APPENDIX A

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Appendix A
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APPENDIX B

ACRONYMS AND GLOSSARY

Appendix B
Acronyms and Glossary

CAV	Community Assistance Visits
CPRC	Citizen Policy Review Committee
CRS	Community Rating System
DEM	Digital Elevation Model
DMA	Disaster Mitigation Act
DPS	Department of Public Safety
D/FW	Dallas/Fort Worth
EF Scale	Enhanced Fujita Scale
EOC	Emergency Management Coordinator
EPA	United States Environmental Protection Agency
FEMA	United States Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GDEM	Texas Governor's Division of Emergency Management
GIS	Geographical Information System
HAZUS	Hazards United States
HB	House Bill
HMAP	Hazard Mitigation Action Plan
HAZUS	Hazards United States (computer model)
HAZUS-MH	Hazards United States Multi Hazards (computer model)
HEC-RAS	Hydrologic Engineering Center River Analysis System
LWP	Local Warning Point
mph	miles per hour
MSA	Metropolitan Statistical Area
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NOAA	United States National Oceanic and Atmospheric Administration
NWS	National Weather Service
OEM	Office of Emergency Management
PDSI	Palmer Drought Severity Index
PIO	Public Information Office

NFIP	National Flood Insurance program
PMF	Probable Maximum Flood
SBA	Small Business Administration
SFHA	Special Flood Hazard Area
TAD	Tarrant County Appraisal District
TDI	Texas Department of Insurance
TORRO	United Kingdom Tornado and Storm Research Organization
TRWD	Tarrant Regional Water District
USGS	United States Geological Survey
USPS	United States Postal Service

Glossary

100-year	frequency of occurrence that once every 100 years an event of a particular magnitude is expected to occur.
500-year	frequency of occurrence that once every 500 years an event of a particular magnitude is expected to occur.
Census Block	the smallest geographic unit used by the U.S. Census to count land areas. A census block is typically bound by streets or streams and may correspond to a city block.
Census Tract	a sum of census blocks that make up a larger area, such as a city or a town. A census track may line up with city boundaries.
Commercial Facility	structures including houses, businesses, hotels, restaurants and other commerce-generating activities. (Term is used in HAZUS model.)
Critical Facilities	facilities vital to the health and welfare of the population and that especially important following a hazard event. (HAZUS calls these "Essential Facilities".)
Entertainment District	the area in north eastern Arlington that includes Six Flags Over Texas, Hurricane Harbor, the Ballpark in Arlington, the future Cowboys stadium, the Arlington Convention Center, and various restaurants and hotels in the immediate area.
Exposure	the condition of being unprotected or being subject to some effect or influence. (Webster, 1984)

Housing Unit	a house, an apartment, a mobile or trailer home, a group of rooms or a single room that is occupied, or, if vacant, is intended for occupancy as a separate living quarters. Both occupied and vacant housing units are included in the housing unit inventory, with the exception of vacant mobile homes and trailers on dealer's sales lots. [i] (Term is used by HAZUS and U.S. Census.)
Non-Residential Facility	all non-residential structures. (Term used by TAD.)
Other Facility	structures associated with industrial plants, agricultural work, and all other permanent structures not already specified as residential or commercial. (Term is used in HAZUS model.)
Other Parcel	all non-residential parcels of land. (Term used by TAD.)
Residential Facility	single-family house, multi-family structures, mobile homes, and trailer homes. (Term used by HAZUS model and TAD.)
Residential Parcel	parcels of land dedicated as residential use (Term used by TAD.)
Special Facilities	facilities that are unique or provide unique services within the city.

[i] U.S. Census Bureau web site http://www.census.gov/popest/topics/terms/housing_unit.html downloaded 7/31/07.

APPENDIX C

STEERING COMMITTEE

Appendix C
Steering Committee

The steering committee for the Arlington Hazard Mitigation Action Plan consisted of city employees, citizens, and a county representative. Table C-1 lists the steering committee members.

Table C-1
Steering Committee

Name	Organization
Keith Brooks, P.E.	Public Works Department, Project Manager
Fiona Allen, P.E.	Deputy City Manager
Keith Melton, P.E.	Assistant Director of Public Works
Don Crowson	Fire Department
Michael Ikner	Police Department
Chuck Vokes	Water Utilities
Steve Harper	Environmental Services
Michelle Hardin, AICP	Community Development
Joe Trammel	Tarrant County
Ron Reber	Citizen
Ed Gutierrez, P.E.	Citizen
Jim Sparks, P.E.	Citizen
Irish Hancock	Emergency Management

The steering committee met numerous times through the course of this project. The meetings notes are included in this appendix for the following meetings:

- August 1, 2006
- September 14, 2006
- December 14, 2006
- February 22, 2007
- April 19, 2007
- July 26, 2007

Freese and Nichols

MEMORANDUM

TO: File

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington Hazard Mitigation Action Plan (HMAP) Steering Committee Meeting on August 1, 2006

DATE: August 2, 2006

The list of attendees is attached to these notes.

The HMAP Steering Committee had its kickoff meeting on August 1, 2006 at 3 PM at the City of Arlington municipal complex. Bob welcomed the steering committee and thanked them for their participation on this committee. We went around the table introducing ourselves to the group.

Keith Brooks also thanked everyone for attending the meeting and passed the attendance list for everyone to sign. Keith introduced Simone Kiel and Stephanie Griffin as the consultants with Freese and Nichols who would be leading this project.

Simone Kiel walked through the presentation (attached). The presentation gave an overview of the elements that would be included in the hazard mitigation action plan, as well as a discussion of the duties of the steering committee. During the discussion, Simone clarified that this project focuses on natural hazards and the determining what actions can be taken to decrease losses associated with future natural disasters. This project is not an emergency response plan and does not replace the need for such plans.

The group discussed the first public meeting and the potential timing of that meeting. The schedule shows August as the timeframe for having this meeting. It was pointed out that the City Manager's Office was about to release the new budget for next year and would be holding town hall meetings around the city. Keith will find out those meeting dates and choose another date for this public meeting. The group decided it would be best to have this public meeting be a stand-alone meeting instead of adding it to a regular city council meeting. The public meeting will be held in the evening to encourage public participation. The first public meeting will be to solicit input on the goals and objectives of the plan. It will be clarified to the public that the focus should be on the prevention and avoidance of natural disasters through planning.

The question was raised as to how to handle natural disasters that could impact the Lake Arlington dam or the water supply system. Both of these facilities have had vulnerability assessment studies performed that are exempt from the open records requirement due to the potential threat of terrorist

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4055 International Plaza ◆ Suite 200 ◆ Fort Worth, Texas 76109-4895
(817) 735-7300 ◆ Metro (817) 429-1900 ◆ Fax (817) 735-7491

actions with such knowledge. The steering committee will narrow down the list of natural hazards that are of most significance to the area. These items could fall off the list with the explanation that they have been analyzed in separate reports. The consultants will look into the FEMA requirements regarding this concern.

The question was raised as to what methodology would be used to develop the priority list of recommended actions to be taken. The methodology used in vulnerability assessments for dams was suggested as a preferred method, if one is not specified. The consultants will look at the FEMA requirements regarding the methodology.

Pantego and Dalworthington Gardens are enclosed by the City of Arlington. These cities are not officially part of the study for Arlington. However, city representatives will be invited to the public meetings to provide input. The impacts that these cities place on Arlington should be considered in the analysis.

The group asked questions about goals and objectives. The consultants provided examples of possible goals and objectives to address various natural hazards. The committee requested that a draft list of goals and objectives be developed prior to the public meeting. The consensus was for the consultants to send the draft list to the committee by email on August 8. The committee will send comments to the consultants prior to the public meeting. The list will be presented to the public to be used as a starting point. The presentation for the public meeting will also be sent to the committee in advance.

The next steering committee meeting is scheduled for September 14 at 3 PM at the City's offices.

FNI Follow-Up Items

- Send draft goals and objectives to steering committee.
- Prepare draft presentation for first public meeting and send to steering committee.
- Review notification requirements for public meeting.

Arlington Follow-Up Items

- Find out dates of town hall meetings.
- Set date for public meeting and notify steering committee and consultants.
- Post meeting information on the City's web site.

Steering Committee Follow-Up Items (After August 8)

- Review draft goals and objectives and send comments to FNI by email.
- Review draft presentation for public meeting and send comments to FNI by email.

Freese and Nichols

MEMORANDUM

TO: Arlington Hazard Mitigation Action Plan (HMAP) Committee

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington HMAP Steering Committee Meeting Held on September 14, 2006 at 3 PM at the City of Arlington

DATE: October 12, 2006

The following attended the HMAP meeting:

Keith Brooks, PM (Arlington)
Keith Melton (Arlington)
Michael Ikner (Arlington)
Steve Harper (Arlington)
Ron Reber (citizen)
Jim Sparks (citizen)
Dell Greer (FNI)
Mike Wayts (FNI)
Stephanie Griffin (FNI)
Fiona Allen (Arlington)
Don Crowson (Arlington)
Julie Hunt (for Chuck Vokes, Arlington)
Joe Trammel (Tarrant Co.)
Ed Gutierrez (citizen)
Alan Greer (FNI)
Bob Pence (FNI)
Tim Raines (FNI)

Michele Hardin was not in attendance.

Alan Greer opened the meeting with an update on the team members. Each team member described his/her responsibilities and experience as it related to HMAP planning. The steering committee was introduced as well.

Presentation

The consultants discussed the attached presentation, including plan development, the role of the steering committee, and public participation. The consultants reviewed what HMAP is and is not. HMAP is not emergency response planning. Examples of HMAP hazards and possible solutions were presented.

Goals and Objectives

The group discussed the draft goals and objectives. Goals should be broad-based statements that represent the long-term vision of the City. Objectives should be performance-based statements that are measurable. The goals and objectives from the 2001 plan were discussed. The requirements have since been updated. Following a review of other FEMA-approved plans, common themes became apparent. The consultants recommended five goals with a couple of objectives for each goal. After some discussion, the consultants agreed to make the appropriate revisions and send them

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to the group prior to the public meeting.

Public Participation

The plan calls for five public meetings to be held throughout the planning process. The City is divided into five districts. The group agreed with the idea of having the public meetings in association with Town Hall meetings that the City hosts regularly throughout the year. The public meetings would rotate through the five districts such that each district would have one meeting in its area with the entire city being invited to attend the meeting.

Alan suggested an approach to the public meetings to be an open format such that the public could speak with a FNI representative and steering committee member at various tables set up around the room. Each table would have a specific topic that would be addressed. This approach works wells in libraries and gymnasiums.

The group liked this concept. Alan and Keith said they would speak with Fiona about this approach and how it could be incorporated with the Town Hall Meetings.

The group discussed what district ought to host the first meeting. The conclusion was to have the first meeting in October, depending on which district agenda would allow for a stand-alone meeting. The group suggested that the second meeting be held in the downtown district and the third meeting be held in District 4.

The consultants plan to develop questionnaires for the public to complete. These will be made available at the public meetings (in English and Spanish) and on the web site (English only).

The steering committee was asked to provide contact information for people/organizations that they believe should be included in the list of contacts for meeting announcements.

FNI is contacting the Chamber of Commerce to discuss distribution options for the local businesses. Julie mentioned that the public meetings could also be advertised in the water bills.

Other Business

Arlington and Grand Prairie are working together on a study of Fish Creek. Someone mentioned that Rush Creek was in need of maintenance.

The date and time of the public meeting will be sent to the steering committee. The meeting will be held in the evening.

The next steering committee is scheduled for December 14 at 3 PM.

Freese and Nichols

MEMORANDUM

TO: Arlington Hazard Mitigation Action Plan (HMAP) Committee

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington HMAP Steering Committee Meeting Held on December 14, 2006 at 3 PM at the City of Arlington

DATE: December 15, 2006

The following attended the HMAP meeting:

Keith Brooks, PM (Arlington)
Don Crowson (Arlington)
Irish Hancock (Arlington)
Michael Ikner (Arlington)
Jim Sparks (citizen)
Alan Greer (FNI)
Dell Greer (FNI)
Tim Raines (FNI)
Fiona Allen (Arlington)
Ed Gutierrez (citizen)
Steve Harper (Arlington)
Ron Reber (citizen)
Keith Melton (Arlington)
Mike Wayts (FNI)
Stephanie Griffin (FNI)

Irish Hancock is a new member to the steering committee. Chuck Vokes, Michele Hardin, and Joe Trammel were not in attendance.

Alan Greer opened the meeting with an update on the agenda for the meeting, including a summary of the public meeting and goals to be accomplished.

Discussion

The consultants discussed the attached presentation.

Update on October 30 Public Meeting

Alan reviewed the public meeting. He noted that sticking with the basic answers would improve communication to the public. He said that the public expressed concerns over the funding for the project. The explanation for the need of the project got bogged down in the details. Alan also discussed the initial survey results received thus far. The minutes from the public meeting were provided at this meeting.

FNI asked Keith to check with the web designers at Arlington about developing a button on the home page that will link directly to the HMAP page (and survey).

Finalize Goals and Objectives

Freese and Nichols, Inc. ◆ Engineers ◆ Environmental Scientists ◆ Architects
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(817) 735-7300 ◆ Metro (817) 429-1900 ◆ Fax (817) 735-7491

The group agreed to the goals and objectives as they were presented to the public. No public comments were provided regarding the goals and objectives.

Discuss Natural Hazards

The group discussed the list of likely/not likely natural hazards. The table below shows the conclusions reached by the group. We moved Lake Arlington Dam Failure up to the "likely" category. Arlington already has an Attorney General ruling that the documents related to the safety of the dam are not required to be disclosed to the public through this report. We added insect infestation to the list but left it in the category of "not likely". We added some more description to clarify flooding.

Discuss Critical Facilities

Mike presented the list of critical facilities to include in the plan. A list of special facilities has also been prepared. The group discussed the list and added to the original submission. The lists below represent the discussion had by the group.

Critical Facilities:

- City Hall
- Communication towers/facilities
- Emergency Management Operations facility
- Fueling facilities for city vehicles (3)
- Fire stations
- Hazardous material facilities
- Health clinics
- Hospitals
- Lake Arlington
- Mission Arlington
- Natural gas
- Nursing homes
- Oil
- Police stations
- Power plant (including electrical system)
- Public Safety Building
- Railways/Bridges
- Roadways
- Recreation centers
- Salvation Army
- Schools (public and private, K-12, colleges)
- Water and wastewater treatment plants
- Water towers

Table of Natural Hazards

Hazard	Potential Hazard for Arlington?	Rationale	Included in 2001 Arlington Plan?	Included in Austin's Plan?
Drought	likely	Currently in a drought	yes	yes
Expansive Soil	likely	Foundation problems with structures and roadway bulging and buckling	no	no
Flooding	likely	Localized flooding, including flooding as a result of stock ponds, holding ponds, levees, storm sewers, drainage systems, river systems, etc.	yes	yes
Hail	likely	Frequent hailstorms	yes	yes
Ice/Winter Storm	likely	Seasonal occurrence. Usually have a few ice days each winter.	yes	yes
Lake Arlington Dam Failure	likely	Lake Arlington is within city limits. It is well maintained and is monitored. The dam was upgraded to hold the probable maximum flood.	no	yes
Lightning and Thunderstorms	likely	Seasonal occurrence	yes	no
Slope Failure	likely	Land sloughs off due to extreme slopes that lose their natural support over time.		
Stream Bank Erosion	likely	Localized erosion	no	no
Temperature Extremes	likely	Seasonal occurrence	yes	yes
Tornadoes and Wind Storms	likely	According to some maps, located within "Tornado Alley". Tornadoes have occurred in the past.	yes	yes
Wildfire	likely	Open areas and grassy medians are subject to wildfire	no	yes
Avalanche	not likely	Does not occur here	no	no
Insect Infestation	not likely	Has not occurred here in the past	no	no
Coastal Erosion	not likely	Does not occur here	no	no
Earthquake	not likely	Unlikely to occur here	no	no

Hazard	Potential Hazard for Arlington?	Rationale	Included in 2001 Arlington Plan?	Included in Austin's Plan?
Hurricane	not likely	By the time a hurricane reaches North Texas, it would not likely be rated as a hurricane. Wind and flooding are included in this study and address any hurricane-related activity.	no	no
Land Subsidence	not likely	Unlikely to occur here	no	no
Landslide	not likely	Unlikely to occur here	no	no
Levee Failure	not likely	A handful of small levees within the city limits. Levee failure would cause localized flooding.	no	no
Sinkhole	not likely	Unlikely to occur here	no	no
Storm Surge	not likely	Does not occur here	no	no
Tsunami	not likely	Does not occur here	no	no
Volcano	not likely	Does not occur here	no	no

Special Facilities:

- Arlington Municipal Airport
- Bell
- City parks
- Churches
- Convention Center
- Entertainment District
- GM Plant
- Historical sites
- Industrial park (Great Southwest Parkway area)
- Museums
- National Semiconductor
- Post offices
- Shopping Centers (The Parks Mall, Forum 303 Mall, Six Flags Mall, Lincoln Square)

Discuss Next Steps

FNI is working on the hazard profile sheets. A sample sheet was included in the committee's packet. A profile must be drafted for each "likely" hazard.

Tim briefly explained the next steps in the asset analysis. He described the HAZUS model that will help us analyze the flooding hazard. He explained that other hazards without models will be overlaid with geospatial data to determine likely areas of hazards to occur and potential damages from such hazards.

Once the damages have been estimated, the hazards will be prioritized based on those with the most significant and far-reaching impacts to those with minimal impacts. At least one action strategy must be developed for each hazard.

Review Data Needs

FNI is working with Keith to gather the data needed for the asset analysis. The HAZUS model includes data up through 2001. Information on buildings constructed since then may need to be gathered.

Upcoming Meetings

FNI will send the committee hazard profile sheets by January 11, 2007.

The next steering committee is scheduled for February 22 at 3 PM.

The next public meeting is scheduled for the first week of March and will likely be held in District 1 or 3.

Freese and Nichols

MEMORANDUM

TO: Arlington Hazard Mitigation Action Plan (HMAP) Committee

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington HMAP Steering Committee Meeting Held on February 22, 2007 at 3 PM at the City of Arlington Service Center

DATE: February 28, 2007

The following attended the HMAP meeting:

Keith Brooks, PM (Arlington)	Ed Gutierrez (citizen)
Irish Hancock (Arlington)	Michele Hardin (Arlington)
Steve Harper (Arlington)	Keith Melton (Arlington)
Jim Sparks (citizen)	Joe Trammel (Tarrant County)
Chuck Vokes (Arlington)	Alan Greer (FNI)
Dell Greer (FNI)	Stephanie Griffin (FNI)
Tim Raines (FNI)	Mike Wayts (FNI)

Fiona Allen, Don Crowson, Michael Ikner, and Ron Reber were not in attendance.

Alan Greer opened the meeting with an update on the agenda for the meeting. Tim Raines led the discussion regarding the hazard profiles, assets, and damages. This was a working meeting to discuss any additional local information that might be available.

Draft Hazard Sections

Assets and Potential Damages and Losses

Tim presented the City of Austin asset and damages table in comparison to the draft table for the City of Arlington. He explained that a hazard that could occur anywhere in the city exposes the total population, property, and structures. Not everyone who is exposed to the hazard will be impacted by the particular hazard at one time. It is also unlikely that all hazards that expose the entire city will happen at one time. The question was asked as to the source of the $22 billion in assets. The source of the data is the HAZUS model. Michele said that she would look into the asset numbers used by the city. The current city figure is about $16 billion. The population number was also questioned. The population number presented is based on the 2000 Census. Michele agreed to send the current population estimate.

The damages and losses presented in the summary table are a product of the HAZUS flood and hurricane (wind) models used for this project. There are no other developed or recognized models available to use for the other hazards. Tim described the approach that is being used to develop

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potential damages for some of the hazards. He also explained that some hazards would be very difficult to attach a dollar amount for damage. This is similar to what Austin found as well.

In some cases, city-specific data may not be available. When this occurs, FNI will attempt to apply information from regional, statewide, or national data sources. If no other information can be found, the damages will be discussed in the text in general terms.

Flooding

Tim walked through the flood hazard write-up. FNI asked about the Johnson Creek buyout program. There was some discussion as to whether or not that project had been completed. The Parks Department will know the status of that project and any other details we might need. Gordon Robertson or Roger Venables are the people to contact at the Parks Department.

As for the history of flooding in Arlington, the group noted that the 1989 flood was omitted from the list. Keith Brooks will speak with David Corley about the 1989 flood to find out more specific details on the date of the flood, the damages, loss of life, and any city initiatives to be better prepared for future floods. The March 19, 2006 flood should be more specific to Arlington, not simply Tarrant County. Jill House will have more details on city specific data related to that flood. Keith Brooks will talk with Jill about this flood event. Ed thought that the Rush Creek watershed was heavily impacted by this flood. Any other floods that are shown to have occurred in Tarrant County can be made Arlington specific, with the appropriate information.

Keith Melton agreed to send information regarding the instances and locations when street barricades were used because of flooding.

Dale Hoff will know the history of FEMA Community Assistance Visits for the City. There was a visit two years ago.

Tim pointed out that we had pulled together an asset table for each hazard listing those assets that were exposed to the hazard. The group reviewed the asset table for the flooding hazard. They noted that the wastewater treatment plant should not be on the list because there isn't one within the city limits. The wastewater plant had been removed from other asset tables. It was also noted that the Kabala Water Treatment Plant is just slightly above the 100-year flood plain and would likely be impacted by a 500-year event. Tim explained that FNI just received the locations for the critical and special facilities. These locations will be overlaid on the flood maps to determine whether or not they are impacted. Irish noted that the Emergency Operations Facility and the Public Safety Building were in the same place. These facilities will be combined in the asset table.

The question was raised as to which boundary was being used for the Entertainment District. The current boundary FNI has received from the City is the smaller version that does not include the Cowboys' stadium. Michele indicated that a larger boundary will be finalized soon and that she could send the draft version for us to use.

The commercial exposure will increase with the new football stadium, Glory Park, and other developments. The group thought that would increase the exposure by $2 billion more than what is currently exposed.

Tornadoes and Windstorms

FNI did not have any particular questions regarding the tornado and wind storm section. FNI asked the group to review the history and let us know if any tornadoes had been omitted. The numbers may include Pantego and Dalworthington Gardens because of the boundaries available in the model. If this is the case, the text needs to reflect the situation. The City of Arlington has nine elevated storage tanks (not 12 water towers).

Expansive Soils

The history of problems caused by expansive soils is unavailable through regional, state, or national sources. Jim Sparks commented that one would think that a local foundation repair company or trade association would have some information on the number of foundation repairs they do in the area and the average cost. FNI has been unable to locate any public data on this topic. Someone noted that the area east of Collins and South of I-20 has had tremendous problems with the soils. Several home developers have had to buy back homes because of the soil conditions.

The history of water main breaks due to shifting soils and the cost of repairs would be useful. Chuck said that he could provide information on water main breaks.

Stream Bank Erosion

FNI has not found any history of stream bank erosion problems in Arlington. Arlington prepared a report about 10 years ago that involved walking about ten percent of the streams and extrapolating erosion to the 137 miles of streams in the City. Jill House should have a copy of that report. Keith Brooks will get this report.

The Citizen Policy Review Committee completed a report about a year ago on storm water that may be useful. FNI has a copy of that report.

Slope Failure

FNI plotted land slopes with three percent grade and higher. FNI needed input on specific locations where slope stability has been reported. Keith Melton circled areas on the map that the City is aware of slope stability concerns. Historical records of property damage are not available.

Wildfire/Grassfire

FNI received wildfire and grassfire locations from the Fire Department for a 16 month period. The fires occurred across the City, averaging almost one fire per day. The period of records provided overlays the current drought. Irish agreed to provide additional data from January 2000 through September 2005.

Drought

Drought is a city-wide hazard with no economic impact data available at state or regional sources. The Parks Department might have information on the dollar impacts to the parks and golf courses.

Hail

Hail is also a city-wide hazard. FNI has NCDC data on hail storms in the Arlington area. Insurance companies have data on claims paid as a result of hail damage. Car dealerships probably have similar information as to the impact on car sales. Gina and Butch may have local hail knowledge regarding damage to public buildings and vehicles.

Ice/Winter Storm

The NCDC historical data on ice and winter storms in Arlington appears to be incomplete. FNI has city information on sand trucks that have been deployed for ice storms. This information does not include costs. Keith Melton indicated that he could get costs associated with the de-icing work. FNI also has the list of priority locations for de-icing activities.

Temperature Extremes

The group discussed how temperature extremes were a hazard in Arlington. The concern regarding temperature extremes is for the people who cannot afford to run their heaters or air conditioners when the weather gets very cold and very hot, respectively. The definition of extreme temperatures could be changed to be days when the temperature is above 100 degrees or days when the temperature is below 32 degrees. The extreme temperature data FNI (including deaths) has found is for North Texas, not necessarily Arlington-specific. What programs does the City of Arlington currently offer to residents in need of assistance (electric bill reduction, free fans, portable heaters, etc.)? TXU would likely have information on assistance with electric bills.

Lightning and Thunderstorms

FNI has been unable to locate historical data regarding lightning and thunderstorms in Arlington. The Fire Department does not have information on the source of what started the fire but rather tracks the type of fire that was fought. Chuck Vokes said that the Water Department has records on the lightning strikes that have hit the water plants. He will provide dates, costs, and the impacts on the system.

Lake Arlington Dam

FNI has provided Fiona the section of Austin's plan that relates to dam failure. FNI is waiting on feedback from Fiona to determine what information can be included in this report. Chuck indicated that the Austin report had information that Arlington will not want to include.

Discuss Hazard Ranking Sheet

The group reviewed the hazard ranking sheet. Stephanie read the FEMA definitions associated with the severity of impact. The group decided that the severity of impact for drought should be changed to "2". After some discussion, the ranking for flooding was left at "4". Due to time constraints, the group did not discuss the ranking sheet much further.

Schedule Next Steering Committee Meeting and Public Meeting on Hazards, Assets, and Damages

The steering committee will meet again once the additional information has been sent to FNI and FNI has had a chance to incorporate the data. The next public meeting will be at a Town Hall meeting after the steering committee meeting. At this time, the only March Town Hall meeting scheduled is on March 1. Keith Brooks will keep FNI posted as to future Town Hall dates. District 1 or 3 has been the recommended site for the next public meeting.

Discuss Next Step – Mitigation Actions

Due to time constraints, we did not discuss this topic in any length. The steering committee may meet in smaller groups to brainstorm possible mitigation actions.

Freese and Nichols

MEMORANDUM

TO: Arlington Hazard Mitigation Action Plan (HMAP) Committee

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington HMAP Steering Committee Meeting Held on April 19, 2007 at 3 PM at the City of Arlington City Hall

DATE: April 25, 2007

The following attended the HMAP meeting:

Keith Brooks, PM (Arlington)	Fiona Allen (Arlington)
Irish Hancock (Arlington)	Ed Gutierrez (citizen)
Steve Harper (Arlington)	Keith Melton (Arlington)
Ron Reber (citizen)	Alan Greer (FNI)
Dell Greer (FNI)	Stephanie Griffin (FNI)
Tim Raines (FNI)	Mike Wayts (FNI)

Don Crowson, Michelle Hardin, Michael Ikner, Jim Sparks, Joe Trammel, and Chuck Vokes were not in attendance.

Alan Greer opened the meeting. Tim Raines reviewed the agenda and led the discussion related to the agenda.

Discuss GDEM E-mail on March 2007 Draft Plan

A draft report was submitted to the Texas Governor's Division of Emergency Management Office (GDEM) by March 31 in accordance with the grant requirements. This draft report was a working document that was in-progress. The GDEM provided some general feedback regarding the draft report. They were pleased with the progress on the report. Tim reviewed the comments provided by the GDEM. These comments will be incorporated into the complete draft report.

Discuss Hazards, Assets, and Damages

Tim had a copy of the draft report with him, along with a copy of the draft presentation for Public Meeting #2. He encouraged the group to search for pictures depicting natural hazards in Arlington. Generic pictures could be used, but photos of the hazards within the city help the public to understand that these hazards can and do happen here. Someone suggested that Doug McCullah might have pictures from March 2000. Irish will look for pictures. Someone suggested that pictures

Freese and Nichols, Inc. ◆ Engineers ◆ Environmental Scientists ◆ Architects
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might be available at the South Service Center. Someone also mentioned that the City should have some pictures of the Shady Valley flooding. Tim asked all pictures to be sent to him or to Keith.

Tim had emailed a summary table of the assets and damages associated with each hazard prior to the meeting. Tim noted that Irish had provided additional fire data (including dollar impacts) and that information would be incorporated into the wildfire section of the report. Mike asked the group if they were comfortable with the drought and temperature extreme analyses on impacts being shown without dollar amounts. The group was in agreement with the summary table as presented.

Tim had also provided a draft ranking of the twelve overall likely hazards. In the end, each likely hazard will have a minimum of two action strategies regardless of the hazard's overall ranking. The severity of impact for hail will be adjusted to 2, increasing the total for hail to 16. The description of current preparedness level 2 will be renamed as "In Progress". The group agreed with the overall totals. In the report, the hazards will be grouped into low, medium, and high categories.

Discuss Draft Presentation for Public Meeting #2

Tim walked through the draft presentation for the second public meeting. The focus of this meeting is the assets and damages associated with each of the likely hazards. A brief explanation of the steps taken up to this point is included in the presentation. Overall, the presentation was well received. Following our discussion of the ranking sheet, the slide showing the hazards as ranked will be adjusted to three categories (low, medium, and high) to avoid arguments as to whether a hazard should be ranked as a 6 or an 8.

Any Arlington hazard-related pictures that are sent to Tim or Keith will be included in the presentation to liven it up and personalize the hazards. A slide explaining how the public input is obtained and included in the preparation of the plan, particularly in the hazard ranking, will be added to the presentation.

Schedule Public Meeting on Hazards, Assets, and Damages

Fiona will keep us posted as to when the next Town Hall Meeting schedule might allow for this presentation to be included on the agenda. Due to the elections, the next Town Hall meeting is likely to occur in late May or early June. Town Hall Meeting #3 is tentatively scheduled for July.

The draft plan is scheduled to be presented to City Council in August. Someone suggested that we wait until after the Council has dealt with the annual budget before presenting the draft Hazard Mitigation Action Plan to them. Therefore, the draft Hazard Mitigation Action Plan will likely be presented to the Council in September or October.

Discuss Next Step – Mitigation Actions

The consultants proposed breaking the committee into subgroups and assigning each subgroup several hazards to prepare action strategies. The committee agreed with the idea. The following table summarizes the hazards to be handled by each subgroup.

flooding, streambank erosion, Lake Arlington Dam	**drought, expansive soils, slope failure**	**hail, tornadoes, wildfire**	**lightning, temp extremes, ice/winter storms**
Fiona Allen	Keith Melton	Irish Hancock	Joe Trammel
Chuck Vokes	Ron Reber	Don Crowson	Michelle Hardin
Jim Sparks	Steve Harper	Michael Ikner	Ed Gutierez
Keith Brooks			

The committee members present were provided a packet of information related to the hazards assigned to him/her. The packet included the current section in the report and a list of ideas for potential action strategies to consider. The list of ideas is simply a starting point for the subgroups. The subgroups can use any of those ideas that they believe are appropriate for Arlington and add any ideas that they develop on their own. The group was reminded that the mitigation action strategies need to relate to the goals and objectives already established for this plan.

The subcommittees can meet in person, by conference call, or by email. Tim, Mike, and Stephanie are available to meet with any subcommittees that request their assistance. The subgroups are asked to schedule their meeting in early May and provide their recommended actions to Tim by the end of May.

Tim will send an email to the committee with contact information for the committee members. He will also include a template of the information that is needed for each action item that is recommended. Additional information regarding the types of projects eligible for PDM grants will be provided as well.

Freese and Nichols

MEMORANDUM

TO: Arlington Hazard Mitigation Action Plan (HMAP) Committee

FROM: Stephanie Griffin

SUBJECT: Notes from the Arlington HMAP Steering Committee Meeting Held on July 26, 2007 at 3 PM at the City of Arlington City Hall

DATE: August 2, 2007

The following attended the HMAP meeting:

Keith Brooks, PM (Arlington)
Irish Hancock (Arlington)
Michael Ikner (Arlington)
Stephanie Griffin (FNI)
Mike Wayts (FNI)
Michelle Hardin (Arlington)
Steve Harper (Arlington)
Ron Reber (citizen)
Tim Raines (FNI)

Fiona Allen, Don Crowson, Ed Gutierrez, Keith Melton, Jim Sparks, Joe Trammel, and Chuck Vokes were not in attendance.

Tim Raines opened the meeting.

Summary of Public Meeting #2

Tim gave a quick overview of the second public meeting, which was held in June. He noted that a question related to natural gas drilling was raised at that meeting. After discussing the topic with the committee, the group agreed that the production of natural gas is a man-made process and should not be part of the Hazard Mitigation Action Plan. Other reports, procedures, and ordinances have been established by the City to address any mishaps associated with natural gas drilling.

Discuss Mitigation Actions

The group reviewed the summaries of each mitigation action item. A priority table had been prepared to help rank the actions. The group discussed the ranking for each mitigation action as they walked through the actions. The group reviewed the summaries and provided input for missing information, including responsible department and potential funding sources. Adjustments were discussed for several actions and rankings. FNI will make the adjustments.

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Steve mentioned that the City Manager's Office might be willing to consider the use of ending balance funding to cover the costs of studies or other one-time expenses recommended by the Committee. He thought that some of the studies mentioned in the mitigation actions might be potential candidates for this funding, depending on availability at year's end.

Schedule Public Meeting #3 – Mitigation Actions

The mitigation actions will be ready to present to the public shortly. Keith will look at the Town Hall Meeting schedule for an opening in August or September. The staff noted that if the budget is scheduled for a Town Hall Meeting that no other items will be added to the agenda. (The budget is scheduled to be presented to the Council on August 7.) Ideally, we would like to be the only topic on the agenda in order to have tables set up around the room with the various hazards and actions for people to discuss their ideas related to specific hazards.

Discuss Next Step – Draft Plan

FNI will make the revisions as discussed today. This information will be incorporated into the draft plan. The draft plan will be sent to the Steering Committee in September for review and comment. Then, the draft plan will be presented to the City Council in a workshop in October.

Keith mentioned that Arlington is preparing to submit a letter of interest for the federal funding that has become available as a result of the Presidential disaster declaration in Texas. Tim and Mike discussed the status of the HMAP report and how that plays into obtaining funding. FNI understands that a FEMA-approved plan has to be in place to receive the funding. Depending on the timing of the release of the funding, the plan may be approved by FEMA before the money becomes available. Tim will check with Dell as to whether or not money could be awarded just not paid out until the plan is approved. If that is not the case, we may want to put the plan on a fast track to getting it wrapped up and submitted to FEMA for review and approval. FNI will get back with Keith on this issue.

APPENDIX D

SURVEY AND SURVEY RESULTS

Appendix D
Survey and Survey Results

City of Arlington – HMAP Study
Natural Hazards Preparedness Questionnaire

Thank you for taking time to answer this questionnaire and for participating in the Arlington Hazard Mitigation Action Plan study. This questionnaire is designed to help the City gauge household and business preparedness for disasters and knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. The information you provide will help prioritize risk reduction activities within the City. We ask that you please take a few minutes to complete this questionnaire.

1. What is your zip code? _____

2. Are you responding to this survey with regards to residential property or commercial property?

   ☐ Residential property
   ☐ Commercial property

3. Do you rent or own your home/business property?

   ☐ Rent
   ☐ Own

4. Do you rent/own a:

   ☐ Single-family home
   ☐ Duplex
   ☐ Apartment
   ☐ Condominium/townhouse
   ☐ Manufactured home
   ☐ Stand alone commercial building
   ☐ Suite in an office building or strip center
   ☐ Other (specify) _____

5. Please rank the three highest natural hazards that are of greatest concern to your location. (1 being the highest and 3 being the third highest concern.)

   __ Extreme heat
   __ Drought
   __ Hail
   __ Earthquake
   __ Flood
   __ Landslide/debris flow
   __ Lightning
   __ Tornado
   __ Wildfire
   __ Windstorm
   __ Winter storm
   __ Other (specify) _____

6. Has any hazard in your area increased in severity in recent years?

   ☐ Yes
   ☐ No

   If yes, please explain: _____

   _____

7. Do you carry flood insurance?

   ☐ Yes (If "Yes", skip to Question 8.)
   ☐ No

   7.1 If "No", what is the main reason you do not have flood insurance? (Please check only one.)

   ☐ Not located in the floodplain
   ☐ Told I could not get it
   ☐ Other (specify) _____
   ☐ Deductibles too high/not worth it
   ☐ Not familiar with it/don't know about it

8. What steps has your household/business taken to prepare for a natural disaster? (Check all that apply.)

   ☐ Prepared a disaster supply kit
   ☐ Trimmed trees along power/telephone lines
   ☐ Raised your house/building above the floodplain
   ☐ Channeled runoff away from your house/building
   ☐ Installed smoke detectors
   ☐ Test smoke detectors twice a year
   ☐ Purchased a generator
   ☐ Other (specify) _____

9. Would you be willing to spend more money on a home that made it more resistant to natural disasters?

   ☐ Yes
   ☐ No

10. How much money would you be willing to spend to better protect your home/business from natural disasters? (Please check one.)

    ☐ $5,000 or more
    ☐ $2.500 - $4,999
    ☐ $1,000 - $2,499
    ☐ $500 - $999
    ☐ $100 - $499
    ☐ Less than $100
    ☐ Nothing
    ☐ Don't know

11. What is the most effective way for you to receive information about how to make your home/business safer in the event of a natural disaster? (Check all that apply.)

    ☐ Newspaper stories
    ☐ Newspaper ads
    ☐ Television news
    ☐ Television ads
    ☐ Radio news
    ☐ Radio ads
    ☐ Outdoor advertisements (billboards, etc.)
    ☐ Schools
    ☐ Mail/bill insert
    ☐ Internet
    ☐ Fact sheet/brochure
    ☐ Chamber of Commerce
    ☐ Magazine ad
    ☐ Other (specify) _____

12. What suggestions do you have for the Steering Committee developing the Hazard Mitigation Action Plan for the City of Arlington?

    _____

    _____

    _____

Summary of Survey Responses

As of August 31, 3007, thirty surveys had been submitted to the City. The majority of the respondents live in a single family home. No responses from the business community were received. The majority of the participants responded that they do not carry flood insurance primarily because they do not live in the floodplain. A summary of the Responses is presented in Table D-1.

Table D-1
Highlights of Public Survey

Questions	Number of Participants Responding	Summary
2-4	28 out of 30	Own a single-family residence.
5	-	Tornado, hail, lightning, and drought were listed as the hazards of greatest concern.
7	22 out of 30	Do not carry flood insurance.
8	-	Primary answer was because the respondent does not live in the floodplain.
10	26 out of 30	Indicated they would be willing to spend money on their homes to make them more disaster resistant.
13	-	TV and radio were listed as the primary methods of obtaining information during a hazard.

APPENDIX E

PUBLIC MEETINGS

Appendix E
Public Meetings

Public participation was an important aspect in the development of the Arlington Mitigation Action Plan. This appendix includes information provided for each of the public meetings. The schedule of public meetings is shown in Table D-1.

Table E-1
Schedule of Public Meetings

Meeting Number	Date & Time	District	Location	Approximate Attendance
1	Oct. 30, 2006 7:00 PM	2	Mary Moore Elementary School	45
2	June 7, 2007 7:00 PM	1	Sherrod Elementary School	30

In preparation for each public meeting, the steering committee sent notices to a list of interested parties and posted the meeting information on the web site. The residential distribution list is on file with the City of Arlington. A memorandum summarizing the discussion at each public meeting is included in this appendix. The sign-in sheets associated with each public meeting are also on file with the City. The following agencies, neighboring communities, and businesses were notified in advance of each public meeting and were encouraged to participate in the development of the plan:

American Red Cross
Arlington Chamber of Commerce
Atmos Energy
AT&T
Ameriquest Field in Arlington
Arlington Convention Center
Hurricane Harbor
Six Flags
Blue Star Development
FEMA, Region VI
Texas Commission on Environmental Quality
TXU Electric Delivery
Arlington Memorial Hospital
Medical Center of Arlington
USMD Hospital in Arlington
Tarrant County College
University of Texas at Arlington
Arlington Independent School District
Kennedale Independent School District
Mansfield Independent School District
City of Dalworthington Gardens
City of Kennedale
North Central Texas Council of Governments

Public Meeting #1

- Meeting Notice
- Memorandum of Meeting Notes

Hazard Mitigation Takes a Plan ...
And the Right Plan Takes Your Participation

You are invited to the City of Arlington's first public meeting for the development of a hazard mitigation action plan. This meeting will be part of the District 2 Town Hall meeting with Arlington City Council Member Sheri Capehart.

Monday, October 30, 2006

Mary Moore Elementary School
5500 Park Springs Boulevard
Arlington, TX 76017

7 p.m.

We will present an overview of the project and solicit input on goals and objectives for the hazard mitigation action plan. The purpose of the plan is to:

- identify natural hazards that could impact Arlington
- identify actions to mitigate the impacts of hazards in advance of a natural disaster

Visit **http://www.ci.arlington.tx.us/HMAP** for project news, meeting agenda and additional information, or to submit comments, questions, or suggestions if you are unable to attend this meeting. You can also submit comments to Keith Brooks, City of Arlington at 817.459.6550 (by October 30, 2006).

If you would like to post this notice on your Web site, please contact Keith Brooks, City of Arlington at 817.459.6550.

This project is led by a volunteer steering committee, along with guidance and input from Arlington's consultant Freese and Nichols, Inc.

The steering committee looks forward to hearing your ideas as we develop a plan to make the City of Arlington a safer place in the event of a natural disaster.

Freese and Nichols

MEMORANDUM

TO: **ARL06193 –** File 1.40

FROM: Tim Raines

SUBJECT: Notes from the Arlington HMAP Public Meeting Held on October 30, 2006 at 7 PM at Mary Moore Elementary School

DATE: November 1, 2006

The following attended the subject meeting:

Steering Committee Members
Fiona Allen (Arlington)
Keith Brooks, PM (Arlington)
Don Crowson (Arlington)
Steve Harper (Arlington)
Ron Reber (citizen)
Joe Trammel (Tarrant Co.)
Jim Sparks (citizen)

Freese and Nichols
Alan Greer
Dell Greer
Tim Raines
Mike Wayts

The Town Hall Meeting was held in City Council Member Sheri Capehart's District 2. Other items on the agenda included CPaRlington, Tierra Verde Development Plan, and the proposed juvenile curfew. About 45 citizens of Arlington were in attendance. An information handout, a survey, and contact information for the HMAP study was provided to the citizens prior to the start of the meeting.

Presentation

Alan Greer opened giving a brief overview of the presentation and introduced members of the Steering Committee and the Consultant Team from Freese and Nichols. Mike Wayts then presented the steps in the development of the plan, described what it is and what it is not, and listed the goals and objectives. Alan Greer then closed the presentation with listing the web site address for the project, requesting that the survey be completed, and announced that the next Public Meeting is scheduled to be held in early February 2007.

Questions

A few questions were asked by the citizens in attendance. The following questions and responses are paraphrased:

1. What is the duration of the grant?

Alan: It is 3-year grant with the plan scheduled to be completed in 18-24 months.

2. How much is it and what type of grant is it?

Mike: About $180K and is a FEMA grant from the Pre-Disaster Mitigation Grant Program.

3. What is the purpose of the plan?

Alan: The handout provides details of what the plan is and what it is not.

4. Who provides final approval of the plan?

Dell: First a State review by the Governor's Division of Environmental Management and then a final review and approval by the Region VI FEMA office in Denton.

5. What can we do about hail storms?

Alan: That is something we will address with actions in the HMAP.

6. Does this include manmade hazards and is this plan being coordinated with other operations?

Alan: It is only natural hazards and the technological/terrorist hazards are being addressed in the fire and police operations and coordinated by their respective representatives on the Steering Committee.

7. Are other cities doing the HMAP planning or have approved plans? Dallas or Fort Worth?

Dell: Only 7 cities have individual approved plans. Other cities are part of regional plans through council of governments or river authorities.

8. What types of funding are not available without completing a HMAP plan?

Dell: Discussed the different types of funding programs and types of assistance from FEMA.

9. If a tree limb falls on my house, will the City repair it because of this plan?

Dell: No

Alan: The HMAP might initiate a tree trimming program that would prevent the limb from falling on your house.

10. What can we do to help?

Alan: Continue to participate in this public process and provide comments and suggestions.

Noteworthy

- A total of 10 completed surveys were collected by the close of the meeting.
- Additional text will be added to the web site to explain why a Hazard Mitigation Action Plan is required.
- The next steering committee is scheduled for December 14 at 3 PM.

Public Meeting #2

- Meeting Notice
- Memorandum of Meeting Notes

Hazard Mitigation Takes a Plan ...
And the Right Plan Takes Your Participation

You are invited to the City of Arlington's second public meeting for the development of a hazard mitigation action plan. This meeting will be part of the District 1 Town Hall meeting with Arlington City Council Member Mel LeBlanc.

Thursday, June 7, 2007

Sherrod Elementary School
2626 Lincoln Drive
Arlington, TX 76006

7 p.m.

We will focus on identifying city assets, natural hazards, and the potential losses associated with them. The purpose of the plan is to:

- identify natural hazards that could impact Arlington
- identify actions to mitigate the impacts of hazards in advance of a natural disaster

Visit http://www.ci.arlington.tx.us/HMAP for project news, meeting agenda and additional information, or to submit comments, questions, or suggestions if you are unable to attend this meeting. You can also submit comments to Keith Brooks, City of Arlington at 817.459.6550 (by June 7, 2007).

If you would like to post this notice on your Web site, please contact Keith Brooks, City of Arlington at 817.459.6550.

This project is led by a volunteer steering committee, along with guidance and input from Arlington's consultant Freese and Nichols, Inc.

The steering committee looks forward to hearing your ideas as we develop a plan to make the City of Arlington a safer place in the event of a natural disaster.

Freese and Nichols

MEMORANDUM

TO: **ARL06193 –** File 1.40

FROM: Tim Raines

SUBJECT: Notes from the Arlington HMAP Public Meeting Held on June 7, 2007 at 7 PM at Sherrod Elementary School

DATE: June 8, 2007

The following attended the subject meeting:

Steering Committee Members
Fiona Allen (Arlington)
Keith Brooks, PM (Arlington)
Steve Harper (Arlington)
Ed Gutierrez (citizen)
Jim Sparks (citizen)
Irish Hancock (Arlington)

Freese and Nichols
Alan Greer
Dell Greer
Stephanie Griffin
Mike Wayts

The Town Hall Meeting was held in City Council Member Mel LeBlanc's District 1. The Hazard Mitigation Action plan (HMAP) was the only topic on the agenda. Twenty eight people registered their attendance at the meeting. An information handout, the presentation, the goals and objectives, a survey, and contact information for the HMAP study was provided to the public prior to the start of the meeting.

Presentation

Alan Greer opened giving a brief overview of the presentation and introduced members of the Steering Committee and the Consultant Team from Freese and Nichols. Alan provided an update on the status of the project and what was presented in the first Town Meeting. Mike Wayts then presented the likely and unlikely natural hazards that could occur in Arlington. Mike also reviewed the City's assets, including critical and special facilities. He reviewed the estimated losses as a result of each likely hazard.

Alan Greer then closed the presentation by explaining how the public can provide input on the project, by providing the web site and other contact information, and by opening up the floor for questions.

Following the questions and answer session, Alan reminded people to complete the surveys and return them. He also asked people to inform their neighbors and co-workers about the project and the survey. The next public meeting will be in association with another Town Hall meeting in another District of the City.

Questions

Several questions were asked by the citizens in attendance. The following questions and responses are paraphrased:

1. *What about the new Cowboys stadium? Is it included in this study?*

   Alan: Yes. The Rangers' Ballpark, Cowboys Stadium, and Six Flags are all included in the Entertainment District as a special facility.

2. *What about the gas wells that may be drilled in those parking lots?*

   Alan: I don't know about gas wells in parking lots. The gas well issue is something we should probably include.

3. *Is the priority based on saving life or property?*

   Alan: We looked at life and property as the two highest priorities. There were a few other items as well. The goal is to mitigate damage to life and property.

4. *Are you only looking at natural disasters?*

   Alan: Yes. Technological disasters are handled by other reports.

5. *What is the time frame of the fires shown in the presentation?*

   Alan deferred to Irish. Irish stated that he had provided data for two different time periods. Stephanie answered that the data were for one year – 2005.

6. *On the survey, what are high winds?*

   Alan: High winds are necessarily tornadoes. Arlington has experienced straight line winds that take down power lines and trees.

7. *Back to natural gas. The production of it is obviously man-made. What are fires or escaping gas that can occur? Was this an oversight or is this not a natural hazard?*

   Alan began by saying the production of natural gas is man-made. Councilman LeBlanc stated that 751 gas wells have been drilled in Fort Worth. Only a few have been drilled in Arlington. Fort Worth has experienced three accidents that were all man-made. All three accidents involved people smoking next to natural gas. When you remove the man-made accidents, zero is a pretty good track record.

Noteworthy

- A total of 29 completed surveys were collected by the close of the meeting.
- The next public meeting will be held in District 3.
- The steering committee should discuss the natural gas question. Is the production of natural gas a natural hazard? Does the City provide protection to the citizens by spacing requirements for the natural gas wells?

APPENDIX F

HAZARD PROFILES

Appendix F
Hazard Profiles

Hazard profiles were developed for all known natural hazards. The 10 natural hazards "likely" to occur in Arlington include:

- Drought
- Expansive Soils
- Flooding
- Hail
- Ice/Winter Storm
- Lake Arlington Dam Failure
- Lightning and Thunderstorms
- Temperature Extremes
- Tornadoes and Wind Storms
- Wildfire

The City of Arlington also has 14 hazards that have been determined "unlikely" to occur here:

- Avalanche
- Insect Infestation
- Coastal Erosion
- Earthquake
- Hurricane
- Land Subsidence
- Landslide
- Levee Failure
- Sinkhole
- Slope Failure
- Storm Surge
- Stream Bank Erosion
- Tsunami
- Volcano

HAZARD PROFILE WORKSHEET

HAZARD: Drought	
POTENTIAL SEVERITY OF IMPACT: Minor	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Typically worse in the summer months.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

Arlington and TRWD have drought contingency plans.
Texas Almanac 2000-2001
http://drought.unl.edu/whatis/concept.htm
www.grba.org/Documents/Publictions/Drought.pdf
http://www.txwin.net/DPC/State_Drought_Preparedness_Plan.pdf
http://www.thmp.info/data_layers/weather-key.html

NOAA has figures of drought projections:
HTTP://WWW.CPC.NCEP.NOAA.GOV/PRODUCTS/EXPERT_ASSESSMENT/SEASONAL_DROUGHT.PDF

PROBABLE DURATION:

Droughts can last for months or even years. The City of Arlington is currently in a drought.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Droughts typically occur during periods of warmer than normal temperatures. Thus, a drought can increase the risk of heat-related fatalities and illnesses, particularly during the summer months.
Drought can also increase the risk of fire. The dry landscape and dry roofs can catch fire quickly and spread rapidly. During a drought, water supplies may be reduced making fire suppression even more challenging with lower water pressure and less water with which to work.

PREVIOUS OCCURRENCES:
City history of implementing drought contingency plan.
City history of drought.

HAZARD PROFILE WORKSHEET

HAZARD: Expansive Soils	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☑ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Extremely wet weather and dry weather.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

SCS Soil Survey of Tarrant County
SCS Soil Maps
Nelson, J. D. and Miller, D. J. Expansive Soils: Problems and Practice in Foundation and Pavement Engineering, published by John Wiley & Sons, New York, 1992.

PROBABLE DURATION:

Expansive soils move with the change in soil moisture content. The amount of time soils will expand and contract depends on the length of time the moisture content stays at elevated or lowered levels.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☑ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Extreme wet weather conditions can cause pavement to heave and buckle. This combined with flooding can create dangerous conditions. Swelling soils can move structures off their foundations.
Extreme dry weather can cause the soil to subside or fall in on itself. This can cause foundations to fall, as well as other paved areas.
The resulting bumps in roadways create a driving hazard.

PREVIOUS OCCURRENCES:

City data on road repairs. City or insurance data on foundation repair.

HAZARD PROFILE WORKSHEET

HAZARD: Flooding	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Typically occurs in the spring and fall

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

100-year and 500-year floodplain maps.
HAZUS model
http://www.fema.gov/hazard/flood/index.shtm
http://www.fema.gov/plan/prevent/floodplain/about_the_nfip.shtm
http://www.fema.gov/pdf/nfip/manual200610/19crs.pdf
Descriptions of flash flooding at http://www.srh.noaa.gov/srh/jetstream/mesoscale/flood.htm
http://tx.usgs.gov/ (gage data)
http://www.thmp.info/data_layers/weather-key.html
HTTP://WWW.FLASH.ORG/ACTIVITY.CFM?CURRENTPERIL=2
HTTP://WWW.WEATHER.GOV/SAFETY.PHP

PROBABLE DURATION:

The rainfall event may only last 15 minutes, but the resulting flooding can take hours or even days to subside. A steady rainfall may last for one or more days and can cause persistent flooding.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Long standing flood waters can become hazardous to human health and are breeding grounds for mosquitoes that may carry West Nile Virus.

PREVIOUS OCCURRENCES:

City flood history. Repetitive loss structures.
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

HAZARD PROFILE WORKSHEET

HAZARD: Hail	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Typically occurs in the late spring and early summer

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://www.nssl.noaa.gov/hazard/hazardmap.html
http://www.thmp.info/data_layers/weather-key.html
Description of how hail is formed at http://www.srh.noaa.gov/srh/jetstream/mesoscale/hail.htm
Historical hail storms with property damage and deaths on a regional basis (Fort Worth area) at http://www.spc.noaa.gov/archive/hail/

PROBABLE DURATION:

Hailstorms typically last only a few minutes. On occasion, a hailstorm can last up to an hour.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Hailstorms can create a hazard on the roadways and walkways for vehicles and pedestrians. Vehicle accidents may occur as a result of the loss of friction between the tires and the roadway when the hail remains on the roadway. Pedestrians may slip and fall because of the hail remaining on the ground after a hailstorm. Hail melts fairly quickly, depending on its size.

Hailstorms can occur during a rainfall event, which may cause flooding.

PREVIOUS OCCURRENCES:

City history of hail storms.
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

HAZARD PROFILE WORKSHEET

HAZARD: Ice/Winter Storms	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☑ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Occurs in the winter.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:
http://www.weather.gov/om/brochures/wntrstm.htm

PROBABLE DURATION:
Ice/winter storms typically last one or more days.

WARNING TIME (Potential Speed of Onset):
☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☑ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:
Ice/winter storms create dangerous conditions for roadways and paved surfaces. These storms can also create problems with standing water – black ice.

PREVIOUS OCCURRENCES:
History of ice storms.
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

HAZARD PROFILE WORKSHEET

HAZARD: Lake Arlington Dam Failure	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Dependent on rainfall.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

Arlington has performed a dam breach analysis and has an Emergency Action Plan for Lake Arlington Dam. These documents contain the emergency response information necessary to handle a dam breach situation. According to the Attorney General, these reports are not public documents.

Lake Arlington was not designed for flood control, but it has been upgraded to pass 100 percent of the Probable Maximum Flood.

The area that could potentially be flooded includes areas along Village Creek and areas along the West Fork of the Trinity River, both upstream and downstream of the confluence with Village Creek.

PROBABLE DURATION:

Warning time for a dam failure depends on the cause of the failure. In most cases, the impacts of a dam breach can be foreseen 1 to 3 hours before it happens. Once a dam is compromised, the release of water and downstream flooding occur quickly. Flooding would continue for 7 to 15 hours.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☑ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Dam failure can cause downstream flooding.

PREVIOUS OCCURRENCES:

No occurrences of dam failure have occurred at Lake Arlington Dam.

Lake Arlington Dam was completed in 1957 and has never failed. The dam was updated in 1992 such that it would pass the Probable Maximum Flood without overtopping

The structure is well maintained and periodically inspected for signs of problems.

HAZARD PROFILE WORKSHEET

HAZARD: Lightning and Thunderstorms	
POTENTIAL SEVERITY OF IMPACT: Minor	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Typically occur in the spring and fall.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

NOAA data – rainfall data
http://www.lightningsafety.noaa.gov/science.htm
http://en.wikipedia.org/wiki/Thunder_storm
Description found at http://www.srh.noaa.gov/srh/jetstream/mesoscale/ingredient.htm
http://www.spc.noaa.gov/climo/

PROBABLE DURATION:

Thunderstorms can last an hour or more. Lightning strikes quickly without warning and lasts merely seconds.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☑ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

More than one lightning strike can occur in a given thunderstorm creating additional hazards.
Lightning can spark fires. Lightning can also electrocute people.
Thunderstorms and lightning can knock out power, as well as take down power lines.
Thunderstorms can cause flooding.

PREVIOUS OCCURRENCES:

City data on fires caused by lightning. City data on damages caused by lightning and/or thunderstorms.
http://www.lightningsafety.noaa.gov/stats/95-04_Deaths_by_state.pdf

HAZARD PROFILE WORKSHEET

HAZARD: Temperature Extremes	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Extreme heat occurs in the summer. Extreme cold occurs in the winter.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

NOAA data –high and low temperatures
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
http://www.fema.gov/hazard/heat/index.shtm
http://www.flash.org/activity.cfm?currentPeril=15
http://cdo.ncdc.noaa.gov/dlyp/DLYP
http://www.ncdc.noaa.gov/oa/mpp/freedata.html

PROBABLE DURATION:

Extreme temperatures can last for a few hours or for days.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Extreme heat can combine with dry conditions to increase the risk of fire.
Extreme cold can combine with precipitation creating a dangerous situation with ice on the roadways and paved areas. Pipes can also freeze and break.
Extreme temperatures can damage landscape causing property damage.

PREVIOUS OCCURRENCES:

History of heat related deaths. History of cold related deaths.
Assistance programs currently available to address extreme temperatures.

HAZARD PROFILE WORKSHEET

HAZARD: Tornadoes and Windstorms	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Typically occur in the spring and fall.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

Tornado classifications and descriptions.
Arlington's weather warning system.
National Weather Service data.
http://www.spc.noaa.gov/faq/tornado/index.html#The%20Basics
http://www.noaa.gov/tornadoes.html
http://en.wikipedia.org/wiki/Wind_storm
http://en.wikipedia.org/wiki/Fujita_scale
http://www.nws.noaa.gov/om/brochures/tornado.shtml
http://www.spc.noaa.gov/faq/tornado/index.html#The%20Basics
http://en.wikipedia.org/wiki/Tornado_Alley
http://www.ncdc.noaa.gov/img/climate/resear/ch/tornado/tornadoalley/500.jpg
http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html
Descriptions of each at http://www.srh.noaa.gov/srh/jetstream/mesoscale/wind.htm and http://www.srh.noaa.gov/srh/jetstream/mesoscale/tornado.htm

PROBABLE DURATION:

Tornadoes occur very quickly and last only minutes. The conditions causing an area to be in a tornado watch or warning may last for hours and may or may not produce a tornado.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Tornadoes and windstorms can occur during thunderstorms. In these instances, flooding may cause problems with people seeking safe shelter.
Downed power lines and flying debris pose a threat to life and property.

More than one tornado can occur in an area at a given time, increasing the potential for damages from the event.
PREVIOUS OCCURRENCES: *History of tornadoes and windstorms.* *Information on tornado resistant buildings.* *http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms*

HAZARD PROFILE WORKSHEET

HAZARD: Wildfire/Grassfire	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☑ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☐ Unlikely: Event possible in next 10 years.	Risk varies based on weather conditions.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

Fire Department records – number of wildfires/grassfires fought and dates of each fire, along with extent of damage and loss of life/injury information. Any other information the FD might have that would be useful.

http://www.tamu.edu/ticc/uwi%20release.pdf
http://www.fema.gov/hazard/wildfire/index.shtm
http://txforestservice.tamu.edu/fire/default.asp
http://www.cnn.com/us/9602/texas_wildfires/23/1am/index.html
http://www.tdi.state.tx.us/consumer/wildfires.html
http://www.txdps.state.tx.us/dem/piowildfire/wildfire_aware_index.htm
http://en.wikipedia.org/wiki/Wildfire

PROBABLE DURATION:

Wildfires can spread quickly and last as little as an hour and as long as several days, depending on the weather conditions and water availability.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Wildfires combined with strong winds and/or drought conditions can create large fires that can be hard to control and eventually suppress. Such conditions create additional hazards to roadways, property, and people.

PREVIOUS OCCURRENCES:

City data on wildfires and grassfires.

HAZARD PROFILE WORKSHEET

HAZARD: Avalanche	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Occurs in the winter Associated with mountainous terrain covered in snow.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://www.avalanche.org/
http://www.avalanchemapping.org/avatlas.htm
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
http://en.wikipedia.org/wiki/Avalanche

An avalanche can create massive destruction of the lower forest and anything else in its path. Avalanches are made of various materials, including snow, ice, rock, and soil. An avalanche can be triggered by weather, animals, or people.

PROBABLE DURATION:

An avalanche typically lasts a few minutes.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

None.

PREVIOUS OCCURRENCES:

Arlington has no history of avalanche activity. Arlington does not have the mountainous terrain and snowfall that are associated with avalanches.

HAZARD PROFILE WORKSHEET

HAZARD: Coastal Erosion	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Coastal_erosion
http://walrus.wr.usgs.gov/hazards/erosion.html

Coastal erosion typically poses more of a danger to human settlements than it does to nature itself. Erosion of coastal area compromises the foundation of structures built above it.

PROBABLE DURATION:

Coastal erosion can take years or even centuries to do significant damage.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Possible flooding.

PREVIOUS OCCURRENCES:

Arlington has no history of coastal erosion. Arlington is located over 200 miles from the coast.

HAZARD PROFILE WORKSHEET

HAZARD: Earthquake	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://earthquake.usgs.gov/regional/states/texas/history.php
http://earthquake.usgs.gov/regional/states/texas/seismicity.php
http://earthquake.usgs.gov/regional/states/texas/hazards.php
http://geology.about.com/library/bl/maps/bl48states.htm
http://www.ig.utexas.edu/research/projects/eq/compendium/earthquakes.htm

PROBABLE DURATION:

Earthquakes occur suddenly with very little warning. Tremors from an earthquake will last for a short period of time (seconds to minutes), depending on the location a person (or object) is in relation to the epicenter of the quake. The closer one is to the epicenter, the more violent the shaking and the shorter the time period.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Earthquakes can cause fires, landslides, and tsunamis.

PREVIOUS OCCURRENCES:

No earthquakes have been recorded in Arlington. The Arlington area is located within the low hazard on the seismic hazard map. Arlington could potentially feel the tremors of a very large earthquake that might occur in Oklahoma, Arkansas, or Northeast Texas.

HAZARD PROFILE WORKSHEET

HAZARD: Hurricane	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	June – November

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Hurricane
http://www.nhc.noaa.gov/

PROBABLE DURATION:

Hurricanes develop over a period of several days at sea. Once a hurricane makes landfall, it can last anywhere from 6-24 hours.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Hurricane strength winds can damage or destroy vehicles, buildings, bridges, etc. High winds also turn loose debris into flying projectiles. Hurricanes can cause a rise in sea level, which can flood coastal communities. They can cause intense rainfall, flooding, tornadoes, and landslides.

PREVIOUS OCCURRENCES:

Hurricanes have not historically occurred in Arlington. By the time a hurricane would reach North Texas, it would not likely be rated as a hurricane. Wind and flooding are included in this study and address any hurricane-related activity that would likely impact Arlington.

HAZARD PROFILE WORKSHEET

HAZARD: Insect Infestation	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Spring and summer

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://www.smartcommunities.ncat.org/codes/sttrees.shtml
http://www.stingshield.com/!ahbtitl.htm
http://en.wikipedia.org/wiki/Africanized_bee
http://en.wikipedia.org/wiki/Mosquito
http://www.health.state.ny.us/nysdoh/westnile/education/ftb.htm

Insect infestation can be detrimental to human health, as well as the economy (i.e. crops, livestock, etc.). Insects can carry disease which may be harmful or fatal to people (i.e. West Nile Virus).

PROBABLE DURATION:

Insect infestation could take months or even years to get under control.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Disease.

PREVIOUS OCCURRENCES:

Arlington has not history of insect infestations. Mosquitoes and termites have been found in the City, but not in large swarms.

HAZARD PROFILE WORKSHEET

HAZARD: Land Subsidence	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://geochange.er.usgs.gov/sw/changes/anthropogenic/subside/
http://ga.water.usgs.gov/edu/earthgwlandsubside.html

Land subsidence causes many problems including: changes in elevation and slopes of streams; damage to bridges, roads, and storm drains; and damage to buildings and other structures.

PROBABLE DURATION:

Land subsidence usually takes several years to develop, but the change in surface elevation takes place in a matter of seconds without warning.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

None.

PREVIOUS OCCURRENCES:

Arlington has no history of land subsidence. Land subsidence is typically associated with high rates of groundwater pumping, particularly in the coastal areas.

HAZARD PROFILE WORKSHEET

HAZARD: Landslide	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Rainy season.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Landslide
http://landslides.usgs.gov/

Landslides can cause severe damage to structures and infrastructure and often claim human lives. Landslides are typically a result of slope-related factors and heavy rains.

PROBABLE DURATION:

A landslide lasts only a few minutes.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

None.

PREVIOUS OCCURRENCES:

Arlington has not history of landslides. Arlington does not have the mountainous terrain typically associated with landslides.

HAZARD PROFILE WORKSHEET

HAZARD: Levee Failure	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Typically occurs during rainy season.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Levee

http://science.howstuffworks.com/levee.htm

Levee failure can cause major flooding and damage homes, buildings, and roads. The most recent national example of levee failure occurred during Hurricane Katrina (2005) when floodwaters breached levees protecting New Orleans.

PROBABLE DURATION:

Levee failure can happen suddenly or gradually over time.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☑ 3 to 6 hours warning. (assuming someone is monitoring the levee)
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

Flooding can occur as a result of levee failure.

PREVIOUS OCCURRENCES:

Arlington has no history of levee failures. Arlington has only a few, small levees within the City. In Arlington, levee failure would cause localized flooding. Flooding is discussed as a likely hazard in this report.

HAZARD PROFILE WORKSHEET

HAZARD: Sinkhole	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Sink_hole

http://www.mme.state.va.us/Dmr/DOCS/Hazard/sink2.html

Sinkholes are not dangerous to human life, but are detrimental to structures and foundations. Sinkholes commonly occur in urban areas due to water main breaks or sewer collapse. They can also occur from the over pumping and extraction of groundwater and subsurface fluids.

PROBABLE DURATION:

A sinkhole can take a mater of minutes up to several years to occur.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

None.

PREVIOUS OCCURRENCES:

Arlington has no history of sinkholes.

HAZARD PROFILE WORKSHEET

HAZARD: Slope Failure	
POTENTIAL SEVERITY OF IMPACT: Limited	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Typically occurs in rainy weather.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://www.fema.gov/hazard/landslide/index.shtm
http://en.wikipedia.org/wiki/Slope_stability
http://landslides.usgs.gov/
http://www.naturalhazards.org/investigate/slopes/index.html

PROBABLE DURATION:

Expansive soils move with the change in soil moisture content. The amount of time soils will expand and contract depends on the length of time the moisture content stays at elevated or lowered levels.

Slope failure may be due to the soil type, the steepness of the slope, a combination of the two, or development activity in the area that disturbs the stability of the surrounding ground.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☐ More than 12 hours warning.

CASCADING POTENTIAL:

PREVIOUS OCCURRENCES:

City data on slope failure.

HAZARD PROFILE WORKSHEET

HAZARD: Storm Surge	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Hurricane season.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Storm_surge
http://www.dpi.wa.gov.au/imarine/coastaldata/1331.asp

PROBABLE DURATION:

Usually caused by tropical storms, a storm surge can last from several minutes to a few hours.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

A storm surge can bring a gush of water several stories high into coastal cities. The damage can be devastating. Nine out of ten people who die in hurricanes are killed by storm surges. The largest recorded storm surge in the U.S. was generated by Hurricane Katrina, which produced a gush of water 30 feet high in the town of Bay St. Louis, Mississippi.

PREVIOUS OCCURRENCES:

Arlington has no history of storm surges. Arlington is located over 200 miles from the coast.

HAZARD PROFILE WORKSHEET

HAZARD: Stream Bank Erosion	
POTENTIAL SEVERITY OF IMPACT: Minor	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	Spring and fall – rainy season.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

Arlington's Capital Improvements Plan; Stormwater Master Plan.
Hydrologic maps showing stream locations.
http://www.maine.gov/doc/nrimc/mgs/explore/hazards/erosion/sites/feb01.htm
http://www.nrw.qld.gov.au/factsheets/pdf/river/r2.pdf
http://www.oacd.org/factsheet_04.html
http://www.rivers.gov.au/manage/is2stable.htm
http://www.epa.gov/warsss/sedsource/streamero.htm
http://en.wikipedia.org/wiki/Erosion

PROBABLE DURATION:

Stream bank erosion continues until action is taken to prevent the problem. Stream bank erosion may last for only a few weeks or up to several years before any action is taken to prevent further damage or to return the stream to its original state.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Flooding may cause stream bank erosion to take place more quickly than it would have otherwise occurred.

PREVIOUS OCCURRENCES:

City data on stream bank erosion. Citizen complaints – known trouble spots.

HAZARD PROFILE WORKSHEET

HAZARD: Tsunami	
POTENTIAL SEVERITY OF IMPACT: Substantial	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://en.wikipedia.org/wiki/Tsunami
http://www.ga.gov.au/urban/factsheets/tsunami3_1.jsp

PROBABLE DURATION:

A single tsunami event can last anywhere from a few minutes to hours, depending on the depth of water.

WARNING TIME (Potential Speed of Onset):

☑ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

Depending on the distance from the cause of the tsunami, people may have anywhere from seconds to a couple of hours to prepare for a tsunami.

CASCADING POTENTIAL:

Tsunamis can cause massive flooding.

PREVIOUS OCCURRENCES:

Arlington has no history of tsunami events. Arlington is located over 200 miles from the shoreline.

HAZARD PROFILE WORKSHEET

HAZARD: Volcano	
POTENTIAL SEVERITY OF IMPACT: Major	
Substantial	• Multiple deaths or • Complete shutdown of facilities for 30 days or more or • More than 50 percent of property destroyed or with major damage.
Major	• Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least 2 weeks. • More than 25 percent of property destroyed or with major damage.
Minor	• Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than 1 week. • More than 10 percent of property destroyed or with major damage.
Limited	• Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10 percent of property destroyed or with major damage.

PROBABILITY OF OCCURRENCE:	***SEASONAL PATTERN:***
☐ Highly likely: Event probable in next year. ☐ Likely: Event probable in next 3 years. ☐ Occasional: Event possible in next 5 years. ☑ Unlikely: Event possible in next 10 years.	None.

LIST SOURCE DOCUMENTS, STUDIES, MAPS, ETC, THAT IDENTIFY AREAS POTENTIALLY AFFECTED:

http://www.ga.gov.au/urban/factsheets/tsunami3_1.jsp
http://en.wikipedia.org/wiki/Volcano
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

PROBABLE DURATION:

A volcano can last up to several hours.

WARNING TIME (Potential Speed of Onset):

☐ Minimal (or no) warning.
☐ 3 to 6 hours warning.
☐ 6 to 12 hours warning.
☑ More than 12 hours warning.

CASCADING POTENTIAL:

Volcanoes can cause damage anywhere from minor to catastrophic. Landslides, tsunamis, earthquakes, and acid rain are all possible following a volcanic eruption.

PREVIOUS OCCURRENCES:

Arlington has no history of volcanic activity. No volcanoes are known to exist in the area.

APPENDIX G

RISK ASSESSMENT RESULTS

Appendix G
Risk Assessment Results

The City of Arlington Hazard Mitigation Action Plan (HMAP) used a variety of analysis tools and methodologies to assess the potential damages associated with the natural hazards that are likely to occur in the area. The FEMA model, HAZUS, GIS, Census data, Tarrant Appraisal District data, and other historical information were used to analyze the assets and potential damages for the ten selected hazards.

HAZUS Model

The HAZUS model is an analysis tool used in conjunction with desktop ArcGIS to analyze flood, wind, or earthquake damage to a chosen region. Using HAZUS in combination with a desktop GIS allows the user to display the results of an analysis and create exhibits from those results. The hazard analysis for the City of Arlington's Hazard Mitigation Action Plan implemented the flood and wind models to assess assets and damages.

The HAZUS model combines vulnerability data with economic and population base data for the algorithms used in analyzing the exposure and losses for events. HAZUS uses a loss estimation model to predict and estimate losses for flood and wind hazards.[1] The national 2000 Census information was the base dataset for the loss estimations. The flood and wind models were developed by the National Institute of Building Sciences (NIBS) and FEMA for the purpose of multi hazard loss estimations and regional mitigation plans.[2]

A level one analysis was performed with HAZUS, using the national dataset provided with the software. A level one analysis with this application is best suited for flood mitigation, pre-feasibility studies, regulatory policy changes, and real-time emergency response with no warning. This type of analysis allows the user to define the study region and choose the appropriate scenario, such as earthquake or 100 year flood analysis. A level one analysis yields a rough estimate of damages based on the nationwide datasets and does not require the user to obtain additional data.

Level two and level three analyses are also options within the HAZUS model. A level two analysis allows for more accurate results by allowing additional data to be added before the models are run. More detailed data for the study region, such as soil data, local roads, and community facilities, can be included to provide a more detailed analysis. This level of detailed information and data allows for more realistic damage values. Generally, this type of analysis requires an expert to import the data into the HAZUS databases before the analysis is performed. A thorough knowledge of the data and database structures is needed to perform this level of analysis.

A level three analysis includes all of the parameters from level two and also includes detailed engineering and geotechnical input geared to the specific needs of the community. This level can import models and data from other software packages such as flooding from tsunamis and analysis of highways systems. This level of analysis is the most sophisticated form of assessing damages in a study region and is preferable if the resources are available.

Flood Model

In a general sense, the HAZUS flood model implements two methods for analysis, flood hazard analysis and flood loss estimation. In HAZUS, a flood hazard is modeled by the relationship between depth of flooding and the annual chance of inundation at that depth. Ground elevation, depth-frequency curves, and discharge within the floodplain are used to further refine the analysis. The velocity and variations in flood depth are modeled spatially in this phase of the HAZUS analysis. During the hydraulic analysis, HAZUS computes the flood elevations and flood depth grid for each frequency or discharge. Flood elevations are computed in HAZUS based on Manning's equation with a roughness coefficient and friction slope calculated from the digital elevation maps (DEM). The model calculates the flood depth hazard by base flood elevation DEM data and flood plain boundaries. In a level one analysis, the HAZUS model uses default hazard data which includes the hydraulic unit codes. The model performs a hydraulic and hydrologic analysis by evaluating the 'discharge frequency relationship for the stream reaches based on USGS data and equations' (4-13 How-To Manual).

HAZUS uses Federal Insurance Mitigation Agency (FIMA), formerly known as FIA, calculations to base the loss estimates for the flood models. HAZUS provides a national dataset with a level 1 analysis which includes information regarding structure occupancy class and depth of flooding throughout the Census block. The HAZUS model pulls general building stock information provided from Census data in the national dataset which was reviewed and adopted as the standard by the National Association of Homebuilders and the ASCE-7 Committee in 1998. Losses are developed based on general building stock from area-weighted Census block data. The flood model assumes these inventory are evenly distributed throughout the Census block and assigns damages based on a percentage of the area affected. This is then used to estimate losses from the FIMA credibility weighted depth-damage curves associated with the occupancy class. Structural damages and losses are estimated within HAZUS based on aggregate Census blocks. Broad assumptions are made for first floor elevation, land use, depth of flooding, foundation type, and agriculture allocations.

The output estimate yields a percentage of replacement cost for the structures. The impact of direct losses are evaluated as a cost or repair value from Census block aggregate values, human shelter needs, and losses affecting crops and livestock. Since building age is another key factor in estimating losses, it is assumed in this model that structures of buildings will remain intact unless the damage to the structure exceeds 50% of the structures replacement cost. Census provides decade of construction and was used to assess this age of construction.

Tornado/Wind Model

The City of Arlington's large scale wind event was performed using a level one HAZUS analysis. In addition to flood models, HAZUS has a hurricane analysis model which estimates losses related to a hurricane event. A hurricane model can be used for the analysis of a tornado event because average gusts associated with a hurricane do not vary greatly from non-tropical storm gusts. The results from a HAZUS hurricane analysis would therefore be comparable to a tornado event and were used for this portion of the analysis.

In general, the basic analysis approach the HAZUS hurricane model uses is hazard-load-resistance-damage-loss. These loss estimates are based on probabilistic structural integrity for aggregate structures assigned to the census tracts. The analysis utilizes wind fields to model storm intensity; the path of a storm can then be implied from the wind fields. This data is then

used to predict similar scenarios and model a storm according to the same wind load and resistance calculations. If wind load is greater than resistance, then some type of failure occurs and losses can be estimated. HAZUS relies on historical storm data compiled from 1886 through 2001, as well as regional surface roughness, tree coverage from national land use data, aggregate Census tracts with building data, wind pressure, wind-borne debris, and rainfall for the calculation of losses in a study region. The HAZUS hurricane model runs probabilistic scenarios, as well as historical scenarios, and estimates losses by averaging the expected losses over one year.

Geographical Information System (GIS) and Tarrant County Appraisal District (TAD) Analysis

Two hazards were analyzed using information available in GIS format. A GIS base map was prepared with GIS shapefiles consisting of city jurisdiction, parcel (cadastre), and road information. These data were provided by the City of Arlington and the Tarrant County Appraisal District (TAD). This base map was used as a starting point for the following analyses.

Expansive Soils

Soil Survey data from the Tarrant County Soil Survey (1981) was spatially overlaid onto the GIS base map data for the evaluation of expansive soil in the City of Arlington. The soil types were summarized by general type (i.e. clay, clay loam, sandy loam, etc.) and spatially intersected in GIS with the parcel (cadastre) layer. The clayey soils are most likely to cause problems with expansion and contraction. The parcels of land located in the clay and clay loam soils are at most risk of exposure to soil expansion. The areas of the city with these soils types were summarized by estimation of damages in residential and non-residential locations.

Lake Arlington Dam Failure

The evaluation of the Lake Arlington Dam Failure began with the GIS base map and model results of the probable maximum flood (PMF) for that area of the City. The analysis focused on Village Creek and the West Fork of the Trinity River downstream from the Lake Arlington Dam. The inundation boundary from the PMF and dam failure was spatially overlaid onto the cadastre layer and the affected parcels were selected. These selected parcels were then used to assess loss estimates for residential and non-residential locations.

Historical Information

Six hazards are considered "all city" hazards in that the whole City is exposed to the hazard. The likelihood that a given hazard will occur in Arlington is based on the frequency of occurrences of the natural hazard. The National Climatic Data Center maintains a history of weather events. This information was used, along with local knowledge of City-specific events for these hazards. The following natural hazards were analyzed based on historical information:

- Drought
- Hail
- Ice/Winter Storm
- Lightning and Thunderstorms

- Temperature Extremes
- Wildfire/Grassfire

Because these hazards have the potential to impact the entire area, all of the city assets are exposed to these hazards. Assumptions are made as to the amount of damage that might be caused as a result of any given hazard. These assumptions are described in the "Potential Damages and Losses" of each hazard summary.

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[1] Federal Emergency Management Agency, *FEMA Publication 443: Using HAZUS-MH for Risk Assessment,* August 2004.

[2] National Institute of Building Sciences and Federal Emergency Management Agency, *A Guide to Using HAZUS for Mitigation,* April 2002.

APPENDIX H

ORDINANCE ADOPTING THE PLAN

Resolution No. 09-272

A resolution adopting the City of Arlington's Hazard Mitigation Action Plan

WHEREAS, the Disaster Mitigation Act of 2000 requires all local governments to prepare a Hazard Mitigation Action Plan (HMAP) in order to be eligible to receive State and Federal funding for mitigation projects; and

WHEREAS, on February 8, 2005, the City Council approved Resolution No. 05-073 authorizing the application for and acceptance of a Pre-Disaster Mitigation Grant from the Federal Emergency Management Agency (FEMA) for funding assistance for the development of a HMAP; and

WHEREAS, on February 14, 2006, City Council approved Resolution No. 06-051 authorizing the execution of an Engineering Services Contract with Freese & Nichols, Inc. relative to the development of a comprehensive HMAP; and

WHEREAS, on August 12, 2009, FEMA sent notification that the City of Arlington's HMAP had been approved pending adoption of the plan by the City; and

WHEREAS, the approved HMAP will allow the City to access funding sources for mitigation action from the State (Governor's Division of Emergency Management and the Texas Water Development Board) and FEMA; NOW THEREFORE

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARLINGTON, TEXAS:

I.

That the City Council hereby adopts the City of Arlington's Hazard Mitigation Action Plan which has been approved by the Federal Emergency Management Agency.

II.

The City of Arlington's Hazard Mitigation Action Plan will be on file with the City Secretary's Office.

PRESENTED AND PASSED on this the 22nd day of September, 2009, by a vote of 8 ayes and 0 nays at a regular meeting of the City Council of the City of Arlington, Texas.

ROBERT N. CLUCK, Mayor

ATTEST:

KAREN BARLAR, City Secretary

APPROVED AS TO FORM:
JAY DOEGEY, City Attorney

BY Eddie Martin

APPENDIX I

FUNDING AND TECHNICAL ASSISTANCE PROGRAMS TO SUPPORT IMPLEMENTATION OF PLAN

Appendix I
Funding and Technical Assistance Programs to Support Implementation of Plan

FEMA Funding

Funding for recommended action strategies can be a challenge, as projects/needs are in excess of most city budgets. To that end, Arlington is no different from any other city. Some of the recommended mitigation actions acre already in the existing budget or can be added without a significant burden on the taxpayer. However, many of the recommended strategies are costly. Arlington will seek federal and state grants to provide funding assistance when possible.

A number of funding opportunities are available for implementing mitigation actions. The following information summarizes basic information on the more well-known mitigation funding programs. This is by no means a complete list. Anytime the City finds an opportunity to fund a recommended action, whether or not it is included in this Plan, City staff should pursue such opportunities.

Federal Emergency Management Agency (FEMA) funds a number of programs that are administered by the Texas Governor's Division of Emergency Management (GDEM). The following three programs are the primary funding opportunities used by local jurisdictions (cities):

- Hazard Mitigation Grant Program (HMGP)[1]: This program requires a Presidential Disaster Declaration to be declared in a State. Upon a State receiving such a declaration, local jurisdictions with FEMA-approved mitigation action plans must apply for these grants. The grants are "75/25 reimbursable" meaning that FEMA will reimburse 75 percent of the cost of the project while the local jurisdiction pays for the remaining 25 percent. The HMGP is not a disaster relief program for victims or damaged property. The HMGP is designed "to prevent or reduce future losses to lives or property" and to minimize the costs associated with future disasters. Common projects that are funded through this program include acquisition or elevation of homes in the floodplain, tornado shelters, storm water projects, and warning systems. Other similar projects may also qualify.
- Pre-Disaster Mitigation Grant Program (PDM)[2]: This program is funded annually by the U.S. Congress. It is similar to the HMGP except that a Presidential Disaster Declaration is not needed to make these funds available. Again, local jurisdictions must apply for the grant and there is a 75/25 match requirement.. Common projects covered by this grant may include acquisition or elevation of homes in the floodplain, tornado shelters, storm water projects, and local flood control projects. Other similar projects may also qualify. Warning systems are not included in this grant funding.
- Repetitive Flood Claim Program (RFC)[3]: The RFC Program provides money to purchase homes located within the 100-year floodplain that can prove previous flood damage. Federal funds may provide up to 100 percent of the cost of the program. Up to $10 million is available annually for this program. The local jurisdiction may apply for (and receive) the grant without a FEMA-approved Hazard Mitigation Action Plan.

FEMA also provides funding for the Flood Mitigation Assistance Program (FMA)[4] that is administered through the Texas Water Development Board (TWDB)[5]. Two types of grants are funded through this program – planning grants and project grants. Planning grants are designed for the development or update of an entity's flood mitigation plan. Project grants provide funding to implement measures that will reduce damages in future floods. Project grants can include property buy-outs of insured structures, demolition of insured structures, elevation of insured structures, and others. Any political subdivision of the State may apply for these grants. FEMA provides a 75% matching grant with 25% to be met by the sponsoring agency.

Grants Sponsored by the State of Texas

The Texas Water Development Board (TWDB) is responsible for administering a variety of financial assistance programs. These programs typically focus on providing safe drinking water supplies throughout the state. However, some of the specific programs described below may be of benefit to the City of Arlington in proceeding with the recommended mitigation actions in this Plan. If a program below appears to meet a need, a discussion with the TWDB would be useful to get the latest requirements for the programs at that time.

The TWDB provides funding through Research and Planning Funding Grants (Texas Water Code, Chapter 15)[6]. Grants may be provided to political subdivisions or federal agencies for projects including water supply, water conservation, and drought contingency planning. The research and planning program focuses on water supply development and planning, including flood control planning. More information on the grant can be obtained from the Texas Water Development Board at http://www.twdb.state.tx.us/assistance/financial/financial_main.asp.

The Texas Administrative Code[7] provides financial assistance for flood control projects and floodplain management plans. The TWDB does so through the Flood Protection Planning Program[8]. Political subdivisions may apply for the grants on an annual basis. This program is part of the Research and Planning Fund Grants. Projects that may be funded include identification of flooding areas and identification of potential solutions. Activities related to permitting are not eligible.

The Texas Water Development Board administers the Drinking Water State Revolving Fund (DWSRF) program. This program provides low interest loans and subsidies to public drinking water systems to aid them in meeting the national drinking water standards. The DWSRF funds water treatment plant expansions, upgrades to water systems, and source protection projects. These funds may be used post-disaster to repair water treatment plants and other delivery issues.

Funding Mechanisms through the U.S. Army Corps of Engineers

One of the focuses of the U.S. Army Corps of Engineers (USACE) is designing, planning, building and operating water resources and other civil works projects. Flood control is of particular interest to the USACE. In an effort to provide these services, the USACE has several funding programs that can be used for mitigation purposes. The main programs that provide this opportunity are described below. Additional information on each program can be obtained from the local USACE District.

The Corps of Engineers provides funding through the Channel Clearing for Flood Control[9] program, which stems from Section 208 of the Flood Control Act of 1954. The USACE provides funding to clear debris from channels, as well as straightening streams for navigation purposes. The intent of clearing the debris is to decrease flooding as a result of obstructed waterways.

The USACE also provides funds for emergency streambank and shoreline protection[10]. Section 14 of the 1946 Flood Control Act (as amended) authorizes the USACE to provide grants to develop/repair streambank erosion problems to protect highways, bridges, utilities, and property.

The USACE provides funding through the Flood Plain Management Services[11] program as authorized by Section 206 of the Flood Control Act of 1960, as amended. This program provides funding for flood plain delineation, dam break analysis, flood warning/preparedness studies, flood damage reduction studies, stormwater management studies, and other similar studies. These services are provided for 100 percent of the cost for political subdivisions.

The Corps of Engineers also provides funding to states for planning purposes through the Planning Assistance to States[12] authorized by the Water Resources Development Act of 1974. This program provides 50-50 matching funds for water quality studies, environmental conservation/restoration studies, dam safety studies, flood reduction studies, and more.

Other Available Grants

Grants.gov is a web site that was established in 1999 through Public Law 106-107[13]. The intent of the law and the web site is to streamline the grant application process and allow applicants to follow the progress of grant applications. This web site is maintained by the Grants Executive Board. Grants.gov is an interactive web site that allows the potential applicant to find information on over 1,000 grants sponsored by 26 federal agencies. Once the applicant finds a grant that meets the need, then the application can be submitted through the web site.

The Texas Division of Emergency Management has developed the Texas Individual Saferoom Rebate[14] that is funded by FEMA through the HMGP and PDM grant programs. The Texas Emergency Management Coordinator determines the number of saferooms they wish to rebate and applies for FEMA funding. If FEMA approves the application, then citizens are encouraged to apply for the available rebates. The citizen applications are considered and the appropriate number is selected. At which time, the citizen may proceed with construction. Half of the cost of the saferoom will be reimbursed through this program, up to $2,500 per home.

The Natural Resources Conservation Service[15] provides funding for watershed protection and flood prevention. Public Law 83-566 authorizes the NRCS to work with federal, state, and local agencies to develop water resource programs, floodplain management studies, and flood insurance studies. Such projects might include the development of watershed plans to mitigate flood damages, as well as other land management practices to decrease flooding. This program is funded annually with NRCS providing 65 percent or more of the cost of the project. Additional information can be found at http://www.nrcs.usda.gov

The National Flood Insurance Program (NFIP) provides for low-cost flood insurance for residential, commercial, industrial, and other permanent buildings. The flood insurance is intended to minimize the repair costs for the owner following a flood. More information on this program can be found at http://www.fema.gov/business/nfip/how.shtm#1.

The National Dam Safety Program provides financial assistance to states for dam safety programs. This program includes dam inspections, dam safety training, and other programs that strengthen dams. More information on these programs can be found at http://www.fema.gov/plan/prevent/damfailure/ndsp.shtm.

Post-Disaster Funding

A number of funding opportunities are available to cities, communities, and citizens to aid in the clean-up of the aftermath following a natural disaster. This Plan focuses on mitigating actions that can be taken in advance of a natural disaster to decrease the damages caused by future disasters. Information related to post-disaster recovery grants should be handled through other reports. Some agencies that provide recovery assistance include:

- Federal Emergency Management Agency (FEMA)
- Natural Resources Conservation Service (NRCS)
- Texas Water Development Board (TWDB)
- Other federal, state and local agencies.

[1] Texas Governor's Division of Emergency Management, information on the Hazard Mitigation Grant Program, obtained from http://www.txdps.state.tx.us/ftp/dem/mitigation/HMGPFactSheet.pdf on 8/24/07.
[2] Texas Governor's Division of Emergency Management, information on the Pre-Disaster Mitigtion Grant Program, obtained from http://www.txdps.state.tx.us/ftp/dem/mitigation/mit_plan_xb.pdf on 8/24/07.
[3] Federal Emergency Management Agency, information on the Repetitive Flood Claim Program, obtained from http://www.fema.gov/government/grant/rfc/index.shtm on 8/24/07.
[4] Federal Emergency Management Agency, information on the Flood Mitigation Assistance Program, obtained from http://www.fema.gov/government/grant/fma/index.shtm on 8/24/07.
[5] Texas Water Development Board, information on the Flood Mitigation Assistance Program, obtained from http://www.twdb.state.tx.us/assistance/financial/fin_FloodMitigation/Flood_Mitagation_Program.asp on 8/24/07.
[6] Texas Water Code, Title 2, Chapter 15, obtained from http://tlo2.tlc.state.tx.us/statues/docs/WA/content/htm/wa.002.00.000015.00.htm on 6/20/07.
[7] Texas Administrative Code, Title 31, Part 10, Chapter 363, Subchapter D, Rules 363.403 and 363.404.
[8] Texas Water Development Board, information on financial assistance with flood control studies, obtained from http://www.twdb.state.tx.us/assistance/financial/fin_regionalfacilityplan/FloodControl.asp on 8/29/07.
[9] U.S. Army Corps of Engineers, information on the channel clearing grant, obtained from http://www.infrafunding.wa.gov/details.asp?GRANTINDEX=15 on 8/29/07.
[10] U.S. Army Corps of Engineers, *Program Fact Sheet on Emergency Streambank and Shoreline Protection, Section 14 of the 1946 Flood Control Act, as amended,* July 2006.
[11] U.S. Army Corps of Engineers, information on the Flood Plain Management Program, obtained from http://www.sam.usace.army.mil/pd/custguide/FloodPlainMgmt.htm on 8/30/07.
[12] U.S. Army Corps of Engineers, information on the Planning Assistance to States, obtained from http://www.lre.usace.army.mil/planning/assist.html on 8/30/07.
[13] Grants Executive Board, information on federal grants, obtained from www.grants.gov on 8/29/07.
[14] Texas Division of Emergency Management, *Texas Individual Tornado Saferoom Rebate Program,* April 10, 2006.
[15] Natural Resources Conservation Service, information on watershed protection and flood prevention, obtained from http://www.nrcs.usda.gov/programs/watershed/index.html on 6/25/07.

APPENDIX J

ASSESSMENT OF PREVIOUSLY IMPLEMENTED MITIGATION MEASURES

Appendix J
Assessment of Previously Implemented Mitigation Measures

In September 2001, the City of Arlington prepared a Hazard Mitigation Plan[1]. At the time, the plan requirements were different from those of today. However, this planning effort involved a steering committee and produced a set of recommended strategies to reduce the impact of future natural disasters on the City of Arlington. While the 2001 Plan considered natural and man-made hazards, the majority of the 19 recommended actions related to flooding. Table J-1 lists the actions included in the 2001 Plan and the status of each action as of August 2007.

Table J-1
Status of Mitigation Actions in the 2001 Plan

Task No.	Description of Action	Current Status of Action
1	Identify repetitive loss structures within the city limits.	The City has a list and the new Plan has an update list from FEMA.
2	Establish a property flood mitigation priority program.	Not started. Included in the 2007 Plan.
3	Identify project structures – survey owners of repetitive loss structures to determine interest and eligibility to pursue mitigation measures.	Not started.
4	Determine mitigation measure for each repetitive loss structure.	No started. Included in the 2007 Plan.
5	Mitigate flood disaster potential for repetitive loss structures.	Have purchased some repetitive loss structures over the years.
6	Reduce flood potential in each repetitive loss area with an ordinance to regulate fill in the floodplain.	Ordinance 05-044 was established June 21, 2005.
7	Conduct elevation certification training.	City provides periodic elevation certification training for new employees.
8	Enforce subdivision and floodplain ordinances.	On-going.
9	Enhance public awareness regarding flooding.	On-going.
10	Improve public awareness for early warning systems.	In progress. New www.knowhat2do.com web site.
11	Promote the purchase of flood insurance.	On-going.

Task No.	Description of Action	Current Status of Action
12	Educate insurance agents, realtors, and lenders regarding flood insurance and the NFIP.	City sends letters annually with information on the NFIP, as well as maps and other elevation information.
13	Conduct activities to improve the City's Community Rating System.	On-going.
14	Enhance post-disaster response and recovery activities.	On-going.
15	Obtain and review or ensure development of emergency response plans for areas of large population, including colleges, large hotels, major office/government buildings, mobile home parks, shopping centers, convention centers, ball parks, and other areas.	On-going.
16	Improve the City-wide emergency alert/notification system and the ability to communicate with local, state and federal agencies.	On-going. Included in the 2007 Plan.
17	Increase the number of wind resistant structures, including incentives for building "safe rooms".	In progress. New www.knowhat2do.com web site.
18	Develop a comprehensive drainage and flood control plan.	In progress. Master storm water plan expected to be complete in 2010. Currently working on Phase I, which includes reviewing ordinances, iSWM, design criteria manual, and repetitive loss buyouts.
19	Evaluate existing City emergency plan to determine adequacy regarding hazardous waste issues.	This plan was updated in August 2007.

[1] Environmental Advantage, *Hazard Mitigation Plan, prepared for the City of Arlington, Texas,* Baton Rouge, La, September 2001.

APPENDIX K

FEMA CROSSWALK

Local Mitigation Plan Review and Approval Status

Jurisdiction: City of Arlington, Texas	**Title of Plan:** DRAFT Hazard Mitigation Action Plan for the City of Arlington	**Date of Plan:** March 2009
Local Point of Contact: Keith Brooks	**Address:** Public Works Department PO Box 90231 MS 01-0220 Arlington, TX 76004-3231	
Title: Project Manager		
Agency: City of Arlington		
Phone Number: (817) 459-6535	**E-Mail:** keith.brooks@arlingtontx.gov	

State Reviewer: Eileen Whitaker	**Title:** Mitigation Specialist	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region VI		
Plan Not Approved		
Plan Approved		
Date Approved		

Jurisdiction:	**NFIP Status***			
	Y	**N**	**N/A**	**CRS Class**
City of Arlington	Y			8

*** Notes: Y = Participating N = Not Participating N/A = Not Mapped**

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

Prerequisite(s) (Check Applicable Box)	**NOT MET**	**MET**
1. Adoption by the Local Governing Body: §201.6(c)(5) OR		
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	**N**	**S**
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		

Risk Assessment	**N**	**S**
5. Identifying Hazards: §201.6(c)(2)(i)		
6. Profiling Hazards: §201.6(c)(2)(i)		
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		
8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)		
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	**N**	**S**
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		

Plan Maintenance Process	**N**	**S**
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		
20. Continued Public Involvement: §201.6(c)(4)(iii)		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED	
See Reviewer's Comments	
PLAN APPROVED	

LOCAL MITIGATION PLAN REVIEW CROSSWALK

PREREQUISITE(S)

1. Adoption by the Local Governing Body

Requirement §201.6(c)(5)**:** *[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted **new or updated** plan?	Section 2, Page 2.1			
B. Is supporting documentation, such as a resolution, included?	Appendix H, Page H.1			
		SUMMARY SCORE		

2. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5)**:** *For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan indicate the specific jurisdictions represented in the plan?	Not Applicable			
B. For each jurisdiction, has the local governing body adopted the **new or updated** plan?	Not Applicable			
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	Not Applicable			
		SUMMARY SCORE		

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3)**:** *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan describe **how** each jurisdiction participated in the plan's development?	Not Applicable			
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	Not Applicable			
		SUMMARY SCORE		

PLANNING PROCESS: *§201.6(b): An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan provide a narrative description of the process followed to prepare the **new or updated** plan?	Section 2, Page 2.1			
B. Does the **new or updated** plan indicate who was involved in the **current** planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, *etc*.?)	Section 2, Page 2.3 Appendix C, Page C.1			
C. Does the **new or updated** plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Section 2, Page 2.3-2.7 Appendix E, Page E.1			
D. **Does the new or updated plan discuss the** opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Section 2, Page 2.3 Appendix E, Page E.1			
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Section 2, Page 2.1			
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?	Not Applicable			
		SUMMARY SCORE		

LOCAL MITIGATION PLAN REVIEW CROSSWALK

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	Location in the **Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include **a description** of the types of **all natural hazards** that affect the jurisdiction?	Section 4, Page 4.1 Appendix F, Page F.1			
		SUMMARY SCORE		

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the **Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the **location** (*i.e.*, geographic area affected) of each natural hazard addressed in the **new or updated** plan?	Section 7, Page 7.4 Section 8, Page 8.4 Section 9, Page 9.6 Section 10, Page 10.6 Section 11, Page 11.9 Section 12, Page 12.3 Section 13, Page 13.3 Section 14, Page 14.6 Section 15, Page 15.12 Section 16, Page 16.7			
B. Does the risk assessment identify the **extent** (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?	Section 7, Page 7.3 Section 8, Page 8.2 Section 9, Page 9.2 Section 10, Page 10.3 Section 11, Page 11.3 Section 12, Page 12.4 Section 13, Page 13.2 Section 14, Page 14.3 Section 15, Page 15.5 Section 16, Page 16.4			

C. Does the plan provide information on **previous occurrences** of each hazard addressed in the **new or updated** plan?	Section 7, Page 7.3 Section 8, Page 8.4 Section 9, Page 9.3 Section 10, Page 10.4 Section 11, Page 11.4 Section 12, Page 12.3 Section 13, Page 13.4 Section 14, Page 14.4 Section 15, Page 15.6 Section 16, Page 16.4			
D. Does the plan include the **probability of future events** (*i.e.*, chance of occurrence) for each hazard addressed in the **new or updated** plan?	Section 7, Pages 7.3 & 7.5 Section 8, Pages 8.2 Section 9, Pages 9.2 & 9.12 Section 10, Pages 10.3 & 10.8 Section 11, Pages 11.3 & 11.7 Section 12, Pages 12.2 & 12.3 Section 13, Pages 13.2 & 13.3 Section 14, Pages 14.4 & 14.7 Section 15, Pages 15.5 & 15.13 Section 16, Page 16.8			
		SUMMARY SCORE		

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Section 7, Page 7.3 Section 8, Page 8.2 Section 9, Page 9.2 Section 10, Page 10.3 Section 11, Page 11.3 Section 12, Page 12.2 Section 13, Page 13.2 Section 14, Page 14.3 Section 15, Page 15.5 Section 16, Page 16.4			
B. Does the **new or updated** plan address the **impact** of each hazard on the jurisdiction?	Section 7, Page 7.3 Section 8, Page 8.2 Section 9, Page 9.2 Section 10, Page 10.3 Section 11, Page 11.3 Section 12, Page 12.2 Section 13, Page 13.2 Section 14, Page 14.3 Section 15, Page 15.5 Section 16, Page 16.4			
		SUMMARY SCORE		

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): *[The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of *repetitive loss properties* located in the identified hazard areas?	Table 9-4, Page 9.10	***Note: This requirement becomes effective for all local plans approved after October 1, 2008.***		
		SUMMARY SCORE		

LOCAL MITIGATION PLAN REVIEW CROSSWALK

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?	Section 7, Page 7.4 Section 8, Page 8.4 Section 9, Page 9.11 Section 10, Page 10.7 Section 11, Page 11.9 Section 12, Page 12.3 Section 13, Page 13.7 Section 14, Page 14.6 Section 15, Page 15.12 Section 16, Page 16.7	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?	Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.11 Section 12, Page 12.4 Section 13, Page 13.8 Section 14, Page 14.7 Section 15, Page 15.15 Section 16, Page 16.8	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan estimate **potential dollar losses** to vulnerable structures?	Section 7, Page 7.4 Section 8, Page 8.5 Section 9, Page 9.12 Section 10, Page 10.7 Section 11, Page 11.9 Section 12, Page 12.4 Section 13, Page 13.7 Section 14, Page 14.6 Section 15, Page 15.14 Section 16, Page 16.7	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe the **methodology** used to prepare the estimate?	Section 7, Page 7.5 Section 8, Page 8.5 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.10 Section 12, Page 12.4 Section 13, Page 13.8 Section 14, Page 14.7 Section 15, Page 15.14 Section 16, Page 16.8	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe land uses and development trends?	Section 3, Page 3.3	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	Not Applicable			
		SUMMARY SCORE		

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards?	Section 6, Page 6.1			
		SUMMARY SCORE		

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?	Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.11 Section 12, Page 12.6 Section 13, Page 13.9 Section 14, Page 14.7 Section 15, Page 15.15 Section 16, Page 16.9			
B Do the identified actions and projects address reducing the effects of hazards on **new** buildings and infrastructure?	Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 13, Page 13.9 Section 15, Page 15.15			
C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?	Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.12 Section 12, Page 12.5 Section 13, Page 13.9 Section 15, Page 15.15 Section 16, Page 16.9			
		SUMMARY SCORE		

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	Section 9, Pages 9.9-9.11	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.***		
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Section 9, Page 9.13 Action F-1	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.***		
		SUMMARY SCORE		

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** mitigation strategy include how the actions are **prioritized**? (For example, is there a discussion of the process and criteria used?)	Section 4, Page 4.5			
B. Does the **new or updated** mitigation strategy address how the actions will be implemented and administered, including the responsible department , existing and potential resources and the timeframe to complete each action?	Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.11 Section 12, Page 12.5 Section 13, Page 13.9 Section 14, Page 14.7 Section 15, Page 15.15 Section 16, Page 16.9			

C. Does the **new or updated** prioritization process include an emphasis on the use of a **cost-benefit review** to maximize benefits?	Section 4, Page 4.5 Section 7, Page 7.6 Section 8, Page 8.6 Section 9, Page 9.12 Section 10, Page 10.8 Section 11, Page 11.11 Section 12, Page 12.5 Section 13, Page 13.9 Section 14, Page 14.7 Section 15, Page 15.15 Section 16, Page 16.9			
D. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	Not Applicable			
		SUMMARY SCORE		

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	**SCORE**	
			N	**S**
A Does the **new or updated** plan include identifiable **action items** for each jurisdiction requesting FEMA approval of the plan?	Not Applicable			
B. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	Not Applicable			
		SUMMARY SCORE		

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe the method and schedule for **monitoring** the plan, including the responsible department?	Section 17, Page 17.1			
B. Does the **new or updated** plan describe the method and schedule for **evaluating** the plan, including how, when and by whom (*i.e.* the responsible department)?	Section 17, Page 17.1			
C. Does the **new or updated** plan describe the method and schedule for **updating** the plan within the five-year cycle?	Section 17, Page 17.1			
		SUMMARY SCORE		

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Section 2, Page 2.3			
B. Does the **new or updated** plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	Section 2, Page 2.3			
C. Does the **updated** plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	Not Applicable			
		SUMMARY SCORE		

LOCAL MITIGATION PLAN REVIEW CROSSWALK

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the **new or updated** plan explain how **continued public participation** will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Section 17, Page 17.2			
		SUMMARY SCORE		

MATRIX A: PROFILING HAZARDS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each** applicable **hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Erosion	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dam Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expansive Soils	☐	☐	☐	☐	☐	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flood	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hailstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hurricane	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land Subsidence	☐	☐	☐	☐	☐	☐	☐	☐	☐
Landslide	☐	☐	☐	☐	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tornado	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tsunami	☐	☐	☐	☐	☐	☐	☐	☐	☐
Volcano	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wildfire	☐	☐	☐	☐	☐	☐	☐	☐	☐
Windstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐

Legend:

§201.6(c)(2)(i) Profiling Hazards
A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

MATRIX B: ASSESSING VULNERABILITY

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required**.

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	§201.6(c)(2)(ii) Assessing Vulnerability: Overview					§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures					§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses					
		A. Overall Summary Description of Vulnerability		B. Hazard Impact			A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)			A. Loss Estimate		B. Methodology			
	Yes	N	S	N	S		N	S	N	S		N	S	N	S		
Avalanche	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Coastal Erosion	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Coastal Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Dam Failure	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Drought	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Earthquake	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Expansive Soils	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Levee Failure	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Flood	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Hailstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Hurricane	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Land Subsidence	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Landslide	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Severe Winter Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Tornado	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Tsunami	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Volcano	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Wildfire	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Windstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Other _____	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Other _____	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		
Other _____	☐	☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐		

Legend:

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

A. Does the **new or updated** plan include an overall summary description of the jurisdiction's vulnerability to each hazard?

B. Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

A. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

B. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

A. Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?

B. Does the **new or updated** plan describe the methodology used to prepare the estimate?

MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	☐	☐	☐
Coastal Erosion	☐	☐	☐
Coastal Storm	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☐	☐	☐
Expansive Soils	☐	☐	☐
Levee Failure	☐	☐	☐
Flood	☐	☐	☐
Hailstorm	☐	☐	☐
Hurricane	☐	☐	☐
Land Subsidence	☐	☐	☐
Landslide	☐	☐	☐
Severe Winter Storm	☐	☐	☐
Tornado	☐	☐	☐
Tsunami	☐	☐	☐
Volcano	☐	☐	☐
Wildfire	☐	☐	☐
Windstorm	☐	☐	☐
Other _____	☐	☐	☐
Other _____	☐	☐	☐
Other _____	☐	☐	☐

Legend:
§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions
A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?