City of Marysville
Contingency Plan
for Water Supply Disruptions
During Emergencies

Draft

March 2002

Prepared by

Economic and Engineering Services, Inc.
Bellevue, WA • Portland, OR
Olympia, WA • Tri-Cities, WA • Mount Vernon, WA

Economic and Engineering Services, Inc.

MEMORANDUM

TO: Mr. Kevin Nielson, City of Marysville

FROM: Andrew Graham and Cil Pierce
Economic and Engineering Services, Inc.

DATE: March 13, 2002

CLIENT: Marysville Water System Plan (WSP) Update (#3-01-122)

SUBJECT: Draft Water Shortage Contingency Plan

Please find attached a draft of the Contingency Plan for Water Supply Disruptions. This report will be an appendix to the WSP Update. This draft is provided for City project team review.

This Contingency Plan is intended to address hazards that could cause emergency water supply shortages. The hazards include both natural and human-caused hazards. This plan does not address drought, as drought conditions typically occur over a period of time, and the planning for them is not of an immediate and emergency nature. The City has undertaken a planning process for many of the hazards addressed within the Contingency Plan, which culminated in the City's Emergency Response Plan (ERP). EES has reviewed the City's ERP, and refers to it, as appropriate, within this Contingency Plan. This plan complements the City's previous planning activities as presented in the ERP, and provides additional detail with respect to the water system.

We have done our best to identify hazards and mitigation approaches, based on our understanding of the water system. It is important that Marysville staff familiar with the water system and the City's Emergency Response Plan review the material to ensure the findings and recommendations are appropriate for the City's system.

Thank you in advance for your time in reviewing the document. Once EES has received the City's comments on this draft, we will prepare the final document. Please call me if there are any questions.

cc: Melinda Friedman

12011 Bel-Red Road, Suite 201
Bellevue, Washington 98005-2471
www.ees-1.com
Telephone 425 452-8100

Post Office Box 1989
Bellevue, Washington 98009-1989

Fax 425 454-4189

Bellevue • Olympia • Portland • Tri-Cities • Vancouver, B.C.

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Section 1
Overview of Plan

1.1 Introduction

This document presents a response plan for unexpected water supply shortages that may occur as a result of operational disruptions from natural or human-made emergency events. It is imperative that utilities plan for emergency disruptions, in order to be able to quickly restore safe drinking water to customers.

While water utilities cannot plan for every possible emergency, they can prepare reasonable approaches to handling the most probable risks. This plan identifies potential risks to the City's water system, how the event would most likely impact service, identifies measures to take in order to continue to provide or restore service as soon as possible, and proactive measures the City can take to properly prepare for emergencies. Such steps include training, draft water purification notification flyers, priorities for maintaining service, and other important measures. This plan was developed using the AWWA Manual M19, *Emergency Planning for Water Utilities,* as a guideline.

This plan does not address drought related issues as these rarely arise unexpectedly, but occur over a period of time. The City has addressed drought considerations in a separate plan, *The City of Marysville Drought Response Plan*, which was adopted by the City Council in 2001.

1.2 Organization of the Study

This report is organized in a sequential manner that first provides a description of possible hazards, followed by sections that assess the vulnerability of Marysville's water system, by key components, and structural measures that can be implemented to prepare for the probable emergencies. The final sections of the plan address preparedness planning, and training and other non-structural measures that can be taken to prepare for probable hazards. These topics are covered in the following sections:

- Section 2 – Hazard Analysis
- Section 3 – Vulnerability Assessment
- Section 4 – Facility Mitigation, Protection and Backup Plan
- Section 5 – Preparedness Planning for Emergency Response
- Section 6 – Training

Appendices are attached at the end of this report detailing various emergency contacts and forms to be used in preparation for and during response to an incident. These are presented in a format more specific to the water utility, rather than citywide related issues. The City has indicated an interest in maintaining these lists, separate from the lists in the Emergency Response Plan (ERP), since these are water system specific. City staff must enter names and contact numbers which are, for the most part, readily available from various forms in the City's ERP.

1.3 Coordination with Other Emergency Planning Efforts

The City has an extensive city-wide emergency response plan (ERP) in place pertaining to all city functions for emergencies such as those addressed in this plan, both natural and human-caused. This plan focuses primarily on contingency plans if there is a short-term, but immediate reduction in water supply to the system. This plan is intended to be an addition to existing plans, not duplicative. Therefore, references are made to contact lists from the City's Emergency Response Plan for emergency backup assistance, suppliers, contractors, etc. which may be needed in certain emergencies.

It is also important to note that these plans are fluid. As system changes occur or staff changes, updates to the plan must occur, and additional training must be provided to ensure that current staff is familiar with procedures, should an emergency supply situation transpire.

This plan assumes that utility staff assigned to respond in emergencies addressed within this plan are familiar with the following procedures:

- ✓ Safe entry into and operating within confined spaces
- ✓ Safe response to fire
- ✓ Safe response to electrical hazards, including faults and downed wires
- ✓ Safe response to flooding from pump station failures
- ✓ Safe response to flooding from water main breaks

1.4 Summary

Use of this plan should provide the City with essential guidelines needed to meet City goals of providing safe drinking water under emergency circumstances. The next section details the hazards that can lead to reduction in water supply.

Section 2
Hazard Analysis

2.1 Introduction

There are generally two types of hazards that can interrupt supply to water system customers. These are natural and human-caused hazards. This section identifies and describes the various types of hazards that can lead to emergency water shortages or other water system impacts (water quality issues, contamination, etc.). It is important to note that more than one type of hazard can lead to emergency water shortages at once. For example, snow and windstorms can knock out power, which can impact water distribution. Or, fires and power and communication outages can occur as a result of an earthquake. By addressing the probability of each hazard, and how it can impact the City's water system, the City will be more prepared to meet the challenges posed by such hazards. At the end of this section the relative probability of each type of hazard potentially impacting the Marysville water system is provided.

2.2 Natural Emergency Hazards

Within this area there are a number of natural emergencies that could occur. These are described below in general terms, and then the specific potential for their occurrence within the Marysville area is addressed.

2.2.1 Earthquakes

Earthquake impacts occur in a number of different ways. The degree of damage is related to the magnitude of the earthquake, distance from the epicenter (the location of earth's surface directly above the subsurface focus of the earthquake), different types of soil conditions and different types of earthquakes and faults that exist. Luckily, significant research and effort has been made in determining potential fault lines and impact areas. The impacts to a water system are varied depending on the type of earthquake and its effects, as described below.

Faults. A fault rupture is the movement of two land masses along a fault. These land movements generally occur along existing fault lines. There are fault lines within the Puget Sound and Cascade region. Fault lines are sometimes visible from aerial photographs and occasionally at ground level. In addition, they may be mapped by agencies such as the United States Geological Survey (USGS). Many faults, however, have not been mapped and may not be

identified. Any facilities built on or across fault lines are susceptible to structural failure. This can impede water supply as well.

Fault lines surround Marysville. Readily available USGS seismic information indicates that there are at least 3 known fault lines within a 60-mile radius of the city. These include the North Whidbey Island, South Whidbey Island, and Seattle fault lines. Information from the USGS indicates that there could be many other unidentified fault lines along which earthquakes can occur.

Ground shaking. The energy generated by an earthquake radiates out from the fault line, central point, or epicenter like ripples caused by a stone thrown into a pond. The waves cause the ground to shake. The closer to the epicenter, the more violent and vertical the ground shaking, and likewise, the farther from the epicenter, the less impact from the earthquake and the more rolling the ground shaking will be. The energy released from an earthquake produces both vertical and horizontal accelerations that can damage water system components. For example, elevated storage tanks can be susceptible to failure from tipping due to water "sloshing" from the ground movement. Or, a waterline without flexible joints adjoining a concrete structure can be subject to shear force, and failure. While the earthquake epicenter may not occur within city limits, the damage can still be significant, depending on the depth of the movement, distance from the epicenter, and the duration of the earthquake.

The most recent earthquake to occur in this area and cause significant damage was the February 28, 2001 earthquake. Damage was minor for the Richter scale reading of 6.8 because the tremor occurred nearly 30 miles below the earth's surface. The epicenter was in the southern Puget Sound area, near Olympia, Washington.

Liquefaction. This phenomenon occurs when the water particles located in the space between soil particles, gain pressure that overpowers the friction between the soil particles. The result is a water-soil slurry that has reduced shear strength. Damage from such action can include foundation failure, differential settlement, lateral spreading, or floating of underground components. Liquefaction can also result in a loss of slope stability and, therefore, lead to landslides. Soils where this is most likely to occur include loose, sandier soils, particularly with high water content. Fill sites are often subject to liquefaction. This phenomenon transpired in the 1989 San Francisco earthquake where areas built on fill had major foundation and structural failures along with gas line leaks and resultant fires.

Densification and Consolidations. Conversely, some soils can become more dense from the ground shaking of the earthquake. Ground subsidence can occur as a result. Foundation and structural failures can occur and shear forces can impact pipelines.

Landslides. As noted earlier, landslides can occur as a slope loses it shear strength and stability. Typically, earthquake-induced landslides are the result of ground shaking or liquefaction.

Tsunami and Seiche. A tsunami is a tidal wave caused by an earthquake or volcanic explosion. A seiche is an oscillation of the surface of a lake or reservoir due to an earthquake. This phenomenon is similar to the "sloshing" that can occur in an elevated tank, but is transferred directly to the water body from the ground shaking in the surrounding land. A seiche can damage dam inlet and outlet facilities or overtop dams, and lead to dam failure. Tsunamis and seiches are dangerous, high waves. They can also be caused by landslides, resulting from an earthquake. They can cause moderate to severe damage along coastal and shoreline areas.

2.2.2 Volcanic Eruptions

Volcanic activity occurs in the Cascade Range. Most recently, Mt. St. Helen's erupted in 1980. All the volcanic peaks in the Cascades have potential to turn active, although there is no known significant activity currently. Hazards from eruptions can include explosive winds, pyroclastic flows containing hot gases, mudflows, falling rock, floods due to mud and snowmelt, and ash. In the Mt. St. Helen's eruption, mudflows and ash were two of the largest impacts, with the ash spreading throughout the Northwest.

Mt. Baker and Glacier Peak are the nearest volcanoes to Marysville. Both are north of the city. Any glacial melt that would occur as the result of volcanic activity would not impact the city as the flows from the nearest peak, Glacier Peak, would enter the Skagit River which is north of the city and lies in a different basin. In addition, the Sultan River, which supplies 40-50% of the City's water supply through the Marysville/Everett Joint Operating Agreement (JOA) pipeline, has no direct flow or impact from any of the major Cascade Range volcanoes.

2.2.3 Flooding

The Northwest is typically impacted by some level of flooding each year, due to the average rainfall the region typically receives. In addition, as noted above, floods can be caused by dam failure due to earthquakes, volcanic eruption impacts, tsunami and seiches. Rapid snowmelt, particularly when combined with high levels of rainfall, can also cause flooding. Flooding can not only impact facilities directly, it can prevent access for repair and maintenance, and can lead to poor water quality when sources are compromised.

2.2.4 Hurricanes, Tornados and Windstorms

While tornados typically impact areas primarily by the heavy winds, hurricanes and windstorms also bring rains, sometimes hail and other weather patterns. This weather can damage water system components which can in turn, reduce source availability or quality. The impacts of each storm type are briefly described below.

Hurricanes. For a storm to be named a hurricane winds must exceed 70 mph. Winds from hurricanes have been recorded as high as 200 mph. These storms also bring devastating rains as well. Luckily, in the Pacific Northwest, these storms are extremely rare. Hurricanes can be tracked by radar, and therefore warnings can be issued. However, most above ground water system facilities are not built to withstand the forces these winds exert.

Tornados. Tornados devastate anything in the direct path of the funnel. Areas 100 feet from the funnel can be completely safe from damage. Therefore, damage is isolated to a relatively narrow swath. Unfortunately, these storms move in unpredictable patterns and sometimes materialize unexpectedly. However, most of time these storms can also be tracked by radar and warnings provided. Scientists believe winds in tornados reach 300 mph, but have little recorded data because wind gauges can't survive the strength of the winds. These storms also are very uncommon in the Marysville area.

Windstorms. Windstorms are common in the Northwest, including Marysville. The common time of year is the fall, but windstorms have also occurred in mid-summer. These storms come through the area, most often accompanied by rains, sometimes hail and occasionally they are accompanied by electrical storms. Winds of 50 mph or higher can occur. Most often temperatures are mild, but temperatures can drop below freezing as well. (Impacts from electrical storms and freezing conditions are discussed below.)

These storms typically knock out power when trees and limbs fall on power lines. This can impact transmission of water into and through the distribution system. In addition, the storms can impede staff from operating and maintaining the system when fallen trees and debris in the roadways prevent access to areas. For perspective, hundreds of thousands of electricity customers throughout the Puget Sound went without power for days after the Inaugural Day windstorm of 1992 where winds approached 90 mph.

2.2.5 Other Severe Weather (Intense Cold, Ice, Snow and Electrical Storms)

In the Northwest extreme weather is rare. Occasionally snow, freezing rain and ice can prevent maintenance crews from accessing facilities that may need repair or maintenance. This can occasionally impact water system operations, and the ability to perform routine maintenance and operational checks on system components.

The typical impact, caused by heavy snow or ice, is fallen trees and power lines or trees or debris on roadways or onto facilities. Occasionally this area will experience temperatures below freezing for more than 3 days. This can lead to difficulty in operating some facilities; valves and waterline leaks from freezing; and ruptured pipes at private residences causing an increase in demand. These impacts are usually temporary in nature.

Electrical storms have relatively the same impacts due to fallen trees. In extremely dry conditions electrical storms can also lead to fires. However, this situation is less likely to occur in the Marysville area due to lack of brush and forests. Occasionally electrical storms can cause power outages due to electrical strikes on transformers. Power outages can impact source, transmission and treatment facilities without standby or backup power supplies. Outages can also effect the ability to monitor and manage the facilities through the telemetry system.

2.2.6 Mudslides/Landslides

Mudslides and landslides can occur on unstable or steep slopes at anytime, but particularly after extended periods of rainfall or due to earthquakes, as noted above. In Marysville, the areas more prone to landslides include the southeast areas where there are slopes up into the Lake Stevens area. While there are slopes in this section, a review of Snohomish County's landslide history from 1941 through 1993 shows no occurrence of slides in this area. While the potential remains, historically, no slides are recorded. Should slides occur, the typical impact is to lines located within the slope. Breakage or blockage of lines can occur as the support around them gives way, or pulls them down with the surrounding earth.

2.2.7 Forest or Brush Fires

Forest fires can damage watersheds and water system structures. If water supply is used in fighting these fires, supply can be strained. Due to the recent growth of urban development in the Marysville area, this type of threat is less of a hazard within the City's own system, than in previous years. However, the Sultan River Basin has more probability of forest or brush fires. The watershed is a protected area but lightning strikes could occur within the area in summer, with drier conditions. If forested areas burn, sedimentation in the watershed can occur, resulting

in turbidity in this portion of the water supply. The City of Everett manages and treats this water source. The filtration plant is equipped to handle certain levels of turbidity. The City has a complete watershed protection plan and emergency response plan wherein this issue is addressed, thereby reducing the potential impact to the Marysville water system. However, the possibility exists that, should a large forest fire occur within this watershed, Marysville's water supply could be significantly impacted.

2.2.8 Waterborne Disease

Outbreaks of *Giardia* or *Cryptosporidium* are hazards that any surface water system faces. Planned filtration of the Stillaguamish water source will provide required protection according to the USEPA Surface Water Treatment Rule. The Edward Springs supply will not require filtration, and will be able to meet microbial inactivation requirements through disinfection. In the future, additional Cryptosporidium inactivation will likely be required at Edward Springs. Waterborne disease is managed as a low hazard to the system. Routine water treatment, sampling, and analyses are performed in compliance with safe drinking water regulations.

All of the above hazards, with the exception of waterborne disease, can impact transportation, at least partially. This is caused either by damaged roadways or debris in or across roadways. Anytime this occurs, it impacts the ability to repair, maintain, inspect and possibly operate facilities. This in turn, can impact the ability to supply safe drinking water to Marysville's customers.

2.3 Human-Caused Hazards

Along with the hazards described above, there are numerous hazards all water systems face that can be caused by a variety of human activities. Hazards that can impact the ability of a utility to supply safe drinking water are described below.

2.3.1 Hazardous Material Release

The definition used for purposes of this plan includes any chemical that can cause harm to humans through contamination of the water supply. Some chemicals that are used in water systems, such as chlorine, can be hazardous if too large a concentration is obtained. Spills of hazardous materials can occur from pipelines (such as the gas line leak in Bellingham in 1999), any mode of transportation, including ships, boats, airplanes, cars, trucks, or trains. Spills can be liquid, solid or gaseous. The more difficult to manage, and return water supply to normal operations, are typically liquid and gaseous spills. The obvious impact of such a hazard is the potential contamination of the water source.

2.3.2 Structural Fires

Fire can impact a water system in a number of ways. If the fire is at a water system location, such as a pump house or treatment facility, the ability to provide water will be impacted. Key computer control systems can also be affected by fire and require repair before operations can return to normal. In addition, water supplies can be depleted in the case of firefighting efforts for a large fire involving a wide area of the City. Temporary short conserving measures may need to be implemented to meet all priority water consumption needs.

2.3.3 Construction or Transportation Accidents

System components can be, and often are, damaged when construction occurs near facilities. The most typical impact is damage to pipelines when construction is underway nearby. Facilities can also be damaged by transportation accidents. For example, elevated reservoirs or pump stations can be struck by motor vehicles or airplanes. Service can be curtailed if a system component is off-line due to a transportation or construction accident. These impacts are usually short in duration, with repairs usually made within 24 – 48 hours of the incident. Other transportation accident impacts can include restriction of staff being able to access facilities or to arrive to work if major freeways or arterials are closed due to serious accidents or spills. Again, these types of situations are usually handled within at least a 24 hour period, with the roadway made at least partially accessible or detours identified.

2.3.4 Nuclear Power Plant Accidents and Nuclear Explosions

An accident at a nuclear power facility could potentially release airborne radiation, with effects on personnel, water sources, and facilities in the downwind direction. The nearest nuclear facility is at Hanford, in eastern Washington. Usual prevailing winds would not generate an impact to Marysville's water supply.

Another type of potential nuclear hazard is contamination by detonation of nuclear devices at facilities such as Bangor Nuclear Submarine Station on Whidbey Island, or possibly nuclear warheads at Fort Lewis or McCord Air Force Base south of Seattle. While such possibilities are remote, the utility must be prepared to respond to such an emergency.

2.3.5 Computer System Failure or Attack

Computer failure can occur from widespread or isolated electric outages. As noted above, this can impact operation of instrumentation and controls, and ultimately the functioning of facilities. Again, with power out, additional staff resources are required to manage the system manually.

One example of potential computer system failure is the Y2K situation. Agencies responsible for a variety of services upgraded systems in order to avoid errors and possible failure of computer systems.

Another real hazard to any computer systems used to manage, monitor, or maintain records is computer virus attacks. These attacks affect the ability of a system to function temporarily, or can completely wipe out whole systems. These threats are real and unpredictable.

2.3.6 Vandalism, Riots, and Strikes

Vandalism and riots would most likely affect elevated structural facilities, such as pump stations, treatment plants, dams, water towers, and City office buildings. There are a number of measures that can be taken to limit exposure to this type of hazard. Strikes of unionized operations staff can impact water service, but normally management employees can fill in on operational tasks until union issues are resolved. In most cases impacts will be temporary. However, if tensions are high, access to facilities by union employees would need to be restricted to reduce the potential for damage. Riots and strikes could also block access to transportation routes used by water system personnel.

2.3.7 Terrorism

Terrorism is a real threat. Prior to the international terrorist attack of September 11, 2001 on United States soil, this threat was considered less likely than local vandalism impacts. However, the threat of this hazard must be addressed seriously for the potential of supply contamination, or damage to water facilities. While terrorism at a national or international level remains somewhat remote, because of Marysville's size and lack of relative prominence, it is close enough to the Seattle metropolitan area to require preparedness for this type of hazard. Additionally, local terrorism, including "copycat" events, may potentially pose a threat to Marysville. In addition to destruction of facilities, release of chemical or biological agents into the water system is a hazard that should be considered.

2.4 Summary of Hazard Analysis

Given the discussion provided above, of the various types of hazards a water utility must address, an estimate of probability of the various hazards to the City's water system was made. Table 2-1 presents the hazards described above with the estimated probability of occurrence within Marysville's water service area. The estimated probability is a relative probability, and is based on general common knowledge of storm systems and weather patterns, research conducted regarding the City's vulnerability to earthquakes, geological information, landslide data,

pertinent maps of the Marysville area, and EES staff's interpretation of this data. None of the hazards described above are deemed to be of a high probability for the City's water system. Those hazards that are identified as having a low – moderate or moderate probability of occurring in the Marysville' area are addressed in the next section, along with potential impacts to critical operational components of the system.

Table 2-1
Hazard Table

Type of Hazard	Estimated Probability	Comments
Natural Hazards		
Earthquake		
Fault rupture	Low	
Ground shaking	low – moderate	3.0 – 6.0 typical
Liquefaction	low – moderate	7.0 – 9.0 unlikely
Densification	Low	Alluvial till
Landslide	Low	
Tsunami and seiche	Low	Inland
Volcanic eruptions	low – moderate	Mt. Baker; ash impact from others
Hurricane	very low	
Tornados	very low	
Wind	Moderate	
Floods	low – moderate	Stillaguamish River: 100 year Ebey Slough numerous creeks
Other severe weather		
Lightning	low-moderate	
Snow or ice	Moderate	
Mudslides/Landslides	low	southeast section of service area
Waterborne diseases	low	
Human-Caused Hazards		
Hazardous-material release/spill		
Chlorine	low – moderate	
Other Spill	low – moderate	
Structure fires	moderate	
Construction accidents	moderate	
Transportation accidents		
Road	moderate	
Rail	moderate	
Water	low	
Air	low	
Computer failure or attack	low - moderate	
Vandalism, Riots and Strikes	low – moderate	2001 incident in Sultan
Terrorism	low - moderate	
Nuclear power plant accidents	very low	Hanford nearest site
Nuclear bomb explosions	low	McChord Air Force Base Bangor Naval Submarine Base

Section 3
Vulnerability Assessment

3.1 Introduction

In this section the vulnerability of major components of the City's water system to hazards is addressed. The vulnerability assessment presented is a two-step process. First, key components of the water supply system that could be impacted by the hazards described in the previous section must be identified. Secondly, after each system component, an estimate of the potential impacts if this system component is compromised is described. Acceptable levels of service for the system, from which the impacts are measured are those identified in Chapter 8 of the Comprehensive Plan.

Before beginning the assessment, a general description of the City's system is provided as a reference point for the general public/more casual reader.

3.2 General Water System Description

The City's system serves approximately 16,000 connections, and a population of about 25,315. The service area includes locations within the City and within the Coordinated Water Service Area. (CWSA) and those outside the CWSA. This covers approximately 10 square miles of service area.

The City's water system has numerous types of water sources providing for customer usage. Edwards Springs, four wells, surface water of the Stillaguamish River and Lake Chaplain and the Sultan River (through the City of Everett's water supply) are the various sources. The distribution system includes four pressure zones and six storage tanks. The flexibility of the various types of water sources contributing to the overall water supply undoubtedly enhances the City's ability to respond to various types of service interruptions.

A more detailed system description is provided in Chapter 2 of the Comprehensive Water System Plan.

3.3 Major System Components

To begin this process, an overall, system-wide view was taken. All system components were assessed for each of the hazards rated as "moderate" or "low-moderate" probability discussed in

Table 2-1. For example, hurricanes and tornados are not addressed due to the "low probability" of occurrence. Table 3-1 provides a summary of the City's system and critical components impacted by the various hazards described in Section 2. A vulnerability assessment form from the AWWA manual, *Emergency Planning for Water Utilities*, was used to evaluate eight of the most critical system components. This assisted in assessing overall impacts caused by potential failures. Assessments are based on date of construction, construction materials, descriptions of systems components in the previously completed Comprehensive Water System Plan, descriptions in the City's Emergency Response Plan (ERP), and geographic location. Following this table is a description of the critical water system components and the impacts to the water system if any of these hazards impair, damage or otherwise limit the system components.

3.3.1 Personnel

Aside from access to clean water, personnel is the most important resource for any water system. City crews maintain, operate, and repair facilities that provide water to the customers. Management manages the system and leads emergency efforts. Management can also assist in routine duties when necessary. Personnel safety and access to system components are key to staff ability to carry out their responsibilities. With many of the hazards described above, staff can be injured, or face needs related to their families and homes. Roadways can have blockages from debris, damage caused by flooding, earthquakes or volcanic eruptions and side effects such as mudslides. Or, hazardous spills can close roadways for hours. In these situations, staff access to facilities, or ability to get to work, can be impacted. In addition, vandalism to either the buildings housing facilities, supplies, or vandalism to vehicles can also impede ability to perform routine duties.

In the case of storms causing power outages and roadway blockages, staff will be required to manually operate some system components but may have limited access to them due to road conditions. Depending on access to components, the impact to the system will vary. These situations, with multiple impacts, must be considered in developing preparedness plans, as discussed in Sections 4 and 5.

Table 3-1
Disaster Effects Matrix of Hazards & System Components[1]

System Components - Likely damage, loss, or shortage due to hazards	Earthquake	Volcanic eruptions	Floods	Wind, Snow, & Storms	Mudslides/ Landslides	Waterborne disease	Hazardous material	Structure fire	Construction accidents	Transportation accidents	Computer Viruses	Vandal, riots, strikes	Terrorism	Nuclear Accidents
Administration/operation														
Personnel[2]	■	■	■	■		■		■				■	■	■
Facilities/equipment	■	■	■	■				■	■		■	■	■	■
Records	■		■					■			■		■	■
Source Water[3]														
Surface water														
Stillaguamish Ranney Collector	■	■	■	■		■	■					■	■	■
Lake Chaplain	■	■	■		■	■	■					■	■	■
Groundwater sources														
Edwards Springs	■	■	■	■		■	■					■	■	■
Sunnyside Well #2	■		■	■		■	■					■	■	■
Goodwin Well	■		■	■		■	■					■	■	■
Highway 9 Well	■		■	■		■	■					■	■	■
Treatment[3]														
Facility Structures														
Stillaquamish Trt Plt	■	■	■	■			■	■	■			■	■	■
Chaplain Filt. (Ever.)	■	■	■	■	■		■	■	■			■	■	■
Storage Tanks[3]														
Edward Springs Res.	■	■		■					■	■		■	■	■
Getchell Hill Res.	■	■		■						■		■	■	■
Highway 9 Reservoir	■	■		■						■		■	■	■
Cedarcrest Reservoir	■	■		■						■		■	■	■
Kellog-Marsh Stdpipe	■	■		■						■		■	■	■
Sunnyside Standpipe	■	■		■						■		■	■	■

Table 3-1 (continued)
Disaster Effects Matrix of Hazards & System Components[1]

System Components - Likely damage, loss, or shortage due to hazards	Earthquake	Volcanic Eruptions	Floods	Wind, Snow, & Storms	Mudslides/ Landslides	Waterborne Disease	Hazardous Material	Structure Fire	Construction Accidents	Transportation Accidents	Computer Viruses	Vandal, Riots, Strikes	Terrorism	Nuclear Accidents
Transmission Pipelines[3]														
JOA 30" Pipeline	■		■						■			■	■	
Stillaguamish Line	■		■						■			■	■	
Edward Springs 12"	■		■						■			■	■	
Everett No. 3 Line	■		■						■			■	■	
Pump Stations	■	■	■	■				■	■	■		■		
Distribution														
Watermains, valves	■			■	■				■			■		
Pump or PRV stations	■	■	■	■				■	■	■		■		
Supplies and Parts	■	■	■	■				■				■		
Electric Power														
Substations	■	■	■	■				■	■	■		■	■	
Transmission Lines	■	■	■	■					■	■		■		
Transformers	■	■	■	■				■	■	■		■		
Standby generators			■	■				■	■	■		■		
Transportation														
Roadway infrastructure	■	■	■						■	■			■	
Roadway Blockages	■	■	■	■			■	■	■	■	■	■	■	
Vehicles[3]		■	■	■				■				■		
Maintenance Facilities	■	■	■	■			■	■	■			■	■	
Communications														
Telephone	■	■		■				■	■	■		■	■	■
Two-way radio								■?			■	■	■	
Networks/Email/Records	■	■	■	■	■			■	■		■	■		■
								■			■	■	■	
Instrumentation/Controls														
Telemetry	■	■	■	■	■			■	■		■	■		

1. Low probability events are not included.
2. Items listed could potentially affect a large number of employees simultaneously, and affect City capabilities to provide service.
3. Controls for these components are addressed under "Instrumentation/Controls" at the end of the table.

3.3.2 Source of Supply

Marysville's peak day demand is currently 88 percent of the total installed primary source capacity. Loss of any source of supply for the Marysville system during emergency conditions will result in a decrease in the ability to meet peak day demands. Loss of any one of the four primary sources (Lake Chaplain, Stillaguamish, Edward Springs & Lake Goodwin Well) sources will drop the source capacity to a level below peak day demand levels. Supply capacity will be close to average day demand levels with the loss of the Lake Chaplain source. A loss of any source will result in the need for short-term emergency curtailment of demands and the use of current emergency only sources (Highway 9 well and Sunnyside Well No. 2).

Loss of source could be caused by any number of emergency conditions including contamination, loss of power for treatment and pumping, pump breakdown, or transmission pipeline breakage.

Depending on the source that is lost, portions of the Marysville system will experience the impacts to a greater or lesser degree. For example, if the Lake Chaplain source is lost, the southern portion of the Marysville system will experience greater impacts than the northern portion, although impacts will be felt throughout the entire system.

Edward Springs. This source serves northern service area. Disruption of this source would impact this geographic area.

Stillaguamish Ranney Collector. This source of supply serves the north and eastern portions of the service area.

Lake Chaplain (Everett water). This water source enters the system in the southern portion of the service area, and serves the southern area.

Sunnyside Well #2. This well is used for emergency purposes and serves the southern service area. Loss of this emergency well would only impact the system if other systems, which it supports as a backup supply, were impacted as well.

Lake Goodwin Well. This well serves the northwest section of the service area. It is primarily backup supply to Edward Springs, so by itself, would not have a large impact on the system should it alone fail. There are a few customers served directly by the Lake Goodwin Well.

Highway 9 Well. This well is used for emergency purposes and serves the southern service area. Loss of this emergency well would only impact the system if other systems, which it

supports as a backup supply, were impacted as well. If the Cedarcrest booster station is out of service, the Highway 9 Well is the sole source for the 510 pressure zone.

3.3.3 Treatment

Treatment facilities are required at the Stillaguamish and Edward Springs sources to meet Federal and State Department of Health Drinking Water Standards. A treatment failure could be caused by electrical power shortage, fire, earthquake damage, flooding, vandalism, terrorism, or computer failure or attack. If the treatment system is bypassed, water quality will be impacted. Boil water orders may be required. Although bypassed water will not meet drinking water quality regulations without boiling, water can still be supplied for other domestic uses and fire protection.

Stillaguamish Treatment Plant. This filtration plant is planned for construction in 2002 and 2003. Once completed, it could potentially be impacted by those hazards noted above. Hazardous material spills or chlorine leaks could also occur at the plant, causing a partial or complete shutdown until cleanup is complete. Transportation accidents are possible due to the fact that the primary road leading to Arlington, from the west, is near the facility.

Lake Chaplain Filtration (Everett water). The filtration plant at Lake Chaplain is owned and operated by the City of Everett, and serves a large portion of the Snohomish County population. If this plant were to become inoperable for any reason, it would affect water supply from the JOA pipeline. One of the greater risks to this filtration plant may be flooding, as it sits at the base of the diversion dam. Hazardous material spills or chlorine leaks could also occur at the plant, causing a partial or complete shutdown until cleanup is complete.

Edwards Springs. This water source has chlorination as the disinfection treatment. At this time filtration is not required. Onsite chlorination containers increase the possibility of either higher than acceptable levels of chlorination concentrations in the water supply through spills or system failure, or the possibility of fire. If the disinfection system were not operating properly due to any hazard, this supply would not be available and the impacts noted above, under source of supply, would apply.

3.3.4 Storage Tanks and Reservoirs

Sudden loss of any reservoir will have a distinct impact on the water system. Each reservoir provides unique support to the distribution system. For example, the Highway 9 Reservoir is the highest reservoir in the system. Loss of this reservoir would eliminate all emergency storage in the highest zone and force the demand to be met solely from the Cedarcrest Pump station. This

station was not designed to be operated in this manner. Loss of the Edward Springs reservoir would cut the volume of citywide storage in half.

In addition, sudden loss of water from any of the reservoirs would cause a significant amount of water to run across the surface, flooding structures located near the reservoirs and causing extensive damage to the ground.

3.3.5 Pump Stations

Pump stations in the City of Marysville primarily are used to transport water from one pressure zone to a higher zone. Pump stations that transport water from sources to the system are discussed in Section 3.3.2.

Pump stations are not the sole source of water to any pressure zone; even the highest zone has a well that is capable of providing some source water on an emergency basis. Thus, loss of any one pump station will not have a significant impact on the overall operation of the distribution system. There will be some minor impacts, such as a need to temporarily curtail demand in localized areas or the need to deliver water to a zone through less used and efficient manners (PRVs from upper zones, use of emergency wells, etc).

3.3.6 Transmission Mains

The transmission lines serving Marysville convey treated water from source and treatment facilities to the distribution system in Marysville's service area. These lines include:

- Edwards Springs Pipeline
- Stillaguamish River Pipeline
- JOA 30" Pipeline (receives water from Everett #3 Pipeline)
- Everett #3 Pipeline from Lake Chaplain

An emergency condition interrupting the flow of water through one of these pipelines would have impacts essentially identical to those previously described for disruption of water supply from the City's source facilities. Loss of transmission in any one of these four main transmission lines will bring supply to a level below peak day demand. However, if only one line is disrupted, average day demand can be met, especially if short-term emergency demand reduction actions are implemented.

These impacts would be felt in the same portions of the service area as described previously for the respective sources.

3.3.7 Distribution Lines

Distribution lines have less of a system-wide impact than transmission lines, due to the smaller diameter size pipe and localized areas typically effected by disruption of flow caused by one of the hazards. As noted in Section 2, Marysville is in an area subject to earthquakes. If a large magnitude earthquake occurred with an epicenter near the City, some older lines would likely fail. The City has listed those lines considered susceptible to earthquake damage in the ERP. This topic is further discussed in Section 4, the Mitigation Plan.

Damage to distribution lines can also occur with extended period of freezing temperatures where valves become difficult to operate, and service lines rupture after the freeze and thaw cycle transpires. This will lead to loss of supply through leaks until valves can isolate leaking areas and repairs can occur.

3.3.8 Electric Power

Electrical power is required for operation of the City's water system. It powers the pumps, instrumentation and controls. There is a portable backup generator that can provide power for one source of supply, and manual operation of systems can occur. However, wide spread loss of power would reduce production and transmission. The result and impact would be similar to that described above for loss of supply and transmission, with need for emergency demand reductions and re-routing of supply, depending on which systems are effected. Fire flow would also be reduced in effected areas of supply reduction.

As described earlier, electrical transmission lines can be effected by any of the storm types described in Section 2, by trees or limbs falling on lines and shutting power off in certain areas. Transformers can receive lightening strikes during storms, interrupting service until repairs are made. This would have the same impact as noted immediately above for power outages.

3.3.9 Transportation

Earthquake or floods can effect roadway infrastructure directly, or bridges can be vandalized or damaged through acts of terrorism, or damaged in floods. Any damage in roadways limits staff access to facilities for maintenance and operations, particularly in times of emergencies. Impacts due to hazards of this nature cannot be easily quantified, except to note there is potential limitation to facility access if this type of emergency occurs. Additionally, roadway blockages caused by storms can limit access to system facilities and can impede system operations.

Vehicles can be effected by ash from volcanic eruptions, floods, fire, vandalism, and debris falling during storms. The same impact occurs, where some limited access to system facilities

can occur. However, alternative transportation can be obtained. Therefore, impact in this area is more manageable and less severe to service and system operation.

The location of maintenance facilities, where vehicles and supplies are stored is important in evaluating vulnerability. The Marysville maintenance facility is located near the Ebey Slough. Hazards most likely to impact the facilities and access to supplies include structural fire, vandalism, terrorism, storms, flooding, and earthquakes. The water system can operate independent of this facility except that telemetry could be impacted. This in turn, could result in the need for manual adjustment of system components for flow. However, access to supplies for repair and maintenance could be temporarily limited by any of the noted hazards. Hazardous material spills also have potential to occur at this site, which could also temporarily limit access to information and supplies.

3.3.10 Communications and Records

Impacts to communications are similar to those for electrical power systems. Communication wires for telephone can receive storm damage. Today, with cell phones, two-way radio and email, other modes of communication limit the impacts of any one system from most of the hazards noted above. However, if a large storm or earthquake occurs, and causes multiple impacts (mudslides, flooding, communications line damage) or multiple hazards occur at once (a computer virus affecting email and a storm affecting telephone communications, including cell phones) the impacts could be greater. In this case, staff resources could be affected because it could require reporting in person to a central location to share information about facility operational status in order to manage the system properly. However, the City has a radio system. As long as the infrastructure for this communication system is not damaged, this will provide for communication regarding system facilities.

The City's radio system's transmitter is located at City Hall. This location reduces exposure to flooding potential. There is also increased security at this location at night, therefore exposure to vandalism and terrorism is reduced as well.

If facilities containing records are damaged, records may also be damaged or lost. In most cases there would be little impact relating to supply of safe drinking water. The same types of hazards as those noted above for transportation would apply to records.

One other component in communication are the computer networks that provide internal and external communication as well as maintaining continuity in the control system. These systems are susceptible to failure from power outages caused by any of the hazards, but more recently a new and real threat is computer attacks from viruses. Viruses can limit access to system information on one or all connected computers. If the virus spreads throughout the system, it

could prevent use of the system until system components are repaired or replaced. The measures the City has in place to prevent this type of impact is discussed in the next section.

3.3.11 Instrumentation and Controls

Instrumentation and controls are essential to efficient operation of the water system. While system components can operate when the telemetry system is off-line for any of the reasons described above, manual operation and management is required. This takes additional staff resources to safely and properly manage the system. In some cases, it may be necessary to use alternate modes of operation to accommodate such outages.

3.4 Summary

This section of the water shortage response plan has identified vulnerability of Marysville's water system to those hazards noted in Section 2 as either low-moderate or moderate in probability of occurrence. Critical system components and impacts of their failure were identified, as well as general impacts from hazard generated emergencies. The next section presents structural mitigation measures the City can take in proactively preparing for these potential hazards and the impacts caused by emergency situations they generate.

Section 4
Facility Mitigation, Protection and Backup Plan

4.1 Introduction

A mitigation plan lays out various measures the City can take to ensure the safety and continuous operation of the water system. In this section actions are described that can be taken proactively to aid the City in minimizing impacts to the City's system due to vulnerabilities in the system from hazards noted earlier. A mitigation plan includes three elements: prevention, protection, and backup actions. Prevention of many of the hazards described is virtually impossible. Earthquakes occur with little warning. Occasionally 24-hour notice may be given for severe weather patterns as they develop, including flooding. Then emergency response measures such as sand bagging can take place. The City's Emergency Response Plan identifies these specific measures that can be taken for each type of hazard generated emergency. Protective measures are those actions that can be taken proactively, prior to the hazard, to minimize potential damage. Protective measures of critical components can be quantified. Suggested protective measures are identified below. Lastly, if a critical component is lost, or temporarily out of service, the provisions the City can take to provide backup supplies, while repairs are made, are another important element of the mitigation plan.

The discussion below includes mitigation actions for facilities in general and specifically for the critical components that were listed in the previous section. This section addresses actions of a more structural nature. This section is organized in the same format as Section 3 and the Disaster Matrix, to provide continuity for the reader. Training programs, resources, and personnel related issues, which are another form of water system mitigation, are presented in Section 6.

Again, it is important to note that the City has a separate Emergency Response Plan (ERP) that contains detailed information regarding emergency contacts, contacts at surrounding jurisdictions, entities with which the utility maintains interties, and specific address location information for facilities. That information is an important resource to this plan and is referenced as necessary. In addition, within the ERP there has been effort made in evaluating critical site conditions. However, further analyses will undoubtedly put the City in a better position for providing safe drinking water during emergencies. The descriptions below have identified studies, field inspections and other measures that can be taken in order for the City to minimize potential threats from any of the noted hazards.

4.2 Mitigation Actions by Critical Components

There are many critical components to continuous operation of a water system. Eight (8) facilities have been identified as most critical to water system operations. These components are:

- Edward Springs and Edward Springs Reservoir
- Stillaguamish Ranney Collector
- Stillaguamish Treatment Plant
- JOA Pipeline and associated Everett water supply
- Telemetry System
- Getchell Hill Reservoir
- Cedarcrest Reservoir
- Highway 9 Reservoir

The components of the water system listed below are listed in relative order of priority. Within each section below, the various specific critical components are listed in an order of magnitude of importance. For example, storage tanks with larger capacity are listed first. This prioritization is used in case there are structural actions for the City to take to limit exposure to hazard vulnerabilities. Listing in this priority order should assist in prioritizing those structural actions or projects.

The discussion presented below is based upon verbal and written information from City staff regarding the facilities. On-site inspections of facilities were not conducted as part of this assessment.

4.2.1 Source of Supply

Source of supply is the most important element in any water system. The City's water supply includes ground and surface water sources. The sources of supply are listed in order of importance.

Edward Springs (supply, wells, reservoir)

Given the hazards identified in Section 3 that could impact operations for Edwards Springs supply, wells and reservoir, this section turns to mitigation measures necessary to prevent and minimize disruption in operations. The system consists of an underground system collecting water from the springs. This area is approximately ¼ mile west of the reservoir. The water flows from the collection system to a screen house facility and is conveyed by gravity to the

reservoir through a 12-inch diameter inlet. There are also three wells (wells 1, 2 and 3) that are used to provide backup supply to the reservoir when necessary.

Power Outages. For any of the hazards that could lead to emergencies, power outage is one result. This system operates with gravity flow, therefore, water will flow through the collectors in a power outage. In the case of a regional power outage, the gravity flow reservoir would be used. If reservoir levels reached a critical point, a portable generator could be temporarily used here to operate wells 1 &2 and the chlorine room together, or well 3 alone, until the level of the reservoir was restored to necessary levels. The City currently has one trailer-mounted generator to provide backup power in the case of a power outage. However, City staff has indicated that the wastewater treatment plant has priority for this backup power supply. A permanent generator set is planned for upgrades to this facility. This will help to alleviate multiple demands on the portable generator and provide reliable backup power to this important water source.

In addition, if telemetry were down, due to power outages or a computer system virus, the reservoir would require manual operation, with staff monitoring the reservoir level and temporarily using the portable generator as noted above. There are ample staff familiar with the facility to ensure there would be someone available to manually monitor and operate this facility.

Fire. This is the City's primary source that is susceptible to a structural fire hazard. It also has low to moderate exposure to a forest fire. If a major forest fire occurred (most likely to occur in August or September, being the driest time of the year and therefore peak water demand season), the well houses, which are wooden structures, could possibly burn. There are no sprinkler systems in place. One measure to take is watering the well houses to prevent the fire. If a structural fire occurred it would prevent operation of the pumps, due to destruction of wiring in the walls.

One measure the City may consider for the future is replacement of the wooden structures. This is a low priority project, as there are more pressing issues in supply, treatment, and distribution and there are a variety of backup supplies, as noted below.

Security. This critical component is partially fenced with a locked security gate on both roads to the collector area. It is, however, susceptible to intrusion through private property and some access through the roads. There are intrusion alerts through the telemetry system on two of the key components here. However, there appears to be some vulnerability. Additional fencing and intruder alerts or alarms on the well houses and reservoir would be beneficial and should be considered during the upgrades to this facility.

Backup Supply. The backup supplies to Edward Springs include the Edward Springs reservoir, Stillaguamish supply, Seven Lakes Water District and the Lake Goodwin Well. If there were

significant forest fires that lead to a well house fire, there could be some water quality issues with Lake Goodwin water. In that case, water quality alerts or other measures would be necessary. If Lake Goodwin were not available, due to other emergency conditions, the Stillaguamish source can handle the system, provided turbidity is low. The Everett supply can also be used for backup but will result in lower pressure.

Stillaguamish Ranney Collector

Given the hazards identified in Section 3 that could impact operations for the Stillaguamish supply, this section turns to mitigation measures necessary to prevent and minimize disruption in operations. The system consists of two 100 horsepower pumps located in a 35-foot deep caisson buried in the riverbed. Seven screened 10-inch collector lines extend out from the caisson bottom. Subsurface water present in the riverbed gravel is screened through the collectors and flows, by gravity, to the caisson pumps where it is then pumped to a chlorine contact facility on shore and into the distribution system.

Power Outages. For any of the hazards that could lead to emergencies, power outage is one result. A new portable generator set is a planned capital improvement for spring 2002. This will address backup power supply to this facility in the case of a power outage. However, as noted above, the wastewater treatment facilities also have power backup requirements. Several of the wastewater pump houses are supplied with backup generators. Therefore, this additional portable generator will ease demand on the other portable generator. City staff will have to prioritize usage on an as needed basis during emergencies.

With telemetry down, due to power outages or other emergencies, the facility must be operated manually, with staff turning the pumps on manually, and off once the reservoir is full. There are ample staff familiar with the facility to ensure there would be someone available to operate this facility.

Floods. The primary potential hazard that has mitigation potential is flooding. The electrical and chlorination equipment are presently located in the flood plain. During the filtration plant construction, the electrical and chlorination equipment will be relocated. While not entirely out of flooding danger, the vulnerability will be reduced.

Security. There is a 24-hour guard at this site. In addition, there is a 3 foot fence and the vaults are locked. Access to the supply is difficult for intruders. There is an intrusion alert on the electricity vault. No other alerts exist at the site. During the construction of the filtration plant, other alerts and alarms for intrusions should be considered.

Backup Supply. Backup supply for this source of supply can be supplied from most of the other sources in the City, including Edward Springs, Lake Goodwin, Everett water, and supply through the Arlington intertie. In addition, the booster pump station at Edward Springs can be used to provide added fire flow.

JOA Pipeline Associated with Everett Water Supply (Lake Chaplain)

The City is not responsible for this supply source, and cannot mitigate many of the hazards that could impact it. However, the JOA 30" pipeline delivers more than 50% of the City's water supply and supplies several other surrounding utility. Therefore, it is critical to normal operations. The pipeline has cathodic protection and is welded pipe. The cathodic protection reduces the potential of a watermain break due to corrosion. The welded joints reduce vulnerability to damage in minor to moderate earthquakes. There are few improvements that are required for the facility at this time.

Power Outages. The JOA pipeline is gravity operated, so power outages do not impact water flow. However, telemetry does operate some of the valves. In case of a power outage these can function with battery backup or be locked into position to maintain flow.

Security. Access to the pipeline is necessary for both Marysville and Everett. Therefore, vaults have not been locked in the past. The pipeline is vulnerable to intrusion by a person with the proper tools, fittings and knowledge of the line. The City indicated that there were feasible improvements that could be considered to provide any further protection to intrusion. There are key lock systems or other locking devices that could be considered, if deemed necessary. Keys can be provided to appropriate maintenance and management personnel for both entities, providing access to both parties, but security from intruders. However, this mitigation measure is of a lower priority for the City at this time.

Backup Supply. Therefore a number of alternate operation modes that are put into place as backup to this system. One is the Highway 9 well. Unfortunately, if the Everett water supply were down for an extended time, when there was also a power outage, this supply would not be available because Highway 9 well is not equipped to operate using a generator. This may be an improvement for the City to consider.

Lake Goodwin Well and Standpipe

Lake Goodwin well is not one of the eight critical components to the City's system. However, as backup supply to Edward Springs, it can play a key role in water supply during emergencies. Additionally, there are the 20 customers that receive their water source directly from Lake Goodwin. Therefore, it is addressed within this section.

The primary issue at this facility is the stabilizing system for the standpipe. The trees, to which the tank is secured, have died and been topped. There is currently an improvement under design to address the stabilizing issue, which is needed primarily in case of earthquake or extreme winds and weather. As part of this project the City may choose to design a screening system for the standpipe. This is needed to meet water quality requirements. This would only be necessary if it is determined that the standpipe will stay in operation for some time. The City is also considering construction of a new reservoir and pressure zone to serve the east side of Edward Springs (the 20 or so customers currently served by Lake Goodwin). Another option is to use the booster pump station at Edward Springs to pump to a new standpipe. Once the project is designed and constructed, the ERP facility description must be updated.

Power Outage. The primary impact of a power outage would be to the 20 customers supplied directly from this source. In extreme conditions, a water truck can supply these customers, provided the City can access water at one of the other sources.

Security. There are no intruder alerts or alarms at this facility. However, due to the close proximity of housing, intrusion may be less likely.

Backup Supply. Lake Goodwin provides backup supply to Edward Springs supply when it is down. There are the 20 or so customers directly dependent upon Lake Goodwin wells for their water. In the case of this source being down, these customers can temporarily be served by a water truck and there is also an intertie with Seven Lakes Water District.

In addition to the sources described above, the City has secured a number of agreements with local jurisdictions for emergency water supply and assistance, should a hazard impact one of the City's sources. These arrangements are described below.

Agreements with Other Agencies

While the City strives to be sole provider of water services to its customers, responsible management of the utility requires that the City maintain agreements with local entities that can provide backup services and assistance in the case of hazard generated emergencies. The City's water utility system is not reliant upon these agreements for operations, but for backup assistance during emergencies, when needed. There are two types of agreements the City maintains. First, there are Mutual Aid Agreements, where entities agree to provide assistance to one another, as requested, and to the extent possible.

Second, intertie agreements are maintained with adjoining jurisdictions with which the City maintains a physical intertie with their water system. This allows for backup supply sources,

when needed in response to emergencies. The City has seven interties with four different entities that provide for supply to various pressure zones in the City's system.

It is important that these agreements are maintained current, contact names and numbers updated as necessary, and that information correspondingly be updated within the ERP. Whenever the City anticipates a benefit from an additional intertie with another entity, this should be considered. The more backup supply sources that are available, the more flexible the system is in response to various hazards, and the sooner normal operations can be restored.

Both the Mutual Aid Agreements and the intertie agreements are further detailed in Section 5, Preparedness Planning for Emergency Response.

4.2.2 Treatment

As noted earlier, there is a filtration plant planned for the Stillaguamish supply, to be operational by the end of 2003. There is currently chlorination treatment at Edward Springs. The Everett supply has its own filtration plant.

Stillaguamish Treatment Plant

This section turns to mitigation measures necessary to prevent and minimize disruption in operations of the proposed Stillaguamish Treatment Plant.

Power Outages. For any of the hazards that could lead to emergencies, power outage is one result. A new portable generator set is planned with construction of the new treatment plant. This will address backup power supply to this facility in the case of a power outage. This emergency generator will be used solely for the treatment plant and will not be shared with the wastewater facilities as with the portable generators.

With telemetry down, due to power outages or other emergencies, the facility must be operated manually. There are ample staff familiar with the facility to ensure there would be someone available to operate this facility.

Floods. The primary potential hazard that has mitigation potential is flooding. The new facility will not be located within the flood plain.

Security. There will be staff at this site during normal working hours. In addition, there will be a 6-foot fence. Access to the building will be difficult for intruders. There will be an intrusion alert on the building when it is not staffed. No other alerts exist at the site.

Backup Supply. Backup supply for this source of supply if the treatment plant is down can be supplied from most of the other sources in the City, including Edward Springs, Lake Goodwin, Everett water, and supply through the Arlington intertie.

Lake Chaplain Filtration (Everett water)

Again, the City is not responsible for this facility. Therefore, mitigation measures by the City are not appropriate for this specific facility. If there is a failure at this treatment facility, the City can shut off the Everett supply and use backup wells and reservoirs for a period of time. In addition, if it becomes necessary to use the Everett supply, the City would follow the instructions given by Everett (alerting customers to the need for boiling water or other necessary precautions).

4.2.3 Storage Tanks and Reservoirs

Mitigation measures for the City's four primary storage tanks are discussed below. The storage tanks are listed in order of priority, determined by their capacity.

Getchell Hill Reservoir – 6 million gallon capacity

This reservoir is a relatively new facility. It has been built to current seismic standards and has low flooding and intrusion vulnerability. Little is needed in the way of mitigation at this facility. Water enters the reservoir from the Everett pipeline (JOA) without pumping. This facility has telemetry for operations and monitoring of reservoir levels. In case of power outages, the reservoir level can be manually checked on a daily basis. One of the portable generators could be used to restore water levels in the reservoir, from other sources, if the JOA pipeline or Everett supply are not available. Conversely, the Everett supply can bypass the reservoir, if the reservoir is not operational but the supply is not impacted by the emergency.

Security. The facility is surrounded by a 6-foot chain link fence. There are locked vaults. Access hatches to the reservoir are also locked. The control and wash down vaults and access hatches are also supplied with intruder alerts.

Edward Springs Reservoir – 6 million gallon capacity

This facility was addressed under the Edward Springs source of supply subsection above.

Cedarcrest Reservoir – 3.5 million gallon capacity

This facility is used primarily for water storage in the 170 pressure zone. The Cedarcrest pump station uses this reservoir as supply to offset the need to pump from the distribution system. This reservoir gravity feeds into the 170 pressure zone in the distribution system.

Power Outage. The pump at this facility is used to pump to the Highway 9 Reservoir. In the case of a power outage, this system cannot be operated with one of the portable generators. The City may want to consider retrofitting this pump house for the portable generator. Without power (and telemetry) the reservoir level needs to be monitored daily and the pump station would not be able to operate.

Security. This facility is surrounded by a 6 foot chain link fence. The access hatches are locked. There is also an intruder alert on the pump house. This facility was characterized by City staff as more vulnerable to bio-chemical assaults. Further security measures to minimize bio-hazards should be considered.

Backup. This facility can be backed up by the JOA and Highway 9 Well. However, this would result in lower pressure in the 510 zone.

Highway 9 Reservoir – 1.8 million gallon capacity

This facility is the only reservoir for the 510 zone. (The well is used for emergency backup only.) Mitigation characteristics and discussion are similar to those of the Cedarcrest reservoir, as presented below.

Power Outage. The pump at the Cedarcrest facility is used to pump to this reservoir. In the case of a power outage, the reservoir level would require monitoring if manual pumping were needed from the Cedarcrest pump house. As noted earlier, the City may want to consider retrofitting the Cedarcrest pump house for the portable generator for pumping to this reservoir as well.

Security. This facility is also surrounded by a 6 foot chain link fence and has locked access hatches. There is also an intruder alert on the pump house and abandoned radio building. No further security measures are necessary at this time.

Backup. Everett water is the backup for this facility. However, lower pressure would result. Also, in extreme emergencies, the Highway 9 well can be used, but would require power. A retrofit for generator operation of the well is an improvement for the City to consider.

4.2.4 Transmission Mains

The most significant transmission line, the JOA pipeline, was addressed previously, under the source of supply subsection. There are numerous other lines that the City has noted in the ERP for inspection in case of earthquake. Most of these line locations are river or creek crossings or on steep slopes. While those conditions are not optimal, they are necessary to provide service to all locations within the City's service area. Replacement projects are not necessarily feasible nor practical. Therefore, maintaining a log of those areas requiring inspection due to susceptibility to failure from earthquake or landslide is the best management practice available to the City.

Some of the other significant transmission lines are noted below.

Stillaguamish Line

This line will supply the new treatment plant once it is completed. It is ductile iron and is vertical to reach 198th Street. With those conditions, it is susceptible to failure in landslides. However, the City does not have any plans within the next twenty years for replacement. It is very deep in some areas, which helps prevent earthquake failure, and crosses wetlands. When replacement does become necessary, it will be costly. One mitigation measure would be to determine if hill holders (structural retaining blocks) are in place. If not, determination of their ability to add any level of landslide/failure prevention to the facility should be made. If appropriate, this alteration may be appropriate.

Everett Pipelines No. 2 and 3

These pipelines connect the Everett water supply to the JOA pipeline. They are not City facilities. According to the City's ERP, they are inspected for damage following earthquakes and landslides.

Edwards Springs 12" Line

This pipeline was built in the 1940's. The material is asbestos cement. It is susceptible to failure under high pressure and earthquake. This line is being considered for replacement. Plans are not yet developed.

4.2.5 Distribution Lines

As with the transmission lines, there are distribution lines that are also susceptible to earthquake and landslide damage. These are also noted in the City's ERP for inspection after either of these

hazards. Some will be replaced over time. However, there is no specific mitigation planned to reduce this potential vulnerability due to other more important priorities.

One issue, which arose as part of this study, is security of valves in vaults. Assessment of accessibility to intrusion could be performed. At the same time, the City can verify that heat tape is present and operational at all inspected valve locations, to minimize potential damage caused by freezing.

4.2.6 Electric Power

As stated above, there are several facilities within the City's water system that require power to operate and are not currently equipped to operate using the portable generator. In addition, there are numerous demands placed on the portable generators when there is a power outage. These facilities include the Cedarcrest pump station (which pumps to the Highway 9 reservoir), the Lake Goodwin well, and Stillaguamish well, and the Highway 9 emergency well. The Stillaguamish well will be retrofitted as part of the filtration plant project. However the remaining facilities are not currently slated for any retrofitting.

The City may want to consider retrofitting these facilities in the following priority order

- Cedarcrest Pump Station
- Lake Goodwin well
- Highway 9 well

There may be future operational changes that will change this priority listing.

Additionally, the City may want to consider a third portable generator. With both water and wastewater facilities requiring the generators for backup power, and with the addition of new facilities in both utilities (the Stillaguamish filtration plant and the wastewater treatment plant upgrades) additional power will be required. It may be necessary, within a few years, to acquire a third portable generator for emergency operations.

4.2.7 Transportation

Roadway Infrastructure and Roadway Blockage

Roadway infrastructure can be heavily impacted by many of the noted hazards, preventing access to facilities. It is impossible to prevent the hazards from occurring. The primary backup measure the City can take in this case is to ensure there are at least two alternative access routes

noted under the facilities descriptions within the ERP "System Component" section. This will provide all emergency responders with the critical information to be able to access the facilities.

If roadways are heavily impacted by a hazard, it may require staff to access the facility and remain there for long shifts at facilities requiring manual operation. This will be dependent on the extent of roadway damage and blockage. At such facilities, provisions should be stored, and periodically refreshed.

Maintenance Facilities and Vehicles

There are a number of hazards that could impact these facilities. However, aside from sand bagging for floods, and moving vehicles, there is little mitigation that is possible to protect against most of the hazards to which these facilities are vulnerable.
One mitigation measure the City could take would be to fence the area in order to reduce the risk of vandalism, terrorism, and slightly reduce transportation accidental hazards. However, given other regulatory driven needs of the system, such a project would rank low in priority. There would also be aesthetic, public access and operational issues to consider before such a security fencing project could move forward.

4.2.8 Communications and Records

There are various forms of communication, internally and outside of the City, requiring systems to provide the connection, or link, to the other party. In addition, various types of important data, both in hard copy and electronic records and data, are stored at numerous City facilities.
Systems providing communication links, and various forms of records for the water utility are discussed below.

Telephone

There is little the City can do proactively to mitigate against loss of telephone service during emergencies except to have a reliable backup communication system.

Two-way radio

The backup system is the City's radio system. The City's current system is the Nextel two-way radio communication system. During the last emergency that the City experienced (the February 28, 2000 earthquake) this radio system failed due to the entire system being overloaded. The City's backup system then was the older radio system. This operated well. However, only about 60% of City vehicles are equipped with the older radio system.

Due the recent terrorist attacks, the telecommunication industry is considering measures necessary to ensure provision of emergency access, within certain communication devices, to emergency management respondents and 911 calls only during actual emergencies. Once these issues are ironed out, reliance upon the old radio system may lessen. However meanwhile, it may be prudent to provide most vehicles with equipment necessary to operate the older, backup radio system, given the current difficulties in radio frequency accessibility.

Records

The City stores originals of hanging files, flat files, and as-built drawings of facilities on the 2nd floor of the maintenance facility building. This would protect these documents from flooding hazard. Copies are stored in the vault on the 1st floor, which protects them from structural fire hazards.

One measure the City can take to ensure against loss of data and records from various hazards is to develop a records backup procedure and verify that it is followed. Storing back up copies of key data and facility as-builts at an alternate location is recommended.

Computer Networks and Email

The City's computer system is networked and there is extensive use of email for communication purposes. The City must be vigilant in maintaining appropriate virus protection measures. These need to be updated weekly, and more often when necessary. The network and personal workstations must be scanned at least once per week for any hidden viruses that can arrive through email. There should be appropriate firewalls in place to prevent viruses from spreading to key elements of the City's network, should one enter the system. Many of these provisions are in place. The City should periodically review and update the protections and procedures and ensure that they are being implemented.

As noted above, one safety measure and fallback plan is to have electronic records backed up on tapes or other media, and located in an alternate location. If a hazard disrupts or destroys the originals, the backup will still be available.

4.2.9 Instrumentation and Controls – Telemetry

Mitigations measures for the telemetry systems of most of the City's system under various emergencies are addressed in each section on critical facilities. If the telemetry at a facility were damaged in a flood or fire, repairs would be required along with repairs to the facility. The impacts of an emergency described below relate primarily to power outages. This section also addresses issues of a security nature in which telemetry system improvements may provide the

City's system with added prevention and protection to reduce or minimize system exposure to intrusion and/or contamination.

The City's telemetry system is expanding as new facilities are constructed and brought on-line. As capital improvements listed in the City's 6-year capital improvement plan are implemented, more of the key facilities will be operated or monitored using telemetry. This improves efficiency during normal operations, but requires staff to maintain knowledge of manual operations in case of power outages.

It was noted in Chapter 2 of the Water System Comprehensive Plan, that the following areas have intrusion alert as part of the telemetry controls:

- Getchell Reservoir
- Stillaguamish System
- Cedarcrest Station
- Highway 9 System
- Tulalip 88th Street Intertie
- Snohomish County PUD Intertie (at Soperwood)

It is recommended that all of the critical facilities identified in the list above, be equipped with automatic intruder detection devices. This would include the Edward Springs system, other interties, pump stations not currently covered, and any valves or vaults considered to be particularly vulnerable to intrusion. This is an important measure to take to provide maximum security and protection of the water supply. There may be federal grant funding for this type of activity in the near future.

As of Fall 2001, the City is inspecting key facilities 3 times each day. Maintenance staff carry out these inspections during the day, with surveillance provided by the police department at night. This procedure can provide security if there is a power outage, preventing intruder alert systems from operating. Additionally, during utility staff inspections monitoring of the facility can be completed, insuring reservoir levels are adequate and other critical system functions are within acceptable operating measures.

4.3 Summary

This section has summarized the physical, primarily structural, mitigation actions the City can take to reduce the impact of hazards on critical components of the water system. The water system resources have been listed in priority order to facilitate prioritization of any of the recommended improvements.

Section 5
Preparedness Planning for Emergency Response

5.1 Introduction

The purpose of preparedness planning is to be prepared for any type of emergency that may impact water system operations as a result of a natural or human-caused hazard. This ensures that the City can maintain or return services to fully operational at the soonest possible opportunity. This section focuses primarily on the City's existing Emergency Response Plan (ERP), as it details many of the steps necessary to follow in case one of the hazards identified in previous sections impacts water utility services. The ERP is a planning document for response to city-wide emergency situations. The focus of this section will be only on response to water system emergencies.

5.2 Overview of Marysville Emergency Response Plan

The City's ERP was established to provide guidelines for City personnel to follow in case of an emergency. The purpose of the plan is to protect life, health, and property and maintain health and safety services to the maximum extent possible. The actions identified within the Plan are intended first to protect life and property, and also to minimize damage as much as possible. Then the focus shifts to returning impacted services to full operations as soon as possible.

The City's Emergency Response Plan covers the following topics:

- Actions measures to take in case of the following emergencies
  - Earthquakes
  - Volcanoes
  - Watermain breaks of major transmission lines
  - Flood
  - Loss of supply in any one of the critical water sources
  - Hazardous material spill
  - Major fire event
  - Sever Storm and Power Outage
  - Train derailment
- Lists priority personnel for response
- Identifies rank of City officers to take command during emergencies
- Provides name, address, phone numbers of all key personnel, contractors and suppliers
- Provides contact name and phone numbers of adjacent water utilities
- Lists available equipment during emergencies
- Location of Chlorine stations and equipment

The ERP also provides emergency response steps for other types of emergencies that do not pertain specifically to the water system.

City officials, as designated within the City's ERP, determine when a situation is deemed an emergency. Once that determination is made, the Emergency Operations Center (EOC) is activated. Activation of the EOC, in turn, activates use of the ERP procedures. The following discussion details eight essential steps in effective response to emergencies. These steps are noted in the AWWA manual *Emergency Planning for Water Utilities*. They are also, for the most part, reflected in the priorities as stated in the City's ERP.

5.2.1 Commanding Officer Determines Severity of the Emergency

The EOC is either activated partially or fully, depending on the extent of damage and impact of the emergency. This is determined by the highest ranking EOC officer, or City officer, available to make the decision when an emergency arises. Priority ranking of City officials is provided within the ERP. The City carefully schedules time off for management staff to ensure there is always more than one key manager available in case of emergencies.

5.2.2 Provide Safety of Personnel and Citizens, Protect Lives

The ERP stipulates the order and priority under which actions should be taken under emergency conditions. Essentially, life threatening situations are addressed first. Then situations in which personnel or citizens are injured or the potential for injury is high are addressed. Attention must be paid to priority water service customers. These would be customers on dialysis, hospitals, and other customers where lack of water can pose a potentially life threatening situation. Appendix B provides a form for the City to use in identifying these customers by address. This list should be updated periodically. Then, when an emergency occurs, those City staff handling this aspect of the response can utilize the list of priority locations for water service. Priority for addressing these customers should be added to the step by step procedures documented in the ERP, that the City takes when water supply is lost.

5.2.3 Reduce Potential for Further Injuries or Damage

Once the above mentioned priorities have been addressed, the ERP states the priority is to minimize further injury and property damage. The steps to follow within the ERP, for response to emergencies caused by any of the hazards described within this report reflect these priorities.

5.2.4 Perform Emergency Repairs Based on Priority to Return to Safe and Full Service

The next step in emergency response is to return essential services and facilities to service. This includes providing backup water supply to the affected areas. The ERP lists measures to take to engage backup water supply for the hazards addressed in this plan. This step is followed by repair of damage caused by the hazard.

5.2.5 Recovery – Return to Normal Service Levels

Once the immediate hazardous conditions have been handled in the above priority order, steps are taken to return to full service and normal operating levels.

In the case of major water supply interruptions, costs of repair and recovery may be large. Sources may need to be replaced if major contamination has occurred and cannot be mitigated. If repair and replacement costs are large, it will be necessary to evaluate utility's rates and possibly implement an emergency surcharge to cover the costs of recovery. Damage reports should be collated and reviewed for any possible cost recovery available through insurance or outside funding sources.

5.2.6 Evaluate Response and Preparedness Plan

The ERP must be continually updated as conditions, staff and system components change. When a hazard generated emergency has occurred, the conditions and responses should be documented for further evaluation. Forms provided in Appendix B should be used during the emergency and should be kept as documentation of response and conditions. The data collected on these forms provides the basis for the City to evaluate emergency response to particular emergencies. This data also often is the basis for any cost recovery available through the Federal Emergency Management Assistance (FEMA) Program or other possible recovery funding sources.

The City can learn from each emergency situation and improve on response procedures and actions based upon documented results. Once the crisis has passed and services have returned to normal operating levels, a meeting to review the emergency response should be conducted. This meeting should include management positions as well as other staff involved in the response. Ideas can be generated about what worked, what didn't, and what will be a better way to handle problem situations for the next emergency. Determination can be made by upper management whether a simulation of the emergency, or training drill, should be conducted, in order to improve response in the future.

5.2.7 Revise Plan as Necessary

As noted above, any changes to the plan, necessary from actual emergency conditions and responses should be made soon after the emergency has occurred. Updates to this Plan must also be made when a change in staff occurs or a change to the system is completed.

A staff person responsible for this updating process should be designated. In addition, the most efficient approach to updating can be accomplished by designating one copy the official copy. Then, at least one copy can be manually updated throughout the course of the year. Once per year all the revisions noted in this primary copy can be collated into a document containing proposed revisions to this Plan. Those changes should be circulated to those management positions with responsibilities during emergency conditions to ensure that all necessary changes have been included. Official updates should be made to any sections of the Plan, including appendices, which have changed. All appendices should be reviewed, staff lists updated, names and contact numbers confirmed for accuracy, and corrected as necessary. Updated copies of any changed sections and appendices must be distributed to all holders of copies of the Plan.

Upon review of the ERP and during development of this plan, it became apparent that there are several areas in the ERP requiring changes, as well as areas in the Appendices of this plan, in order to develop a comprehensive emergency response document for the City's water system.

Due to the terrorist attack on the United States on September 11, 2001, there is a renewed emphasis on security, especially for life critical services, such as water and power. It will be prudent for the City to update their ERP accordingly. It should be noted that the City is currently developing a new section for the ERP to address terrorism and measures to take in case of attacks.

Those areas, which should be amended in the ERP, from the perspective of having comprehensive documentation of the City's water system and emergencies procedures, include the following areas:

- In general, the facility descriptions in the ERP include: year of construction, construction materials, location and address, elevation, construction dimensions and details, and whether or not chlorine is stored at the site. Other items that would complete these descriptions include: main access routes and alternative access routes (especially for facilities whose main access route is known to be susceptible to flooding, earthquake susceptible areas such as creek crossing, etc.)

- A facility description for the Stillaguamish Ranney Collector was not located within the "System Components" section of the ERP copy reviewed. This description should be added to the ERP.

- Schematics of the eight critical system components, and other key facilities, should be included in an additional appendix to the ERP (or this plan). This would make it much easier for external emergency response personnel to safely access and effectively correct problems at these facilities.

- The ERP contains procedures to follow when certain supply lines go down. It was noted that for Edwards Springs, Lake Goodwin well is part of the backup plan. The City should develop an alternative backup plan, in case the Lake Goodwin well is impacted by the same hazard that may cause the loss the Edwards Springs supply and/or reservoir.

- A section addressing response procedures to follow in case of computer system or network intrusion or virus attack should be developed. This should include steps to take in order to protect the telemetry system from potential damage and how to return the system to full operation. If there is any power backup supply to the computer or telemetry system, appropriate steps should be described.

- A section addressing measures to be taken in the case of intrusion into a water system component should be developed and added. In addition, it was noted in Section 4, that intruder alert systems should be installed at as many critical facilities as is feasible.

In addition, the City should develop a section in the ERP where a hierarchy of communication systems is listed along with steps to take in case of power outage, frequency overload for radio systems, or other system failures. The backup system would be person to person communication. To the extent a procedure for this can be developed, it should be, for extreme emergencies. It will make resources more available for response and recovery.

5.3 Communications

The ERP Appendices list key personnel and staff call-back priority order for response to emergencies. This section contains an organizational chart, lists of staff with their home and cell phone numbers and addresses. In addition, the ERP lists outside agencies that can provide assistance in response to emergencies. Private contractors that can provide services to assist in repairs and recovery from an emergency are also listed in the ERP Appendices. Several of these contacts are also provided in Appendix A of this Plan. The agreements made with these various parties are discussed below.

5.4 Agreements with Other Agencies

As noted under Section 4, there are two types of agreements the City maintains with other jurisdictions in preparing for response to emergencies. These are Mutual Aid Agreements and Intertie Agreements. These types of agreements and the entities with which the City maintains these relationships are described below.

5.4.1 Mutual Aid Agreements

The City of Marysville is party to the 1995 "Sewer and Water Mutual Aid Agreement" that addresses sharing of personnel and equipment during emergency conditions. Such mutual aid is authorized in State law, at Chapter 39.34 RCW. Other parties to the agreement are listed below.

- Alderwood Water District
- Cross Valley Water District
- City of Edmonds
- City of Everett
- City of Lynnwood
- City of Monroe
- Mukilteo Water District
- Olympic View Water and Sewer District
- Silver Lake Water District

The agreement includes the following provisions.

- A public agency may request specific types of assistance, to deal with a disaster or emergency, either orally or in writing. If the request is oral, it must be documented in writing as a follow-up. The request must come from the agency's "designated official."

- A disaster or emergency is defined in the agreement as an event or situation that demands immediate action to preserve public health or protect life or property; or a state of emergency declared by the Governor.

- The responding public agency, through its designated official, can determine whether equipment and personnel are available. Failure to respond shall not be a cause for liability.

- Personnel and equipment made available shall, whenever possible, remain under the control of the responding agency, and may be withdrawn at any time.

- The requesting agency shall reimburse the responding agency for the cost of providing assistance.

- The City of Everett is charged with maintaining and distributing an up-to-date list of all agencies that have adopted the mutual aid agreement.

- In addition, the agreement includes various provisions regarding status of personnel while engaged in response actions, indemnification, insurance, terms of reimbursement, operational procedures, authorization and termination of the mutual aid agreement, and a prohibition on third-party rights.

These agreements are helpful if the other jurisdictions are not also impacted by the hazard. In the case of a regionwide event, many of the other entities will also be impacted and may not be available to respond. If however, there is an isolated incident, affecting Marysville alone or Marysville and its immediate neighbors only, then the mutual aid agreements and intertie agreements will more likely be effective in providing the City with assistance while the City works to remedy the impact of the hazard.

5.4.2 Intertie Agreements

Intertie agreements are maintained with adjoining jurisdictions that can provide backup supply when the City's own supply is interrupted. The City has intertie agreements with four jurisdictions at seven locations that provide flow into the City's system. There are additional interties that provide service to the other entities as well. Several of the interties noted in Table 5-1 provide flow in both directions.

Table 5-1
Interties Providing Flow to Marysville's System

Entity	Size of Intertie	Location/Address
Arlington	8"	198th Place NE and 57th Drive NE
	8"	198th Street and Cemetery Road
Snohomish County PUD	8"	7300 block of 44th St. NE
	4"	4020 71st Ave NE
Tulalip Tribes	8"	Marine Drive & 27th Ave NE
	4"	2000 block of Marine Drive
Seven Lakes Wtr. Asso.	?	North of Lake Goodwin well*

* Provides emergency backup service to Lake Goodwin well customers.

As noted above, these agreements are helpful if the other jurisdictions are not also impacted by the hazard. In the case of a regional event, many of these other entities will also be impacted and

may not be available to respond with backup supply. If however, there is an isolated incident, affecting Marysville alone, then the intertie agreements will more likely be effective in providing the City with backup supply while the City repairs critical system components.

The contact names and numbers for the individuals to contact are provided in Appendix A of this plan. These should be updated as necessary. The intertie locations are provided in the Emergency Response Plan.

Agreements with Service Providers

One other type of agreement the City should consider is service agreements with contractors of various types of services. As noted above, the City has several contact names and numbers for various services that would be needed during an emergency. What is not apparent is if any actual contracts are in place for services to be rendered under emergency circumstances. Having these contracts in place can smooth the resource acquisition process when there is an area-wide hazard and numerous entities are impacted. These contracts may specify hourly rates and services to be provided. If hourly rates are specified, the contracts will require periodic updating. These contractors should also have current copies or portions of the ERP and this Plan that the City deems appropriate. These vendors should be included in some of the emergency simulation practices, or kept apprised of any procedural changes made as a result of a simulation.

The responsibility for maintaining the agreements should be assigned. Periodic updates will be necessary, and subsequent updating of the City's ERP and this plan, as necessary.

5.5 Summary

This Section of the Plan has documented the response actions the City can take to protect the water system, to the extent possible, from emergencies caused by the hazards previously identified. In addition, activities to maintain current emergency operating procedures in the event of an emergency were also recommended. The intent of these measures is to minimize emergency impacts caused by the hazards, and return to normal operating service levels as soon as possible.

Section 6
Training

6.1 Introduction

There are numerous training programs designed to assist in training staff how to handle emergency situations. Well-trained staff will be better prepared to carry out response procedures to various types of emergency situations that could impact water supply, treatment, transmission, or distribution. Three key areas of training were identified for the City to consider as it develops its training programs to address contingencies in case of water supply interruptions. These three areas are:

- Training programs on operation of key facilities, equipment and backup systems
- Cross-training programs to ensure multiple staff understand facilities and operations outside their normal sphere of activity; and
- Simulated emergency scenarios.

The City provides much of this type of training already, especially in the area of specific facilities and equipment. The discussion below provides a description of existing training programs, related to the City's water system, and recommends additional options for the City to consider.

6.2 Training Programs

Operational training is essential, not only to smooth operation of the utility, but also to effective response to hazard generated emergencies. This training helps ensure that staff know safety measures necessary to ensure their own safety, as well as others, when responding to an emergency. This includes the basics, such as safe operations in confined spaces, electricity and power basics, and where emergency water and food supplies are stored. These essentials apply to employee homes as well as the work place, in order to free staff for emergency response.

Also covered within the area of training is training in the basic operations of system components. Training in this area may include:

- Location and operation of valves
- Manual operation of critical system components

- Location and operation of the portable generators, and priority sites for their use
- Manual operation of facilities normally controlled by telemetry

The City should augment this list as deemed necessary. Another important type of training for the City to undertake in its preparedness planning is cross-training. This involves selection of staff that would not normally respond to an emergency. The purpose of training these individuals is to provide familiarity and backup, in case they are the only ones available at the time of the emergency. Since the City has contractual issues which may prevent this type of training, it will be more important to cross-train management, or non-represented staff, and other outside personnel who respond to emergencies. Upper management can determine which staff are eligible for this type of training. An example of this type of training would be to train non-represented fire personnel on key water system facility locations and operations.

Finally, one other important training element involves simulated emergency training sessions or drills. These types of drills are most effective when held in conjunction with other City staff (fire, police, street maintenance crews) and/or outside agencies that will be involved in response to any real life water system emergency. Simulated emergency training sessions are further discussed in Section 6.2.3.

The next section describes the City's existing training programs, as they relate to water system operations and emergency response. That discussion is followed by further details of available resources within the above categories of training elements, and recommendations for frequency of the various types of training.

6.2.1 City's Existing Training Programs

The City's training program for staff that would respond in case of an emergency includes many of the essentials, the operational nuts and bolts training. There is a new employee orientation, which includes an introduction to the facilities and the emergency response plan. Health and safety training such blood borne pathogens, certifications on asbestos cement pipe handling, CPR, first aid and flagging are offered annually and in the new employee orientation. The City also has a Safety Officer who provides safety training opportunities in the first two months of each year. This training includes annual updates to:

- emergency response,
- blood borne pathogens,
- electrical safety,
- personal accident prevention,
- flagging certification (biannual),
- the chlorine program,

- confined space safety program,
- trenching and evacuation program,
- and several other maintenance equipment handling program.

There is also a weekly inspection and testing of important valves and pump operations. The portable generators are tested for readiness monthly. This testing can be performed by rotating staff for the task, in order to maintain staff familiarity with these facilities.

In summary, the City has a program covering the nuts and bolts training for general operations, which also prepares staff for emergency response. It is important to maintain this program over time, and make adjustments as new equipment is purchased and installed.

This training should be augmented by cross training sessions and simulated field trainings of emergencies. The value of cross-training is making a larger number of the personnel knowledgeable and available for emergency response. This provides more flexibility during the emergency. Simulation drills allow personnel to see how procedures and personnel operate in artificial emergency conditions. These training areas are further described below.

6.2.2 Training Resources

There are numerous resources available for many types of training, from operational to emergency response. A few are listed below:

- Seminars for staff to attend;
- Materials and videos available to provide to staff;
- Assigning key staff to attend seminars and return to train others.
- Coordinating training sessions with other outside agencies that handle emergency response.

Professional organizations are one source for these training programs. One of the most prominent training sources for water systems is the American Waterworks Association (AWWA). The AWWA has written, audio, and video resources available as well as speakers that the City may find useful. A listing of available resources, primarily websites, is provided in Appendix C.

In addition, there can be various sources available in surrounding jurisdictions. Utilities are often called upon to share a particular expertise they have developed, in order that others can learn and benefit from their experience. Learning about the expertise of a nearby jurisdiction may occur by word-of-mouth, the media, at professional organization meetings, or through their newsletters and websites. The City may chose to coordinate an annual meeting of surrounding jurisdictions to share information in a particular area, or to discuss emergency response issues in

general. In the past, the Snohomish County Office of Emergency Response has organized such meetings. They have also coordinated simulated drills. This may be a resource to draw upon to begin these meetings again. Determining the appropriate staff to train with each type of resource is essential to an effective program.

6.2.3 Exercises and Drills

Simulated emergency drills can be training sessions that are either carried out in the field, or discussed at a meeting. The latter type is referred to as "table top" simulations. This type of training is focused around a simulated situation, generated to force those in the training to test their familiarity with the facilities as well as with emergency procedures. Making the situation as detailed as possible adds more value to the result. Over time, multiple simulation exercises can address different types of emergency conditions. Identifying who is in charge, or in charge of each response area, and how to respond are some of the issues that are tested by these simulations. Elements such as disruption of communication systems, failure of backup supplies, and unavailability of key personnel can contribute to the effectiveness of the training exercise. Simply discussing this among the most likely effected staff is beneficial. Following up with field tests of that or other scenarios provides more depth and improves effectiveness.

These training sessions should occur at least once per year. Optimally, the utility maintenance staff would have at least one session of their own each year, followed by one session with either other City emergency response staff (hazardous materials response staff from the Fire Department, for example, or police officers), or outside agencies' emergency personnel. Each session would address a different scenario of hazard and subsequent supply reduction or impact. Any training above this level will improve the City's chances of minimizing damage to the system, and returning to full operation and services as quickly as possible during emergencies.

Security training should be coordinated with local police, fire and emergency preparedness personnel. This is done for several purposes. One, is for City staff to learn important security steps and to learn how to look for evidence of tampering on utility facilities. In addition, the City staff can familiarize the others with facilities and important aspects to know about each critical system component. This type of coordination should occur at a minimum of once per year, and more often if possible. Multiple personnel should be included so that there are more personnel familiar with the most important aspects of the system.

6.2.4 Availability of Personnel

Personnel are the most important resource to the City for operating the water system under emergency conditions triggered by the hazards described in earlier sections. Safety and well being of all personnel is key to having them available for response to hazard conditions. This

includes having resources available for personnel's family, in order to free them for work responsibilities. As training occurs for work place safety, encourage City staff to think about needs in their homes. Just as there must be emergency supplies of food and water available at work sites, so must there be supplies at home in order that staff can not only take care of themselves in off-hours during emergencies, but also that their families are cared for, which frees them for their work responsibilities. Staff should receive direction and training regarding preparations necessary at their homes in order for them to be available for work related duties during emergencies. This training would include information regarding provisioning at home, refreshing stored water supplies, and addressing any potential hazards their homes may face. Mitigation measures to take in homes can include securing bookshelves to walls, securing house to foundation, latches in cabinets, etc. With these measures secured for key water system personnel, they will more likely be available to maintain or repair system operations should any of the hazards occur.

An effective utility security program includes a number of straightforward, common sense measures. These include careful screening of all individuals who have access to utility facilities and procedures that create a record of who enters or leaves each facility and a record the time of entry and departure for the most critical system components (water supply and primary reservoirs). This program can also be used to determine if anyone if left at a site and is in danger. Additionally, staff must be trained to be alert to potential reliability or security threats.

Community Vigilance

Another security approach some utilities have used in the past includes alerting citizens to security problems or vandalism. Asking citizens to report any suspicious activity can assist in protecting the system, while minimizing cost to the ratepayers. Some utilities offer rewards for reports that result in apprehension of criminals and prevention of facility damage.

6.3 Summary

This section has documented the City's existing training program related to emergencies, and available training resources. In addition, recommendations were made to assist the City in continuing to develop its training program for emergency response to water supply reduction and emergencies.

Appendix A
Emergency Contacts

Note:

Formats are provided for important emergency contacts. The City can use existing information to enter into these formats, or use appropriate appendices from the City's existing Emergency Response Plan. Some forms require completion by City staff, or determination to use or not.

EMERGENCY CONTACT PERSONNEL/TELEPHONE NUMBERS

NAME	DEPARTMENT	HOME PHONE	WORK PHONE	CELL/PAGER

FIRE AND POLICE: EMERGENCY 911

Fire and Rescue
Fire Department
Police
Sewer Utility
Street Department
Parks Department
Mayor's Office
Alarm Company/Telemetry
The Alarm Center -
Office/Shop
Well 10

MEDIA CONTACTS (for notification of supply contamination/reduction)

(See City ERP for contact names and phone numbers)

Radio
TV/Cable
Newspaper
Staff to place notice on City website immediately

EMERGENCY REPAIR

ONE CALL (#0069)	(800) 424-5555, 1-800-553-4344
GTE	(800) 823-3233
Puget Sound Energy	(800) 321-4123, 1-800-424-5555
Street Light Outages	(800) 225-5773
Electric Contractor	
Towing Company	
AT&T Cable Broadband	(800) 526-7378, 1-800-241-3624
U.S. West Communications	(800) 214-8043
U.S. West Government Repair	(800) 214-8043
Verizon	(800) 483-1000
Snohomish County PUD	(425) 258-8211, 1-800-783-8300
DOH (Drinking Water Operations)	(425) 464-5401
DOE	(4250 649-7000
WSDOT	(206) 440-4490
Department of Fish and Wildlife	(360) 902-2614
EPA	(206) 442-1263
WISHA	(206) 281-5447
FEMA	(425) 487-4600
Snohomish County Emergency Management	(425) 423-7635
Washington State Office of Emergency Management	(800) 358-5990
Snohomish County Department of Health Emergency	(425) 339-5250 (day) (425) 681-0921 (cell)

NEARBY JURISDICTIONS/UTILITIES

City of Everett	(425) 257-8821
City of Arlington	(425) 258-0919 (water) (360) 435-3811 (general)
Seven Lakes	(360) 652-8192 (water)
Tulalip Tribes	(360) 653-4585
City of Stanwood	(425) 347-9795 (water) (360) 629-4577 (general)
Mukilteo Water District	(425) 355-3355

MUTUAL AID AGREEMENTS SIGNATORS / INTERTIE AGENCIES

List In Alphabetical Order, or priority order, or zone order, with Telephone numbers and contact Names

INTERTIES

ENTITY	CONTACT NAME	TITLE	CONTACT NUMBER
Tulalip Tribes			(360) 653-4585
Seven Lakes			(360) 652-8192
City of Arlington			(360) 435-3811
PUD			(425) 783-8616
City of Everett			(425) 257-8200

MUTUAL AID AGREEMENTS

Alderwood Water District			
Cross Valley Water District			
City of Edmonds			
City of Everett			
City of Lynnwood			
City of Monroe			
Mukilteo Water District			
Olympic View Water District			
Silver Lake Water District			

PORTABLE GENERATORS AND LOCATIONS

GENERATOR NAME/DESCRIPTION	ADDRESS OF LOCATION

WATER FACILITIES INVENTORY

FACILITY TYPE/ NAME	ADDRESS/LOCATION	TELEMETRY/CONTACT
Water Sources		
Edwards Springs		
Stillaguamish Ranney Collector		
Lake Goodwin Well		
Highway 9 Well		
Sunnyside Well #2		
Lake Chaplain/Everett Pipeline		
Treatment		
Stillaguamish Treatmnt Plant		
Chaplain Filtration (Everett)		
Storage Tanks		
Edward Springs Res.		
Sunnyside Standpipe		
Getchell Hill Res.		
Kellog-Marsh Stdpipe		
Highway 9 Reservoir		
Cedarcrest Reservoir		
Pump Stations		
Cedarcrest		
Stillaguamish Source		
Pipelines, Valves		
JOA 30" Pipeline		
Stillaguamish Line		

Appendix B
Priority Service Customers
Facility Inspection/Damage Forms

Note:

Forms are provided for the City to list priority service customers, in order to focus immediate response and follow-up. These would include customers on dialysis, hospitals, other emergency response centers, and other customers requiring water supply for life or death health reasons. These forms should be updated frequently. Other inspection forms are provided for City use during emergencies.

PRIORITY-SERVICE FORM*

Individuals/organizations located at the following service connections are critically dependent on an uninterrupted supply of water. Examples of customers include individuals on dialysis, hospitals, schools, and other customers dependent on water supply for life and health reasons. In the event of an emergency effecting their primary source, the following actions must be taken:

1. Notify the customer immediately. Verify that the second source, if any, is functioning.
2. Take the indicated emergency action, if required.

Name	Address	Telephone	Reason for Requesting Priority Service	Alternative Source Available Yes No	Emergency Action(s) to Be Taken

Approved _____ Date _____

*To be completed and used by water system personnel.

WATER FACILITY INSPECTION FORM

Inspect Facilities for the following items:

- Repair, replace or abandon facility.
- Possible affects from aftershocks.
- Indicate if field crews have performed the review and tagged facility and/or individual equipment items with preliminary assessment information.
- Structural Damage
- Utilities Status

	Normal	Off-Line	Standby Power
Power			
Telephone			
Telemetry			
Damage			

FACILITY TYPE/ NAME	external structural	non-struct damage	utilities status	additional hazards
Water Sources				
Goodwin Well				
Edwards Springs				
Stillaguamish Ranney Collector				
Highway 9 Well				
Sunnyside Well #2				
Lake Chaplain				
Treatment				
Stillaquamish Treatmnt Plant				
Chaplain Filtration (Everett)				

FACILITY TYPE/ NAME	external structural	non-struct damage	utilities status	additional hazards
Storage Tanks				
Edward Springs Res.				
Sunnyside Standpipe				
Getchell Hill Res.				
Kellog-Marsh Stdpipe				
Highway 9 Reservoir				
Cedarcrest Reservoir				
Pump Stations				
Cedarcrest				
Stillaguamish Source				
Pipelines, Valves				
JOA 30" Pipeline				
Stillaguamish Line				
No. 3 Line				
Interties				
Other_____				

OPERATING AND DAMAGE REPORT

This report must be filled out in detail and turned in. It must be signed by the responsible foreman and supervisor on completion of repair/emergency.

Part 1 – General Information

1. Date of this report_____

   Date and time water system became aware of break or problem_____

2. Location of break or problem_____

3. Person or persons who notified water system of break or problem_____

   _____

   Position(s)_____

4. Location and custody of book, card, memo, etc., containing information relative to this report

   _____

Part 2 – Pre-Action Information – Assessing the Emergency

1. Time/date crew arrived at scene_____

2. Names of crew persons at scene_____

3. Nature of problem and/or cause of break. If unknown, state probable cause and detail facts supporting conclusions._____

   _____

   _____

4. What damage was done?_____

5. What damage was done to adjacent property?_____

   _____

Part 3 – Emergency Action Taken

1. What emergency action(s) was taken to control situation at the scene?_____

   _____

   _____

   _____

2. Names of crew persons making emergency repairs_____

_____

3. Time/date emergency repairs were made and service was restored_____

_____

4. Materials used for repair_____

_____

5. Is further action needed? If so, explain_____

_____

_____

Part 4 – Supplemental Information

1. If quality problem, what disinfection procedures were followed?_____

_____

_____

_____

Is further action needed? Yes____ No____ Action _____

2. Were water quality samples taken?

Yes_____	No_____	Parameter	Date	Results
		_____	_____	_____
		_____	_____	_____
		_____	_____	_____
		_____	_____	_____
		_____	_____	_____

3. Were any photos taken? Yes____No____By whom?_____

4. Size and location of valves operated or work necessary to effect shutdown (diagram)_____

_____

5. Size, kind, type, pressure rating and/or class pipe appurtenance_____

_____

6. Date of installation _____Life expectancy_____

7. Date of last inspection of pipe or appurtenances_____

8. Is main subject to excessive pressure or pressure changes?_____

9. History of prior trouble within_____feet and dating back to_____

10. Present condition_____

11. Condition and type of joints_____

12. Type of soil in ditch and characteristic of ground cover around existing water main_____

_____

13. Depth of pipe (top of pipe to street surface)_____

14. Size of hole in street_____

15. Type and thickness of street surface_____

_____

IMPORTANT: WHERE IT APPEARS THAT DAMAGE CLAIMS MAY ARISE, FILL OUT AND ATTACH SUPPLEMENTARY SHEETS WITH ALL INFORMATION POSSIBLE AND DRAW A DIAGRAM ON A SEPARATE SHEET SHOWING AS MUCH DETAIL AS POSSIBLE, LOCATION, AND ADDRESS OF DAMAGED PROPERTY

Crew Leader_____Supervisor_____

WATER QUALITY NOTICE

Date:_____

AN OFFICIAL NOTICE FROM CITY OF MARYSVILLE WATER UTILITY

During the earthquake (or other emergency situation) of (date), the water treatment and distribution system operated by the City suffered extensive damage. Water quality tests are underway to assure that the water is safe to drink. As a precaution, until the water quality tests are completed, the City is advising residents in the _____ area to only use boiled tap water or bottled water for drinking and cooking purposes. ***All tap water used for drinking or cooking should be boiled for at least five minutes.*** An alternative method of purification for residents that do not have gas or electricity is to use unscented liquid household bleach (Clorox, Purex, etc.). To do so, add 8 drops of bleach per gallon of clear water or 16 drops per gallon of cloudy water, mix thoroughly, and allow to stand for 30 minutes before using. A chlorine-like taste and odor will result from this purification procedure and is an indication that adequate disinfection has taken place. Water purification tablets may also be used by following the manufacturer's instructions.

Failure to follow this advisory could result in stomach or intestinal illness.

The City will notify residents as soon as can be determined that the water is safe to drink.

For further information or questions regarding your water, call the City Water Utility at _____.

Appendix C
Training Resources

Appendix C
Training Resources

Many of the following websites contain general infrastructure training information. In addition, there are a number of training programs and information in development, or recently developed, to address issues of security for critical infrastructure.

Critical Infrastructure Protection Board (www.cipb.gov)

An October 16, 2001 Executive Order from the President of the United Stated established a new senior executive branch board to coordinate a voluntary public-private partnership to protect information systems for critical infrastructure, including public water systems. The new board, the Critical Infrastructure Protection Board, is developing policies and coordinating programs for protecting information systems for critical infrastructure, including emergency preparedness communications and physical assets that support such systems. This board is also establishing voluntary standards, best practices, incident response policies and is coordinating research in this area. This executive order also established the National Infrastructure Advisory Council.

National Infrastructure Protection Center (www.nipc.gov)

There is also an FBI operation with infrastructure related information from the National Infrastructure Protection Center. This organization has been working with the electric industry in developing physical and cyber security indications, analysis, and warning reporting procedures. The emphasis of this effort is to encourage utilities (power in this case, but the same policies can be applied to all critical service utilities) to work together, and to centralize information about cyber attacks, in order that assistance can be provided to prevent widespread cyber attacks. Information on this topic may also be available at the National Electric Reliability Council (NERC) website [www.nerc.com].

Additionally, The Chemical and Emergency Preparedness and Prevention Office of the U.S. EPA, FEMA and many other Federal agencies provide support at their websites, as follow:

www.doj.gov/terrorism/funding.htm
www.epa.gov/ceppo/cntr-ter.html
www.fema.gov/emi/crslist.htm

The following organization's websites also contain useful information related to security of water systems:

The American Water Works Association (www.awwa.org)

Select "Security, What you need to know" or "Press Room" and then "Security Resources" Water Utility Managers and operators can send their name, title, utility name, public water system number, complete address, phone number and e-mail address to security@awwa.org with a request for "AWWA Resources" for a more extensive list of AWWA resources.

The National League of Cities (www.nlc.org)

The NLC recently conducted a survey of cities regarding security measures they are taking, including whether or not to close public facilities, especially reservoirs to the public.

Center for the Study of Bioterrorism and Emerging Infections
(www.bioterrorism.slu.edu)

National Domestic Preparedness Office (www.ndpo.gov)

Federal Emergency Management Agency (www.fema.gov)

The National Safety Council (www.nsc.org)

Centers for Disease Control (www.bt.cdc.gov)