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EXECUTIVE ANALYSIS OF

FIRE SERVICE OPERATIONS IN EMERGENCY MANAGEMENT

Man-Made Disaster Risk Analysis for the City of Denton, Texas

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Certification Statement

I hereby certify that this constitutes my own product, that where the language of others 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.

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Abstract

This research project was prompted by the Denton Fire Department [DFD] wanting to formulate a current comprehensive risk assessment on potential man-made disasters that can occur in the City of Denton [COD]. The problem was that the DFD did not have a current comprehensive risk assessment on potential man-made disasters that can occur in the COD. The purpose of this applied research project was to identify potential man-made disasters, their potential frequency in the COD, and make recommendations to help mitigate these risks. The descriptive research approach was used to complete this project. The research was designed to answer four inter-related questions: a) What is a comprehensive risk assessment and does the COD need one?, b) What are potential man-made risks which could have significant impact on the citizens of Denton?, c) What is the COD's current preparedness level towards identified man-made risks?, and d) What preparedness measures should the DFD utilize to mitigate and/or respond to these identified risks?

Procedurally, original local data was compared to known existing national data on potential man-made disasters predicted, frequencies, and magnitude. Results showed that government agencies all follow the guidelines established by the Federal Emergency Management Agency [FEMA] and the Department of Homeland Security [DHS] for establishing preparedness strategies and mitigation plans as they relate to man-made risks. Recommendations were made to establish a hazard mitigation, response, and recovery plan for man-made disasters that the COD may likely face.

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Introduction

Man-made disasters have occurred throughout the world for hundreds of years. A man-made disaster can be intentional or unintentional, results can directly or indirectly affect people, and they can occur as a result of due diligence or neglect. Man-made disasters can be a small single isolated event. Man-made disasters can also be cascading events like the Chernobyl Nuclear Power plant in the Ukraine, which directly affected over 345,000 people, can have long lasting and even generational effects not only on the affected areas, but also on the world (United Nations Scientific Committee on the Effects of Atomic Radiation, 2000). Whether large or small, the effects of man-made disasters can be compounded greatly when they involve critical infrastructure.

September 11, 2001 changed the way how the United States views critical infrastructure protection [CIP]. Up until this man-made disaster, CIP had been encouraged and passively promoted by the federal government along with other public and private entities. September 11, 2001 was the triggering event that caused the United States to dramatically change CIP activities to a more fluid, dynamic, and proactive process. The goal in changing the CIP process is to help protect mission critical people and systems. Ultimately, CIP reduces the risk of attacks and helps mitigate the consequences of a man-made disaster or other disaster if they ever do occur again on United States soil (United States Fire Administration).

There were over 2,800 people killed as a result of September 11, 2001. The financial fallout was estimated to be $84 billion over four years just in New York City [NYC]. NYC alone lost over 146,000 jobs and over two billion dollars in revenue just one year after the attacks (Thompson, 2002). Various other sources contributed an additional 100,000 jobs lost in the

airline industry alone due to the financial impact that the airlines incurred directly as a result of the attacks. Overall, it has been estimated that the long-term costs of the September 11, 2001 attacks will cost the economy two trillion dollars.

On a local level, the COD possible could be financially destroyed if a man-made disaster occurred in the city. The COD has over 72 pieces of critical infrastructure in addition to two major universities and an ever-growing population that need some level of protecting. While in an ideal world it would be preferred to eliminate 100% of all risks to all critical infrastructure and other identified man-made risks in the COD, this is neither realistic nor attainable. To adequately and effectively protect the citizens of Denton and its' critical infrastructure against man-made disasters, a process must be developed.

The problem is the Denton Fire Department [DFD] does not have an up-to-date comprehensive risk assessment on potential man-made disasters that can occur in the City of Denton [COD]. The purpose of this applied research project is to identify potential man-made disasters and their potential frequency in the COD. The descriptive research approach will be used to complete this project. Based on the findings, recommendations will then be able to be made to help mitigate these risks in the COD. The research was designed to answer the following questions: a) What is a comprehensive risk assessment and does the COD need one?, b) What are potential man-made risks which could have significant impact on the citizens of Denton?, c) What is the COD's current preparedness level towards identified man-made risks?, and d) What preparedness measures should the DFD utilize to mitigate and/or respond to these identified risks?

Background and Significance

The COD is a rapidly growing city in North Texas. The city is located approximately forty miles northwest of Dallas, Texas and forty miles northeast of Fort Worth, Texas. DFD operates seven frontline fire engines, four ACLS ambulances, one truck, one hazmat vehicle, one bomb squad, and one rescue truck out of seven fire stations. DFD has grown from a humble beginning in 1874 as an entirely volunteer fire department to a force today of approximately 165 career personnel spread throughout fire suppression, emergency medical services, prevention, public education, support services, administration, community affairs, and emergency management divisions. The COD current population is approximately 124,746, and the city encompasses approximately 100 square miles. The COD is expected to almost double in size over the next 20 years to approximately 214,000 residents (Clower, 2008). With this continued and rapid growth over the next several years, the COD must become more aware of potential man-made disasters especially as our population becomes more densely populated.

The overall vision of the COD is to provide exceptional service, and the DFD's simple mission statement is to prevent harm, provide great service, and always act nice. In keeping with the DFD vision and mission, the fire department must fully understand three key background reasons why this research is important. First, we know that the COD is rapidly growing in population that also includes the annual enrollment at the University of North Texas [UNT] and Texas Woman's University [TWU] which are located in the COD (Clower, 2008). Second, as the COD grows, risks become even greater in magnitude, so must the COD's ability to prevent, prepare, respond, and recover from any potential man-made attacks. Third, recent history has shown that man-made threats are real and will happen within homeland of the United States.

The ability to forecast the potential likelihood of man-made disasters in the COD is a four step process. First, the COD must identify man-made hazards that could possible occur. Second, the DFD must determine the probability that a particular man-made event will take place in the COD. Third, the specific man-made hazard must be analyzed to determine if it would be a significant threat to the COD. Fourth, the DFD and COD must determine what the overall vulnerability the hazard is to the citizens and the city as a whole.

The four step approach follows the National Fire Academy's Executive Analysis of Fire Service Operations in Emergency Management [EAFSOEM] unit on community risk and capability assessment. The EAFSOEM manual suggests that a community risk assessment process focuses on the present need to protect the public and on long-term goals to reduce the risk. The information found in unit 4: Community Risk and Capability Assessment, points out the importance of collecting accurate and detailed information on the actual and potential risks in your community (Department of Homeland Security, 2009). This unit also goes into detail on ways to research specific groups from within a community to help pinpoint higher frequency and potentially more severe hazards specific to a particular group. This multi-step approach will allow the research to be focused on particular hazards that can occur in the COD which are not currently addressed in the city's emergency management plan.

The overall risk reduction of preventable man-made disasters is also part of the United States Fire Administration's [USFA] goal to "Improve the fire and emergency services' capability for response to and recovery from all hazards" which is also included in the current USFA strategic plan. This goal emphasizes that the key to being prepared to handle a wide variety of hazards is through prevention, advocacy, resources, and data exchange [PARADE]. Utilizing the PARADE format in an all-hazard approach allows local emergency response

personnel to better assess the risks that they may face and analyze their overall vulnerabilities (United States Fire Administration).

Literature Review

The literature review for this research project was driven by the problem that the DFD does not have a current comprehensive risk assessment on potential man-made disasters that can occur in the COD. Through the research of each question, the literature review will explore the overall purpose in identifying potential man-made disasters, their potential frequency in the COD, and make recommendations to help mitigate these risks.

It is important to begin with a thorough understanding of what is comprehensive risk assessment is and if the COD needs one. By definition, risk assessment involves the identification, evaluation, and estimation of the degree of a risk in a particular event as it relates to or is compared to known benchmarks or standards. This overall degree of risk is then used to determine if the level of risk is acceptable or not (Web Finance, 2010). This basic theory of risk assessment in the fire service is the analysis of specific threats as it relates to the fire industry with a goal of reducing the risk (Jenaway, 2006).

The Federal Emergency Management Agency [FEMA] utilizes a similar methodology to analyze risk assessment. First, FEMA predicts the probability that a specific threat will occur. To determine this, the analysis looks at the overall likelihood that an attack will be carried out based on various data such as past history and current similar threats. Once a threat is determined, FEMA determines the potential consequences of the threat. To help determine the consequences, the FEMA methodology rates the magnitude of such a potential threat and potential outcomes. The third step rates the overall vulnerability an asset is to a specific threat or

hazard. Once these three items are evaluated and given a numeric value, the overall risk assessment is the product of the value of each step multiplied together. This overall risk matrix gives the agency performing the risk assessment a tool to help determine overall priorities in protecting their assets (Kennett, 2005).

In comparison, the United States Environmental Protection Agency [EPA] handles risk assessment through a three step process after initial research and planning. The first phase involves the gathering of information which determines what actually needs to be protected. The second develops the first step into a problem to be analyzed. Analysis of the problem helps determine what is exactly at risk and to what degree it is at risk. The final step in the EPA risk assessment model is risk characterization. The EPA uses this three step risk assessment approach in two main ways. The first is to help predict the potential of future risks and second, they use this risk assessment process to determine the long-term effects from past exposures (Suter, 2003).

In the fire industry, risk assessment is a cornerstone on how decisions are made in way one or another. The National Fire Protection Association [NFPA] has outlined the requirement that each fire department must develop a detailed risk management plan. It is recommended that this risk management plan include a thorough risk analysis of each threat that includes four components as outlined in NFPA 1500, standard on fire department occupational safety and health program. To begin with, the actual or potential risk must be identified and then evaluated based on the potential severity and likelihood that the risk will occur. After the first two steps are evaluated, some form of risk control must be put into place which can either reduce or eliminate the risk potential. Finally, a monitoring program should be put into place to manage the effectiveness of the risk control techniques that have been implemented (NFPA, 2007).

Bringing the scope of man-made risks down to a local level, the COD currently lists nineteen natural and man-made threats. These risks all have the potential for disrupting the community, causing causalities, and damaging or destroying public and private property including critical infrastructure. Table 1 depicts the eight potentially significant man-made risks that the COD could face based on assumptions made in the COD emergency management plan.

Hazard Type	**Likelihood of Occurrence**	**Estimated Impact on Public Health and Safety**	**Estimated Impact on Property**
Energy/Fuel Shortage	Likely	Moderate	Moderate
Hazmat Spill (fixed)	Highly Likely	Moderate	Moderate
Hazmat Spill (transport)	Highly Likely	Moderate	Moderate
Nuclear Facility Incident	Unlikely	Limited	Limited
Water System Failure	Unlikely	Limited	Limited
Civil Disorder	Occasional	Moderate	Limited
Enemy Military Attack	Occasional	Major	Major
Terrorism	Likely	Major	Major

Table 1

These man-made threats that the COD may face are classified into three different risk categories. The first category is the likelihood that a threat or risk will occur in the COD. This category is listed from unlikely to highly likely to occur. The second category shows the expected impact on the safety and health to the citizens of Denton if a specific risk occurs. The health and safety impacts are listed from limited to major impact potential. The final category lists the estimated financial impact on private and public property that may occur and this category is also ranked from limited to major (City Of Denton, 2005).

Identifying potential man-made risks that could have type significant impact on the citizens of Denton will be the next research question to be explored. A man-made risk is a risk or threat that has an element of human intent or negligence that can result in a disaster. The key in determining if a potential risk or threat is man-made or natural is the human element. Natural risks are naturally occurring and they are not a result of human negligence or intent (WordIQ, 2010).

FEMA is the recognized government organization that has established potential risk matrixes and lists that are used widely throughout the United States. Since the FEMA classification system is widely recognized it will be used as the standard used throughout this research. Table 2 shows a current list of potential natural and man-made hazards that people and cities may encounter (Federal Emergency Management Agency, 2004).

Hazard	**FEMA Classification**
Floods	Natural
Hurricanes	Natural
Thunderstorms/Lightening	Natural
Tornadoes	Natural
Winter Storms	Natural
Extreme Heat	Natural
Earthquakes	Natural
Volcanoes	Natural
Landslides	Natural
Tsunamis	Natural
Fires	Natural
Wildfires	Natural

Hazardous Materials Incidents	Man-Made
Nuclear Power Plants	Man-Made
Explosions	Man-Made
Biological Threats	Man-Made
Chemical Threats	Man-Made
Nuclear Blasts	Man-Made
Radiological Dispersion Device (RDD)	Man-Made

Table 2

While a few of the natural hazards listed in Table 2 may also be considered man-made risks, the FEMA standard will be followed, and only man-made hazards will be considered in the research.

Bringing the potential man-made risks down to a regional level, the COD is part of a local council of governments [COG] that covers 16 north Texas counties which includes 230 cities and a population of approximately 7,000,000 citizens. The members of COG have developed an urban area security initiative [UASI] program to help strengthen the areas' abilities to combat terrorism and other forms of man-made threats. The COG's goal is to combine and coordinate efforts from within the area to build a measurable and sustainable capability that helps prevent, prepare, protect, respond to, and recover from man-made threats.

Table 3 outlines three critical mission areas along with fourteen sub-categories of enhancement areas that COG focuses on to reduce man-made risk levels for the area.

Common Mission Areas	
	Emergency Management Plans
	Interoperable Communications
	Citizen Participation
Prevent/Protect Mission Areas	
	Protect Critical Infrastructure
	Information Sharing and Analysis
Respond/Recover Mission Areas	
	Emergency Operations Management
	Early Warning Systems
	CBRNE Detection and Response
	Counter-terror Investigations
	Explosive Device Response
	WMD/Hazmat Response
	Search and Rescue Capability
	Medical Surge Capacity
	Regional Recovery Capability

Table 3

The COG emphasis is not directly focused on specific man-made risks. Instead the COG emphasis is on larger preparedness measures that can enhance the safety of the entire region that it covers (North Central Texas Council of Governments, 2008).

Finally bringing the scope of man-made risks down to a local level, the COD currently has a list of nineteen natural and man-made threats. These risks all have the potential for disrupting the community, causing causalities, and damaging or destroying public and private

property including critical infrastructure. Table 4 depicts the eight potentially significant man-made risks that the COD could face based on assumptions made in the COD emergency management plan.

Hazard Type	**Likelihood of Occurrence**	**Estimated Impact on Public Health and Safety**	**Estimated Impact on Property**
Energy/Fuel Shortage	Likely	Moderate	Moderate
Hazmat Spill (fixed)	Highly Likely	Moderate	Moderate
Hazmat Spill (transport)	Highly Likely	Moderate	Moderate
Nuclear Facility Incident	Unlikely	Limited	Limited
Water System Failure	Unlikely	Limited	Limited
Civil Disorder	Occasional	Moderate	Limited
Enemy Military Attack	Occasional	Major	Major
Terrorism	Likely	Major	Major

Table 4

The COD's emergency management plan has listed some man-made risks that the city may encounter even though there has never been an actual incident of that type in the city or surrounding areas. The COD's plan notes that threat assumptions are based on the generally accepted standards set primarily by DHS. Beyond that, there appears to be little published data on a local level to evaluate specific man-made risks in the COD (City of Denton, 2005).

The COD's current preparedness level towards indentified man-made risks will be evaluated next. To begin with, the literature review focused on the overall vision of preparedness as it relates to the national security. A modern day level of national preparedness was formally initialized in 2003 with Homeland Presidential Security Directive-8 [HPSD-8].

As a result of this directive, an official national preparedness vision was set for "a nation prepared with coordinated capabilities to prevent, protect against, respond to, and recover from

all hazards in a way that balances risk with resources and need." Along with the overall vision there are three additional critical elements outlined in the preparedness guideline which are national preparedness scenarios, universal task list, and target capabilities list [TCL].

The research revealed that the TCL is of particular interest as it relates to preparedness. The TCL consists of thirty-seven capabilities that all public and private entities should posses in order to be properly prepared for and effectively respond to disasters whether man-made or natural. To achieve an effective level of preparedness in each capability, there are six elements of planning, organization and leadership, personnel, equipment and systems, training, and exercises, evaluations and corrective actions that must be achieved (Department of Homeland Security, 2007).

The research then looked at preparedness as it relates to safety concerns in today's schools. The U.S. Department of Education wants schools to base their preparedness planning on a worst-case scenario. The department wants schools to prepare themselves for a wide array of possible risks including man-made risk such as hazmat spills, school shootings, bomb threats, acts of terrorism, etc. To achieve a satisfactory level of preparedness, there is a five step process of organizing the proper response teams, establishing a centralized incident command post, establishing determined response procedures, pre-determining any special equipment and procuring, and conducting regular training, drills, and exercises that the Department of Education recommends be followed. This preparedness model points out that well prepared organizations must invest resources and time, but this investment is well worth the effort if it increases the potential of reducing injuries and/or saving lives when faced with a man-made or natural threat (United States Department of Education, 2007).

In the fire industry, preparedness is best known as pre-incident planning. The NFPA describes pre-incident planning as a document developed by gathering general and detailed data used by first responders. This preparation in a pre-incident plan then enables responding personnel to determine the resources and actions necessary for specific emergencies or threats at identified facilities. To ensure that a fire department is prepared properly, they must utilize a six step method for collecting data. The six step approach breaks specific risks down by identifying physical elements, occupancy types, fire protection systems, special hazards, emergency operations considerations, and any special characteristics. In the NFPA approach, each of the six steps are evaluated and then each individual result is combined to come up with a general overall risk for each type of occupancy. Based on this risk level, the fire department and other first responders can then determine the proper preparation steps to take. The goal with the preparation steps are to either eliminate, or in most cases, reduce the risks that the occupancy may potentially have. Just with other risk preparation methodology researched, the NFPA approach is based on a systematic approach. This systematic approach is based on assumptions. This approach also includes a form of overall measurement so each individual threat can be prioritized (National Fire Protection Association, 2010). This prioritization helps first responders prioritize their resources. It also helps identify when, where, and how to prepare for a specific risk.

Bringing the focus of preparedness levels down to a state level, the research then focused on the Texas Department of Emergency Management [TDEM]. When specifically focusing on man-made risks, Texas's overall preparedness goal is to minimize damage through a rapid response and recovery from terrorist attacks and other disasters.

To achieve this goal, Texas has outlined nine individual objectives which are:

1. Achieve statewide communication interoperability
2. Improve the use of the national incident management system [NIMS] in Texas
3. Maximize response capabilities
4. Amplify public health capabilities
5. Integrate homeland security training
6. Fully integrate homeland security exercises across all jurisdictions
7. Ensure that emergency management plans are updated and validated
8. Increase citizen participation in statewide preparedness
9. Maintain effective avenues in alerting local officials and public about all hazards in their communities

Through achieving these nine objectives, Texas aims to be better protected towards the stated goal. The plan emphasizes that Texas has and will continue to dedicate a large amount of resources, time, and effort towards the prevention of terrorist and other man-made risks, but not all man-made threats are completely preventable (Texas State Office of the Governor, 2010). Being at the state level, the Texas plan has focused on a more overall approach on preparing for man-made risks and left the more detailed focus up to the local governments and private entities throughout the state.

And finally on a local level, the COD's current preparedness level towards identified man-made risks, the research focused on the COD's level of readiness. Currently, the research revealed that the COD pre-incident preparedness to man-made threats and risks consists of determining what the threat is and identifying the actual or potential perpetrators with a goal of

preventing the man-made threat from occurring. The emergency management preparedness plan focuses on the following six steps in becoming better prepared:

1. Conduct awareness training on potential threats for necessary public and private entities in the city
2. Develop emergency communication procedures (alternate and redundant)
3. Maintain information on potential individuals or groups that are suspected of having the potential of carrying out a man-made event in the area
4. Establish mutual aid agreements
5. Conduct drills and exercises
6. Adjust readiness actions as potential or actual risks arise

As outlined with the six step approach, the preparedness plan consists primarily of actions to be taken in the form of training response personnel and/or the collecting and analyzing of information on individuals or groups that are suspected of being able to carry out a man-made event in the COD. The plan does not identify specific risks (City of Denton, 2005).

A methodology in the development of a risk assessment plan that identifies potential man-made risks and ways to prepare for such threats has been researched. Now the research will focus on preparedness measures that the DFD should utilize to mitigate and/or respond to these identified risks. In addition to the terrorist attacks on September 11, 2001, hurricanes Katrina and Rita changed the ways that Americans view the importance of mitigation. Hurricane Katrina devastated the State of Louisiana and when combined with Hurricane Rita which happened a few weeks later, these two events displaced over 200,000 residents and cost at least 90 billion dollars. Today, Louisiana has one of the most thorough hazard mitigation plans that the research investigated. The plan's goal for mitigation is to save lives and help reduce the loss of critical

infrastructure, property, and business continuity. Financial losses to the public and private sectors can be tremendous, so effective mitigation efforts are paramount according to Louisiana's preparedness and mitigation plans (Louisiana Governor's Office of Homeland Security and Emergency Preparedness, 2008).

Now that a basis has been established for paramount importance of mitigation, the research will now focus mitigation preparedness measures. The mitigation standard in the United States has been established by FEMA as a result of the Disaster Mitigation Act [DMA] of 2000. As a result of the DMA, FEMA developed a multi-hazard guidance known in the emergency management field as the "blue book" to assist states and local governments in preparing mitigation plans. This guidance plan outlines the four required components of any government approved mitigation plan. The mitigation plan must include the four steps:

1. Goals and objectives in the selection process to mitigate and reduce losses
2. Pre- and post-disaster hazard policies and programs used to mitigate hazards including a capability assessment
3. Identify mitigation actions which must be cost-effective and feasible
4. List all current and potential resources attained or needed to implement the mitigation actions (Federal Emergency Management Agency, 2008).

Changing gears from the public sector to the private sector, the research revealed that mitigation measurement standards where fairly consistent with the federal plans. In the facility management sector, a successful mitigation plan is a result of several core elements which include a specific list of goals and milestones that are interrelated and all must be achieved. From these goals a list of specific tasks must be formulated and prioritized. From there each tasks needs to have a specific individual assigned to it. This individual will oversee the task

assignment and ensure that the task is completed by a specific date. Finally, there needs to be an exercise and re-evaluation program to ensure that the entire emergency management program is evolving and continuously improving. Through the constant evolution of an emergency management program and mitigation plan, if an actual disaster occurs then there will likely be fewer injuries, deaths, loss of business, and property damage (Gustin, 2002).

Table 5 illustrates a sample mitigation measurement chart that could be formulated for a specific goal.

Sample:

Goal 1: Fortify the exterior security of the ABC building

Task	**Assigned**	**Priority**	**Completion**	**Measurement**	**Cost**
1.1 Keep vehicles at least 100' from building	J. Jones	2	12/01/2010	Install reinforced bollards around building	$215,000
1.2 Limit visitor access points into the building	B. Smith	1	2/12/2011	Install security locks on all exterior doors. Public to enter only through security desk locations	$62,000
1.3 Increase emergency generator capabilities	M. Brown	3	6/25/2011	Install generator capable of running 100% of the building for 24 hours	$980,000

Table 5

This table shows all of the specific items needed to construct an effective mitigation measurement program. The one addition to the table not mentioned previously in the research in the priority column. Priorities should be listed from one to three. In a perfect environment all priority one tasks will be completed, priority two tasks may be fully or partially completed, and

priority three items will not be considered most likely due to financial constraints (Canton, 2007).

On a local level, the COD has a State of Texas approved hazard mitigation program. This program is part of the North Central Texas Council of Governments (NCTCOG) overall plan for the north Texas region. The local program is specifically outlined in the Denton County local mitigation strategy section which is part of the entire program that has been formalized and approved by the State of Texas Department of Emergency Management. As with all state and ultimately federally approved mitigation plans, there is a specific process in developing goals and achieving these goals through tasks and other of measureable items. The mitigation strategy addresses ten hazards which are dam failures, droughts, earthquakes, extreme heat, floods, hail, high winds, tornadoes, wildland fires, and winter storms. All of these hazards are considered natural hazards. There are no man-made hazards, threats, or risks listed in this mitigation strategy that has been implemented for the NCTCOG (North Central Texas Council of Governments, 2010).

Procedures

The research for this project was driven by the problem that the DFD does not have a current comprehensive risk assessment on potential man-made disasters that can occur in the COD. The literature review took a broad theoretical to narrow local research approach. The research questions were answered using a descriptive research approach. Through the research of each question, this paper will reach its purpose in identifying potential man-made disasters, their potential frequency in the COD, and make recommendations to help mitigate these risks.

The initial research began with some informal conversations with the COD emergency manager, first responders, and some staff position members of the COD's emergency operations center [EOC]. This initial informal research was used to determine if there was a perceived or real problem that the DFD does not have an up-to-date comprehensive risk assessment on potential man-made disasters that can occur in the COD. These initial conversations and some basic initial research suggested that there was a problem in the COD, which then made the paper a reasonable paper to investigate and research. The informal meetings were later formalized into a specific original research questionnaire (*Appendix A*) and a sample size expanded with the results shown in *appendix B*. The questionnaire was formulated early in the research process which helped steer some of the additional research. Some of the data originally obtained was not necessary as the paper progressed, and only the relevant data that was used in the final research of this project was included in the final questionnaire. All other data was removed. Other forms of original research were considered. Ultimately, the local and regional level questionnaire formats were determined to be the best avenue to further strengthen the validity of the research.

The research began with focusing on man-made disasters. From there, the research focused on the first question of determining what a comprehensive risk assessment plan was. The literature review utilized a theoretical or global approach and then narrowed the research down to local level. Research was conducted into the methodology of assessing risks. Extensive research analyzed the process used to evaluate and rank risks (Kennett, 2005). Additional research was also performed through the EPA, NFPA, and the local level to determine the various programs, methodology, and steps that each entity utilized in developing risk matrixes and overall risk assessment plans.

The second research question focused on determining the potential man-made risks that could have a significant impact on the citizens of Denton. Again, this research began with a broad or wide approach and then gradually narrowed down to a local level. The research first defined man-made risks and then outlined the differences between man-made and natural risks. The research then narrowed down to the regional level to show how potential man-made risks are identified and how they were handled. Further narrowing the scope, the research then focused on the risks that were formally identified in the COD's emergency management plan. Unfortunately, the emergency management plan only had identified basic general man-made and natural risks to the COD (City of Denton, 2005).

To fill in this gap of information about man-made risks in the COD, original research was formulated to bring to light specific man-made risks. The detailed questionnaire focused on two specific groups that were knowledgeable about potential man-made risks in the COD. The first group was internal COD emergency first responders and EOC members. The second group consisted of other emergency related providers and responders that are members of the Denton Emergency Planning Advisory Committee [DEPAC]. A common questionnaire to both groups was utilized to formalize the many initial informal meetings that had been conducted (*Appendix A*). Based on the data received through the questionnaire, the sample size obtained appeared to be adequate. Responses were received from 94% of the DEPAC members. Additionally 86% of the total questionnaires sent to the internal COD group were deemed acceptable to utilize in the research. Relevant results have been combined and are shown in *appendix B* in the results section.

The third research question focused on determining the actual preparedness level that the COD currently had for man-made risks. The research started on a national level with HPSD-8

that officially established the modern day national directive on preparedness. Through this mandate, the DHS developed a list of target capabilities. DHS also established a six step model of planning, organization and leadership, personnel, equipment and systems, training, and exercises to achieve an effective level of preparedness (Department of Homeland Security, 2007).

Additional research conducted by the U.S. Department of Education looked into how schools should be prepared for natural and man-made threats. Their research resulted in a five step process of organizing the proper response teams, establishing a centralized incident command post, establishing determined response procedures, pre-determining any special equipment, and conducting regular training, drills, and exercises (United States Department of Education, 2007).

The third question research also revealed how the NFPA handles preparedness through pre-incident planning. The NFPA approach is a systematic and measureable six step process. The process in pre-incident planning is the identification of physical elements, occupancy types, fire protection systems, special hazards, emergency operations considerations, and any other special considerations. The identified items are then combined and a level of risk is then determined. From there, preparedness measurements can then be established (National Fire Protection Agency, 2010).

The research into the third question was then brought down to a state and local level with research looking into the TDEM and the COD. Texas views the preparedness concept in more general terms and focuses primarily on an overall preparedness goal of rapid response and quick recovery. To achieve this level of preparedness, TDEM currently has nine objectives that steers the overall planning and preparedness process (Texas State Office of the Governor, 2010). Like

the TDEM plan, the COD's preparedness plan also has a list of steps or objectives which will enable the COD to become better prepared (City of Denton, 2005). Both plans did not list any specific man-made risks in their preparedness models.

The last question researched was based on what preparedness measures should the DFD utilize to mitigate man-made risks. The research revealed that preparedness measures are part of each level of government's emergency management plan. It requires that each level of government follow the same basic principles and guidelines to become an approved emergency management and hazard mitigation plan. To achieve this approval, all of the mitigation plans focus and emphasize preparedness measurements on natural threats and not on man-made risks. The research required looking outside of the public government arena to find measurement tools and preparedness measures that could be utilized for the DFD. The research did indicate that despite whatever preparedness measures taken, there should always be a methodology used to formally evaluate the risks and rank their overall risk level.

The four research questions utilized built upon each other to strengthen this research paper. Since the four questions were inter-related, each of the questions helped strengthen and interlock the research as a whole. The procedure utilized to answer each research question was a four step approach. First, a theory or working definition was established for each question. Second, the question was researched focusing on using recognized federal government requirements that have been mandated since new federal laws, standards, and regulations have been introduced including NIMS, DMA, and HPSD-8. Third, a fire industry or other related industry was utilized to build credibility to the research. Finally, relevant original data and local established emergency management documents, plans, and programs were researched and utilized to strengthen the research on a local COD level.

Limitations

While the research questions were thoroughly researched and the data analyzed, there is always some limitations to the research. First, it was revealed that prior to this research paper, very little data was readily available for man-made risks on a local level in the form of a formalized plan. This lack of data on man-made risks and threats became more obvious as the research continued and eventually finalized. The realization became apparent that the current approved mitigation strategy program lacks any information on man-made mitigation measures. The detailed plan focuses entirely on natural disasters, since this basically follows the national framework of emergency management and mitigation plans that are officially approved by government entities.

Definition of Terms

Disaster-	A sudden event bringing great damage, loss, or destruction.
Man-made disaster-	Disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions.
Mitigate-	To make less severe.
Natural disaster-	Disaster caused by natural forces rather than by human action.
Risk-	The possibility of suffering harm or loss; danger.

Results

Research Question 1. What is a comprehensive risk assessment and does the COD need one? The research began with the determination of what risk assessment truly is as it relates to a fire department. The research revealed that in theory, a comprehensive risk assessment should

involve the identification, evaluation, and the estimation of the degree of risk in a particular event as it relates to a set standard (Web Finance, 2010). This level of risk can then be utilized to decide whether the overall risk is acceptable or if measures need to be taken to reduce part or all of the identified risk.

The research then began focusing on how the federal government viewed and handled comprehensive risk assessments. FEMA and the EPA were found to handle risk in fairly the same manner. Both federal institutions rely on a three step process to achieve an overall comprehensive risk assessment of a particular item. The FEMA program's result is a risk matrix. The matrix tool is used to measure the overall risk of a threat (Kennett, 2005). In comparison, the EPA model develops a risk assessment to help make predictions in long-term effects of past or potential exposures (Sutter, 2003). Both models emphasized the importance of developing a standardized model or process to gather and analyze information to help determine a level of risk. The measurement process of both processes enables an organization to develop an overall ranking of risks based on predictable levels of threat.

The research for the first question then focused on the NFPA and what recommendations they have made to fire departments in developing risk assessments. The NFPA plan on risk analysis had the same general components as the FEMA and EPA models with one added addition. The NFPA suggested plan adds a fourth step of mitigation into their comprehensive risk assessment model. This fourth step is a monitoring and review step, put into the plan to keep it fluid and up-to-date (National Fire Protection Association, 2007).

Bringing the focus down to the DFD, it was found the COD's emergency management plan simply lists the nineteen potential natural and man-made threats. The plan does compare each hazard against three measurement tools of likelihood of occurrence, public health impact,

and impact on property. There is no methodology listed behind making the assumptions for man-made risks. Data is also listed in the emergency management plan and no overall ranking is listed (City of Denton, 2005).

Some interesting original research results were found for the first research question which are included in combined results of *appendix B*. 84% of the surveyed respondents indicated that they have an emergency management plan in place and have also conducted a risk assessment in the development of their plan. One of the government agencies surveyed had multiple respondents. Over 30% of these respondents stated that their emergency plan did not have a comprehensive risk assessment plan or they were not sure if they had a plan or not. Overall, the questionnaire showed that comprehensive risks assessments are not necessarily always used in emergency management plans in local COD organizations.

The first question was answered by first establishing a national level methodology of a comprehensive risk assessment plan as was previously outlined in the procedure section. This plan was compared and contrasted against other established risk assessment programs by the EPA and NFPA. This information was then brought down to a local level and compared against the method utilized in the COD emergency management plan in the development of a local comprehensive risk management plan (City of Denton, 2005).

Research Question 2. What are the potential man-made risks which could occur that could have a significant impact on the citizens of Denton? Throughout the United States, FEMA is the recognized standard in emergency management. This governmental organization has established a list of potential natural and man-made risks that may potentially occur in the United States. There are seven man-made risks identified by FEMA which are hazardous materials

incidents, nuclear power plants incidents, explosions, biological threats, chemical threats, nuclear blasts, and radiological dispersion devices (Federal Emergency Management Agency, 2004).

Another source of study found that the local COG which represents roughly 7,000,000 citizens in the north Texas region have developed their plan on man-made risks in a slightly different manner. To identify man-made risks, the COG has developed a UASI program that mimics the basic standards set by TDEM. The COG plan outlines three specific areas that they consider to be mission critical with fourteen additional sub-categories of enhancement areas. While the UASI plan does not specify any specific man-made threats, it has an emphasis on more global preparedness measures that are focused on improving the safety of the entire region that the COG protects and serves (North Texas Council of Governments, 2008).

The research then revealed that the COD has a list of eight potentially significant man-made risks that may face the COD. The eight threats are energy/fuel shortage, hazmat spill at a fixed site, transportation hazmat spill, nuclear facility incident, water systems failure, civil disorder, military attack, and terrorism. The COD emergency plan states that these man-made risks are based on TDEM assumptions and generally accepted guidelines set by the DHS (City of Denton, 2005). Since the risks or threats listed in the COD plan were generalized and based on many assumptions from the state and federal guidelines, original research questions were utilized to get additional data to help strengthen or disprove the assumptions made in the COD emergency management plan.

The questionnaire utilized (*Appendix A*) was used to collect additional data on man-made risks that may threaten the citizens of Denton, Texas. The combined results revealed eight unique man-made risks that members of DEPAC expressed were of concern. The eight threats were hazardous material incidents, terrorist attacks, power failure, active shooter, cyber attacks,

transportation incidents, workplace violence, and bombings. As shown on the combined results page (*Appendix B*), the top answer was hazardous materials incidents with 82% of the responders identifying this risk as significant and cyber attacks was a distant second at 64% of the respondents. Terrorist attacks and power failures rounded out the top four responses. Other than cyber attacks, all of the man-made risks responses were closely related to items listed in the COD plan.

The literature review and original research answered the second research question. This question focused on indentifying the potential man-made risks which could have a significant impact on the citizens of Denton. This question was answered through first establishing the basis of how man-made threats are determined through national standards and guidelines set by FEMA and DHS. These standards were then compared to the critical mission areas established by COG. Finally, the results of the research on man-made risks revealed in the COD emergency management plan and from the original research conducted were compared to the national and COG lists of man-made risks.

Research Question 3. What is the COD's current preparedness level towards man-made risks? Modern day preparedness has been on the forefront on virtually every level of government since national preparedness was formalized with HPSD-8. This national preparedness directive established an overall vision that the United States will be "a nation prepared with coordinated capabilities to prevent, protect against, respond to, and recover from all hazards in a way that balances risk with resources and need." The preparedness plan outlines that the vision is accomplished through three critical elements which are national preparedness scenarios, a universal task list, and TCL. The TCL was the main point of research since it lists

thirty seven individual capabilities that all entities should posses to be better prepared (Department of Homeland Security, 2007).

The research then looked at another related industry to research how they handle preparing for potential man-made risks. The U.S. Department of Education revealed data they prepare for incidents from a worst-case scenario point of view. To achieve preparedness based on their standard, a five step model is utilized. The model steps are the organization of response teams, establishing a command post, establishing determined response procedures, pre-determining any special needs, and conducting drills, exercises, and training (United States Department of Education, 2007).

Additional preparedness tools were identified by the NFPA. The research into the NFPA pre-incident planning standard showed that they recommend a six step approach on preparing for pre-identified risks. These steps include identifying physical elements, determining occupancy types, fire protection systems, special hazards, emergency considerations, and any special considerations. The NFPA approach also included a process to determine the overall list of all risks identified which ranks each risk from highest to the lowest risk (National Fire Protection Association, 2010).

Finally, the research was brought down to a state and local level that the TDEM and COD emergency management preparedness plans revealed. Preparedness is achieved through a number of goals. While the individual objectives to reach the preparedness goal were not identical, they were very closely related. The research determined that the goals and objectives were designed this way to achieve approval and potential funding for the COD plan. As a result, the plan must fit within the Texas plan. The Texas plan must then fit within the federal guidelines established by the DHS and FEMA. The Texas preparedness plan emphasized Texas

will continue to dedicate a large amount of resources, time, and effort towards the prevention of terrorist and other man-made risks (Texas State Office of the Governor, 2010). In comparison, the COD plan focuses efforts in identifying potential man-made risks with the goal of preventing the threats from occurring (City of Denton, 2005). Neither the Texas nor the COD preparedness plan identifies any specific man-made risks.

Through the literature review and procedure section, it became apparent that successful preparedness plans or models have a systematic approach. The plans may differ in style and content, but all of the plans ultimately include the common overall vision of being prepared with coordinated capabilities. These coordinated capabilities include an organization's ability to prevent, respond, and recover from all identified man-made risks.

Research Question 4. What preparedness measures should the DFD utilize to mitigate and/or respond to these identified risks? Research showed that FEMA has set the preparedness and mitigation standards in the United States. The research also revealed that FEMA has developed a multi-hazard guidance book better known as the "blue book" in the emergency management field. This guideline contains four required components that all government preparedness and mitigation plans must follow to be approved. The plan must include goals and objectives in the selection process of mitigating risks, pre- and post-disaster hazard policies, mitigation actions which are cost effective, and current or potential resources necessary to implement the mitigation measures (Federal Emergency Management Agency, 2008).

Since the research initially revealed that the FEMA "blue book" was the mandated standard on preparedness measures that any government agency must adhere to, the research then focused entirely outside of the government arena to find additional viewpoints on mitigation. The private facility management field was researched. It was identified that in the

facility management business sector, a successful mitigation plan and preparedness measures are based on core elements. An acceptable level of preparedness is achieved by achieving these core elements with site specific goals and objectives. The research stressed that an important aspect of preparedness is the constant re-evaluation of each core element, goal, and objective to ensure that each inter-related step is evolving and always improving upon itself (Gustin, 2002).

An additional answer to the last research question was obtained from the NCTCOG. The NCTTOG has a formalized mitigation plan for the North Texas area. This regional/local mitigation strategy has been approved on the state and federal levels. The official plan for the COD addresses ten potential risks to the area and strategies to reduce or eliminate these risks (North Central Texas Council of Governments, 2010). Unfortunately, the research showed that all of these risks were considered natural risks, so original research was utilized to fill this short-coming in the local plan.

Finally, original research was utilized to help strengthen the overall answer for the final research question. The questionnaire's overall results (*Appendix B*) showed that 76% of the respondents had some form of preparedness measures with a goal of lowering specific risks to their organizations. An alarming response in the questionnaire was found in question number fourteen. Overall respondents believed that they were only 70% prepared in handling the top five man-made specific hazards that they listed. Furthermore in question number fifteen, the results did not reveal any new information. The majority of the answers centered around the need to better follow existing plans in place through better communication, additional training, and following and/or strengthening policies and procedures.

This final research question was ultimately answered with an overwhelming amount of literature review pointing towards one direction. The answer was revealed from the "blue book"

that is the accepted standard in the development of preparedness and mitigation measures. This guideline contains four required components that all government preparedness and mitigation plans must follow to be approved. The plan must include goals and objectives in the selection process of mitigating risks, pre- and post-disaster hazard policies, mitigation actions which are cost effective, and current or potential resources necessary to implement the mitigation measures.

Discussion

Through research gathering and the dissemination of the raw data collected, it became very apparent that FEMA was the nationally recognized authority on virtually everything about risk management, preparedness, and mitigation in the United States. This level of expertise also includes their methodology in developing comprehensive risk management plans as outlined in research question number one. The research agreed that FEMA's three step risk matrix of looking at a risk's likelihood, determining the potential consequences of the risk, and establishing an overall vulnerability of the risk does give agencies a vital tool to develop their own overall risk assessments (Kennett, 2005). Additional research into another related industry showed that the EPA also follows a three step process in the development of risk assessments. The EPA plan does emphasize the importance of having a risk management plan to help determine the consequences of previous exposures and to help predict the potential of future risks (Suter, 2003). Bringing the focus back to the fire industry, the research then focused on the NFPA recommendation that each fire department establish a detailed risk management plan. The plan includes the four components of risk identification, determination of potential severity and likelihood of occurrence, risk control measures, and finally a monitoring program to manage the overall effectiveness of the program (National Fire Protection Association, 2007). Finally, the

answer that the DFD needs a comprehensive risk management plan was strengthened on the local level with the COD's emergency management plan. The plan contains a list of eight specific man-made risks that have the potential from occurring in the COD (City of Denton, 2005). All of the research supported the answer to question number one that the COD does need a current comprehensive risk management plan.

The second question that was answered through research analyzed the types of man-made risks that could have a significant impact on the citizens of Denton, Texas. The question was first analyzed on potential man-made threats that could affect the United States. FEMA was found to have set the standard on potential man-made risks. FEMA achieved this through the development of hazard matrixes on potential natural and man-made risks. This broad based list includes hazardous materials incidents, nuclear power plant incidents, explosions, biological threats, chemical risks, nuclear blasts, and radiological dispersion device incidents (Federal Emergency Management Agency, 2004). Bringing the research down to a more local level looked at the UASI program developed by the local COG. While this program was developed in a different manner than most, it still has an overall goal of building a plan that help prevent, prepare, protect, respond to, and recover from man-made threats. Instead of focusing on specific man-made risks, the COG plan places an emphasis on overall preparedness and response objectives (North Central Texas Council of Governments, 2008). Researching the local COD plan, the research found that risk assumptions are based on generally accepted standards set by the DHS and FEMA. Currently, the COD emergency management plan contains the basic overview on man-made risks that is from FEMA and does not address any specific man-made risks to any specific sites that may occur within the COD (City of Denton, 2005). To fill in this local data gap, original research was conducted and found that the eight man-made risks were of

concern to the local DEPAC member. The eight threats were hazardous material incidents, terrorist attacks, power failure, active shooter, cyber attacks, transportation incidents, workplace violence, and bombings (*Appendix B*). Other than cyber attacks all of these threats are listed indirectly in the current COD threat assessment plan.

The third question was based on the COD's current preparedness level towards identified man-made risks. As a result of HPSD-8 in 2003 the DHS has been tasked with preparing the nation against natural and man-made risks the research first revealed. The DHS has established a three step approach to achieve the vision of becoming a nation that is fully prepared. The three preparedness steps are national preparedness scenarios, universal task list, and a TCL. The TCL was of particular interest to the research because it provides the actual elements required to be better prepared. The six preparedness elements are the following:

1. Planning
2. Organization and leadership
3. Personnel
4. Equipment and systems
5. Training
6. Exercises, evaluations, and corrective actions

These six steps or elements were found to be the backbone on what every public or private entity should posses in order to be better prepared (Department of Homeland Security, 2007). The research then looked at the U.S. Department of Education and how this department prepares for man-made risks. Overall, the education department's plan closely mimics the DHS plan with the one exception. The exception is that the education department's preparations are based on worst-case scenarios instead of expected outcomes (United States Department of Education,

2007). In the fire industry, the NFPA preparedness methodology was discovered in pre-incident planning. The NFPA goal of fire departments being better prepared focuses on achieving a six step approach of identifying physical elements, occupancy type, fire protection systems, special hazards, emergency operations considerations, and any special characteristics. While the NFPA approach mainly focuses on the protection of a physical property and not necessarily the preparation against a specific threat other than fire, it does utilize a systematic and measureable approach in determining an overall level of preparedness (National Fire Protection Agency, 2010). Finally, the focus on determining preparedness levels towards man-made risks turned to the TDEM and the COD. The research showed that these plans have slightly different objectives in preparing for man-made risks, but the root goal is virtually the same since the COD preparedness plan is required to be based on the TDEM's plan to gain approval. Furthermore, the Texas plan is based on the TCL developed by the DHS. TDEM's goal is to minimize damage through a rapid response and quickly recover from terrorist attacks and other disasters (Texas State Office of the Governor, 2010). Conversely, the COD preparedness plan's basic goal is to reduce overall risks to man-made threats through better overall training of emergency responders which includes techniques on collecting and analyzing information (City of Denton, 2005). The research to the third question resulted in similar results that defend the answer that preparedness levels must be based on an established process. The research further revealed that these plans or processes should be established on the model programs established be the DHS and basically mandated through HSPD-8.

The last portion of research to be discussed focused on the question of what preparedness measures should the DFD utilize to mitigate and/or respond to man-made threats. The procedures used to answer this question were essentially the same as throughout the research in

which a broad methodology or theoretical basis was first established and then the researched narrowed the perspective down to local level relevance. The first portion of research was from FEMA's multi-hazard guidance known as the "blue book". This guidance outlines the four required components of any approved government mitigation plan (Federal Emergency Management Agency, 2008). The mitigation plan must include the following:

1. Goals and objectives in the selection process to mitigate and reduce losses
2. Pre- and post-disaster hazard policies and programs used to mitigate hazards including a capability assessment
3. Identify mitigation actions which must be cost effective, feasible, and are current
4. List potential resources attained or needed to implement the mitigation actions

Looking into the private sector which is not entirely mandated to follow the FEMA guidelines, the research turned to the facility management arena. The research showed a slightly different approach to establishing an effective mitigation by establishing measureable goals and objectives to become better prepared against man-made risks. The main difference in the FEMA and private industry plan is that the private industry plan introduced the importance of having a priority level to given to each task. The private sector plan noted that while it would be ideal to accomplish all tasks in becoming a better prepared facility, it is unlikely that all tasks or preparedness measures can be accomplished due to a variety of reasons. This is why it is essential that a priority level be assigned to each task, which enables the decision makers to know where and how to spend resources (Canton, 2007). Finally, the research focused on the state, regional and local level. These three areas were combined since all were included in the official approved state mitigation plan. This hazard mitigation plan goes into great detail on mitigation strategies, developing goals, and achieving these goals but it only addresses natural

risks and does not list any man-made risks (North Central Texas Council of Governments, 2010). Original research was utilized to help strengthen the overall answer for the final research question. The results (*appendix B*) revealed that 76% of the respondents had some form of preparedness measures in place with a goal of lower specific risks to their organizations. The alarming response came from question number fourteen in which only 70% of the respondents felt that were prepared to handle what they deemed to be the top five man-made risks to their organizations. The research determined that through the literature review, original research, and procedures, the COD does have the required preparedness measures in place, but does need to improve man-made risk preparedness and mitigation measures that potentially can impact the citizens and property of Denton.

Recommendations

This research project revealed that risk preparedness throughout the United States and the COD is widely based on a systematic approach. The DHS and FEMA have been established as the recognized source in the development of acceptable national preparedness and mitigation strategies through federal actions such as the Homeland Presidential Security Directive-8 and Disaster Mitigation Act. Since the DFD is part of a city government, it was determined through the research that the fire department is mandated to follow the overall guidance and emergency management plans set forth by the federal government. This is a requirement so the COD can implement emergency management plans and programs that are fully accepted and approved by the State of Texas and ultimately FEMA. With an ultimate goal of producing a comprehensive risk assessment on potential man-made risks, the types of man-made risks that the COD may actually face needs to be addressed along with appropriate mitigation strategies for these man-

made risks. To achieve this, the Denton Fire Department needs to implement a three step process including the following:

1. Identifying specific man-made risks
2. Determining overall risk of man-made threat
3. Establishing mitigation measures for each man-made risk

Each of these three core elements should be considered critical in achieving the goal. The steps also need to be broken down into individual objectives that are measureable and obtainable.

This first step would not only identify additional man-made risks, but it would also assign initial objectives to each threat. The COG's UASI and the COD's plans have already established the mission critical elements needed to reduce risks. The key and basic requirement is to take specific man-made risks like hazardous materials incidents, active shooter, terrorist attacks, cyber attacks, workplace violence, transportation incidents, power failures, and bombings as outlined in the original research and model them to fit into the already established plans.

The second step of determining a man-made risk's overall threat is a complex five step process. First, a prediction in the probability that the risk will occur must be established by researching past, current, and projected data on similar threats. Once the probability is determined, the potential consequences of a man-made risk can be analyzed. The third step involves determining how vulnerable that the COD is to the identified man-made risk. The fourth step will involve determining the risk's overall numeric threat level. To determine this numeric value, each of the first three steps are assigned a number based on the degree of severity, then each step is multiplied together to establish a final value. Finally, the numeric value will be used to help establish on overall risk matrix for all of the indentified man-made risks.

The last recommendation would be to institute the third step to help achieve the goal of developing a realistic comprehensive risk assessment and mitigation plan on man-made risks. This last step involves establishing a mitigation plan for each identified man-made risk. The mitigation plan needs to include the four key steps as outlined in the "blue book" plus one additional step for a total of five which include the following:

1. Establishing specific goals and objectives in the when deciding to select a specific risk to mitigate
2. Developing and adhering to disaster hazard policies and programs used to mitigate hazards including a capability assessment
3. Identifying mitigation actions which must be cost effective, feasible, and are current
4. Listing resources needed to implement the mitigation actions
5. Evaluating and updating the mitigation plan on a constant basis

The fifth step which has been added to FEMA's four step "blue book" plan is obtaining the proper measurement tools to know if a program is succeeding or not. This step also establishes a built-in checks and balance system to help constantly improve the entire program.

This three-step process recommended by the author is intended to be an on-going process in any implemented comprehensive risk assessment plan for man-made risks implemented by the DFD. The three key steps of identifying specific man-made risks, determining their overall risk level, and establishing mitigation measures for each risk will produce results in both the short- and long-term. Hopefully with a comprehensive risk assessment and mitigation plan on man-made risks specifically designed for the COD, the citizens will never face a devastating man-made disaster in Denton, Texas.

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Appendix A

National Fire Academy
Executive Fire Officer Program
Questionnaire

1- City/Organization that you cover: _____

2- Approximate Population that this covers: _____

3- Does your City/Organization have a written Emergency Disaster Plan?
_____

4- If you answered "yes" to question 3, when was the plan last updated: _____

5- If you answered "yes" to having a written plan, is the plan NIMS compliant (ie: Is the plan flexible enough to use at a small or large incident while utilizing national standards, etc.): _____

6- If you have a written Emergency Disaster Plan, do you ever conduct disaster drills, tabletops, etc? _____

7- If you answered "yes" to question #6, what type of drills do you conduct and approximately how often?
_____
_____
_____

8- If you have a disaster plan, was a comprehensive risk analysis of various risks conducted as part of the development of the disaster plan (ie: My organization is prone to a potential terrorist attack)? _____

9- If you have a disaster plan, was a hazard identification conducted for specific items?
_____

10- If you have a disaster plan, was a vulnerability assessment conducted (ie: What is our level of security against a potential disaster)? _____

11- If you have a disaster plan, does it include an overall risk rating for specific hazards based on their probability of occurrence and vulnerability (ie: A list of all of your potential threats ranked from most serious)?_____

12- If you answered "yes" to question #11, has your city/entity taken any measures to lower any specific risk rating items on target hazards? _____

13- What are the top man-made threats which could have significant impact on the organization/city that you cover and/or work for? (ie: terrorists, hazmat, transportation, power failure, arson fire, cyber attack, etc.)

_____

_____

_____

_____

_____

14- On a scale of 1 to 5 (1 being not prepared and 5 being well prepared), go back to question #13 and rate each man-made threat on how well you feel that your organization/city that you cover is prepared to handle each risk (place a number next to each item).

15- Based on the man-made threats identified in question #13, are there any additional preparedness measures that your city/organization should take to help mitigate and/or respond to these identified risks?

_____

_____

_____

_____

Appendix B

National Fire Academy
Executive Fire Officer Program
Questionnaire Results

1- City/Organization that you cover: **Numerous**

2- Approximate Population that this covers: **100- 40,000,000**

3- Does your City/Organization have a written Emergency Disaster Plan? **Yes= 94%**

4- If you answered "yes" to question 3, when was the plan last updated: **2010= 82%**

5- If you answered "yes" to having a written plan, is the plan NIMS compliant (ie: Is the plan flexible enough to use at a small or large incident while utilizing national standards, etc.): **Yes= 94%**

6- If you have a written Emergency Disaster Plan, do you ever conduct disaster drills, tabletops, etc? **Yes= 82%**

7- If you answered "yes" to question #6, what type of drills do you conduct and approximately how often? **Tabletop, Full Scale, Drills, Lock Downs, Field, and Functional. Average was 1.8 per year**

8- If you have a disaster plan, was a comprehensive risk analysis of various risks conducted as part of the development of the disaster plan (ie: My organization is prone to a potential terrorist attack)? **Yes= 82%**

9- If you have a disaster plan, was a hazard identification conducted for specific items? **Yes= 94%**

10- If you have a disaster plan, was a vulnerability assessment conducted (ie: What is our level of security against a potential disaster)? **Yes= 88%**

11- If you have a disaster plan, does it include an overall risk rating for specific hazards based on their probability of occurrence and vulnerability (ie: A list of all of your potential threats ranked from most serious)? **Yes= 82%**

12- If you answered "yes" to question #11, has your city/entity taken any measures to lower any specific risk rating items on target hazards? **Yes= 76%**

13- What are the top man-made threats which could have significant impact on the organization/city that you cover and/or work for? (ie: terrorists, hazmat, transportation, power failure, arson fire, cyber attack, etc.)

Hazmat
Terrorist
Power Failure
Active Shooter
Cyber Attack
Transportation Incident
Workplace Violence
Bombing

14- On a scale of 1 to 5 (1 being not prepared and 5 being well prepared), go back to question #13 and rate each man-made threat on how well you feel that your organization/city that you cover is prepared to handle each risk (place a number next to each item).

Hazmat-	3.5 average score	Appeared in 82% of responses
Terrorist-	4.1 average score	Appeared in 47% of responses
Power Failure-	3.7 average score	Appeared in 59% of responses
Active Shooter-	3.7 average score	Appeared in 18% of responses
Cyber Attack-	3.1 average score	Appeared in 65% of responses
Transportation Incident-	4.0 average score	Appeared in 12% of responses
Workplace Violence-	4.0 average score	Appeared in 6% of responses
Bombing-	5.0 average score	Appeared in 6% of responses

15- Based on the man-made threats identified in question #13, are there any additional preparedness measures that your city/organization should take to help mitigate and/or respond to these identified risks?

-Numerous- No, none, or blank responses
-Work more closely with state/local officials
-More tabletop/ drill based training
-Education of community in proper response
-Can always use more resources- equipment for decon, etc.
-Notification to population
-Drills
-Awareness
-Prepare written plan specific for this
-Conduct training/exercise
-Redundant systems (technology)
-Planning and better communication with locals
-Information technology and security measures
-Back-up power
-More stringent visitor policy