Chapter 7 - Risk and Vulnerability Assessment

Hazard Ranking Methodology

After a thorough review of the community profile, a county hazard ranking was completed using a three-step process. The first step was selecting evaluation criteria, the second step assigned relative weights to each of the rating criteria and the third step assigned point values in each of the selected criteria for each of the hazards.

Evaluation Criteria

Selection of evaluation criteria was accomplished by determining what aspects of the hazards were of most concern to the community. This process was completed by assigning level of importance ranging from "Always Important" to "Not Worth Considering" to each hazard aspect. **Table 7.1** shows a complete list of all aspects considered and level of importance assigned by the committee.

Table 7.1: Alpena Hazard Evaluation Criteria

Hazard Aspect	Always Very Important	Usually Important	Sometimes Important	Rarely of Importance	Not worth Considering
Likelihood of Occurrence	X				
Capacity to Cause Damage	X				
Size of Affected Area		X			
Speed of Onset				X	
Percent of Population Affected		X			
Potential for casualties	X				
Potential for Negative Economic effects		X			
Duration of Threat				X	
Seasonal Risk Pattern			X		
Environmental Impact		X			
Predictability of Hazard				X	
Ability to Mitigate	X				
Availability of Warning System		X			
Public Awareness	X				
Corollary Effects		X			
Intergovernmental Cooperation		X			
Response Capability	X				

Each evaluation criteria was then assigned a "weight" to express the level of importance each of criteria will have in ranking hazards. The sum of weights of all of evaluation criteria must equal 100%. Each individual criterion was then assigned a percentage value based on the relative importance that specific criteria would have in ranking the various hazards. Point values of 1-10 were assigned using the scoring parameters as outlined in the Evaluation Measure Benchmark Factors shown below. Using a spread sheet, values were input and calculated to provide a hazard ranking as shown in **Table 7.2**.

Hazard Analysis Evaluation Measures and Benchmark Factors

This model uses a common set of 8 evaluation measures to evaluate each hazard facing the community. Those measures are: 1) likelihood of occurrence; 2) potential for damage; 3) potential for casualties; 4) ability to mitigate; 5) public awareness; 6) current response capabilities; 7) inter agency cooperation; and 8) economic impact. Each corresponding benchmark factor has been assigned a specific point value (10, 7, 4 or 1 point), based on each individual factor's relative severity and negative impacts. In recognition of the fact that some factors need to be given more consideration than others, each of the criteria was weighted. A percentage value has been assigned to each measure based on the relative significance of the measure in ranking the hazards. The sum of all of measures must equal 100 percent. The following is a synopsis of each hazard evaluation measure, weight and benchmark factor used in this analysis:

Likelihood of Occurrence 25%
Likelihood of occurrence measures the likelihood that a particular hazard will occur. More frequently occurring hazard events will reflect more potential for damage and negative impact on a community.

The specific benchmark factors used in the likelihood of occurrence analysis are:
10 Points - Excessive Occurrence, indicating hazard event will occur 1 or more times per year
7 Points - High Occurrence, indicating the hazard event is likely to occur every 2-3 years;
4 Points - Medium Occurrence, indicating the hazard event is likely to occur each 5 years;
1 Points - Low Occurrence, indicating the hazard event occurs less than once every 5 years

Potential for Damage 15%
Each hazard affects a geographic area. For example, a blizzard might affect an entire state or even several states, while a flood might only affect a portion of a county or municipality. Although size of the affected area is not always indicative of the destructive potential of the hazard (a tornado is a good example), generally the larger the affected area, the more problematic the hazard event is on a community.

Specific benchmark factors used in an affected area analysis are:
10 Points- Entire Area, hazard event has potential to impact all or most of the area in a county;
7 Points - Large Area, hazard event could impact one half to three quarters of county;
4 Points - Medium Area, hazard event could impact multiple areas but less than half the county;
1 Point - Small Area, hazard event is likely to only impact only a small area within county.

Potential for Casualties 15%
Potential for Casualties refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs.

Specific benchmark factors used in the population impact analysis are:
10 Points -High Impact, indicating 10 or more casualties can be expected;
7 Points - Medium Impact, indicating 6-10 casualties can be expected;
4 Points - Low Impact, indicating 1-5 casualties can be expected;
1 Points - No Impact (none), indicating that no casualties can be expected.

Negative Economic Effects 10%

Economic effects are monetary damages incurred from a hazard event, and include both public and private damage. Direct physical damage costs, as well as indirect impact costs such as lost business and tax revenue, are included as part of the total monetary damages.

Specific benchmark factors used in the economic effects impact analysis are:
10 Points - Significant Effects, indicating over $100,000 in monetary damages incurred;
7 Points - Medium Effects, indicating $50,001-$100,000 in monetary damages incurred;
4 Points - Low Effects, indicating $10,000-$50,000 in monetary damages incurred;
1 Point - Minimal Effects, indicating less than $10,000 in monetary damages incurred.

Public Awareness 5%
The extent of public awareness reflects the ease with which the public can be informed about particular hazards. This measure does not address current level of public awareness existing in the community. Rather, it looks at overall value of public awareness in general for a particular hazard event occurring. Generally, hazards that have little or no availability of warning tend to be more problematic for a community from a population protection and response standpoint.

Specific benchmark factors used in availability of warnings analysis are:
10 Points- Significant Value, the nature of the hazard is such that public awareness of the hazard event will always help save lives and/or property from the hazard;
7 Points - Some Value, the nature of the hazard is such that public awareness of the hazard event may sometimes help save lives and/or property from hazard;
4 Points - Limited Value, the nature of the hazard is such that public awareness of the hazard event will generally have limited effects;
1 Point - No Value, the nature of the hazard is such that public awareness of the hazard event is of no value.

Mitigative Potential 20%
Mitigative potential refers to the relative ease with which a particular hazard event can be mitigated against through application of structural or non-structural (or both) mitigation measures. Generally, the easier a hazard event is to mitigate against, the more a community can do to lessen the future threat it may pose to a community in terms of loss of life and property.

The specific benchmark factors used in the mitigative potential analysis are:
10 Points - Easy to Mitigate, indicating there are a wide variety of structural and/or non-structural measures that can be reasonably and economically applied to a particular hazard event to lessen or eliminate future vulnerability;
7 Points - Possible to Mitigate, indicating there are some structural and non-structural measures that can be applied to a hazard event, but not all can be applied in an economical manner or are absolutely effective in lessening or eliminating future vulnerability;
4 Points - Difficult to Mitigate, indicating that there are very limited choices for mitigating a hazard event, and not all measures may prove to be effective in lessening or eliminating future vulnerability;
1 Point - Impossible to Mitigate, indicating that the nature of the hazard event is such that it is virtually impossible to effectively apply mitigation measures to lessen or eliminate future vulnerability

Current Response Needs 5%

Current Response Needs refers to those assets and resources that are currently needed with which a particular hazard event can be adequately responded to. Generally, the more assets and resources currently in place the for a particular hazard event, the less of a future threat it may pose to a community in terms of loss of life and property.

The specific benchmark factors used in the mitigative potential analysis are:
10 Points - No Resources, the community has no resources that can be used for the hazard that would lessen or eliminate hazard effects;
7 Points - Minimal Resources, there are very limited resources for responding to a hazard event, and measures would have limited success in lessening or eliminating hazard effects;
4 Points - Some Resources, indicating there are some resources that can be applied to a hazard event, but not sufficient amounts or types that are needed to effectively lessen or eliminate hazard effects;
1 Point - Sufficient Resources, indicating there are a wide variety of resources that can be applied to a particular hazard event to lessen or eliminate hazard effects.

Interagency Cooperation 5%
Interagency Cooperation refers to the amount of cooperation that is needed to deal with a particular hazard event. Generally, specific smaller or localized events require less interagency interaction and can be adequately responded to by a limited number of agencies or jurisdictions. Hazards that effect large areas or have multiple effects and facets require cooperation and coordination of multiple agencies and jurisdictions.

Specific benchmark factors used in Interagency Cooperation analysis are:
10 Points - Total Coordination, indicating the impacts of the hazard would require total coordination of all agencies and jurisdictions in order to effectively respond to or mitigate the hazard.
7 Points - Significant Coordination, indicating the impacts of the hazard would require coordinated response multiple agencies or jurisdictions in order to effectively respond to or mitigate the hazard.
4 Points - Moderate Cooperation, indicating that the hazard event would require the cooperation of a several jurisdictions or agencies in order to respond to or mitigate the hazard.
Point - Limited Cooperation, indicating that the nature of the hazard event is such that the effects can be responded to or mitigated by a single jurisdiction or agency.

TABLE 7.2
ALPENA COUNTY HAZARD RATING

Evaluation Criteria										
CRITERIA	**Likelihood of Occurrence**	**Potential for Damage**	**Potential for Casualties**	**Ability to Mitigate**	**Public Aware**	**Current Response Needs**	**Inter-Agency Cooperate**	**Economic Impact**	**Total Weight Must = 100%**	**Rank**
WEIGHT =========>	**25%**	**15%**	**15%**	**20%**	**5%**	**5%**	**5%**	**10%**	**100%**	
Hazard										
Dam Failure	**6**	**10**	**3**	**8**	**7**	**6**	**4**	**9**	**6.80**	**1**
Fixed Site Hazmat	**7**	**8**	**8**	**7**	**7**	**7**	**1**	**5**	**6.80**	**2**
Transportation Accident	**9**	**8**	**7**	**6**	**2**	**8**	**5**	**2**	**6.65**	**3**
Structural Fire	**9**	**7**	**5**	**7**	**8**	**2**	**1**	**5**	**6.50**	**4**
Winter Weather Hazard	**9**	**7**	**2**	**7**	**4**	**3**	**5**	**4**	**6.00**	**5**
Infrastructure Failure	**7**	**6**	**2**	**8**	**5**	**5**	**5**	**7**	**6.00**	**6**
Terrorism/Sabotage/WMD	**2**	**7**	**9**	**7**	**2**	**9**	**7**	**7**	**5.90**	**7**
Transportation Hazmat	**7**	**7**	**3**	**7**	**7**	**7**	**1**	**3**	**5.70**	**8**
Riverine Flooding	**8**	**6**	**1**	**6**	**6**	**2**	**4**	**2**	**5.05**	**9**
Tornados	**4**	**6**	**7**	**5**	**4**	**3**	**5**	**4**	**4.95**	**10**
Extreme Temperature	**5**	**8**	**2**	**7**	**8**	**2**	**1**	**1**	**4.80**	**11**
Severe Winds	**7**	**5**	**4**	**5**	**4**	**2**	**3**	**2**	**4.75**	**12**
Nuclear Attack	**1**	**10**	**7**	**0**	**1**	**9**	**7**	**10**	**4.65**	**13**
Wildfire	**6**	**6**	**1**	**5**	**8**	**3**	**1**	**3**	**4.45**	**14**
Public Health	**5**	**1**	**5**	**5**	**6**	**3**	**5**	**5**	**4.35**	**15**
Pipeline Accident	**5**	**3**	**1**	**7**	**4**	**4**	**4**	**4**	**4.25**	**16**
Shoreline Flooding	**5**	**5**	**0**	**5**	**2**	**1**	**2**	**1**	**3.35**	**17**
Oil/Gas Well Incident	**4**	**2**	**1**	**7**	**1**	**4**	**2**	**1**	**3.30**	**18**
Lighting	**8**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**3.00**	**19**
Hail	**5**	**5**	**1**	**1**	**2**	**1**	**1**	**4**	**2.95**	**20**
Scrap Tire Fire	**2**	**1**	**1**	**9**	**1**	**0**	**1**	**1**	**2.80**	**21**
Civil Disturbance	**1**	**1**	**1**	**10**	**1**	**1**	**1**	**1**	**2.80**	**22**
Drought	**1**	**7**	**1**	**1**	**3**	**2**	**1**	**7**	**2.65**	**23**
Subsidence	**3**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1.45**	**24**
Earthquake	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**5**	**0.75**	**25**

Composite Hazard Rankings

High
Dam Failure
Fixed Site Hazmat
Transportation Accident
Structural Fire
Winter Weather Hazard
Infrastructure Failure

Moderate
Terrorism/Sabotage/WMD
Riverine Flooding
Tornados
Extreme Temperatures
Severe Winds
Nuclear Attack
Wildfire

Low
Public Health
Pipeline Accident
Shoreline Flooding
Oil/Gas Well Incident
Lightning
Hail
Scrap Tire Fire
Civil Disturbance
Drought
Subsidence
Earthquake

NOTES:
1) FOR PURPOSES OF THIS ANALYSIS, SHORELINE AND RIVERINE FLOODING ARE COMBINED AS ONE RANKING.
2) HAZARDS SUCH AS EARTHQUAKES, TSUNAMIS, AND HURRICANES (NOT CONSIDERED VIABLE HAZARDS IN ALPENA COUNTY) WERE PURPOSELY EXCLUDED FROM THIS ANALYSIS.
3) RANKINGS IN THIS ANALYSIS SHOULD NOT BE USED TO ASSUME THAT ANY ONE HAZARD WILL OCCUR PRIOR TO ANOTHER – OR IF A HAZARD DOES OCCUR – THAT IT WILL BE ANY MORE DEVASTATING OR COSTLY THAN ANOTHER. IN OTHER WORDS, ANY OF THESE HAZARDS CAN OCCUR AT ALMOST ANY TIME. THIS ANALYSIS IS TO BE USED FOR PLANNING PURPOSES ONLY.

Risk Assessment and Vulnerability Assessment Summary

Risk Assessment
The goals of risk assessment are to determine where hazards exist, and develop an understanding of how often they will arise and how much harm they cause. Based on the weighted hazard ranking process recommended in the Michigan Hazard Analysis workbook, a composite of hazards and their relative risk are presented below. This list will be used as the foundation for developing hazard mitigation goals and strategies in subsequent chapters.

High Risk: -- very likely to occur during hazard mitigation planning horizon of 20 years, and/or affect all or most of the county.

Medium Risk: -- somewhat likely to occur during hazard mitigation planning horizon of 20 years, and/or effect a significant area of the County.

Low Risk: -- means it is not likely to occur, or cover only a limited area within county.

Vulnerability Assessment

This step looks at such points as population concentrations, age-specific populations, development pressures, types of housing (older homes, mobile homes), presence of agriculture, sprawl (spreading resources too thin), and other issues that may make Alpena County more vulnerable to specific hazards. Basic criteria are listed below.

High Vulnerability: **--** If an event occurred it would have severe impacts over large geographic areas or more densely populated areas and have a serious financial impact on County residents and businesses.

Medium Vulnerability: **--** If an event occurred it would have confined impacts on the safety of residents but would have a financial impact on County residents and businesses.

Low Vulnerability: **--** If an event occurred it would have very minimal impact on the safety of County residents and minimal financial impact on County residents and businesses.

Table 7.3,
Alpena County Risk and Vulnerability Assessment Summary

Ranked Hazards in Alpena County	Risk Assessment	Vulnerability Assessment
Dam Failure	High	Medium
Fixed Site Hazmat	High	Medium
Transportation Accidents	High	Medium
Structural Fire	High	Low
Winter Weather Hazard	High	High
Infrastructure Failure	High	High
Terrorism/Sabotage/WMD	Medium	Low
Transportation Hazmat	Medium	Medium

Riverine Flooding	Medium	Low
Tornados	Medium	Low
Extreme Temperatures	Medium	Medium
Severe Winds	Medium	Medium
Nuclear Attack	Medium	High
Wildfire	Medium	Medium
Public Health Emergencies	Medium	Medium
Oil/Gas Pipeline Accident	Low	Medium
Shoreline Erosion	Low	Low
Oil/Gas Well Incident	Low	Low
Lightning	Low	Low
Hail	Low	Low
Scrap Tire Fire	Low	Low
Civil Disturbance	Low	Low
Drought	Low	Medium
Subsidence	Low	Low
Earthquake	Low	Low

Principal Vulnerabilities

Dam Failure

As described in Chapter 6, there two dams classified as "High Hazard", the Seven Mile (Norway Point Dam and Four Mile Dams both on the Thunder Bay River. Inundation maps have been prepared to estimate the duration and extent of flooding if these dams were to fail. **Figures 7.1 through 7.4** depict flooding stages projected for a sunny day failure of Severn Mile Dam. Maximum flood inundation would submerge much of the downtown and residential area of the City of Alpena to a depth of at least 3 feet within three and one-half hours after breaching. Approximately 80% of the Alpena built up area will experience some degree of flooding. The City's entire downtown commercial area and industrial facilities would be affected. **Figure 7.5**

A specific potential hazard related to dam failure flooding relates to the location of critical power substations at Four Mile Dam in a position to be vulnerable to flooding.

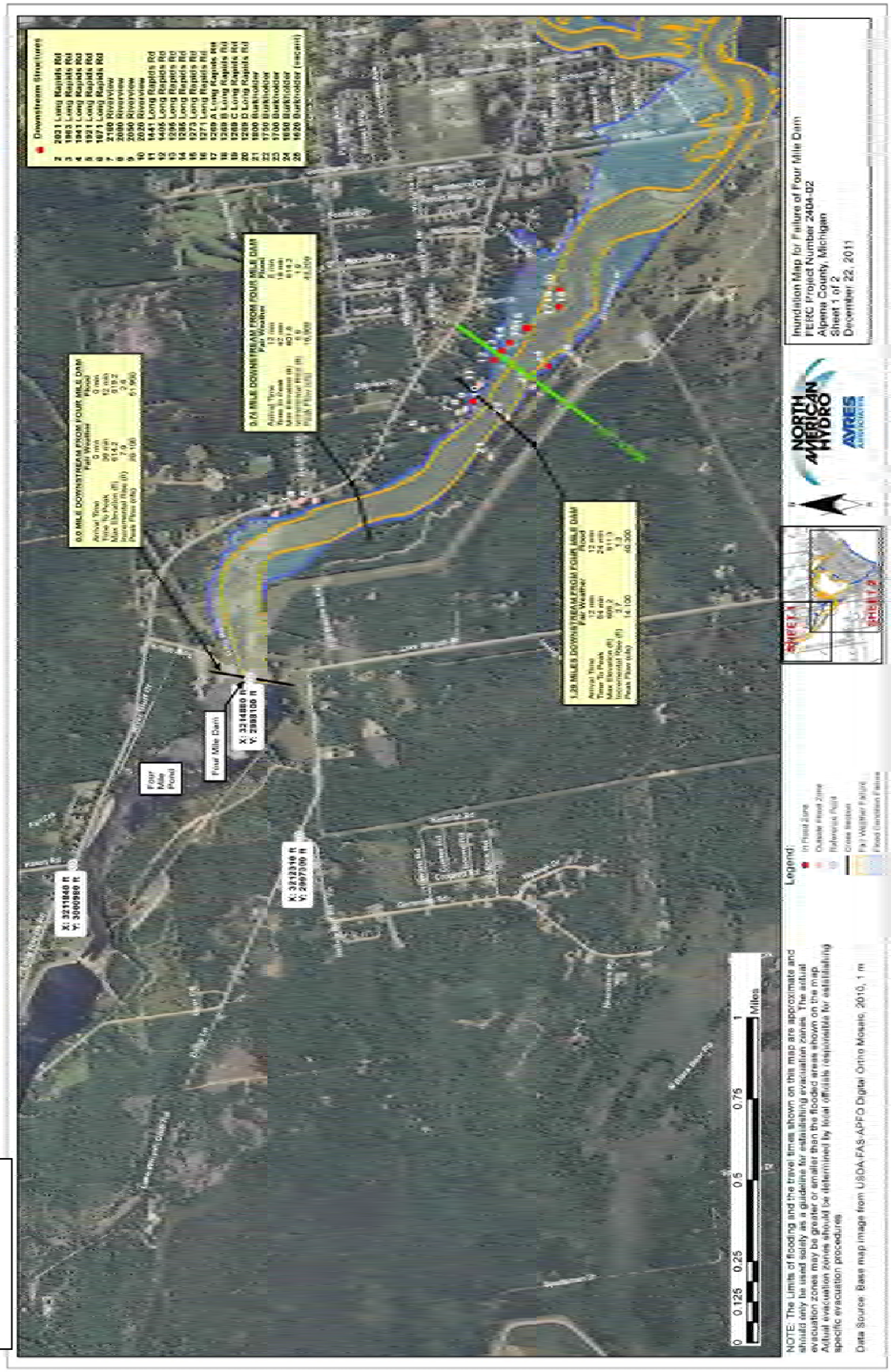

Downstream Structures
2031 Long Rapids Rd
1983 Long Rapids Rd
1941 Long Rapids Rd
1921 Long Rapids Rd
1871 Long Rapids Rd
2100 Riverview
2080 Riverview
2050 Riverview
2020 Riverview
1441 Long Rapids Rd
1405 Long Rapids Rd
1295 Long Rapids Rd
1285 Long Rapids Rd
1273 Long Rapids Rd
1271 Long Rapids Rd
1269 A Long Rapids Rd
1269 B Long Rapids Rd
1269 C Long Rapids Rd
1269 D Long Rapids Rd
1800 Burkholder
1750 Burkholder
1700 Burkholder
1650 Burkholder
1626 Burkholder (vacant)
0.0 MILE DOWNSTREAM FROM FOUR MILE DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
0.74 MILE DOWNSTREAM FROM FOUR MILE DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
1.28 MILES DOWNSTREAM FROM FOUR MILE DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
Four Mile Dam
Four Mile Pond
X: 3211840 ft
Y: 3060980 ft
X: 3212310 ft
Y: 2997300 ft
X: 3214850 ft
Y: 2999100 ft
Legend
In Flood Zone
Outside Flood Zone
Reference Point
Cross Section
Fair Weather Failure
Flood Elevation Failure
0 0.125 0.25 0.5 0.75 1
Miles
NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA FAS APFO Digital Ortho Mosaic, 2010, 1 m
SHEET 1
SHEET 2
NORTH AMERICAN HYDRO
AYRES ASSOCIATES
Inundation Map for Failure of Four Mile Dam
FERC Project Number 2404-82
Alpena County, Michigan
Sheet 1 of 2
December 22, 2011

Figure 7.1

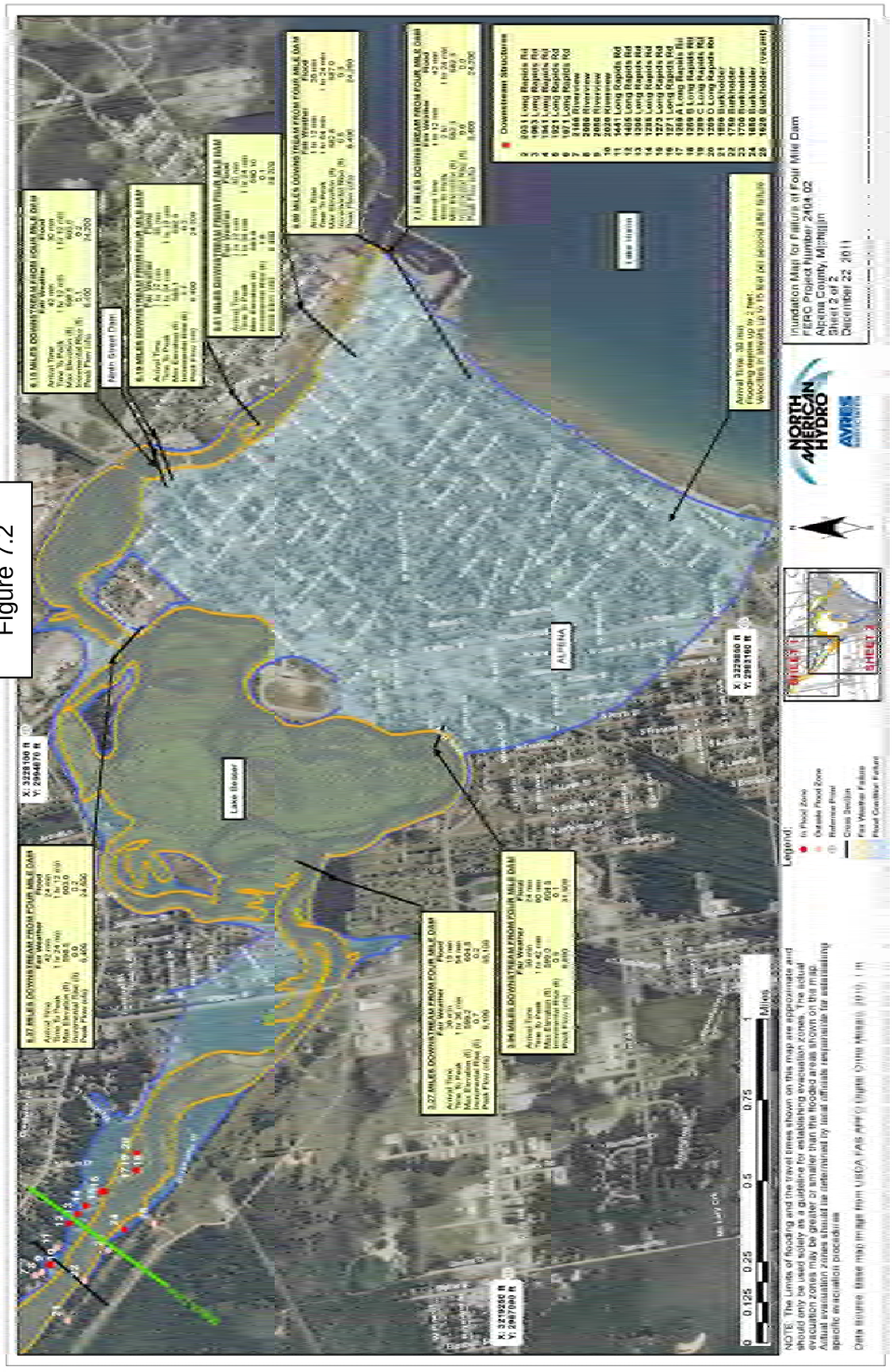

Inundation Map for Failure of Four Mile Dam
FERC Project Number 2404-02
Alpena County, Michigan
Sheet 2 of 2
December 22, 2011
Downstream Structures
Legend:
In Flood Zone
Outside Flood Zone
Reference Point
Cross Section
Fair Weather Failure
Flood Overtop Failure
NOTE: The limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on this map. Actual evacuation zones should be determined by local officials responsible for administering specific evacuation procedures.
Data Source: Base map image from USDA FSA APFO Digital Ortho Mosaic (DOQ), 1m
Miles
Lake Besser
Alpena
Lake Huron
NORTH AMERICAN HYDRO
AVISTA

Figure 7.2

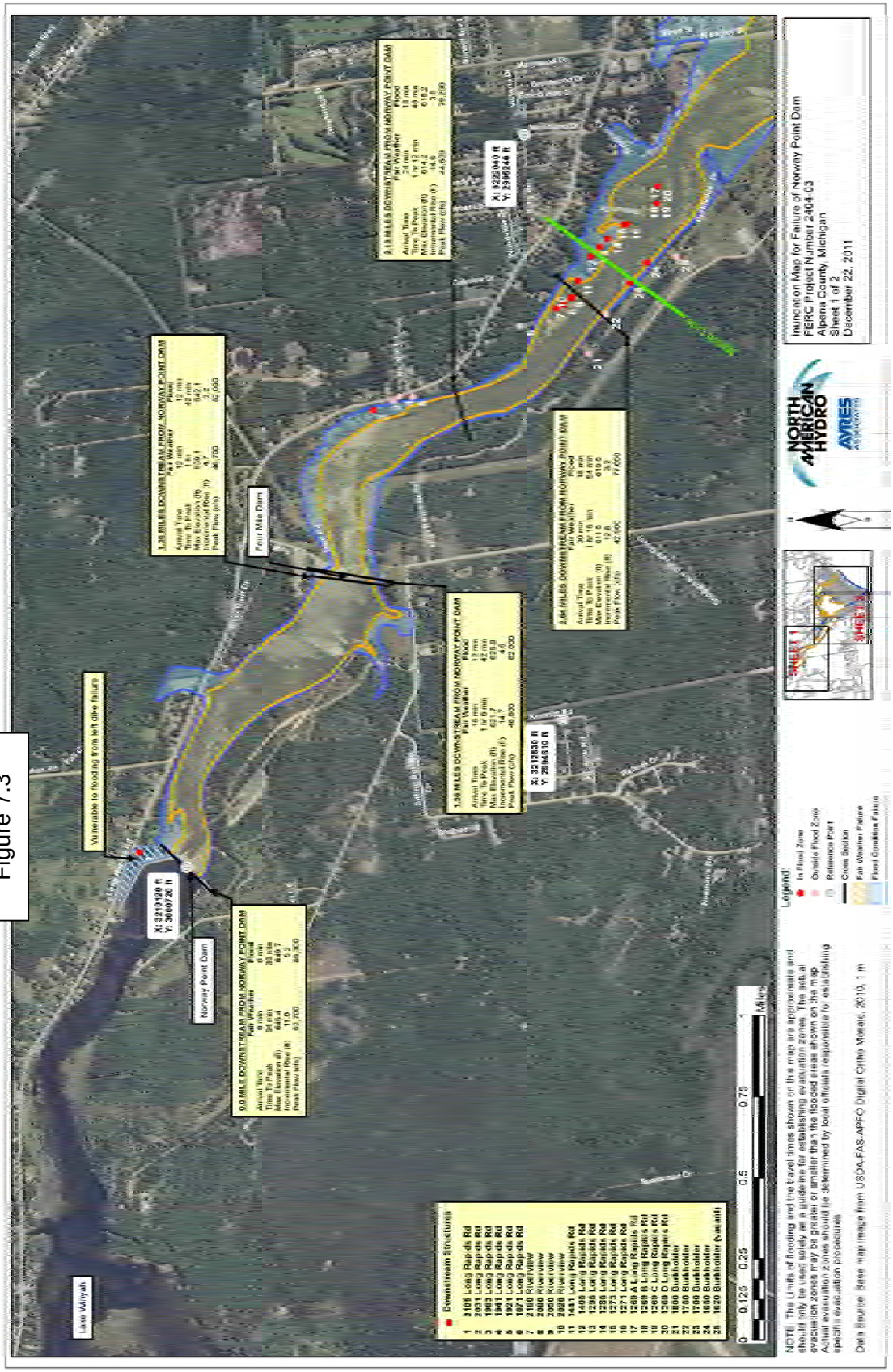

Lake Winyah
Vulnerable to flooding from left dike failure
X: 3249120 ft
Y: 2909720 ft
Norway Point Dam
9.0 MILE DOWNSTREAM FROM NORWAY POINT DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
1.38 MILES DOWNSTREAM FROM NORWAY POINT DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
X: 3232830 ft
Y: 2894619 ft
Fair Mile Dam
3.26 MILES DOWNSTREAM FROM NORWAY POINT DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
3.8 MILES DOWNSTREAM FROM NORWAY POINT DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
5.18 MILES DOWNSTREAM FROM NORWAY POINT DAM
Fair Weather
Flood
Arrival Time
Time To Peak
Max Elevation (ft)
Incremental Rise (ft)
Peak Flow (cfs)
X: 3232040 ft
Y: 2890240 ft
Downstream Structures
1 3105 Long Rapids Rd
2 2931 Long Rapids Rd
3 1993 Long Rapids Rd
4 1941 Long Rapids Rd
5 1921 Long Rapids Rd
6 1921 Long Rapids Rd
7 2150 Riverview
8 2080 Riverview
9 2050 Riverview
10 2030 Riverview
11 1441 Long Rapids Rd
12 1405 Long Rapids Rd
13 1295 Long Rapids Rd
14 1288 Long Rapids Rd
15 1273 Long Rapids Rd
16 1271 Long Rapids Rd
17 1269 A Long Rapids Rd
18 1269 B Long Rapids Rd
19 1269 C Long Rapids Rd
20 1269 D Long Rapids Rd
21 1690 Burkholder
22 1780 Burkholder
23 1700 Burkholder
24 1650 Burkholder
25 1620 Burkholder (vacant)
0 0.125 0.25 0.5 0.75 1 Miles
NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA-FAS-APFO Digital Ortho Mosaic, 2010, 1 m
Legend:
In Flood Zone
Outside Flood Zone
Reference Point
Cross Section
Fair Weather Failure
Flood Condition Failure
SHEET 1
SHEET 2
NORTH AMERICAN HYDRO
AYRES ASSOCIATES
Inundation Map for Failure of Norway Point Dam
FERC Project Number 2404-03
Alpena County, Michigan
Sheet 1 of 2
December 22, 2011

Figure 7.3

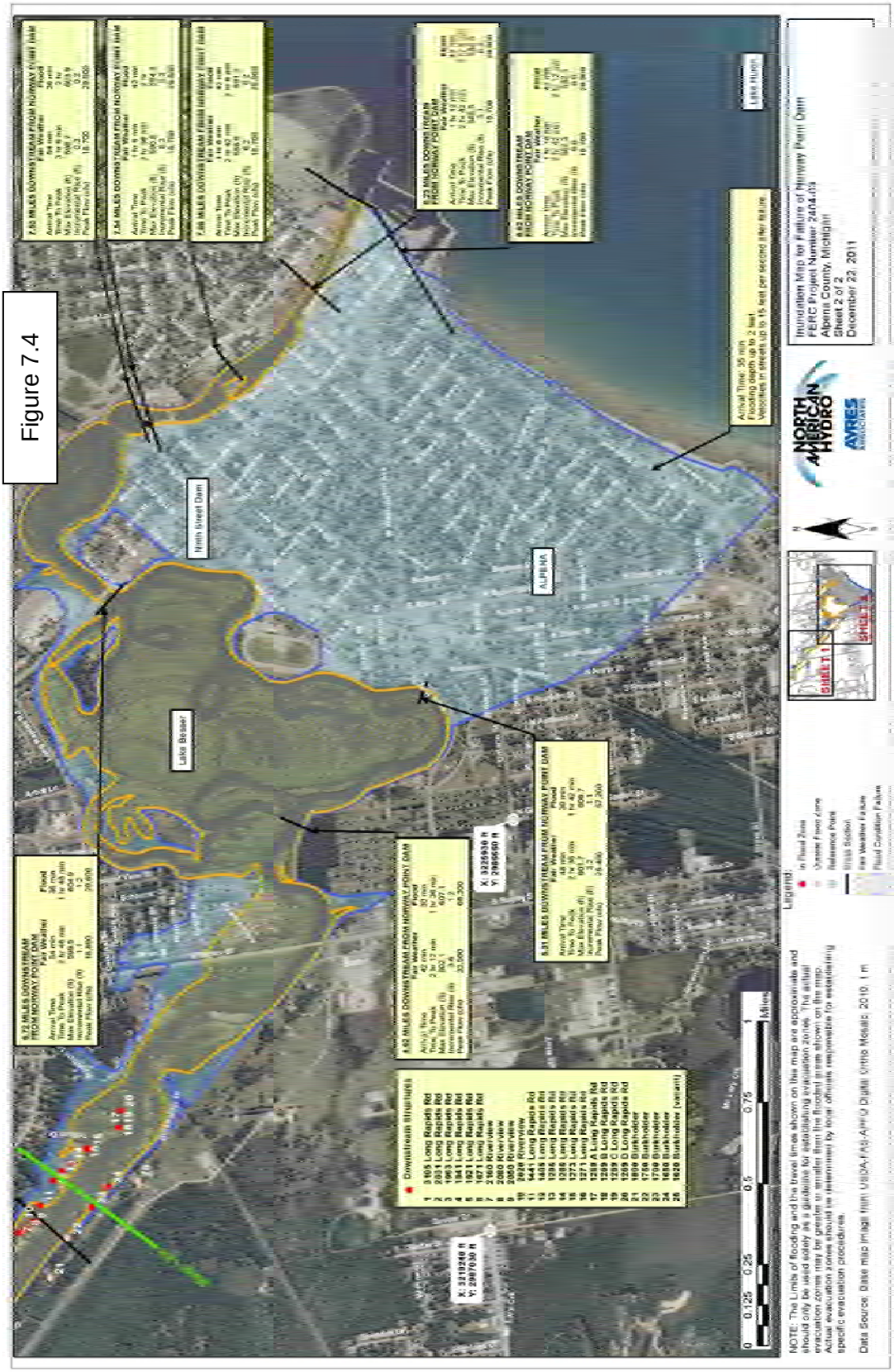


Figure 7.4
Inundation Map for Failure of Norway Point Dam
FERC Project Number 2404-013
Alpena County, Michigan
Sheet 2 of 2
December 22, 2011
Lake Besser
Ninth Street Dam
ALPENA
Lake Huron
Downstream Structures
NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on this map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA-FSA-APFO Digital Ortho Mosaic 2010, 1 m
Legend:
In Flood Zone
Upstream Flood Zone
Reference Point
Flood Condition Failure
NORTH AMERICAN HYDRO
AVRIES

Figure 7.5

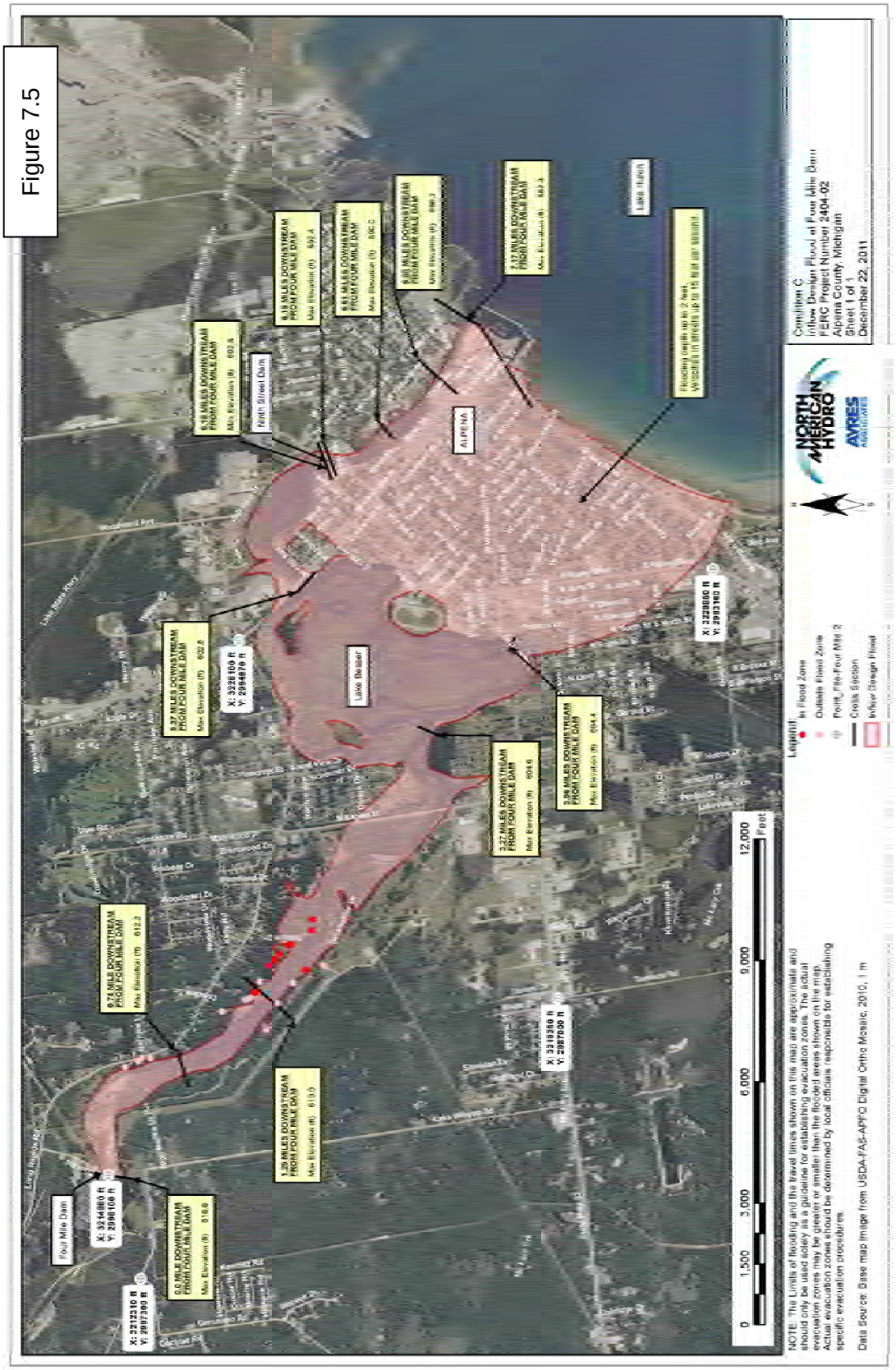
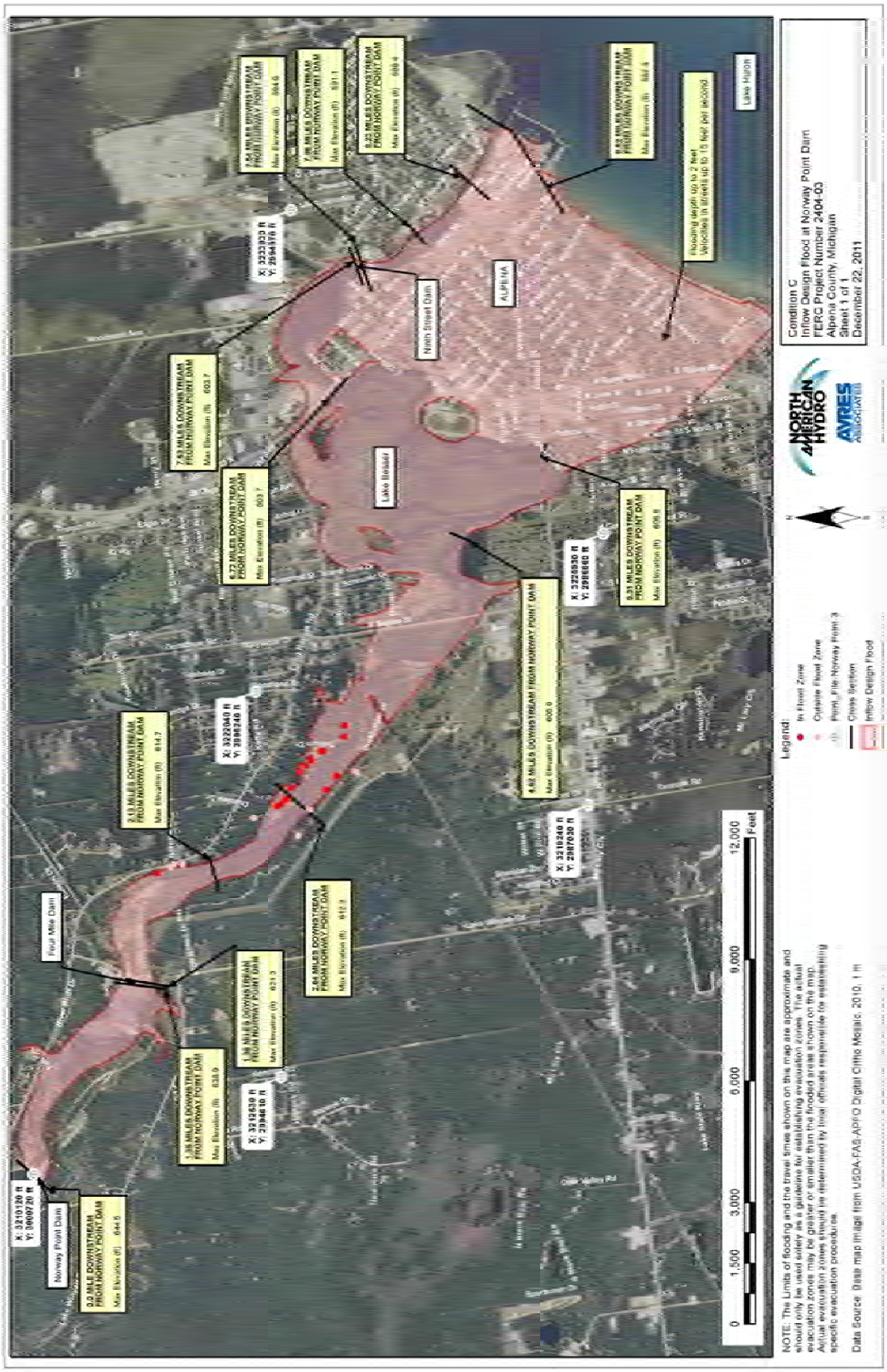

Four Mile Dam
0.0 MILES DOWNSTREAM FROM FOUR MILE DAM
0.71 MILES DOWNSTREAM FROM FOUR MILE DAM
1.29 MILES DOWNSTREAM FROM FOUR MILE DAM
3.27 MILES DOWNSTREAM FROM FOUR MILE DAM
3.86 MILES DOWNSTREAM FROM FOUR MILE DAM
4.37 MILES DOWNSTREAM FROM FOUR MILE DAM
5.19 MILES DOWNSTREAM FROM FOUR MILE DAM
5.61 MILES DOWNSTREAM FROM FOUR MILE DAM
6.09 MILES DOWNSTREAM FROM FOUR MILE DAM
6.49 MILES DOWNSTREAM FROM FOUR MILE DAM
7.17 MILES DOWNSTREAM FROM FOUR MILE DAM
North Street Dam
Lake Besser
Lake Huron
ALPENA
Legend
In Flood Zone
Outside Flood Zone
Point_Fite-Four Mile 2
Cross Section
Inflow Design Flood
NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA-FAS-APFO Digital Ortho Mosaic, 2010, 1 m
0
1,500
3,000
6,000
9,000
12,000
Feet
NORTH AMERICAN HYDRO
AYRES ASSOCIATES
Condition C
Inflow Design Flood of Four Mile Dam
FERC Project Number 2404-02
Alpena County, Michigan
Sheet 1 of 1
December 22, 2011

Figure 7.6


NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA-FAS-APFO Digital Ortho Mosaic, 2010, 1 m
Legend
Reference Point
Cross Section
Inflow Design Flood
NORTH AMERICAN HYDRO
AMRES
Condition C
Inflow Design Flood
at Ninth Street Dam
FERC Project Number 2404-01
Alpena County, Michigan
Sheet 1 of 1
December 22, 2011
Ninth Street Dam
0.00 MILE DOWNSTREAM FROM NINTH STREET DAM
0.93 MILE DOWNSTREAM FROM NINTH STREET DAM
0.93 MILE DOWNSTREAM FROM NINTH STREET DAM
0.93 MILE DOWNSTREAM FROM NINTH STREET DAM
ALPENA
Lake Besser
Lake Huron
0
700
1,400
2,800
4,200
5,600
Feet

Figure 7.7


Norway Point Dam
Four Mile Dam
Ninth Street Dam
Lake Besser
ALPENA
Lake Huron
Legend:
In Flood Zone
Outside Flood Zone
Point_File Norway Point 3
Cross Section
Inflow Design Flood
Condition C
Inflow Design Flood at Norway Point Dam
FERC Project Number 2404-03
Alpena County, Michigan
Sheet 1 of 1
December 22, 2011
NORTH AMERICAN HYDRO
AVIRES ASSOCIATES
0 1,500 3,000 6,000 9,000 12,000 Feet
NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.
Data Source: Base map image from USDA FAS APFO Digital Ortho Mosaic, 2010, 1 m

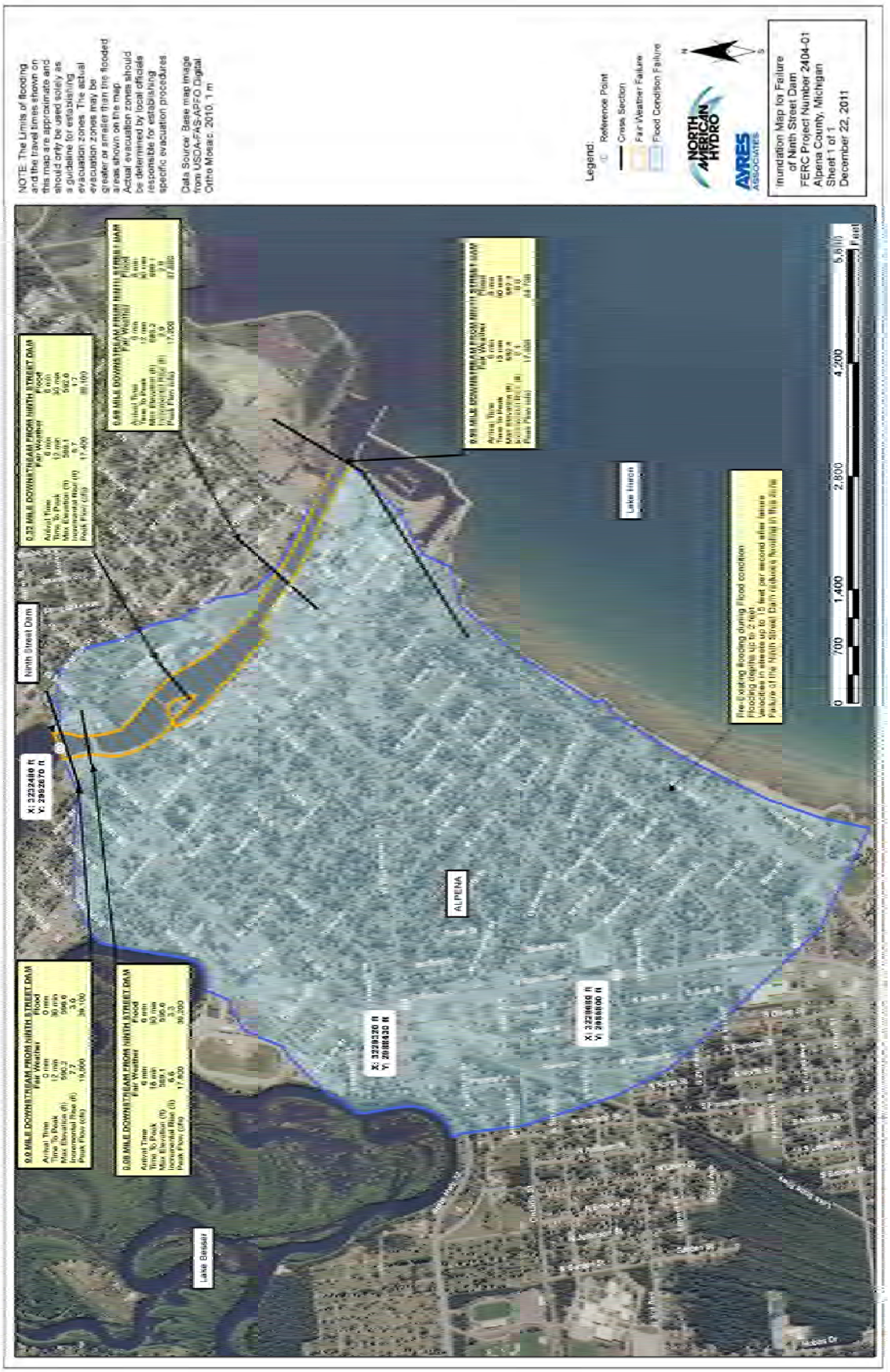
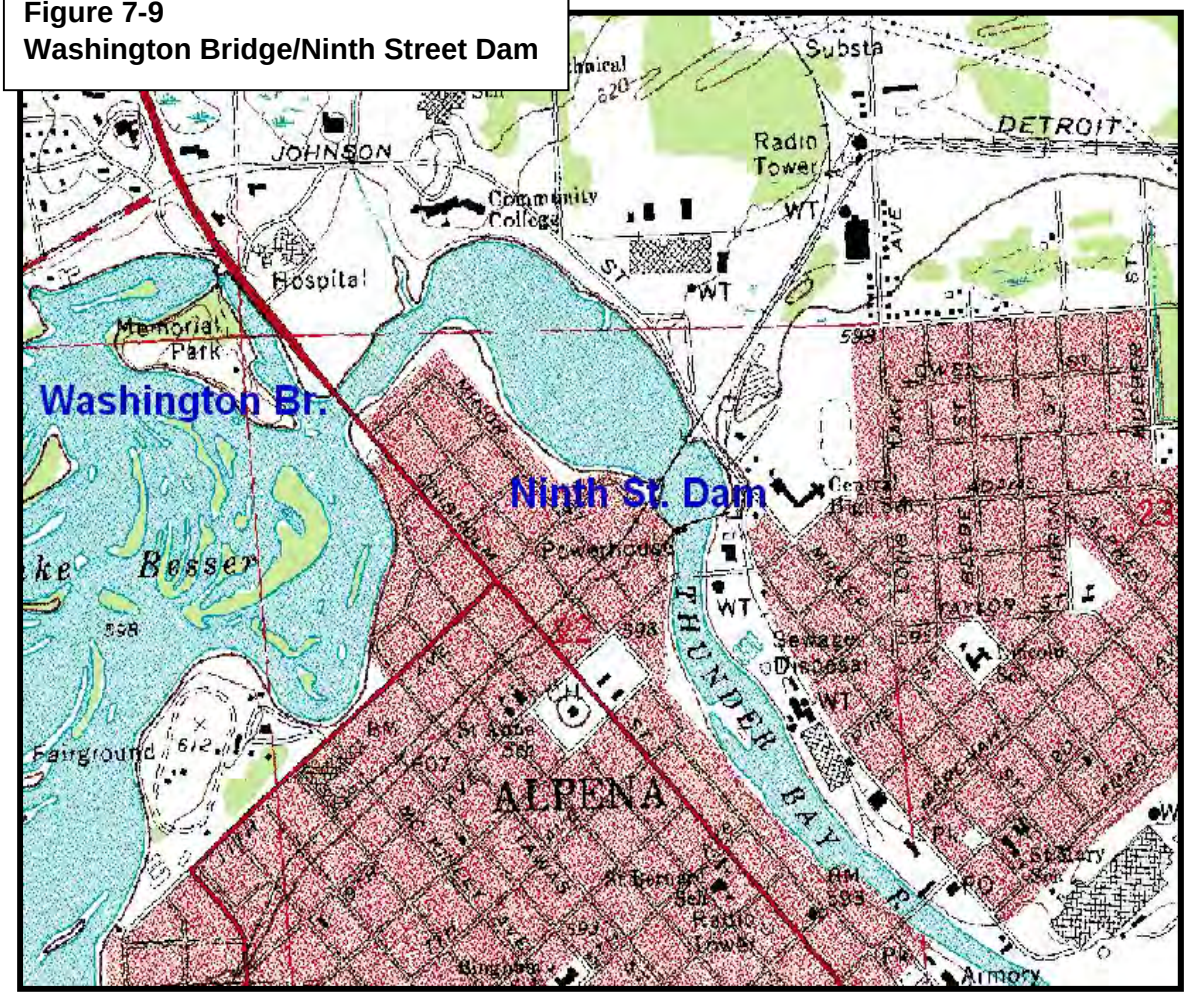

NOTE: The Limits of flooding and the travel times shown on this map are approximate and should only be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the flooded areas shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures
Data Source: Base map image from USDA-FAS-APFO Digital Ortho Mosaic, 2010, 1 m
Legend:
Reference Point
Cross Section
Fair Weather Failure
Flood Condition Failure
NORTH AMERICAN HYDRO
AYRES ASSOCIATES
Inundation Map for Failure of Ninth Street Dam
FERC Project Number 2404-01
Alpena County, Michigan
Sheet 1 of 1
December 22, 2011
Ninth Street Dam
Lake Besser
Lake Huron
ALPENA
0.0 MILE DOWNSTREAM FROM NINTH STREET DAM
Fair Weather
Flood
0.08 MILE DOWNSTREAM FROM NINTH STREET DAM
0.32 MILE DOWNSTREAM FROM NINTH STREET DAM
0.68 MILE DOWNSTREAM FROM NINTH STREET DAM
0.99 MILE DOWNSTREAM FROM NINTH STREET DAM
Flow 6 visiting flooding during Flood condition
Flooding depths up to 2 feet
Velocities in streets up to 15 feet per second after failure
Failure of the Ninth Street Dam reduces flooding in this area
0
700
1,400
2,800
4,200
5,6 (ii)
Feet

Figure 7.8

Riverine and Urban Flooding

The principal flooding concern in Alpena County involves potential flooding from back up at the Washington Bridge on US-23. Although the Ninth Street Dam's maximum designed CFS flow is capable of 27,000 CFS, the dam pool behind the Washington Bridge will rise when CFS flow is 14,000 or greater. **(Figure 7.9)** In 1998, during an extreme high runoff period, the dam pool behind Washington Bridge went up 2.5 feet, causing the storm drainage system to flood and putting water onto 9th and 11th Streets. **)** Proximity of Alpena General Hospital and residential, commercial and industrial development make solution of this problem imperative. Removal of debris left from the previous bridge in the stream channel, bridge extension, and other mitigating practices should be studied and implemented

Figure 7-9
Washington Bridge/Ninth Street Dam



National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP). Since most homeowners' insurance policies did not cover flood, property owners who experienced a flood often found themselves financially devastated and unable to rebuild. The NFIP was formed to fill that gap. To ensure the program did not take on unnecessary risks, one of the key requirements to participate in the program was that communities had to adopt standards for new construction and development.

Pre-existing homes and businesses, though, could remain as they were. Owners of many of these older properties could obtain insurance at lower, subsidized, rates that did not reflect the property's real risk. In addition, as the initial flood risk identified by the NFIP has been updated over the years, many homes and businesses in areas where the revised risk was determined to be higher have also received discounted rates. This "Grandfathering" approach prevented rate increases for existing properties when the flood risk in their area increased.

In 2012, the U.S. Congress passed the Flood Insurance Reform Act of 2012 which calls on the Federal Emergency Management Agency (FEMA), and other agencies, to make a number of changes to the way the NFIP is run. As the law is implemented, some of these changes have already occurred, and others will be implemented in the coming months. Key provisions of the legislation will require the NFIP to raise rates to reflect true flood risk, make the program more financially stable, and change how Flood Insurance Rate Map (FIRM) updates impact policyholders. The changes will mean premium rate increases for some – but not all -- policyholders over time.

In September of 2012 FEMA completed a Countywide Flood Insurance Study and DFIRM (Digital Firm) Status for Alpena County. Alpena, Maple Ridge, and Sanborn Townships and the City of Alpena are participating in the NFIP. Green, Long Rapids, Ossineke, Wellington and Wilson Townships have chosen to not participate at this time.

A review of the State of Michigan database found no incidents of repetitive loss properties in Alpena County.

Fixed Site Hazmat

The Alpena County Emergency Management and LEPC maintain a list of 302 sites, materials and quantities, and key contact information. The County Emergency Management office maintains and updates Emergency Hazmat Response Plans.

Wildfire

The large number of permanent and seasonal homes in northeastern Michigan, coupled with the increase in tourists during the most dry (and therefore most vulnerable) times of the year, greatly increases the risk from wildfires.

"The threat of life and property losses related to wildfires is a significant issue for federal, state and local fire and planning agencies who consider the mix of residential areas and wildlands. The wildland fire threat is part of the more general consideration of human development encroaching wildlands. The March, 2000, edition of the Journal of Forestry reflects this with urban encroachment and wildland fragmentation the principal subject with residential fire one of the specific issues. (Cohen 2000). Presently, the wildland fire threat to homes influences fire

management and protections policies at national and local levels." (Jack D. Cohen, "What is the Wildland Fire Threat to Homes?)

Current research indicates lowering building ignition potential will significantly reduce chances of home destruction without extensive wildland fuel reduction. This becomes an issue of homeowner education and community involvement. Community/homeowner understanding of the methods of lowering home ignition potential is the primary mitigative action to reduce wildland fire threat to residential areas.

To adequately institute practices of lowering home ignitability it will require changing relationships between homeowners and local fire services. Instead of all fire protection responsibilities being with fire agencies, homeowners should take primary responsibility for adequately lowering home ignitability. The role of fire protection agencies becomes that of a community partner to provide homeowners the technical assistance needed to reduce home ignitability. To be successful, this partnership arrangement must be shared and implemented equally by homeowners and fire services.

Projects designed to mitigate the threat of wild fire should evolve from the concepts and materials represented by "Firewise". Firewise is a cooperative effort among federal, state, and private agencies and organizations to promote fire safety in the wildland/urban interface. The primary Firewise tenet is that it is unnecessary to lose homes or other buildings in wildfires if those homes or buildings are built and maintained according to simple Firewise principles. Firefighters cannot be everywhere when a wildfire occurs, but if homeowners follow Firewise suggestions, homes and buildings will survive wildfires without any firefighters being there to protect them. The Firewise program addresses the risk to homes in the wildland/urban interface to wildland fire and provides a potential vehicle upon which a partnership between homeowners and fire services can develop