APPENDIX F:
LIFELINE SECTOR ASSESSMENT

This section describes the findings from the 2016 Marion County Lifeline Sector Assessment. In 2015, a University of Oregon Community Planning Workshop student team conducted an assessment of lifeline sectors identified by Marion County – transportation, energy, communication, and water. The assessment focused on review of each sector's adaptive capacity and vulnerabilities, as well as critical interdependencies. The team adapted OPDR's Hazard and Climate Vulnerability Assessment Tool, which was created through public and private partnerships, to complete the assessment. The assessment consisted of the following general steps:

- Sector Assessment Part 1: The first step was to assess each sector's adaptive capacity. The team conducted this assessment independent of any particular hazard scenario. To complete the task the team adapted and administered Part 1 of the Vulnerability Assessment Tool to representatives from each sector. The team conducted this phase as part of facilitated meetings with lifeline sector stakeholders, system managers and experts. The team then summarized the information received in the sector report.
- Sector Assessment Part 2: The second step was to assess each sector's hazard sensitivity and potential impacts. The team utilized specific chronic and catastrophic hazard scenarios to inform and direct the discussion. The team worked with the local project lead to select one chronic hazard – flood, and one catastrophic hazard – Cascadia earthquake. To complete this task, the team adapted and administered Part 2 of the Vulnerability Assessment Tool to representatives from each sector. The team conducted this phase as part of facilitated meetings with lifeline sector stakeholders, system managers and experts. The team then summarized the information received in the sector report.
- Sector Assessment Part 3: The team compiled the results and information into a set of sector summaries.

The following subsections are organized as follows: Transportation, water, energy, and communications.

LIFELINE SECTOR: TRANSPORTATION

Transportation is critical lifeline infrastructure. The transportation network facilitates the movement of people, goods, resources and commerce throughout Marion County and beyond. The transportation system consists of local, state, and federal road and highway networks; passenger and freight rail; passenger and freight air service; pipelines; transit; dedicated bicycle and pedestrian systems; and limited water-based modes. All lifeline sectors depend on the transportation system.

Assessment Snapshot

Transportation Sector Summary

Critical Interdependencies:

Systems of all types are dependent on other systems in order to function. In order to operate, the transportation sector is particularly DEPENDENT ON:

- Energy and Fuel
- Communication
- Business and Industry
- Public Works

Other critical lifeline sectors that DEPEND ON the transportation sector to operate include:

- Water
- Electricity
- Liquid fuel
- Public Safety and Emergency Management
- Public Works
- Economy

Crucial Vulnerabilities:

Each sector has a number of vulnerabilities. The transportation sector is particularly vulnerable to the following:

- Federal, state and local bridge infrastructure is particularly vulnerable to earthquake (especially ODOT facilities over the Willamette).
- System relies heavily on fossil fuels for construction, operation, and maintenance.
- Hwy 22 is the primary east-west connection; there are few redundant east-west routes.
- Significant backlog of deferred transportation maintenance projects.

Major Findings:

- ODOT considers I-5 and Highway 22 to be critical routes. Other critical concerns include bridges, roads, communication, and energy including power and fuel.
- Much of the existing transportation infrastructure, including those of major roadways such as I-5, Highway 22, and Mission Road, are not seismically retrofitted and will likely experience structural failures during a Cascadia event.
- Following a Cascadia event, transportation will be limited for 6-12 months; aftershocks may extend that timeframe.

- Transportation is interdependent with communication, water, and energy systems and requires coordination and collaboration during the response and recovery process.
- Although winter storms continue to impact transportation systems, stakeholders respond to these events efficiently and continue to improve plans with every winter weather event. Downed trees, debris, and accumulated ice impact the response of this lifeline.
- Salem-Keizer Transit operates city and regional buses, dial-a-ride, CherryLift for people with disabilities, and coordinates non-emergent medical transportation services. They provide about 4-million rides a year and are currently working to improve individual employee preparedness as well as existing emergency plans.
- Salem-Keizer Public Schools transports an estimated 22,000 students a day including about 2,000 medically fragile students. The top priority for this organization is student safety.
- The electricity grid in Oregon is not particularly dependent on the transportation sector to operate. However, the power generation and distribution network does rely on the transportation network for construction as well as ongoing maintenance and repairs.
- Conversely, all of the liquid fuel in the state is transported by one of three primary transportation modes: truck, rail, and pipeline. Therefore, the distribution fuel in the state is completely dependent on the transportation sector.
- Like the electric grid, the communications sector is not particularly dependent on the transportation sector to operate. However, the power generation and distribution network does rely on the transportation network for construction as well as ongoing maintenance and repairs.
- Business and industry is very dependent on the transportation sector. From the movement of raw material, to getting employees to and from work, to getting finished products to market, virtually all business and industry activity in the region is facilitated by transportation.
- Public works is dependent on transportation in two primary ways. First, the transportation sector facilitates the movement of equipment, materials, and workers. Second, significant portions or components of public works' infrastructure are collocated within transportation rights of way.

Introduction

Access to means of transportation is fundamental to human existence. Transportation infrastructure facilitates everything from a local trip to the park, drugstore or place of employment to international trade and commerce. Furthermore, the ability to move people, goods and services is vital before, during and after emergency events. It is no accident that FEMA's number one Emergency Support Function is transportation. ESF #1 covers the following:

- Aviation/airspace management and control
- Transportation safety
- Restoration/recovery of transportation infrastructure
- Movement restrictions
- Damage and impact assessment

The scope of ESF #1 includes supporting, ". . . prevention, preparedness, response, recovery and ***mitigation*** activities among transportation stakeholders . . .[emphasis added]" and coordinating, "the restoration of the transportation systems and infrastructure."[1]

Transportation lifeline sector participants identified a number of interconnected resources and elements of their operations. These include included roads, bridges, buses, and physical buildings. While this assessment focusses on infrastructure, participants noted that transportation staff and professionals are a critical resource as well.

Primary Agencies and Organizations

The following organizations and agencies participated in this assessment:

- City of Salem
- City of Woodburn
- Marion County Public Works
- Marion County Sherriff's Office
- ODOT
- Salem Public Works
- Salem-Keizer School District
- Salem-Keizer Transit
- Woodburn Transit Service

Sector Description

The transportation sector consists of a vast, multimodal network of fixed and mobile public and private assets. This diversity is part of what makes the transportation sector so vital to so many users. However, it is also what makes assessment of the sector challenging.

The primary transportation infrastructure components in Marion County are summarized below followed by more detailed descriptions as provided by the sector participants:

- State and interstate highways: I-5, Hwy 22, Hwy 99, Hwy 214
- County and city road collection and distribution networks. Participants identified eight roads as making up the county's primary collector network: Cordon Road in Salem,

[1] FEMA, Emergency Support Function #1 – Transportation Annex. 2008. https://www.fema.gov/pdf/emergency/nrf/nrf-esf-01.pdf

Cascade Highway(213), Hillsboro-Silverton Highway (214), Lancaster Drive, Butteville Road, Jefferson/Marion Road, River Road, Aumsville Highway (connects to prison).
- Bridges, as a critical subset of the city, county, state and interstate road network.
- Public and semi-public transit providers (e.g. Salem Keizer Schools has over 250 school busses, a yard and 56 school drop sites with transit responsibility for roughly 22,000 schoolchildren daily; Salem transit district maintains 56 full size busses and multiple regional busses).
- Passenger and freight rail system: Amtrak operates on the UP line and offers daily passenger rail service through Marion County; Union Pacific, which runs roughly 24 freight trains a day on its line, including hazardous materials; and Portland and Western.
- Fuel and natural gas pipelines
- Two regional airports: Salem municipal airport (includes Oregon Army National Guard – Army Aviation Support Facility) and Albany Municipal Airport and numerous local airports and heliports.
- Two limited capacity ferries: Buena Vista Ferry and Wheatland Ferry

Marion County Public Works

Marion County Public Works identified critical roads for their operation including:

- Corden Road
- Cascade Highway
- Silverton Road
- Hail Prairie
- Butteville Road
- Jefferson Marion Road
- River Road N/S
- Aumsville Highway
- Highway 22
- Highway 99E
- Interstate 5

The City of Salem is the seat of Marion County. Accordingly, it is the main base of operations for Marion County Public Works and has access to backup power. There are three other district buildings, as well as underground fuel storage tanks. The only site that has its own generation capacity to pump fuel is at the North Marion location.

Marion County Sherriff's Office

The Marion County Jail is located on Aumsville Highway. It has backup generation for 36-hours. The Sherriff's Office is also responsible for the continued operation of the Marion County Courthouse. The jail is only served by Aumsville Highway without any redundancy in access.

City of Salem

Arterial streets and bridges are the most critical infrastructure in the City of Salem. The City has jurisdiction over several bridges and there are ODOT bridges that cross the Willamette River. The City identified these bridges as important to accessing West Salem. In the case of an emergency or natural hazard event, the Salem Public Works operations facility has heavy equipment that includes snowplows and dump trucks.

City of Woodburn

Woodburn identified the major roadways Oregon Routes 213, 214, 99E, and U.S. Interstate 5 as key transportation infrastructure. During a hazard event, the City's priority is keeping critical arterials roads open, as well as service collectors to help mitigate traffic flow.

Keizer School District

Keizer School District has a fleet of buses that transports over 20,000 students every day, of which 10 percent have special needs. The school district has 66 traditional school sites and 15 nontraditional school sites and their vulnerable populations are concentrated at their preschool, teen parent site, and alternative school site.

There are 12 support sites and school buses are stored at three facilities located on River Road, Gaffin Road, and Hawthorne Avenue respectively. Each facility has over 200 buses and 10,000 gallons of diesel fuel storage. But, their Hawthorne facility is constructed of poor quality concrete and is not ready for an earthquake. The facilities building has trucks and vans, in addition to refrigerator trucks located at the food service site. Keizer School District relies on a radio dispatch network to communicate with buses out on their routes. It is supported by repeaters and has backup generation capacity, with the intent to switch to a digital cable system.

Lastly, Risk Management staff are continuing to plan for scenarios with the Sheriff's Office and Salem by developing responses for man-made and natural hazard events.

Salem-Keizer Transit

Salem-Keizer Transit has 64 large buses and also operates regional and paratransit buses. The agency is taking steps to have employees prepare at home so that employees can get to work.

The buses run on either diesel or compressed natural gas (CNG). There is a direct connection to the natural gas line, but there is not backup power for pumping natural gas.

ODOT

ODOT considers all state and federal highways as priority roads and in Marion County. However, Highway 22 was identified as being particularly critical as it is the primary east-west connection through the county. ODOT also manages a railroad overpass that has been converted to a non-motorized alternative modes bridge. The bridge is open to runners, cyclists, and pedestrians. Notably, the project provides a critical half-mile link in the bicycle and pedestrian circulation systems for the community, the region, and the state. Moreover, ODOT also maintains a motor pool in Salem and operates its own inter-city transit services and vanpools. It also works with rail, airports, and public transit providers, including Amtrak, which maintains a hub in Salem. Amtrak shares rail lines with freight and while ODOT does not own any stations or lines, it is an important partner in operation for both services.

Highway 22 and Mission Road have structures that are not seismically retrofitted. However, the walking bridge would likely remain a viable alternative for pedestrian and bicycle access across the river after an earthquake. Some ODOT facilities are seismically retrofitted, including ODOT headquarters. ODOT is currently considering an option for a ferry to cross the Willamette River.

ODOT relies heavily on the communications sector and would have difficulty functioning without communications. They do have radio backup capabilities. ODOT identified rerouting must consider overpass availability and has established rerouting of traffic around Interstate 5 using side and city roads. Some facilities, like the Salem Operation Center, may not withstand a Cascadia event. ODOT identified Highway 22 as a critical road as it may be one of the only east-west connections through the cascades.

Adaptive Capacity

Adaptive Capacity refers to a system's ability to accommodate a new or changing environment, exploit beneficial opportunities, or moderate negative effects.

In general terms, the transportation sector has a low level of adaptive capacity. This is primarily due to the large scale and fixed nature of the infrastructure itself. Highways, roads, bridges, airports, and railroads are expensive to construct and not easy to relocate. The political, financial and policy issues related to transportation work as further limits to adaptation. Furthermore, when transportation infrastructure is damaged or otherwise impacted, it takes significant time and investment to fix. Similarly, a huge portion of the sector is completely reliant on fossil fuels to operate. In a state with significant fuel vulnerability, fuel availability becomes a single point of failure for much of the sector even if the physical infrastructure is not impacted. Finally, the entrenched set of sub-sector or mode-specific subsidies, incentives or disincentives pose significant challenges to sector diversification, particularly at the local level.

Interdependencies

Systems of all types are dependent on other systems in order to function. In order to operate, the transportation sector is particularly ***dependent on***:

Energy: Electricity and Fuel

The transportation sector is not particularly dependent on electricity. Electricity is needed for traffic signaling and network lighting needs. Further, a small but growing portion of passenger vehicles and some transit modes use electricity. However, these represent a very small percentage of the entire transportation fleet across all modes. The sector is, however, critically dependent on liquid fuel. The vast majority of passenger and freight vehicles, emergency vehicles, aircraft, equipment, and rail all run on fossil fuel. In addition, significant portions of the infrastructure itself consists of fossil fuel derivatives, asphalt being the most notable.

Communication

Transportation is dependent on communication in some modes more than others. Air traffic control, for example, depends on multiple modes of communication to ensure safe air travel. Similarly, passenger and freight rail rely on communications for switching and scheduling. Increasingly, communication systems are used for real-time transportation demand management, traffic control, emergency routing information and trip planning purposes. Finally, communication systems are used to dispatch maintenance crews and to communicate with transportation-related public-safety and law enforcement units.

Business and Industry

The transportation system is heavily reliant on private engineering, design, construction, manufacturing and raw material businesses and industry. Further, most of the vehicles used in transportation are manufactured by private business and industry. Freight rail, commercial air, and pipeline infrastructure is largely owned and operated by private businesses. In short, the transportation sector is critically dependent on private business and industry to operate.

Public Works

Similarly, significant portions of the physical transportation infrastructure are financed, constructed and maintained by the public sector. State and local public works departments are responsible for much of the surface transportation infrastructure in Marion County.

Vulnerabilities

The assessment team evaluated the transportation sector's vulnerability using a scenario planning approach which included one chronic event (winter/ice storm) and a catastrophic event (9.0 Earthquake).

Chronic Hazard: Winter/Ice Storm

Participants indicated that a winter storm could lead to flooding, further compounding damage and harm. ODOT identified that winter storms have significant impacts on their operations as it interrupts emergency, commercial, and personal vehicle capability. In 2014, the mid-Willamette Valley experienced a significant winter storm. ODOT has identified gaps in their response and has planned for future events accordingly. All five ODOT regions have a winter storm plan. There are now also electronic copies, in addition to paper copies.

Keizer School District is also highly sensitive to a winter storm. Decisions around how and when to shelter students or cancel school follow a very specific plan. An area of concern is in regard to bus drivers' hesitance to drive in snow and ice and whether there will be enough drivers and keeping students safe on buses if they are stuck on roads in severe winter conditions. Diesel gelling in extremely cold weather is also a concern for bus operation.

Salem Public Works reported low sensitivity to a winter storm and that their staff and equipment are prepared for this type of event. Their County counterpart, Marion County Public Works, has a yearly test of equipment and staff assignments. Salem-Keizer Transit has a snow plan that facilitates their determination of service capability during a winter storm event.

Catastrophic Hazard: Cascadia Earthquake Event

All participants report extremely high sensitivity to a Cascadia Earthquake with widespread impacts. ODOT in particular reported extreme sensitivity to a Cascadia earthquake event. Much of interstate highway system is not seismically retrofitted and it is likely that Interstate-5 would fail. ODOT has plans to mitigate seismic impacts, but lacks funding to execute.

The Sherriff's Office identified a need to maintain the Courthouse operations and balance law enforcement duties. Of particular concern is moving a population of 3,700 incarcerated individuals if the jail structure is damaged.

Several participants have already begun hazard mitigation and have regular planning meetings. While Salem-Keizer Transit does not have a formal plan, but has begun assessing capabilities and limitations.

Mitigation Opportunities

The transportation sector representatives identified a number of potential mitigation opportunities.

Add Lifeline Corridors to Transportation System Plan

The Marion County Transportation System Plan is "a planning tool that is used to identify transportation projects throughout rural Marion County – this includes roads, transit, bicycles, pedestrians, rails, ferries, freight, and air." In short, it outlines medium- and long-term investments in transportation infrastructure. Although it was recently updated in 2013, the TSP does not specifically identify lifeline corridors or utilize lifeline corridors as a factor in determining TSP project priority. Aligning critical infrastructure mitigation with standard planning activities is one way to better ensure implementation and increase resilience.

Designate Critical Facilities and Employers in City and County TSP

Similar to lifeline corridors, city and county TSPs do not currently include comprehensive assessments of critical facilities and employers. Therefore, transportation investments are not necessarily being targeted to ensuring critical facility and employer transportation access before, during and after disaster events. Integrating hazard mitigation considerations related to critical facilities and employers with standard transportation planning activities is one way to ensure implementation and increase resilience.

Designate Priority Transportation Routes in Marion County

Sector participants highlighted the need to prioritize transportation planning routes in Marion County. The group discussed a "hub and spoke" approach to ensure that resources can be distributed throughout the county from known centralized assembly points (e.g. the Oregon Army National Guard – Army Aviation Support Facility at the Salem Airport). Once routes are prioritized, the county can use that framework to focus transportation related vulnerability assessments (e.g. bridge structural assessments for seismic) and capital improvement plan investments.

Identify Local Funding Sources

While some additional prioritization and integration is warranted, as outlined above, participants also acknowledged that many plans already ID transportation related mitigation projects. These are evident across multiple departments and agencies. Participants identified funding, primarily local sources, as a key barrier to implementation. Participants encouraged efforts to identify local sources of funding to support transportation related mitigation projects.

24-Month Preparation and Outreach Campaign

Participants acknowledged that without increased awareness and preparation, no amount of planning will be enough. The group proposed a targeted and focused 24-month Preparation and Outreach Campaign. The goal of the campaign could be to increase awareness about the vulnerability of the transportation sector in Marion County. Key outcomes could be to increase the level of preparation on the part of citizens, businesses and agencies related to transporation.

Partner with the Marion County Farm Bureau

Participants briefly discussed opportunities to coordinate with the Marion County Farm Bureau on transportation related mitigation projects. The Farm Bureau has not traditionally been a partner in the county's mitigation efforts. However, the Farm Bureau represents a constituency that is highly dependent on access to multiple transportation modes. Collaboration with the Farm Bureau on issues of mutual benefit could be a way to increase awareness and political buy-in.

Water is critical to life. After three days without water, a person will experience severe dehydration, which may lead to death if not reversed. Alone, the intrinsic need for water qualifies the water sector as a lifeline. Water is something our family, friends, emergency personnel, healthcare professionals, and whole community is dependent upon.

Assessment Snapshot

Water Sector Summary

Critical Interdependencies:	**Crucial Vulnerabilities:**
Systems of all types are dependent on other systems in order to function. In order to operate, the water sector is particularly <u>DEPENDENT ON</u>: • Electricity • Communication • Transportation • Liquid Fuel **Other critical lifeline sectors that <u>DEPEND ON</u> the water sector to operate include:** • Fire and EMS • Business and industry • Electricity	**Each sector has a number of vulnerabilities. The transportation sector is particularly vulnerable to the following:** • The water sector in Marion County consists of numerous local and regional systems. • Several reservoirs, transmission lines and the Salem Treatment Facility are vulnerable to multiple hazards. • Aquifer storage capacity not sufficient to meet need as a backup source.
Major Findings: • People living in unincorporated areas of Marion County rely on wells and septic tanks. • Low water reserves and low river flow pose a serious threat to the water supply. • Some infrastructure pertaining to water systems are old which increases the risk vulnerability to withstand a Cascadia event. Impacted infrastructure located near rivers could cause service disruptions and flooding during an event or incident. Power is vital to the water facilities. • Generators are co-located at critical facilities and need to be maintained requiring various fuel types in order to support redundancy. • Road access is vital to conduct damage assessments and or repair impacted facilities.	

Introduction

For the purposes of this assessment, the water sector includes information pertaining to drinking water, stormwater, and wastewater. Stakeholder participants included a range of local and regional infrastructure and service providers. The information provided in this summary is based on research of the county's water resources and infrastructure.

Ready access to virtually unlimited amounts of clean drinking water is often taken for granted, particularly here in the Pacific Northwest. Water is vital for basic daily living, for business and industry especially including agriculture, for fire protection and medical service provision, and for wastewater management. In addition, stormwater facilities provide critical protection from a variety of localized flood risks. FEMA Emergency Support Function #3 covers public works, including water, wastewater and stormwater services. Ensuring that all water related public works infrastructure is operational is critical to the function of any community.

Primary Agencies and Organizations

The following organizations and agencies participated in this assessment:

- Public Works
- City of Stayton
- City of Turner
- City of Salem
- Marion County
- City of Keizer
- North Santiam Watershed Council

The North Santiam Water Council (NSWC) provides resources and knowledge to Marion County. The NSWC is currently working on a Drought Contingency Plan. This will allow the NSWC to better understand the availability and general magnitude of available water resources.

Sector Description

The water sector consists of three primary sub-sectors: drinking water, wastewater and stormwater. Common elements of the drinking water system include source water, intakes, treatment, reservoir storage, transmission, and distribution. Common elements of the wastewater system include collection and treatment. Stormwater systems are primarily collection systems.

Because each jurisdiction has their own infrastructure with similar components additional information specific to each of the participating jurisdictions is included below.

City of Salem

People living in unincorporated areas of Marion County mainly rely on wells and septic tanks.

Marion County Storm and Surface water drainage system includes urbanized East Salem Service District infrastructure, as well as rural roadside drainage ditches. The Service District was established for sewer and lighting, and is now also serving as a stormwater service area. There is a wastewater treatment plant near Keizer. The County Board of Commissioners also serves as the District Board.

City of Aurora

The City of Aurora relies on a groundwater system and the Pudding River to provide access to water. It is located at the end of the Troutdale watershed.

Stayton

Stayton's sanitary sewer, stormwater and water systems are bound within the City limits of Stayton. The City buys water from the Santiam Water Control District and draws water off of a Santiam ditch intake. The City of Stayton also has two wells, which each store enough water for one day. Both of Stayton's drinking water facility and wastewater facility are located near the Santiam River. The drinking water facility used a slow sand filtration system and is currently working on looping the system.

Turner

The City of Turner buys water from the City of Salem. Its water system is capable of serving its 2000 residents and is comprised of two water tanks, two pump stations, 15 miles of pipes, and 200 hydrants. Turner's two water tanks gravity feed the city and are located on a "cliff." Turner also hosts one of Salem's reservoirs.

Salem

As the County seat and capitol of the State of Oregon, Salem plays a significant role in the water sector. The City owns water rights in the North Santiam Watershed and its treatment facility is located on Geren Island, just east of Stayton. Water is conveyed through two large transmission mains to reservoirs, pump stations, and customer taps. There are 17 miles of transmission mains that separate Geren Island from the City of Salem. There are 18 finished water reservoirs. Salem utilizes SCATA, which detects problems in the distribution system. The City of Salem is 70 percent gravity fed and uses a slow sand filtration system to purify its water. The water is also tested upstream. The system is also protected by two valves that are able to isolation sections of the system.

Salem also provides water to three wholesale customers: City of Turner, Suburban East Salem Water District, and Orchard Heights Water Association. The City also operates an Aquifer Storage and Recovery (ASR) system in south Salem. The ASR is replenished in winter rains and stored for the dry days of summer.

Adaptive Capacity

Adaptive Capacity refers to a system's ability to accommodate a new or changing environment, exploit beneficial opportunities, or moderate negative effects.

In general terms, the transportation sector has a low level of adaptive capacity. This is primarily due to the large scale and fixed nature of the infrastructure itself. Highways, roads, bridges, airports, and railroads are expensive to construct and not easy to relocate. The political, financial and policy issues related to transportation work as further limits to adaptation. Furthermore, when transportation infrastructure is damaged or otherwise impacted, it takes significant time and investment to fix. Similarly, a huge portion of the sector is completely reliant on fossil fuels to operate. In a state with significant fuel vulnerability, fuel availability becomes a single point of failure for much of the sector even if the physical infrastructure is not

impacted. Finally, the entrenched set of sub-sector or mode-specific subsidies, incentives or disincentives pose significant challenges to sector diversification, particularly at the local level.

Interdependencies

Systems of all types are dependent on other systems in order to function. In order to operate, the transportation sector is particularly *dependent on*:

Vulnerabilities

The assessment team evaluated the water sector's vulnerability using a scenario planning approach which included one chronic event (winter/ice storm) and a catastrophic event (9.0 Earthquake).

Chronic Hazard: Winter Storm

The drought conditions of 2015 caused great concern and pointedly raised awareness of the water's vulnerability to drought. Low water reserves and low river flow pose a serious threat to the ability to supply water. In addition, with low water levels water quality is of concern. Even with a normal pollutant load, the pollutant concentration will be higher than normal due to the lack of water to dilute.

Winter storms did not pose a high threat to the water sector, but the potential flooding to follow was a major vulnerability. Many of the Cities' infrastructure is located near a river. Flooding could shut down operations creating supply issues. A flood may also wash pollutants into the water sources. However, the predictability of a flood allows for the sector to mitigate and prepare for the hazard event. Lastly, flooded roads and bridges could create an access issue in trying to reach facilities.

Catastrophic Hazard: Cascadia Earthquake Event

Much of the water sector's necessary infrastructure and facilities are old and it is unknown how they will fare in an earthquake event. Some underground transmission lines are over 80 years old and none of the treatment facilities were known to be seismically retrofitted. The location of drinking water treatment facilities and wastewater facilities along riverbanks poses a threat as the soil underneath is subject to liquefaction. If any water supply is available, it will only be used for priority usage including drinking water and water for fighting fires.

The water sector's large uncertainty of how the earthquake will impact their operations parallels their uncertainty of how they will respond and recover. The staff's first reaction will be to secure their own families and then try to find a way to communicate with their colleagues. However, regular communication pathways might be shut down and other options are instead being considered, such as satellite and HAM radio.

Secondly, communities will need to identify points in the system that have been broken, which relies on their ability to access roads and bridges. Currently, supplies, tools, and machinery are not equally distributed throughout the County, which could lead to difficulty in staff accessing and repairing isolated facilities if roads, communications, or energy is inaccessible. Overall, the response and recovery of the water sector will hinge on the ability of staff to access the section of the system needing fixed and having the right resources to fix it.

Wastewater treatment plants pose a health risk. A prime example is the Marion County wastewater treatment plant, just outside of the Keizer city limits. If the Marion County

wastewater treatment plant shuts down, the sewage will become backlogged and spill out into the streets of Keizer. This may pose a health and safety hazard, while also potentially contaminating freshwater supplies.

In addition, earthquakes may cause landslides into rivers, causing high turbidity and a potential of high pollutant loads. There are also a number of railroad lines located along river ways, and a hazardous spill that contaminates a relied upon watercourse could result in serious consequences.

Mitigation Opportunities

The water sector representatives identified a number of potential mitigation opportunities. Notably, the need to increase diversity and redundancy were key themes throughout the water sector conversations.

Complete and Implement Drought Contingency Plan

Participants indicated that water quantity will continue to grow as a key issue. Participants acknowledged the work being done to develop a drought contingency plan for the county and applauded the collaborative, multi-agency effort currently underway. The group indicated that completing and moving quickly to implementing the Drought Contingency Plan should be the highest priority for the water sector in Marion County.

Add risk assessment and hazard mitigation information to water master plans

Participants noted that most water master plans do not integrate risk assessment and hazard mitigation strategies. Generally speaking, water master plans outline a program to ensure customers have access to quality drinking water. These include medium- and long-term investments in water infrastructure. Aligning critical infrastructure mitigation with standard planning activities is one way to better ensure implementation and increase resilience.

Increase diversity and redundancy of equipment

Sector stakeholders noted throughout the discussion, that increasing the diversity and redundancy of equipment is critical to the provision of water. Single points of failure, whether at an intake, pump station, or transmission line can take the entire system off-line. Therefore, the group emphasized the need to ensure critical components of the system are backed up.

Increase diversity and redundancy of information

Participants noted that much of the detailed information about water systems is now held in digital or on-line files. Should the electronic system be down or access to electronic files be limited, water system managers would not have access to even basic information about the processing, transmission and distribution systems. Participants indicated that maintaining paper copies of key information and maps should be common practice.

Develop a pre-determined "shut down" process, procedure and prioritization

If multiple systems need to be shut down, the county does not currently have a good understanding of the order and priority. The group discussed the need to predetermine a process, procedure and prioritization scheme. As part of this effort, determining points of contact and communication protocols is important.

Continue to evaluate infrastructure mitigation opportunities

Participants outlined several examples of water infrastructure that is old, out of date. In other cases, participants cited partial progress on resilience where additional investments are still needed.

The energy sector is critical to modern life. Electricity is vital for virtually all household, business and emergency operations; liquid fuel is used for transportation, facility construction and repair, and backup power; natural gas is used for electricity generation, heating, cooking, powering vehicles, and other uses. The resilience, redundancy, and interdependencies of the energy sector will largely determine the timeline for emergency response and long-term community recovery. Diverse and redundant energy supply and distribution can significantly increase regional resilience.

Assessment Snapshot

Energy Sector Summary

<table>
<tr>
<td>Critical Interdependencies:
Systems of all types are dependent on other systems in order to function. In order to operate, the communication sector is particularly <u>DEPENDENT ON</u>:
• Transportation
• Communication
Other critical lifeline sectors that <u>DEPEND ON</u> the communication sector to operate include:
• Public Safety and Emergency Management
• Transportation
• Water
• Communication
• Economy</td>
<td>Critical Vulnerabilities:
Each sector is vulnerable to a variety of impacts. The energy sector is particularly vulnerable to the following:
• Consumption consists almost entirely of one of three forms: electricity, liquid fuels, natural gas.
• Dependence on BPA for electric power; Marion County produces very little power locally.
• Lead time for ordering critical system components (e.g. transformers)
• Concentration of liquid fuel storage facilities in Portland; limited local fuel storage and supply.
• Lack of capability to pump fuel locally without power.
• Reliance on supply and distribution facilities located outside Marion County.</td>
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<tr>
<td colspan="2">Major Findings:
• Generators are co-located by equipment and are used at critical infrastructure throughout the county; however, require various fuel types depending on the unit.
• Oregon’s fuel storage facilities are located in Portland and are susceptible to failure due to soil liquefaction. The storage capacity on a normal day is six days; therefore, it is anticipated that fuel will be an undersupplied commodity during a Cascadia event. It will take 3-6 weeks to reacquire fuel.
• Energy is critically interdependent with the transportation, communication, and water sectors. For example, not having access to roads nor having the ability to communicate with responders leaves the energy sector extremely vulnerable. In addition, there is a need for energy in powering water treatment plants. These</td>
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vulnerabilities are particularly heightened in areas where accesses via bridges or singular roads are susceptible to failure.

- The EPA regulates energy in terms of emissions limiting the capacity to produce additional energy resources.
- Damage assessments will be critical to capture the impacts to this lifeline. Downed trees, accumulating ice, and high winds can impact the resiliency of energy as a lifeline.
- The energy sector also prepares and mitigates against human-made disasters, such as cyberattacks.
- The energy sector grants people with uninterrupted services due to medical status during non-catastrophic events.
- An estimated 1-3 months of electrical service interruption during a Cascadia event.

Who participated?

The following organizations and agencies participated in this assessment:

- Pacific Gas and Electric (PGE)

Sector Description[2]

The energy sector is one of the most crucial lifelines in Marion County, providing electricity, liquid fuel and natural gas to residents and businesses from Aurora to Stayton and Salem to Idanha. Energy supports a wide array of community needs from charging cellphones to powering lifesaving medical equipment. Furthermore, other lifeline sectors rely on energy to provide many basic services. The resilience of this sector in a natural hazard event will greatly influence response capabilities. Furthermore, post-event recovery operations and success will depend in large part on the length of time it takes the energy sector to come back on line.

Electricity

The electric sector in Marion County is comprised of two local providers (Salem Electric and Pacific Power), and a federal power agency (Portland General Electric (PGE)). These three companies provide electricity to over 300,000 people in Marion County. Electric facility construction and maintenance is a key component of this sector's responsibility. The local agencies are primarily responsible for the distribution of electricity to residential, commercial, industrial and institutional customers. The vast majority of electricity generation is provided by the Bonneville Power Administration (BPA). Their resiliency and ability to respond in a hazard event is vital to reestablishing other important lifelines and facilities. For the purpose of this analysis, the information included primarily pertains to PGE, which is the largest distributor of electricity in Marion County.

PGE's critical infrastructure is located throughout Marion County and the larger Willamette Valley region. Currently, all of PGE's major hydroelectricity facilities are located outside of Marion County, in Timothy Lake, Clackamas River, and Estacada. Most of Oregon's liquid fuel is stored in reserves along the bank of the Willamette in the Portland Metro area. Notably, PGE

[2] Due to limited stakeholder involvement, portions of this section are informed by the City of Salem Local Energy Assurance Plan and the Marion County Commodity Flow Study.

maintains a local critical facilities list that consists of key emergency response, industry and public agency partners.

Participants emphasized that the sector is actively working to increase the diversity and redundancy of local electricity supply and distribution through a number of innovative projects. The Salem Smart Power Center, hosted by PGE, is intended to be the hub of "one of the most advanced electrical systems in the country."[3] Consisting of a 5-megawatt lithium-ion battery and inverter system, the Smart Power Center is intended to provide backup power to the regional grid. In conjunction with this project, the sector is working on a number of additional "micro-grid" projects. To date, the sector has identified seven potential sites micro-grid throughout the county. One of those sites, located at the Oregon Department of Public Safety Standards and Training facility in Salem, is currently being explored as a pilot project. Additionally, the sector is evaluating distributed satellite generation (DSG) siting opportunities throughout the region. Collectively, the vision for these electric supply and distribution projects is to create a "triangle of control" that significantly increases local electricity resilience.

Liquid Fuel

The petroleum supply chain consists of extracting crude oil, transporting it to refineries, processing it into petroleum products, and finally transporting it to consumers, often via intermediate suppliers. After being extracted, crude oil is refined into a number of petroleum products, including:

- Motor fuel, primarily gasoline;
- Distillate fuel, including diesel fuels, industrial fuels, and heating fuels;
- Liquefiable Petroleum Gas, including ethane, propane, butane, and others;
- Jet fuel, used in aircraft engines;
- Residual fuel oil, a by-product of the refinement process often used to produce heat or electricity; and
- Other products such as asphalt, kerosene, and lubricants.

According to the Oregon Resilience Plan, over 90% of Oregon's liquid fuel supply originates in the Puget Sound area in Washington. All of that fuel passes through the Critical Energy Infrastructure Hub north of Portland before it is distributed throughout the state. Marion county has limited liquid fuel supply reserves. According to the Salem Energy Assurance Plan, the Salem area has roughly 2.5-3.7 million gallons of fuel storage capacity. Assuming an average fuel storage volume, this equates to between three- and five-days of fuel availability.

Natural Gas

The primary natural gas supply chain consists of the extraction and processing of natural gas; the transportation of that gas via pipeline; and the underground storage or direct use of the gas for heating, fuel, electricity generation, or other uses. Approximately one in three Oregonians rely on natural gas as the primary source for heating their homes.[4] Oregon produces no natural gas of its own and must import its entire supply from out-of-state. Oregon's natural gas is produced in British Columbia, Alberta, Wyoming, Colorado, and New Mexico, and is transmitted to Oregon via an interstate pipeline system.

[3] https://www.portlandgeneral.com/our-company/energy-strategy/smart-grid/salem-smart-power-center

[4] U.S. Energy Information Administration, *State Energy Data System* (Washington, DC: U.S. Energy Information Administration, 2011).

Marion County has two major gas transmission pipelines. Distribution lines are located throughout the county.

Summary Considerations:

- Oregon imports 100 percent of its petroleum and natural gas, but generates most of its own electricity.
- Salem generates almost no electricity, and over half of its electricity supply is dependent on fossil fuels.
- Local generation and storage of electricity through on-site generators, solar panels, fuel cells, battery arrays, and other technologies can provide a way for individual facilities to diminish their vulnerability to electrical supply disruptions. Adoption of these technologies is far from universal; a widespread or long-term electrical outage would likely have severe consequences.
- The Puget Sound refineries provide more than 90 percent of Oregon's refined petroleum products, and it operates at about 95 percent capacity.
- About one-third of Oregonians residents use natural gas for heating, and Salem's natural gas supply is dependent a on a single pipeline.
- Salem depends on the road network for deliveries of petroleum products, and for deliveries of liquefied natural gas (LNG) if the natural gas network is disrupted. A petroleum pipeline travels through Salem but has no outlet there.

Vulnerabilities and Risk Assessment

The energy sector's vulnerability was assessed through scenario planning, which included a chronic event and a catastrophic event.

Chronic Hazard: Winter/Ice Storm

The energy sector has fared well in recent winter storm events. On its own, a winter storm poses risk, but the negative impacts are often geographically isolated, limited to the electricity, and easily recovered from. For example, a winter storm might bring freezing rain, sleet, and ice which accumulates on tree branches, causing them to break and possibly damage power lines. Flooding as a result of snow melt poses a potential risk primarily due to impacts on the transportation system.

Damaged transportation infrastructure or the potential for limited road access in the event of a winter storm is the energy sector's primary vulnerability. Transportation access is particularly a concern in rural areas that are accessible via bridges or singular roads. Energy providers must coordinate with transportation departments and public works crews to ensure roadways are passable prior to responding to damage or power outages.

Overall, energy sector recovery occurs relatively quickly during winter storm events as there are established protocols, trained personnel and equipment needed to respond and adapt to the event.

Catastrophic Hazard: Cascadia Earthquake Event

Currently, the energy sector is extremely sensitive to a Cascadia subduction zone event or other large local earthquake. Energy infrastructure and facilities are highly sensitive to violent shaking and liquefaction. Notably, significant portions of Marion County are susceptible to liquefaction

during a large magnitude earthquake. An event of this size is expected to have significant impacts to all energy transmission, distribution, and storage facilities. The unpredictability of the Cascadia event stems from the inability to properly estimate individual facility impacts. As a result, the energy sector must work towards establishing hazard mitigation, infrastructure resilience, and coordinated response efforts that anchor their ability to provide service. The following vulnerabilities demonstrate points of weakness and opportunities for mitigation within the energy sector.

First, damaged transportation infrastructure or the potential for limited road access in the event of a Cascadia earthquake leaves the energy sector extremely vulnerable. This is particularly a concern in rural areas that are accessible via bridges or singular roads. Some of these roads and bridges are not seismically sound, or are located in areas that would be difficult to get supplies and repair vehicles and personnel to.

Marion County lacks energy independence; it is reliant on hydroelectric power, liquid fuel, and natural gas inventories that are supplied from outside of the County. Generators can be used in an emergency event. However, these depend on fuel to run. As a result of Oregon's current practices for storing fuel, a large earthquake event will lead to drastically lessened access to fuel. It is highly likely the fuel supply will be significantly limited and prioritized for emergency response and recovery following an event.

Mitigation Opportunities

The energy sector assessment identified several potential mitigation opportunities.

Compare, crosswalk and maintain critical facilities lists

BPA, Marion County and other state and local partners maintain lists of critical facilities. Some agencies prioritize those critical facilities for emergency response and recovery resources, including electricity and other energy sources. Participants expressed a desire to compare and coordinate those critical facilities lists to ensure consistency.

Develop and maintain a "no-disconnect" list

At present, electric and natural gas utilities disconnect service after periods of non-payment. Vulnerable populations, particularly those that require electricity for medical equipment, can be placed a significant risk if service is disconnected. Developing a strategy to ensure that critically vulnerable populations are not disconnected from electrical service, even if they are unable to pay for service, is needed.

All-hazard risk assessment for critical energy infrastructure

Stakeholders indicated that additional risk assessment information is needed across a range of hazards and infrastructure sectors. Specifically, there is a desire for a "bulk upload spreadsheet" where assessment information can input.

Source additional funding for tree trimming projects

Participants acknowledged that additional funding is needed for hazard-tree trimming projects. Because power outages disproportionately impact vulnerable populations, these funds should be prioritized for improving electrical system resilience for vulnerable populations.

Innovation project: Utilize used batteries tied to solar generation for backup power

Sector participants discussed how innovation could be used to increase local or micro-energy resilience. One participant observed that forklift, golf-cart and other batteries are often replaced prior to the end of their useful life. Batteries of this size are capable of storing significantly more

power than smaller car batteries. This project would assess the feasibility of utilizing used industrial batteries for backup power.

LIFELINE SECTOR: COMMUNICATION

The communication sector facilitates the rapid exchange of information across a broad range of systems and technologies. These include: broadcast television and radio, telephone, cellular phone, cable, internet, two-way radio, and Ham (or amateur) radio.

Assessment Snapshot

Communication Sector Summary

Critical Interdependencies:	**Critical Vulnerabilities:**
Systems of all types are dependent on other systems in order to function. In order to operate, the communication sector is particularly <u>DEPENDENT ON</u>: • Electricity • Energy (fuel) • Transportation **Other critical lifeline sectors that <u>DEPEND ON</u> the communication sector to operate include:** • Water (SCADA) • Electricity • Public Safety and Emergency Management • Transportation • Economy	**Each sector is vulnerable to a variety of impacts. The communications sector is particularly vulnerable to the following:** • All systems rely on electricity for operation and maintain generators for backup power. Generators rely on fossil fuels to operate leading to questions about what systems and services would be prioritized for gasoline/diesel fuel use if there were a disruption to fuel supply. Also, some generates operate on propane or natural gas, neither of which are included in state or federal energy assurance plans. • All systems rely on infrastructure (towers, antennae) spread across large areas, often in remote locations. Road access to repair equipment is a primary concern • 911 service and other emergency communication relies on line-of-site microwave transmission. Even small changes in antennae alignment can disrupt transmission and require recalibration to re-establish connections between towers. Fiber infrastructure is vulnerable to earthquake damage, in particular where lines are connected to bridge spans.

Major Findings:

- Many providers share infrastructure and or have their infrastructure co-located.
- Stakeholders are well prepared to address winter storms and other disasters as long as there is access to their facilities. Transportation, water, and energy are equally dependent on communication infrastructure. In addition, trees, wind and ice are hazards that can impact this lifeline.
- During a power outage, battery and generator backups provide limited power for a varying duration of time depending on the fuel source and capacity. Redundancy is a needed resource for critical infrastructure that requires access and the supply of multiple fuel types, primarily gasoline and diesel. Notably, propane is a fuel source for some generators; however, propane will not be provided through state resources. Some generates operate on propane or natural gas, neither of which are included in state or federal energy assurance plans.
- All providers anticipate a 75-100% shut-down after a Cascadia event. Due to the roads and bridges being impassable, network connections could be severed.
- Largest barriers to respond in a Cascadia event include: staff ability to respond, access to facilities, shortage of supplies to repair infrastructure, time, funding, and political support.
- Stakeholders recognize that their staff and families need to be prepared. To address this need, they are supporting a proactive approach to disasters. In particular, the Communications sector is working to train employees to be prepared for disasters so they can address their own immediate needs before safely addressing the needs of the sector post-event.
- Some towers have fiber optic lines as a redundancy. However, these lines are vulnerable in a catastrophic earthquake, in particular where lines are connected to bridge spans.
- Water infrastructure systems rely on communication for operations and maintenance through a “Supervisory Control and Data Acquisition” (SCADA) system. The system provides remote monitoring and control of the water system components. Radio system capability is needed for these systems to operate effectively. Much of this infrastructure is isolated. For example, Salem’s infrastructure is located on an island.
- Amateur Radio provides critical back up to public safety radio communications in a disaster, but does not provide the necessary capacity to meet emergency management needs. Jurisdictions should consider investing in satellite voice and data capabilities.
- Local servers may be damages in an earthquake. Jurisdictions should consider "cloud based" data storage solutions to backup vital records.

Introduction

Communication is an essential aspect of virtually all public and private sector activities. The ability to communicate is especially critical during an emergency. Notably, FEMA's Emergency Support Function #2 – Communications specifically supports the restoration of communications infrastructure. The scope of ESF #2 includes, "restoration of public communications infrastructure" and assisting "State, tribal, and local governments with emergency communications and restoration of public safety communications systems and first responder networks."[5]

This assessment focusses on (1) the adaptive capacity of the communications sector, (2) hazard-specific vulnerabilities to communication infrastructure, and (3) mitigation opportunities that can support uninterrupted or rapid restoration of communication capability during or following emergency or disaster event.

Primary Agencies and Organizations

The following organizations and agencies participated in this assessment:

- Capital Community Television (CCTV)
- Amateur Radio Emergency Service (ARES)
- Marion Area Multi-Agency Emergency Telecommunications Dispatch Center (METCOM 911)
- Santiam Canyon Phone
- Willamette Valley Communications Center (WVCC)
- Frontier
- Verizon
- Oregon Statewide Inoperability Coordinator (SWIC)
- Service Master of Salem
- Pacific Gas and Electric Company (PGE)

Sector Description

The communication sector consists of many primary infrastructure components, including microwave and radio frequency antennas, cable and fiber optic lines, routers, switches, and more.

Many communication providers share infrastructure, poles and lines, or have their infrastructure collocated. Additionally, energy providers often share poles and wires with communication providers. While local private-sector communication providers often have emergency response agreements with their national or parent organization (e.g. Frontier and Verizon) most public sector communication providers (e.g. ARES and METCOM 911) have to maintain and repair their own networks in the event a hazard disrupts service.

A point heavily emphasized to the project team, particularly by METCOM 911 (which dispatches and maintains communication links for 29 different agencies throughout Marion County), is that their entire network is connected through microwave transmission. This infrastructure relies on networks of relay stations that require line-of-site connections to operate. Therefore, a single

[5] FEMA, Emergency Support Function #2 – Communications Annex. 2008. https://www.fema.gov/pdf/emergency/nrf/nrf-esf-02.pdf.

point failure resulting from a loss of relay station alignment could mean that a large portion of the network is down until the facility can be accessed and repaired.

Additionally, some communication providers have systems that rely on selective routing. This means that their cell towers send signals to an electric router in Portland and then back to Marion County. The providers who use this method have limited control over this portion of the process until it reaches their facility. For those who use or can access C4 routing, 80 percent of the calls are wireless.

The HAM/amateur radio network (ARES) utilizes VHF/UHF technology. VHF/UHF utilizing a repeater enables communication ranges of 100+ miles; HF facilitates communication from 100+-3000+ miles w/o a repeater. There are 100 or more repeaters across the state, which are managed through the State Repeater Coordinating Council, an independent HAM radio body. The channels are open and are non-secure. However, the HAM radio network can establish repeater sites, which allow the portable network to link over hills and create a statewide network that can be linked remotely with radio. These radio repeaters are often collocated with 911 towers and have a battery life of six to twelve hours. Some operators have cross band repeaters, which can extend their communication range anywhere from three to forty miles, depending on where repeaters are placed. HAM radios can also use digital signals and non-voice communication, which sends information in a format similar to email. At this moment, there is a long waiting list for volunteers to access a limited number of frequencies. Locations and frequencies are managed on a first come, first serve basis through the State Repeating Coordinating Council.

Adaptive Capacity

Adaptive Capacity refers to a system's ability to accommodate a new or changing environment, exploit beneficial opportunities, or moderate negative effects.

In general, the communications sector exhibits a high degree of adaptive capacity. This is primarily the result of the diverse and redundant nature of communication infrastructure. For example, sector stakeholders indicated that much of the communication equipment is redundant across the system. Further, many of the systems components (e.g. towers, switches, etc.) have both primary and secondary power sources. This facilitates signal rerouting when needed. Further, the mix of deployed technologies, public and private sector vendors, and redundant equipment all contribute to the sector's ability to adapt to a range of potential impacts.

Within specific geographic areas (such as the Santiam canyon) or infrastructure components (e.g. cable), some adaptive capacity is lost. Participants reported that this is primarily due to single points of failure or lack of redundant equipment.

System Vulnerabilities

The assessment team evaluated the communication sector's vulnerability using a scenario planning approach which included one chronic event (winter/ice storm) and a catastrophic event (9.0 Earthquake).

Interdependencies

Systems of all types are dependent on other systems in order to function. In order to operate, the communication sector is particularly *dependent on*:

Energy: Electricity and Fuel

Communication equipment requires power to operate. If the power grid is down and backup power is not available through generators, batteries or other sources, system components will not function. During a power outage, battery and generator backups provide limited power for a varying duration of time depending on the fuel source and capacity. Energy redundancy is a needed resource for critical infrastructure that requires access and the supply of multiple fuel types, primarily gasoline and diesel. Notably, propane is a fuel source for some generators; however, propane will not be provided through state resources.

Transportation

Sector stakeholders indicated that if they can get repair crews, equipment and power to their system components, they can generally restore service quickly. However, many system components are located in remote locations with limited access under normal circumstances. Any disruption to the transportation network can limit or delay restoration of the communication network. Further, where communication infrastructure is collocated within the transportation network (e.g. buried cable within a road right-of-way), damage to the transportation facility can disrupt communication service.

Water

Water infrastructure systems rely on communication for operations and maintenance through a "Supervisory Control and Data Acquisition" (SCADA) system. The system provides remote monitoring and control of the water system components. Radio system capability is needed for these systems to operate effectively. Much of this infrastructure is isolated. For example, Salem's infrastructure is located on an island.

Vulnerabilities

Chronic Hazard: Winter/Ice Storm

Many stakeholders indicated that they are well prepared to address winter storms. Winter storms are common in the region and communication providers have significant experience maintaining and repairing infrastructure during such events. Further, the Communications sector actively mitigates storm related impacts through ongoing risk reduction actions. For example, communication service providers often partner with utility providers to trim trees near above-ground communication lines. Downed trees were also a concern and therefore, monitoring tree health and stability is a part of this maintenance program.

Another factor that may affect addressing the impacts of a winter storm on service is the ability of communication agencies to access critical facilities and infrastructure via roads. While this is a minor concern, as Marion County Public Works has a number of snow plows and snow cats, many communications providers recalled the 2008 winter storm in which Interstate 5 was largely inaccessible. However, this can be remedied by the ability to take alternative routes and if necessary, using snow chains or snowmobiles to access sites. That being said, residents of Marion County who live in rural areas may experience communications outages for up to a week until utility providers can repair their systems.

Power disruptions are also a concern for this sector because their ability to deliver service and respond to emergencies is contingent on consistent access to power. If the power goes out, there is limited battery backup and available generators, which could generate power for up to ten hours. For example, Frontier stated that while rural facilities have batteries, they do not have portable generators and teams must travel to those facilities to deploy emergency generators. Yet, many providers have disaster checklists and train their staff on how to implement their internal and external crisis communications plans. Their reaction depends on the size of the storm and providers have the capability to scale up or down as needed. Additionally, restoring communications is prioritized based on the importance of the infrastructure. Ensuring hospitals, police and fire departments, and other critical community assets have access to communications is prioritized over restoring residential communications.

Another concern in regard to a winter storm is that those who work for communications providers may not live nearby and therefore could have trouble getting to work. This means that these providers may be working with limited staff, making it more difficult to restore and maintain operations. Although some providers do require their staff to have emergency kits at home, this is implemented on an ad hoc basis.

Catastrophic Hazard: Cascadia Earthquake Event

There was overwhelming consensus that the communication sector in general is not adequately prepared for a Cascadia earthquake event. Many expressed a range of concerns, including:

- "The State of Oregon is unprepared. DOGAMI mentions almost every bridge and road. Salem does have several mobile-com centers, which is the only positive."
- "Nobody knows. It depends on how devastating [Cascadia is]."
- "It would cost millions to replace the system. Equipment replacement would be costly and would take weeks to acquire the necessary replacements."
- "We have a lack of redundancy in the communication system. There is a time delay to activate backup systems and we have a training deficiency."

Every provider and agency in the meeting is anticipating a 75 to 100 percent shutdown in operations in the event of a Cascadia earthquake. While many are taking steps to prepare for Cascadia, these efforts are slow moving and limited by a variety of factors. Steps that have been taken or are being taken to reduce vulnerability to a Cascadia earthquake event include:

- Plans for system improvements to infrastructure over next fifty years
- Establishing similar timing and synchronism with other sectors
- Developing a standard set of planning assumptions
- Implementing a system for fuel coordination with other communications agencies and ensuring that sites have an emergency fuel supply
- Each entity will take on the responsibility of re-establishing a priority system or infrastructure piece

The biggest barriers for adequately responding to a Cascadia earthquake event include:

- Lack of regulations and decision-making protocol,
- Funding for operations and maintenance (particularly for public systems),
- Access to capital for mitigation activities, and
- Political will to prioritize mitigation activities.

While there are limited state and federal resources, these are not always readily accessible or easy to obtain due to availability or priority.

One of the largest concerns raised by the group was the lack of coordination across the sector. The mix of public, private, and volunteer entities compounds the issue. Sector participants indicated that there are very few conversations focused on building partnerships and relationships within the communications sector. For many, the sector meeting was the first time they had met or talked to representatives from other agencies, companies or groups. The group agreed that coordinated partnership building and collaboration will be necessary in order to mitigate hazard impacts across the sector. This is particularly true in the case of planning for a Cascadia earthquake event. Building partnerships also provides an opportunity to pool resources and potentially labor, especially since many of the agencies and organizations that were interviewed have collocated facilities.

Another concern was the ability to maintain service in the event of a hazard. Many discussed the importance of determining how to access locations that are blocked in the event of a hazard; how to maintain critical service connections, particularly after a catastrophic event; how to get signals out if landlines are disrupted; and, how to get labor from facilities and out to citizens. Further, sector representatives anticipate that they will experience staff shortages following an event.

Other concerns included education and outreach, particularly on educating the public on what is an emergency and what isn't. Moreover, organizations, such as ARES, struggle with recruiting new volunteers and training individuals on HAM radio operation. Additionally, while they do have a volunteer base, they lack equipment.

Mitigation Opportunities

The communications sector representatives identified a number of potential mitigation opportunities.

Joint Utility Liaison

Sector representatives indicated that creating a Joint Utility Liaison position could be an important first step in promoting coordination. The purpose of the position would be to share information across sector providers and coordinate regular meetings. Many representatives indicated that the primary value of the risk assessment process was the simple act of sitting down together to discuss the issues – system vulnerabilities, mitigation priorities and lessons learned. However, the group noted that "meeting for the sake of meeting" would not be productive. Further, the group indicated that regular coordination was unlikely without a person dedicated to coordinating sector stakeholders and facilitating the discussion. The group expressed support for a quarterly meeting schedule.

This action was deemed a high priority by the communication sector participants. When this action is implemented with the communication sector, CPW recommends instituting a facilitation approach such as the Purdue University "Strategic Doing" model.[6] Strategic Doing, "teaches groups how to form collaborations quickly, move them toward measurable outcomes and make adjustments along the way." The model is intended to design and guide networks that generate innovative solutions. With Strategic Doing, people:

[6] Strategic Doing is, "a new strategy discipline specifically designed for open, loosely-connected networks. Unlike strategic planning that was designed primarily to guide strategic activity in hierarchical organizations, Strategic Doing is designed for situations in which nobody can tell anybody else what to do. Collaboration is the only way to move forward."

- Link and leverage their assets to create new opportunities
- Convert high-priority opportunities into measurable outcomes
- Define pathfinder projects that move toward these outcomes

In short, the Strategic Doing is designed for open, loosely connected networks like what currently exists within the communications lifeline sector in Marion County.

Special Communication District

Because funding was cited as an issue (particularly for public agency representatives) some stakeholders suggested exploring the feasibility of a Communication District. The purpose of the district would be to generate funds needed for ongoing system maintenance, equipment modernization and hazard mitigation activities (such as site hardening, redundant power supplies and training).

FirstNet Resources

Signed into law as part of the February 22, 2012 Middle Class Tax Relief and Job Creation Act, the First Responder Network Authority (FirstNet) has a mission to, "build, operate and maintain the first high-speed, nationwide wireless broadband network dedicated to public safety."[7] The FirstNet vision is to provide a single interoperable platform for emergency and daily public safety communications. Marion County communication sector representatives support mitigation actions that leverage FirstNet funding to support the "hardening" of local communication infrastructure. This approach would meet FirstNet's task to leverage existing telecommunications infrastructure and assets. The approach also includes the exploration of public/private partnerships, which is consistent with the Joint Utility Liaison approach advocated above.

Leverage Department of Energy Clear Path IV Exercise and ESF 12

The Department of Energy is facilitating a series of exercises across the nation to address hazard impacts and other challenges to the energy sector. Because the communications sector is so heavily dependent on electricity and fuel (primarily gasoline and diesel), stakeholders indicated that participation in the Clear Path IV Cascadia Subduction Zone (CSZ) exercise could help focus attention on needed public/private sector collaboration.

UPDATE: ClearPath IV occurred April 19-20, 2016. Marion County participated directly in the exercise. While communication sector stakeholders are not specifically listed in the exercise participant list, one on the key recommendations includes improved coordination with, "agencies and organizations providing critical services in support of energy restoration."[8]

Training

Participants identified the need for additional training of staff and personnel. In some cases, there are limited numbers of technicians with the expertise needed to repair specific communication components. Further, the number of HAM operators is declining. Finally, fewer young people are entering the communication trades. Stakeholders expressed a need for additional training of the existing workforce, as well as the need to encourage new interest in the industry.

Coordinate Planning Assumptions

[7] http://www.firstnet.gov/about

[8] U.S. Department of Energy. *Clear Path IV Energy-Focused Disaster Response Exercise – Exercise Summary Report*. 2016. http://energy.gov/sites/prod/files/2016/08/f33/ClearPathIV_Exercise%20Summary%20Report_Public%20Release.pdf

Communication sector stakeholders indicated that agreement about hazard planning assumptions is needed. While there was general consensus about the range of vulnerabilities across the sector, assumptions about specifics varied. Stakeholders identified energy availability (including fuel), staff/personnel availability, and infrastructure impacts as potential planning topics that could benefit from shared understanding for planning purposes.

Networks

The primary theme in the assessment of the communication sector was the critical importance of networks. Because of the interconnected nature of communication technology and the sector's reliance on energy and transportation, as well as its critical importance to the water system, developing and maintaining relationships was identified as a critical strategy. Stakeholders reinforced the importance of pre-event relationship building. This can only occur through regular interaction, common operating assumptions and co-production of strategy options. Using a State Homeland Security Grant, Marion County will develop a Marion County Communications Plan in FY17-18. This planning will provide an opportunity to develop a comprehensive strategy to build capability and mitigate vulnerabilities as well as sustain further stakeholder engagement.