is approved by both department directors, the command staff personnel from each of the three departments will be educated on the contents by the researcher. Long term recommendation will be to conduct a post incident review of the first time the pre-scripted IAP is utilized.

Table of Contents

Introduction

The Village of Bolingbrook (VOB) is located approximately 30 miles southwest of Chicago, Illinois, has a population of 74,000 people and is approximately 24 square miles (quickfacts.census.gov, 2013). The VOB has 304 miles of roads of which certain areas of these roads are prone to flood during flash flood incidents (T. Torres, personal communication, September, 2013). On some occasions, vehicles have driven through flooded road areas prior to them being closed and thus became stranded.

The problem is there is no pre-scripted Incident Action Plan (IAP) for road closures when flash flooding occurs in the VOB. The purpose of this applied research project (ARP) is to develop a pre-scripted IAP for road closures when flash flooding occurs in the VOB. This study will identify through action research: a) What are the locations that can be identified as predicted flood areas. b) What are the objectives of the pre-scripted Incident Action Plan. c) What resources are needed during flood incidents. d.) What is the action timeline for the pre-scripted Incident Action Plan. This research developed a pre-scripted IAP which is located in the appendix.

Background and Significance

The VOB roads are maintained by the VOB public works department (PW) and patrolled by the Bolingbrook police department (PD). Each year the VOB experiences two to three heavy rainfalls that produce significant enough rain that could be classified as flash floods. These incidents flood roadways to the point that the researcher believes pose a danger for driving; however the roads are sometimes not closed in a timely manner. This has caused vehicles to be stranded in the flooded roadways and required citizens to be helped to safety by emergency

responders. This has been a common challenge the researcher has experienced and observed for twenty three years.

It has been identified that there are ten road locations that are predictable to flood when heavy rains and flash flooding occurs. These roads flood primarily due to the significant rainfall in a short period of time with a contributing factor of clogged sewer grates. These water congested roadways sometimes have water moving swiftly. According to the National Oceanic and Atmospheric Administration (NOAA), this moving water could result with people being knocked off their feet and move cars if it is six inches deep (National Weather Service [NWS], 2005, p. 11) The researcher this past year observed a PD officer wading through moving water on a roadway trying to locate a sewer grate while vehicles were driving around him.

This ARP developed a pre-scripted IAP which identifies the objectives for road closures and their locations. The pre-scripted IAP will identify the responsibilities for the VOB departments directly involved including PW, PD and the fire department (FD). It identifies timelines, responsibilities specific to each department, and gives the authority to establish a unified command. Implementation of this pre-scripted IAP during flash flood incidents will reduce the potential of vehicles getting stranded in water filled roads and thus minimize the need to put emergency responders in dangerous conditions to remove victims from vehicles.

The significance of this research is related to the goal from the National Fire Academy (NFA) Executive Analysis of Community Risk Reduction (EACRR) class as it “empowers the Executive Fire Officer (EFO) with the ability to lead community risk reduction in a strategic manner”(United States Fire Administration [USFA], 2012, p. 1-7). It correlates with the United States fire Administration (USFA) operational objectives two and three: “improve local planning

and preparedness" and "improve the fire and emergency services' capability for response to and recovery from all hazards" (USFA, 2012, p. 1-7).

Literature Review

Flash flooding can occur for numerous reasons including multiple thunderstorms and slow moving storms which are usually in areas of streams or low lying urban areas. The majority of these flash floods occur at night which hampers the ability of drivers to see the roads and it is reported that a significant, almost half, of fatalities are occurring in vehicles (NWS, 2005, p. 2). The NOAA and the NWS have worked in conjunction together to educate citizens about the dangers of flooded roadways and what citizens can do to be prepared and avoid these dangers including the campaign of "Turn around, Don't Drown" (United States Geological Survey [USGS], 2005, p. 2).

Citizens and emergency responders are given numerous terms to understand and differentiate regarding weather related events including watches and warnings. According to the Flood Safety Education Project, an organization whose goal is to reduce flood related fatalities, defines a flash flood warning as "threatening flooding that will occur within six hours" (floodsafety.com, n.d.). A flash flood warning can also be defined as being issued to inform not only the public, but also the "emergency management and other cooperating agencies that flash flooding is in progress, imminent, or highly likely" (Baum, 2007, p. 174). The NWS predicts weather by reviewing data, however according to Baum; difficulties are still remaining in warning all persons of impending weather regardless of current technological advances (Baum, 2007, p. 16). It is estimated that on average each year, according to the WMO Commission for Hydrology and Basic Systems, that flash floods kill over 5,000 people worldwide (WMO Commission for Hydrology and for Basic Systems, 2007, p. 1).

Response to weather emergencies could require the need of agencies such as the roads department, police department and rescue personnel. Recent research by Nancy Powell Quinn in Manitoba, suggests that multi-lateral partnerships are what the public sector primarily engages in to solve complex problems (Quinn, 2007, p. 26). According to Baum, "governments and societies take the same approaches to problems over and over" (Baum, 2007, p. 138). During flooding emergencies there can be numerous reasons why emergency services are compromised as was discovered by Cedric Scott of Rockdale County, Georgia. His research discovered that inaccessible and impassable roads and inaccessible and impassable bridges all played a role in challenging the emergency services of their area (Scott, n.d, p. 28).

Coordination of these agencies and departments can be directed best by implementing a unified command structure as is suggested by a recent technical report distributed by the United States Fire Administration (USFA) and the Federal Emergency Management Agency (FEMA) (Sensenig & Stambaugh, 2008, p. 17). Unified Command has been defined by the National Incident Management System (NIMS) as:

> An application of ICS when more than one agency has incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of the Unified Command, often the senior person from agencies and/or disciplines participating in the Unified Command, to establish a common set of objectives and a single Incident Action Plan (Sensenig & Stambaugh, 2008, p. 29)

This technical report also suggests that weather disasters can cause infrastructure damage such as debris on roadways and flood waters. It recommends public works departments can be of assistance to close roads with barricades and could provide resources such as heavy equipment to clear roads (Sensenig & Stambaugh, 2008, p. 17). Sensenig and Stambaugh also suggest in this

technical report that a risk assessment be conducted first as they believe many of the operational challenges the fire service faces during disasters can be anticipated and planned (Sensenig & Stambaugh, 2008, p. 1).

The Incident Command System (ICS) and NIMS were discussed in a Police Chief Magazine. The author of the article, Mr. Gil Jamieson who was the Acting Director of the NIMS Integration Center in 2005, suggested that in some areas of the country only the fire service was utilizing the ICS structure and that agencies such as public works and law enforcement regarded it as a "fire service system"(Jamieson, 2005, p. 2). Jamieson says that the fire service did pioneer the ICS, but that ICS is "at its core, a management system designed to integrate resources to effectively attack a problem" (Jamieson, 2005, p. 2).

There are many resources government officials can utilize to help prepare for incidents including recommendations from the National Fire Protection Association (NFPA). In October of 2007, there was a fire at a paint manufacturing facility in North Carolina where the pre-incident planning process was credited with helping emergency responders. It was stated that because of this planning process, it made the "operation much faster and, more importantly, much safer" (National Fire Protection Association [NFPA], 2010, p. 1620-24). Specifically, the NFPA 1620 standard is titled "Standard for Pre-Incident Planning". This standard suggests that data be collected by utilizing knowledgeable personnel in operations (National Fire Protection Association (NFPA, 2010, p. 1620-7). The NFPA recommends that when developing IAP's, the incident commander develops the strategy and that the IAP is updated throughout the incident (NFPA, 2010, p. 1620-6). Obtaining consensus on pertinent information and understanding the intended audience are considerations this NFPA 1620 standard recommends when developing pre-incident plans (NFPA, 2010, p. 1620-14).

FEMA gives insight into IAP's as they describe them as being operational directives that could be considered "downward-looking" (Federal Emergency Management Agency [FEMA], 2012, p. 7). Disseminating information in IAP's, the FEMA guide suggests it produces effective and efficient management of incident resources and minimizes confusion, however if not done correctly the ability to gain situational awareness could possibly fail (FEMA, 2012, p. 9). The guide recommends developing a "Action Planning Team" and that teamwork will be developed through the incident action planning process all of which will promote "communication, cooperation and coordination"(FEMA, 2012, p. 10). Developing objectives are a component for success and according to this guide it states that NIMS defines it as "statements of guidance and direction necessary for the selection of appropriate strategies and the tactical direction of resources" (FEMA, 2012, p. 18). Incident objectives are described to provide details that according to the guide should be "clear, measureable, achievable and flexible (FEMA, 2012, p. 19).

How all these objectives and pertinent information is disseminated to responders is through a standard form called the FEMA-ICS 202. This ICS form is recommend being in order of priority starting with the highest priority (FEMA, 2012, p. 20). Safety messages that are considered to be "relevant and actionable" to the emergency responders is a recommendation from the FEMA guide and should be included on the ICS 202 form (FEMA, 2012, p. 36).

Preparing emergency assets including personnel is recommended when flooding is noted to be highly probable according to researcher Charles Farlow in his theses research with the Naval Post Graduate School. His thesis focused upon the Sacramento, California region in developing what he considered a prepositioning optimization model (Farlow, 2011, p. XV). Coordination of people and resources takes part on roadways for not only flash flooding

situations but also traffic accidents and other types of emergencies. This is discussed in a dissertation by Kristen E. Shepherd where Shepherd explains that the most obvious need for coordination is with law enforcement when dealing with transportation and roadway emergencies (Shepherd, 2005, p. 4). Shepherd expounds and recommends that "all aspects of emergency services" be involved when circumstances change (Shepherd, 2005, p. 4). Shepherd reiterates what many fire service organizations have been teaching and that is to establish authority for decision makers by utilizing the incident command system and unified command systems (Shepherd, 2005, p. 27).

Government workers on a daily basis go to work and just know what they are responsible for and to whom. When emergencies occur such as with flash flooding, it is recommended to clearly identify the objectives including who is responsible for closing roads and who has the authority. Illinois law identifies that law enforcement has the authority and also a fire department officer in the absence of law enforcement. The Illinois Vehicle code defines it as the following:

> In the absence of a law enforcement officer or a representative of the highway agency having jurisdiction over the highway, an officer of a fire department, in the performance of his or her official duties, has the authority to close to traffic a highway, or a lane or lanes of a highway, as necessary to protect the safety of persons or property (Illinois Criminal and Motor Vehicle Law, 2013).

In summary, the literature review focused on areas of incident action planning, preplanning, incident objectives, flash flooding and natural disasters. The researcher utilized these areas to research the problem and assist with developing the pre-scripted IAP. Professional organizations guidelines were the predominate source in addition to other researchers

dissertations and thesis projects. All of this helped the researcher in developing questions for the interviews, steering the group meeting of the department representatives, and developing a pre-scripted IAP.

Procedures

This ARP was written and formatted utilizing the sixth edition of the American Psychological Association publication manual. Action research was completed to identify what are the locations that can be identified as predicted flood areas, what are the objectives of the pre-scripted IAP, what resources are needed during flood incidents and what is the action timeline for the pre-scripted IAP.

The researcher began initial research in June 2013 while attending the NFA in Emmitsburg, Maryland. The Learning Resource Center (LRC) was utilized by researching past Executive Fire Officer (EFO) projects for topics that included: IAP's, flash flooding and natural disasters, preplanning, and incident objectives. The researcher continued research at the Fountaindale Library in Bolingbrook, Illinois, and continued with online searching by utilizing the search engine www.google.com in the related topics.

The researcher set up interviews with three of the VOB department's command personnel representing the PW, PD and FD. These three departments are usually involved with mitigating flash flood incidents in the VOB. Gathering data from reliable knowledgeable people involved in operations is a recommendation from the NFPA so that is the reason why these individuals were selected (NFPA, 2010, p. 1620-7). The interviews were conducted separately over a period of three days in September 2013 and were approximately sixty minutes in duration.

The first interview was with Mr. Tony Torres on September 16, 2013 in a conference room at the PW administration building. Mr. Torres is a PW supervisor who oversees the daily

operations for the PW department and reports directly to the Director of PW (Appendix A). The second interview was with Commander Denny Hess on September 17, 2013 in a conference room at the PD administration. Commander Hess oversees the patrol division for the PD which includes all the patrol personnel and he reports to the Deputy Chief of Police (Appendix B). The third interview was with Deputy Chief Trinidad Garza on September 18, 2013 in his office at the FD administration. Deputy Chief Garza oversees all the operations for the FD and reports directly to the Director of Public Safety for the VOB (Appendix C).

Each of the interviewees were given the same eight questions that assisted the researcher with identifying where in the VOB are predictable to flood, what should be the objectives for a pre-scripted IAP, what resources does their agency have to provide, and what timeline were they recommending for these types of events. The information was gathered from all three interviews, typed and sent out to each of them to review. The researcher then called for a meeting for all three representatives to be together and meet on September 25, 2013.

The September 25, 2013 meeting was conducted at the fire administration conference room where the researcher presented a draft pre-scripted IAP utilizing the ICS 202 and ICS 201 forms for their review (Appendix D and E). This meeting was approximately 45 minutes in duration and each representative was allowed input into any changes or additions. This meeting was conducted because it is suggested by the FEMA guide for planning and what the researcher considered the meeting would be promoting “communication, cooperation, and coordination” (FEMA, 2012, p. 10). Within the draft pre-scripted IAP was a map of the identified areas discussed in the interviews (Appendix F). There was a brief discussion about notifications amongst the three departments and when unified command should be implemented and by

whom. It was agreed by all three department representatives that the researcher should move forward with implementing the draft pre-scripted IAP after minor modifications were made.

The researcher utilized the internal reporting system for the fire department called firehouse to find statistical data for water emergencies (Bolingbrook Firehouse Reporting System, 2012). It discovered vague reporting into two categories titled “person in distress calls for service” and “water problem, other”. This was a limitation for the research as the narrative sections written by officers were vague and some of these calls for service were for issues such as flooded basements. The researcher did identify with the three representatives of the PW, PD and FD that heavy rainfalls that include flash flooded roadways occur approximately two to three times per year. The researcher was unable to identify an exact statistic on vehicles and people stranded in flooded roadways.

Results

The researcher first started reviewing fire department statistical data for the past three years through the internal firehouse reporting system. The data was broken down into two categories for each year as “person in distress calls for service” and “water problem, other”. The year 2010 had a total of 27 emergency responses, the year 2011 had a total of 17 emergency responses, and the year 2012 had a total of 11 responses (Bolingbrook Firehouse Reporting System Version 2012, 2012). There was no statistical data available from the PD and PW departments to review.

The interview with Mr. Torres discovered that the VOB had a total of 304 miles of roads and that there was a two phase engineering project underway that had already displayed some alleviation of flooding to the Lily Cache/Schmidt Road flooding problem. It is expected to almost eliminate the flooding to that roadway area and also explained that he believes the

common cause of flooded roads was because of storm drains/sewer grates being clogged. Mr. Torres also explained that the PW department recently built an emergency response trailer for the purpose of closing roads for any type of emergency (T. Torres, personal communication, September 16, 2013). The details for all his answers are available in Appendix A.

The interview with Commander Hess discovered that the PD could utilize unmanned vehicles to block roads and that they rely upon calls being received into the dispatch center and patrol units finding areas that are flooded. Additionally, they have available volunteer personnel who could assist with road closures if the need arises such as with flash flooded roads (D. Hess, personal communication, September 17, 2013). The details for all his answers are available in Appendix B.

The interview with Deputy Chief Garza discovered that the FD sometimes will have a chief officer report to the dispatch center during flood situations and that the FD also has volunteer personnel available for road closure duty if needed. One consideration the FD needed to be made aware is that notifications to area fire departments need to be made if any roads close affecting area fire department ambulances transporting into the Bolingbrook hospital emergency room (T. Garza, personal communication, September 18, 2013). The details for all his answers are available in Appendix C.

To answer question one of the ARP "What are the locations that can be identified as predicted flood areas", the researcher discovered through the interviews the following ten locations: Royce Road at Bolingbrook Drive, Weber Road at the DuPage River, Schmidt Road at Lily Cache Lane, Schmidt Road at West Briarcliff Road, Schmidt Road at Blackhawk Lane, West Briarcliff Road at Glengary Drive, Remington Boulevard at Veterans Parkway, 115th Street

and Belvideer Boulevard, Pinecrest Road at Seabury Road, and Schmidt Road at Remington Boulevard. See Appendix F for a detailed map.

To answer question two of the ARP "What are the objectives of the pre-scripted IAP", the researcher developed the following objectives after interviewing the three department representatives and utilized the FEMA form ICS 202 with the following: ensure the safety of all fire, police and public works employees; implement the pre-scripted IAP within fifteen minutes of receiving notice from the NWS that the VOB has been identified as an area for flash flood warning; ensure that within fifteen minutes of receiving notice from the NWS that the VOB has been identified as an area for flash flood warning, that all command staff personnel (FD, PD and PW) have been notified via text messaging; consideration and implementation of unified command can be enacted by any command staff personnel (FD, PD, PW) based on the NWS predictions, radar maps and current conditions; ensure that the ten areas identified as predictable flooded road areas are assessed for water levels within thirty minutes of first rainfall; ensure that road closure equipment is pre-staged by PW personnel at the ten identified locations within ninety minutes of being notified by the NWS that the VOB has been identified for a flash flood warning; once water levels reach four inches on the road or deemed unsafe by PD personnel, the road will be closed by PD personnel and reassessed every thirty minutes; once water levels recede to less than four inches, consideration and opening of the road will be completed by police personnel; and reassessment of the need for another operational period or ending the IAP will be conducted at thirty minutes prior to the end of the current operational period. All of these objectives are available in Appendix D.

To answer question three of the ARP "What resources are needed during flood incidents", the researcher provided the list on FEMA form ICS 201 which are: emergency

response trailer (PW), six one ton trucks (PW); fifteen seven ton trucks (PW); six fourteen ton trucks (PW); approximately one hundred pre-filled sandbags (PW); three arrow stick boards (PW); two flat bottom boats with motors (PW); eight squad cars/patrol cars (PD); one police shift commander (PD); twelve unmanned police cars (PD); twelve personnel including detectives and code enforcement personnel (PD); six volunteer community watch radio personnel (PD); one pick-up truck (FD); one boat with motor (FD); ten citizens emergency response team personnel (FD), five suppression apparatus (FD) and three medic units (FD). The entire list of these resources including their estimated time of availability with notations is available in Appendix E.

To answer question four of the ARP "What is the action timeline for the pre-scripted IAP", the researcher developed a four hour timeline through the input of the three department representatives. Within that four hour timeline, the action of command staff notifications would be made and the pre-scripted IAP would be implemented within fifteen minutes of the PD dispatch being notified that the VOB was under a flash flood warning. The ten identified areas noted for flooding will be assessed by the PD and that the PW department will have road closure equipment pre-staged within ninety minutes. There will also be a reassessment of the need for another operational period thirty minutes prior to the end of the current operational period. These timelines are listed in the objectives section of the FEMA ICS 202 form in Appendix D.

During the meeting on September 25, 2013 all three of the department representatives also reviewed and agreed to the operational period command emphasis and the general situational awareness which was developed by the researcher. These were developed after summarizing their thoughts and concerns for the pre-scripted IAP and are the following: PW emphasis will be to provide road closure equipment and personnel; PD emphasis will be on assessment of road conditions, specifically the ten pre identified areas, and to close the roads

when deemed necessary for the safety of the public; FD emphasis will be to conduct search and rescue. The situational awareness were developed as the following: safety is the responsibility of all personnel, remain alert and maintain situational awareness; utilize proper personnel protective equipment in accordance with departmental guidelines/policies; standing water on roadways has inherent hazards including missing manhole covers/sewers, entering these areas should be done with extreme caution; moving water at the level of six inches or higher has the capability of moving cars and knocking people of their feet. These too are listed on FEMA form ICS 202 in Appendix D.

Discussion

The process of interviewing all three department representatives and producing a draft pre-scripted IAP assisted not only the researcher for the ARP, but also fostered a good teamwork concept in what the researcher believes was a "Action Planning Team" as is suggested by FEMA in the IAP planning guide(FEMA, 2012, p. 10). This team meeting on September, 25, 2013, allowed for discussion, agreements and disagreements, but ultimately displayed what the FEMA guide suggested which were "communication, cooperation and coordination" (FEMA, 2012, p. 10). The researcher simply put their ideas and thoughts on paper and produced a pre-scripted IAP that each of them agreed too.

The discussion discovered that notifications of flooded roads were being made in a timely manner from PD dispatch to the PW department. However, it was discussed in the meeting that there may be what could be perceived as a delay in getting the roads closed by PW. The PW department first has to have a supervisor visualize the areas that are reported to them as flooded prior to PW resources being dispatched to the affected areas. This delay situation was noted to be occurring during after business hours timeframes including weekends. The FD sometimes

sends a representative into dispatch to assist with high call volume situations and assist with decisions. However, this being an informal process, it is an example of one step toward formal unified command if all three departments were to send a representative. This coincides with what Shepard discussed in her dissertation where she describes the need for people and resources being coordinated and that unified command and incident command be strongly considered (Shepherd, 2005, p. 4). Utilization of this pre-scripted IAP should better define timelines of when objectives will be completed.

During the meeting of all three department representatives, discussion related to safety issues including the fact that all three had department specific needs and policies. For example, the FD requires their personnel to where personal flotation devices (PFD) anytime they are working around water and the other two departments do not require any such safety device. It was decided to define what department was responsible for what objectives and that some basic safety guidelines could be added to the ICS 202 form. This is in agreement with what is recommended within the FEMA guide to have “actionable and relevant” safety messages (FEMA, 2012, p. 36).

The development of the pre-scripted IAP through action research, allowed the people involved in the operations and knowledgeable of the problems, to work together as is recommended in NFPA 1620 standard for pre-incident planning (NFPA, 2010, p. 1620-7). It also would agree with what Jaimieson stated as “attacking a problem” and the problem being the roads are not getting closed in a reasonable timeframe (Jamieson, 2005, p. 2). A risk assessment was essentially completed by identifying the ten areas known to flood as is recommended in a 2008 technical report on weather emergencies (Sensenig & Stambaugh, 2008, p. 17). That same report also suggests the PW departments be utilized for road closures and this too was agreed

upon by all three departments and written into the pre-scripted IAP under operational period command emphasis (Sensenig & Stambaugh, 2008, p. 17). Surprisingly and important to note for this ARP, just two hours after this meeting of all three department representatives, the VOB had a small aircraft crash in the vicinity of the local airport(Sadovi, Sobol,& Ziezulewicz 2013). During that incident, the researcher observed all three departments working cohesively and the PW department utilized their newly developed emergency response trailer to assist the PD with road closures. The researcher also learned in December of 2013, that the PW department had recently utilized this same trailer once again to assist the PD for another road closure emergency involving a natural gas leak (T. Torres, personal communication, December, 2013).

The implications of not developing a pre-scripted IAP are that there is the potential for roads to not be closed in a timely manner when flash flooding occurs. This in turn will provide a higher possibility of vehicles and people being stranded in water. If people are stranded in water, then emergency personnel from the FD and PD will need to decide when, where and how to safely remove those people with the least amount of risk to emergency workers. Also, this pre-scripted IAP will provide basic and relevant safety reminders to all personnel when faced with these conditions as it is statistically rare situation emergency responders are faced with. Not utilizing or having a pre-scripted IAP allows for the possibility of ineffective use of resources from each of the three departments as was suggested in the FEMA guideline (FEMA, 2012, p. 9).

The three departments have worked cohesively in the past year by utilizing resources such as the PW department personnel and their emergency response trailer, to close roads for emergencies other than flooded roads. It is highly attainable to conduct these same operations during flash floods if the pre-scripted IAP is utilized. This pre-scripted IAP lists all the available resources but does not necessarily dictate that all of them are needed for each flood incident.

They are listed to assist those who are involved in a unified command structure to reference if the need arises. By implementing and utilizing the pre-scripted IAP developed by the researcher, it will give the personnel working in all three departments a guideline and a starting point when the VOB is designated by the NWS as a flash flood warning area. Baum in her book discusses that emergency management personnel can consider a flash flood warning as being imminent or in progress (Baum, 2007, p. 174). When personnel know that the situation is imminent, the pre-scripted IAP can assure that notifications to command staff of all three departments are consistent and timely. It will also preempt PD personnel to actively evaluate the ten identified areas known to flood and not wait for the dispatch center to receive calls from citizens and or notifications from PD units patrolling.

Recommendations

This ARP provides the research and development of a pre-scripted IAP for road closures due to flash flooding in the VOB. It was developed by the input from all three VOB departments' that are directly involved in mitigating flash flood road emergencies. Considerations for both short term and long term are recommended.

The researcher short term recommendation will be requesting review and implementation of the pre-scripted IAP from the Director of Public Safety (PD and FD) and the Director of PW. This will be done prior to the spring of 2014 as that is the next timeframe anticipated for heavy rainfalls including flash flood situations. Once approved by both department directors, education of all command staff personnel from each of the three departments (PW, PD and FD) will be completed by the researcher. During that instructional period, the researcher intends to emphasize the importance of utilizing resources effectively including the use of volunteers

within the FD and PD departments. These volunteer personnel can assist with road closures and in essence free up PD units for other emergency responses.

The researchers' long term recommendation will be to conduct a post incident review after the first time the pre-scripted IAP is utilized. This review will be to evaluate areas of the pre-scripted IAP that may need modification. Areas that were anticipated to be recently corrected with engineering such as the Lily Cache and Schmidt Road project may be removed from the list of ten identified areas. This post incident review can also evaluate the timelines identified in the objectives and make the necessary changes.

The implementation of these recommendations are believed to make the VOB more prepared and safer for the next time it encounters flash flooding of roads. If the pre-scripted IAP is utilized, it is believed by the researcher that roads will be evaluated for water levels quicker and the resources to close those roads will be made more readily available. The end result will be that the VOB citizens and emergency responders will be safer by not having vehicles stranded in water filled roads.

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Appendix A

Interview: Tony Torres (Public Works Supervisor)
Date: September 16, 2013
Location: Public Works Administration

1.) What road areas in the Village of Bolingbrook do you know of that have historically flooded during rainstorms?

- 304 miles of roads in the Village.
- Lily Cache/Schmidt Rd (Secondary Road). This area was recently mitigated with a two phase project to correct flooding. Phase 1 showed an improvement in last flooding (April 2013). Phase 2 was recently completed in July 2013 and anticipates this area has been corrected.
- Remington/Schmidt (Primary). Cause is believed to be undeveloped farmland adjacent to road that floods.
- Royce/Rt53 (Secondary). DuPage River is the cause.
- Schmidt/Blackhawk (Secondary).
- Weber/DuPage River (Primary).
- 115th/West end dead end road (Side street)
- Briarcliff/Glengary (Side street)

2.) What resources does your agency have (equipment and personnel) to assist with road closures?

- (6) One ton trucks
- (15) Seven ton trucks. (Advantage is height from ground is significant).
- (6) Fourteen ton tandem axle trucks. (Advantage is height from ground is significant).
- Equipment for sandbagging with dry sand on site at Public Works facility.
- Approximately 100 bags already filled and ready for deployment. This is intended to be used in conjunction with barricades.
- Type I, II and III barricades.
- Emergency response trailer consisting of construction cones, barricades detour signs and portable generator signs.
- (3) Arrow stick boards for directing traffic
- (2) Flat bottom boats with motors.

3.) What process does your agency follow when flash flooding occurs?

- Informal process
- Monitor weather via updates via phone, e-mail and pager notifications from private weather notification companies.
- During weekday hours of operations (0700-1700) foreman send crews to noted flood hazard areas and clear the catch basin/sewer grates of debris. Also stage barricades in areas prone to flooding. Catch basin debris is the primary cause for flooding on roadways per Mr. Torres.
- After hours and weekends the Director of Public Works will contact a foreman. Foreman can usually respond back within approximately 30-60 minutes. After

foreman assess problem areas, and then he/she will call in additional personnel based on needs.

4.) How is your agency officials notified prior and during a flash flood or heavy rainfall weather occurrence?

- Private weather service (Murray and Truttle) notification companies contacting Public Works Supervisors via e-mail, paging and phone.
- During after-hours and weekends, 911 dispatch center has call out procedures for a PW official.

5.) Does your agency have the authority to close roads?

- No

6.) What are some of the causes for road flooding?

- Storm drains/sewer grates being blocked with debris.
- Heavy rains (in excess of 1inch per hour)
- Undeveloped farmland flooding
- DuPage river overflowing.

7.) What objectives should be considered in the pre-scripted Incident Action Plan for road closures during flash flooding incidents?

- Remove hazard from public by stopping traffic. Remove access to roadway.
- Safety of our village employees.
- Personnel need to understand their assignments
- Agency (PW, PD and FD) notifications to supervisors.
- What is the deciding point to close a road?
- When does the unified command setting become implemented and by whom? Possibly the Public Safety Director?

8.) What timeline would you suggest for a pre-scripted Incident Action Plan for road closures in the Village of Bolingbrook?

- Police department has patrol so they know conditions better than anyone. They could be the lead in starting the process.
- Once implemented, a 4 hour timeline is suggested and reevaluation at that time.

Appendix B

Interview: Denny Hess (Police Commander)
Date: September 17, 2013
Location: Police Administration

1.) **What road areas in the Village of Bolingbrook do you know of that have historically flooded during rainstorms?**

- Royce/RT53
- Schmidt/Briarcliff
- Schmidt/Lily Cache
- Schmidt/Blackhawk
- Weber/DuPage River
- Briarcliff/Glengary

2.) What resources does your agency have (equipment and personnel) to assist with road closures?

- Squad cars (Minimum of 8)
- Squad car (Minimum of 1 shift supervisor)
- Traffic cones and flares
- Volunteer Community Radio Watch (VCRW) personnel available via page (6-8 personnel).
- Unmanned police squad cars with emergency lights that can be locked and utilized for blocking roads (Minimum of 12 available).
- Call back overtime of personnel.
- Detectives and Code Enforcement personnel (Monday-Friday usual hours of 7am to 7pm). Approximately 12 personnel available.

3.) What process does your agency follow when flash flooding occurs?

- Informal process of officers patrolling areas of town (total of 8 assigned beats) where they will report in flooded roadways
- Informal where 911 and non-emergency calls are received into dispatch reporting flooded roadways. Additionally, reports from fire department units while responding or returning from emergency calls report flooded areas into dispatch.
- Police squad cars are dispatched to those areas reported in from the public and fire department and asses' area. If the road is determined to be shut down, then a police supervisor gives the authority to shut down the road.
- Formal, the police shift commander initiates the "Emergency Traffic Plan" which allows property damage only vehicle accidents report writing is conducted at the police station and not at the location of the traffic accident. This allows for better utilization of resources to be free for emergency calls.

4.) **How is your agency officials notified prior and during a flash flood or heavy rainfall weather occurrence?**

- During regular business hours officials monitor police radio traffic and weather reports.
- After business hours, dispatch and/or the police shift commander notify police command staff via e-mail and texting.

5.) Does your agency have the authority to close roads?

- Yes, per state law.

6.) What are some of the causes for road flooding?

- Sewer grates being clogged.
- Possible engineering issue.

7.) What objectives should be considered in the pre-scripted Incident Action Plan for road closures during flash flooding incidents?

- Blocking roadways to prevent cars from driving into flooded areas.
- Detouring of traffic
- Re-open roads at earliest time to alleviate traffic congestion
- Protect lives of citizens, police, firefighters and public works personnel.

8.) What timeline would you suggest for a pre-scripted Incident Action Plan for road closures in the Village of Bolingbrook?

- Within 30 minutes of roads beginning to flood.
- Recommend a 4 hour reevaluation.
- Unified command implementation by the police department and specifically the on duty police shift commander.

Appendix C

Interview: Deputy Chief Garza
Date: September 18, 2013
Location: Fire Administration

1.) **What road areas in the Village of Bolingbrook do you know of that have historically flooded during rainstorms?**

- Royce / Rt 53
- Lily Cache / Schmidt
- Veterans / Remington
- Seabury / Pinecrest
- Schmidt / Briarcliff
- Schmidt / Blackhawk
- Weber / DuPage River

2.) **What resources does your agency have (equipment and personnel) to assist with road closures?**

- Pick Up Trucks (2)
- Fire Apparatus and ambulances are needed for emergency calls. He needs his equipment and personnel for emergency responses.
- Overtime call back of personnel if needed.
- Citizens Emergency Response Team (CERT) available via page call out. Approximately 10 are available with a 1 hour response time to report.

3.) **What process does your agency follow when flash flooding occurs?**

- Formal process the fire department shift commander initiates a "Storm Response Mode" whereas emergency responses are limited to minimal equipment. Due to numerous emergency calls during storms, this mode allows the fire department to utilize its resources more effectively.
- Informally, a fire department chief officer will report into dispatch and assist with decisions and monitoring road closures.

4.) **How are your agency officials notified prior and during a flash flood or heavy rainfall weather occurrence?**

- Emergency Management Network Secure Messaging System (EMnet) notification to all fire department command staff advising of current and predicted conditions.
- Dispatch notifies fire department command staff via text messaging the predicted weather notifications they receive.

5.) **Does your agency have the authority to close roads?**

- Yes. Per state law.

6.) **What are some of the causes for road flooding?**

- Engineering / Infrastructure issues
- Excessive rainfall in a short amount of time
- Sewer grate/storm drains being clogged with debris

7.) **What objectives should be considered in the pre-scripted Incident Action Plan for road closures during flash flooding incidents?**

- Asses the pre-determined areas for flooding
- Isolate the pre-determined areas that are beginning to flood from allowing vehicles to enter
- Continually monitor weather conditions and forecasts.
- Assure notifications are made to area fire departments advising them of road closures affecting transports into Bolingbrook ABH hospital.
- Safety of first responders and citizens.

8.) **What timeline would you suggest for a pre-scripted Incident Action Plan for road closures in the Village of Bolingbrook?**

- Based on weather forecasting from NWS affecting Bolingbrook.
- Initiate the Incident Action Plan (IAP) within 1 hour of being notified from NWS of Bolingbrook being in a flash flood warning area..
- Unified Command at dispatch center within 1 hour of initiating the IAP. This can be on the authority of any command staff personnel from police, fire or public works departments.

Appendix D

INCIDENT OBJECTIVES (ICS 202)

1. Incident Name:	2. Operational Period: Date From: TBD	Date To: TBD
Pre-Scripted(IAP) for road closures due to flash flood	Time From: TBD (4 hrs)	Time To: TBD (4 hrs)

3. Objective(s):

1.) Ensure the safety of all fire, police and public works employees.

2.) Implement the Pre-Scripted IAP within 15 minutes of receiving notice from the National Weather Service (NWS) that the Village of Bolingbrook has been identified as an area for "Flash Flood Warning".

3.) Ensure that within 15 minutes of receiving notice from the National Weather Service (NWS) that the Village of Bolingbrook has been identified as an area for "Flash Flood Warning", that all Command Staff Personnel (Fire, Police, and Public Works) have been notified via text messaging.

4.) Consideration and implementation of Unified Command can be enacted by any Command Staff personnel (Fire, Police or Public Works) based on the NWS predictions, radar maps and current conditions.

5.) Ensure that the (10) areas identified as predictable flooded road areas(see attached map) are assessed for water levels within 30 minutes of first rainfall.

6.) Ensure that road closure equipment is pre-staged by Public Works personnel at the (10) identified locations (see attached map) within 90 minutes of being notified by the National Weather Service (NWS) that the Village of Bolingbrook has been identified for a "Flash Flood Warning".

7.) Once water levels reach 4 inches on the road or deemed unsafe by police personnel, the road will be closed by Police personnel and reassessed every 30 minutes.

8.) Once water levels recede to less than 4 inches, consideration and opening of the road will be completed by police personnel.

9.) Reassessment of the need for another operational period or ending the IAP will be conducted at 30 minutes prior to the end of the current operational period.

4. Operational Period Command Emphasis:

A.) Public Works Department emphasis will be to provide road closure equipment and personnel.

B) Police Department emphasis will be on assessment of road conditions, specifically the (10) pre identified areas, and to close the roads when deemed necessary for the safety of the public.

C.) Fire Department emphasis will be to conduct search and rescue.

General Situational Awareness

1.) Safety is the responsibility of all personnel. Remain alert and maintain situational awareness.
2.) Utilize proper PPE in accordance with departmental guidelines/policies.
3.) Standing water on roadways has inherent hazards including missing manhole covers/sewers. Entering these areas should be done with extreme caution.
4.) Moving water at the level of 6 inches or higher has the capability of moving cars and knocking people of their feet.

5. Site Safety Plan Required? Yes ☐ No ☑

Approved Site Safety Plan(s) Located at:

6. Incident Action Plan (the items checked below are included in this Incident Action Plan):

☐ ICS 202	☐ ICS 206	Other Attachments:	
☐ ICS 203	☐ ICS 207	☐	
☐ ICS 204	☐ ICS 208	☐	
☐ ICS 205	☑ Map/Chart	☑	ICS 201 Section 10 (Resource Summary)
☐ ICS 205A	☐ Weather Forecast/Tides/Currents	☑	http://radar.weather.gov/radar (Website for Radar)

7. Prepared by: Name: Daniel Ross Position/Title: Battalion Chief (BFD) Signature: _____

8. Approved by Incident Commander: Name: TBD Signature: _____

ICS 202	IAP Page _____	Date/Time: TBD

Appendix E

INCIDENT BRIEFING (ICS 201)

1. Incident Name: Pre-Scripted IAP for road closure flash flood	2. Incident Number: TBD	3. Date/Time Initiated: Date: TBD Time: TBD

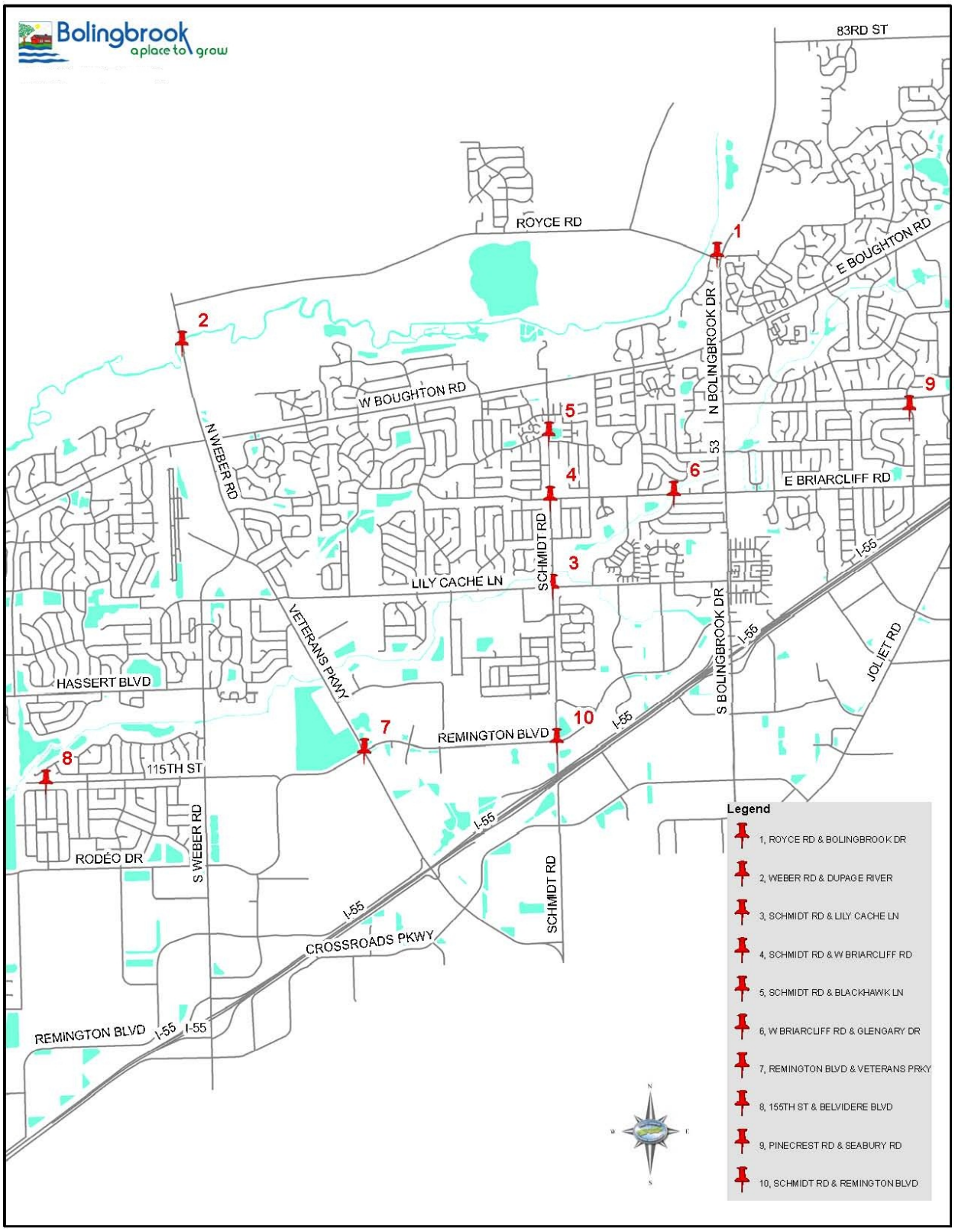
10. Resource Summary:

Resource	Resource Identifier	Date/Time Ordered	ETA	Arrived	Notes (location/assignment/status)
Emergency Response Trailer (Public Works)	TBD	TBD	90 Minutes	☐	This trailer has construction cones, barricades, detour signs and portable generator signs. It is located at the PW garage
(6) One Ton Trucks (Public Works)	TBD	TBD	90 Minutes	☐	Equipment delivery of barricades.
(15) Seven Ton Trucks (PW) (6) Fourteen Ton Trucks (PW)	TBD	TBD	90 minutes	☐	Advantage of these trucks is that they are high off the ground.
Approx (100) pre-filled sandbags (Public Works)	TBD	TBD	90 Minutes	☐	Assist with barricades for road closures.
(3) Arrow stick boards (Public Works)	TBD	TBD	90 minutes	☐	Assist with detouring of traffic.
(2) Flat bottom boats with motors (Public Works)	TBD	TBD	90 minutes	☐	Assist with entering flooded areas for evacuation/rescue.
(8) Squad cars/patrol cars minimum (Police)	P 1 thru P8	TBD	Immediate	☐	(8) beat cars for assessment/closing of roads. Aslo have road flares and traffic cones.
(1) Police Shift Commander	TBD	TBD	Immediate	☐	Police department has a minimum of (1) Sergeant or Lieutenant available for Unified Command.
(12) Unmanned squad cars (Police)	TBD	TBD	Immediate	☐	These squad cars can be utilized for road closures by locking doors and using emergency lights activated.
(12) personnel (Detectives and Code Enforcement) available.	TBD	TBD	See notes	☐	During the hours of 0700-1700 (Monday-Friday) these Police personnel are available for road assesment/closure.
(6-8) Volunteer Community Radio Watch (VCRW) personnel.	TBD	TBD	60 minute ETA	☐	Volunteer personnel, under the direction of the police department, are available for road closure.
(1) Pick-up Truck (Fire)	Utility 4	TBD	Immediate	☐	Pick-up truck at fire station#4 available for road closure.
(1) Boat with motor (Fire)	Utility 1	TBD	Immediate	☐	Pick-up truck with boat attached available for rescue.
(10) Citizens Emergency Response Team (CERT)	TBD	TBD	60 minute ETA	☐	Volunteer personnel, under the direction of the fire department, are available for road closure.
(5) Suppression Apparatus (Fire)	T1, E2, E3, E5 and Q4	TBD	Immediate	☐	These fire department resources are available for search/rescue.
(3) Medics (Fire)	M2, M3 and M4	TBD	Immdeiate	☐	These fire departemnt resources are available for search/rescue.
				☐	

6. Prepared by: Name: Daniel Ross Position/Title: Battalion Chief (BFD) Signature: _____

ICS 201, Page 4 Date/Time: _____

Appendix F


Bolingbrook
a place to grow
83RD ST
ROYCE RD
E BOUGHTON RD
W BOUGHTON RD
N BOLINGBROOK DR
N WEBER RD
E BRIARCLIFF RD
SCHMIDT RD
LILY CACHE LN
VETERANS PKWY
HASSERT BLVD
S BOLINGBROOK DR
JOLIET RD
REMINGTON BLVD
115TH ST
RODEO DR
S WEBER RD
CROSSROADS PKWY
I-55
53
Legend
1, ROYCE RD & BOLINGBROOK DR
2, WEBER RD & DUPAGE RIVER
3, SCHMIDT RD & LILY CACHE LN
4, SCHMIDT RD & W BRIARCLIFF RD
5, SCHMIDT RD & BLACKHAWK LN
6, W BRIARCLIFF RD & GLENGARY DR
7, REMINGTON BLVD & VETERANS PRKY
8, 155TH ST & BELVIDERE BLVD
9, PINECREST RD & SEABURY RD
10, SCHMIDT RD & REMINGTON BLVD