Catastrophic Incident Annex

Tab C:
Infrastructure Systems

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Purpose

This tab is intended to provide detailed information on the Infrastructure Systems core capability and reflects the planning that has taken place across the state for its associated Critical Tasks. Infrastructure Systems response considerations addressed in this Tab includes: Energy, Water, Wastewater, Information Communication Technology[1].

Strategic Goals[2]

Life Safety

Water Services
1. Provide sufficient and sustained support for water services to meet life-sustainment incident objectives.

Water Systems
1. Assist local jurisdictions with the prioritization of water system restoration by those critical consumers who are needed to respond to and stabilize the incident.
2. Identify local jurisdiction resource needs for system restoration and assist to the extent possible under legal guidelines for providing resources to public and private entities.

Incident Stabilization

Water Services

1. Sustain water resource assistance to protect life and safety of the Whole Community.

Water Systems
1. Identify funding sources to assist local jurisdictions in repair of water systems to meet the needs of impacted communities and restore the functionality of the system.
2. Assist local jurisdictions with mutual aid resource requests to restore the functionality of community systems.
3. Assist local jurisdictions with meeting approved water quality standards.
4. Assist local jurisdictions by addressing environmental impacts degrading water source impacts.

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[1] Current planning efforts have only addressed Water Infrastructure. While some information is presented on these other subcomponents the in-depth planning required to address these topics will be addressed through future planning efforts.

[2] Due to the nature of ownership and authorities, state-led efforts center around assistance and support for water infrastructure.

Situation Overview

General

The infrastructure considered within this Tab is vulnerable to many geological, technological, and seasonal impacts for which any could result in a catastrophic incident by themselves.

Water

Water is a potentially immediate need following an incident. Utilities that have infrastructure components which are in liquifiable soils, river valleys, or utilize non-seismically retrofitted pipe bridges are highly vulnerable to disruption. Impacts experienced to water infrastructure may negatively impact other Critical Infrastructure and Lifeline Sectors involved in immediate response operations. Conversely, impacts to other Critical Infrastructure or Lifeline Sectors may adversely impact or impair the ability of water utilities to function. For example:
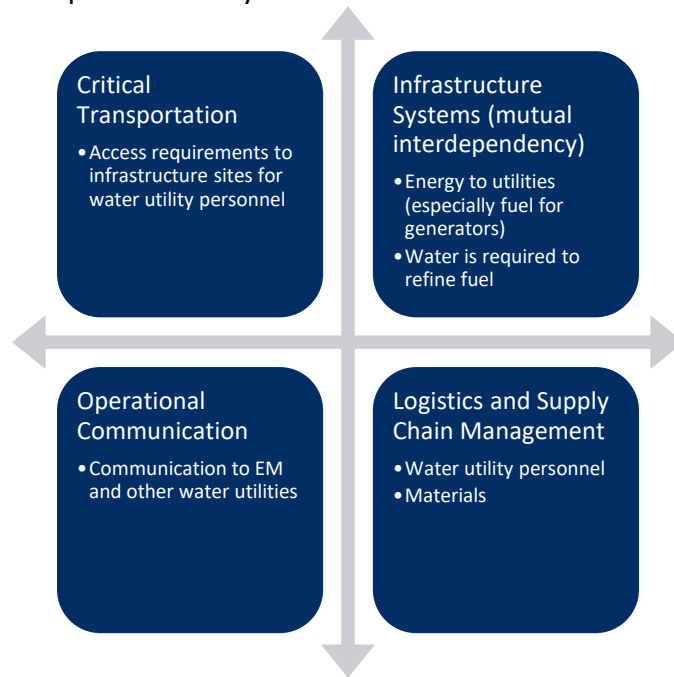
Critical Transportation
- Access requirements to infrastructure sites for water utility personnel

Infrastructure Systems (mutual interdependency)
- Energy to utilities (especially fuel for generators)
- Water is required to refine fuel

Operational Communication
- Communication to EM and other water utilities

Logistics and Supply Chain Management
- Water utility personnel
- Materials

Figure 1 - Water Infrastructure Interdependencies

Planning Assumptions and Response Considerations

Water
- The resources available post-incident may be insufficient to concurrently provide services and restore systems.
- Essential water utility personnel will likely not be available in sufficient numbers to operate, maintain, repair, and restore significant portions of the water system for the first few weeks of the incident.
- Water utilities may have the capabilities to do limited debris clearance and removal.
- A water provider's service area is likely not consistent with jurisdictional boundaries

- A coordinated response involving water services may require the coordination of many different providers for a single community
  - Coordination structures must account for the possibility of many different providers of water.
- Water systems in dense urban settings may be out of water within 24 hours if significant damage is experienced to the infrastructure.
  - Dense urban settings that experience damage to water systems may have a lower threshold to meet the requirements of catastrophic incident.
- Residents may self-evacuate to other outlying areas (e.g., friends and family residences)
  - Those with AFN may be unable to self-evacuate and will require support
- Communities that are located at the "end of line" or on peninsulas may need immediate assistance to provide outside or alternative water resources.
- Populations may need to be moved from areas where water infrastructure is non-functioning and water services either cannot meet the demand or are beyond the response capacity to support it.
- Source water may be expected to be a primary source to draw water from post-incident.
- Damage assessments can take a week to occur and are dependent on time of occurrence.[3]
- Priorities vary among water systems for the restoration of water for firefighting, hospitals, and hydration for the population.
  - For some water systems there may be no established priorities.
  - Other water system's priorities are dictated by the governing body of a jurisdiction.
- Non-potable water can be used for certain emergency services (where appropriate).
- There may be insufficient personnel, equipment, and materials (both specialized and general) to accomplish incident objectives due to resource competition with other response activities.
- Smaller utilities may be more vulnerable than larger utilities due to:
  - Fewer materials and equipment available on hand
  - Less seismic planning
  - Less seismic retrofits
- The total number of population served by small water utilities should be factored in as those likely to be impacted by a disruption to water infrastructure.
- Water reservoirs may be quickly depleted of water following a significant incident that causes damage to the system.
- The period between onsite water quality testing and laboratory testing may take several days.

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[3] Estimation provided by water infrastructure subject matter experts during the planning effort for this core capability.

- Larger utilities may test and determine water quality faster than smaller utilities.
- Utilities who depend on private labs for water quality testing may have to seek alternatives post-incident.
- Duplication of effort may occur if communication between WARN, the water utility, and local emergency management is not occurring.
- Some impacted individuals, households given no alternatives, will use potentially contaminated source water.
- The ability to repair or restore water systems and/or provide water services is directly correlated to the condition of the transportation system.
- Water utilities may be able to operate 2 to 4 weeks with water treatment chemicals on hand.
- Local utilities and water providers should have a list of available sources for alternative water resources in their response plans.
- Water infrastructure (utility operators) will require the functioning of other services in order to maintain operations, provide additional services (community collection points), and repair and restore damaged systems.

Wastewater

- Alternate wastewater services may include interconnections with neighboring wastewater utilities or providing portable toilets.
- Protecting utility facilities, equipment, and vital records is essential to restoring operations once an incident has occurred.
- Inoperable pumps at a wastewater utility can lead to sewage overflows that damage the environment, wastewater treatment technologies and threaten public health.
- Wastewater contamination emergencies could result in a surge of water sampling and analysis that can quickly overwhelm resources or require laboratory expertise unavailable to most utilities.
- Utility pipes may be contained in common structures (e.g., utilidors, utility corridors, etc.) that can result in one system disrupting others.
- There exists the potential for a higher risk of disease and illness without a working wastewater system.

Energy

- Except for some agency specific uses, the State of Washington does not own or operate any significant energy supply facilities, nor is it involved in any wholesale or retail energy transactions or businesses.[4]

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[4] With the exception of rate regulation by the Washington Utilities and Transportation Commission (UTC), the State does not regulate energy financial transactions. Energy supply and distribution is a function almost entirely of the private sector or local jurisdictions (such as Public Utility Districts or municipal utilities).

- Local fuel resupply is limited (Tacoma to Everett)
- Useable fuel inventories are low
- Unrationed fuel use is expected to exceed supply (prioritized rationing required)
- Bulk fuel deliveries will require significant coordination to move throughout the regions
- Fuel Points of Distribution (F-POD) may be implemented to facilitate deliveries within local jurisdictions
- The ability for energy providers to request mutual aid assistance through normal channels will be disrupted
- Issues within the transmission corridor must be addressed in combination with issue in the distribution system
- Transmission cannot be fully reestablished until distribution lines are ready to accept load
- Initial system safe shutdowns (breakers tripping due to shorts) may cause statewide blackouts that could impact transmission throughout the region covered by the Western Electricity Coordinating Council
- Short term distributed generation (generators) will be required to provide energy to critical facilities
- The use of generators will require short and long-term prioritization of fuel distribution
- Large scale above ground and underground storage can experience structural damages, impacting seasonal natural gas availability
- Pipelines may experience breaks and leaks, impacting product availability in the western US
- Restoration of fuel refinery operations will require both water and electricity (to include replacement of components)
- Damage to petroleum ports and rail may impact crude stock for refineries
- Damage to refined product pump stations will impact end consumers
- Fuel stations with generators are limited and consumers may not be able to easily access gasoline for evacuation or small generators[5]
- Damage to transportation corridors may reduce the overall demand for petroleum products, however fuel demand for response and recovery efforts will increase significantly and be a high priority for the first weeks and months of a catastrophic incident.

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[5] There should also be secondary considerations made for impacts to payment systems as many individuals rely on electronic payment, which may be inoperable.

- Fuel refinement requires potable water, requiring water quality testing to be performed.

Information and Communications Technology[6]

- The SEOC's Alert and Warning Center provides for a centralized point for ICT to be sent and received across the state.
- Movable and deployable resources capable of establishing and providing immediate communications infrastructure using ICT will be necessary to facilitate a response in which communications has become disrupted.
- Collaboration with the Private Sector will be required to bring in temporary resources which can establish necessary communications.
- The use of GPS systems in emergency response during a catastrophic incident will be essential in coordinating emergency response and communicating and mapping impacts through GIS.
- The common use of WebEOC across the state is essential in coordinating resource requests and resource tracking.
- Maintaining ICT file sharing and communications systems (e.g., MS SharePoint and MS Teams) which can allow access from any location is necessary to coordinate both internal and external operations.
- Social media and communications applications available to the general public can become a primary source of information when situational awareness has become severely affected. These platforms can be utilized to allow community members to feed information to response personal to provide situational assessment.
- ICT tools can be limited by user training and knowledge of the systems being employed.
    - Some systems and tools require qualified individuals to operate and maintain.
- Systems may be incompatible with each other across different manufacturers, vendors, and application version.
    - This issue may not be apparent until a disaster has disabled commonly used systems necessitating the use of other systems which are then found to be incompatible during the incident.

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[6]Some information on this topic was retrieved from: Hu, Qian & Kapucu, Naim. (2014). Information Communication Technology Utilization for Effective Emergency Management Networks. Public Management Review. 18. 1-26. 10.1080/14719037.2014.969762.
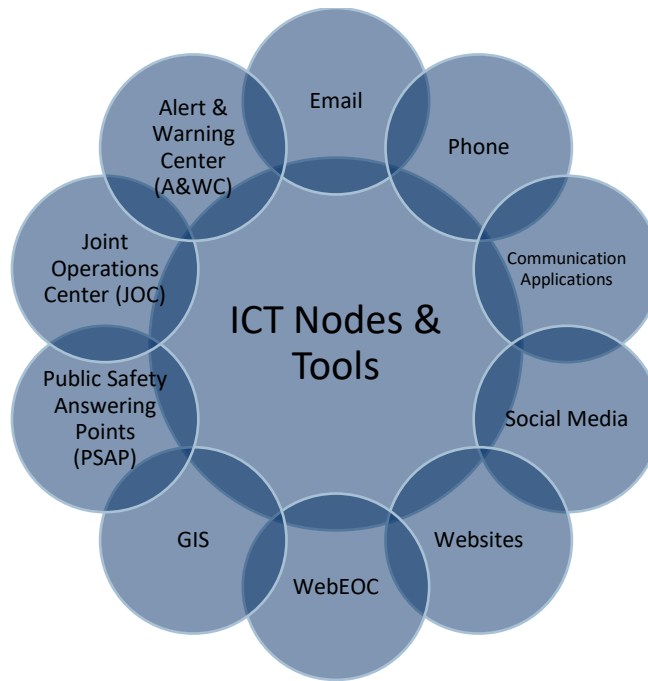
Figure 2 - ICT Nodes and Tools

Capability Targets

Placeholder

Non-Standardized Targets

Placeholder

Concept of Operations

General

Upon notification of an incident significant enough to disrupt an infrastructure system capable of presenting life safety issues that exceed the capabilities of local response and the typical coordination used through activated ESFs to deploy resources and services, then the Operations Section will establish the Business and Infrastructure Branch[7]. These activated ESFs will:

- Coordinate with impacted jurisdictions and the appropriate activated Sections to coordinate the delivery of resources and services
- Identify state resource gaps in meeting resource requests
- Identify barriers and limitations in deploying state resources
- Provide information on impact effects over time to assist in the identification of sustainment or degradation in Community Lifelines.

Critical Consumers

Critical consumers are infrastructure, businesses, or organizations that produces a commodity or enables a service vital to a community's safety, security, and public health. During a large incident which disrupts many systems and capabilities, critical consumers represent dependencies and interdependencies that should be addressed during a response to ensure that functions and capabilities are stood back up together.

Water

For the purposes of this plan, water infrastructure is comprised of 2 elements: water systems and water services. Water systems include treatment facilities, distribution pipelines, transmission pipelines, storage facilities and locations, dams (as a component of a reservoir/water supply), and source water. Water Services include providing water to the public, providing water for critical infrastructure, providing water for emergency services, and providing water for Mass Care Services.
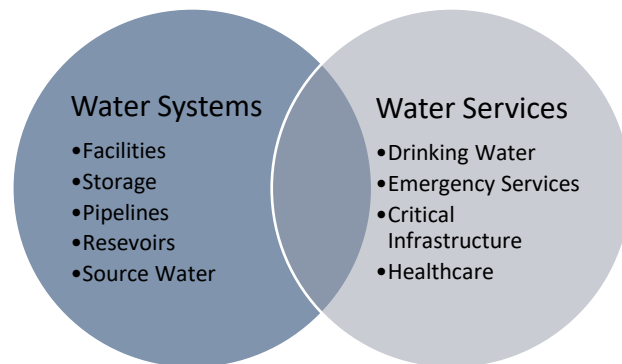
Water Systems
- Facilities
- Storage
- Pipelines
- Resevoirs
- Source Water

Water Services
- Drinking Water
- Emergency Services
- Critical Infrastructure
- Healthcare

Figure 3 - Components of Water Systems and Water Services

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[7] Based on incident impacts and response objectives, not all of the ESFs associated with this Branch may require activation or inclusion.

The commitment of resources to one response objective will diminish the capabilities to meet other response objectives that utilize like resources. Incident objectives that include both water restoration and providing water services will compete for similar resources. Early incident objectives should focus on providing water services until operations have been established and similar/conflicting resources can be redirected towards restoration.

Fuel prioritization must include water utilities that are essential in providing services to large populations or that do not have access to alternative water services. Fuel prioritization should also reflect the assessment of evacuation potential based on water availability as fuel may not be required for areas that are [temporarily] deemed unable to support life based on other planning factors (i.e., availability of resources and essential services.

Response Objectives

Short-Term	Provide potable water to impacted jurisdictions which meet immediate life safety needs.
Incident Stabilization	Coordinate the restoration of water quality to approved standards
	Provide potable water to impacted jurisdictions which address life sustainment gaps
Long-Term Response	Identify long-term solutions for jurisidictions anticipating extended outages in service
	Coordinate and facilitate mutual aid for the restoration of systems
	Monitor for and address supply chain disruptions
Transition to Recovery	Identify triggers and other conditions needed for a transfer to a Recovery Support Function.
End State	Provide sufficient and sustained water services to meet life-sustainment incident objectives.

Figure 4 - Water Infrastructure Systems Response Objectives

Water Systems

Water infrastructure (utility operators) will require the functioning of other services to maintain operations, provide additional services (community collection points), and repair and restore damaged systems.

Water systems restoration should be prioritized by the critical consumers it enables. These critical consumers are those that are necessary to meet incident stabilization goals. The damage state of a facility and its corresponding components will determine if the facility can be easily repaired within the early parts of the incident. Smaller utilities who purchase water from larger suppliers will be impacted by the priorities of the supplier. Prioritized repair should also account for:

> *The term Critical Infrastructure has slightly different meanings across sectors.*
>
> *Within the water sector, Critical Infrastructure can refer to the components of the system (e.g., pipes pumps, and tanks) rather than the system or utility itself.*

- Hospitals are considered Critical Consumers of water infrastructure and will be required to be a part of a prioritized restoration.
- Dams are a critical part of a water system when used by water utility. The reservoirs created by the dam can also represent a major water source when the system has been compromised.
- Efforts and objectives that are focused on water infrastructure must account for transportation impacts and in some cases may require that specific transportation routes are prioritized to allow for water infrastructure personnel to conduct operations

A water system that maintains sufficient pressure post-incident will meet water quality standards so long as the original source maintains standards. If water pressure is degraded, the water quality in the system may contain contaminants. Water that has not been tested is considered non-potable. As such some boil water orders will be communicated to large areas that may contain both clean and contaminated water. Actions taken to mitigate against bacterial contaminates (i.e., increasing chlorine levels) will require additional resource support.

Densely populated urban settings will require a specific targeted focus due to the greater potential for loss of life from lack of water and this will require coordinated response planning with mass care services operations involving Community Points of Distribution (CPOD).

Water Services

Providing water services is one of the primary focuses for catastrophic response. Water utilities with infrastructure components in heavily impacted areas and those communities which reside

on the exterior of service areas will require extended water service operations due to the amount of time and resource required to restore damaged and impacted systems. Policy groups at all levels will be required to quickly address how water should be provided for impacted areas to save and sustain lives.

Large-scale/long-term water services will be employed when restoration targets impact life sustainment. If water impacts are expected to last longer than 1 day, and an area has a significantly large population, then this incident is potentially catastrophic. Densely populated urban settings will require a specific targeted focus due to the greater potential for loss of life from lack of water.

Efforts centered around obtaining and employing alternative water resources should be a primary and continuous focus early in the incident. These efforts should be maintained until a clear restoration timeline is established. Resources should be demobilized according to a phased approach to limit potential disruption.

WARN
The Washington Water/Wastewater Agency Response Network (WA-WARN) allows water and wastewater systems to receive rapid mutual aid and assistance from other systems during an emergency. Utilities sign the WARN standard agreement, which allows them to share resources with other Washington systems that have signed the agreement.

The WARN member who needs help identifies the resources needed to respond. The WARN member can either contact a fellow WARN member who has the necessary resources directly or use a state-specific process for requesting aid. Information provided by WARN should be incorporated in Situational Assessment.

Debris Clearance and Removal
Both debris clearance and removal may be necessary to access an infrastructure site that has sustained damage from fallen or collapsed objects. These functions may occur over an extended period of time and exceed the time horizon of an initial response and transition into sustained response and recovery. Debris disposal is not addressed in this planning but should be considered when working with contractors.

Debris Clearance
Debris Clearance activities are likely to be essential in establishing access to a worksite.

- Most water utilities have the capability to do minor debris clearance

Debris Removal

Some infrastructure sites may require the removal of objects that are obstructing the operation and present a persistent problem (e.g., fallen trees clogging a water intake). Other removal activities may likely occur over large amounts of time and require resources that are unavailable because they are being employed elsewhere. Due to the time required to accomplish debris removal, only specific situations should be considered.

Primary Core Capabilities

Infrastructure Systems

Objective:

Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services.

> ***Energy***
> Facilitate the strategic restoration of electrical grid and fuel resources to affected population, critical services, and critical infrastructure.
>
> ***Water***
> Facilitate the strategic restoration of water supply and distribution systems to affected population, critical services, and critical infrastructure.
>
> ***Wastewater***
> Facilitate the strategic restoration of wastewater collection and treatment systems to affected population, critical services, and critical infrastructure.
>
> ***Information Communications Technology***
> Facilitate the strategic restoration of information communications technology systems to affected population, critical services, and critical infrastructure.

Expected Outcome:

Facilitate the coordinated effort of multiple dependent and interdependent critical infrastructure sectors to stabilize internal operations and system restoration.

Critical Tasks:

1. Decrease and stabilize immediate infrastructure threats to the affected population, to include survivors in the heavily damaged zone, nearby communities that may be affected by cascading effects, and mass care support facilities and evacuation processing centers with a focus on life-sustainment and congregate care services.
2. Re-establish critical infrastructure within the affected areas to support ongoing emergency response operations, life sustainment, community functionality, and a transition to recovery.

3. Provide for the clearance, removal, and disposal of debris.
4. Formalize partnerships with governmental and private sector cyber incident or emergency response teams to accept, triage, and collaboratively respond to cascading impacts in an efficient manner.

Supporting Core Capabilities

Operational Coordination

Objective:
The National Preparedness Goal defines operational coordination as the ability to establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.

Critical Tasks:
1. Mobilize all critical resources and establish command, control, and coordination structures within the affected community, which may no longer be defined by established jurisdictional boundaries as needed throughout the duration of an incident.
2. Enhance and maintain command, control, and coordination structures (C3), consistent with the National Incident Management System (NIMS), to meet basic human needs, stabilize the incident, and facilitate the integration of restoration and recovery activities.

Operational Communication

Objective:
Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available, among and between affected communities in the impact area and all response forces.

Critical Tasks:
1. Ensure the capacity to communicate with both the emergency response community and the affected populations and establish interoperable voice and data communications between the Federal, tribal, state, and local levels through primary and redundant communications technology and protocols.
2. Re-establish sufficient communications infrastructure within the affected areas to support ongoing life-sustaining activities, provide basic human needs, and facilitate the integration of recovery activities.
3. Re-establish critical information networks, including cybersecurity information sharing networks, to inform situational awareness, enable incident response, and support the resilience of key systems.

Situational Assessment

Objective:
Provide all decision makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the state of the response.

Critical Tasks:
1. Deliver information sufficient to inform decision making regarding immediate lifesaving and life-sustaining activities, and engage governmental, private, and civic sector resources within and outside of the affected area to meet basic human needs and stabilize the incident.
2. Deliver enhanced information to reinforce ongoing lifesaving and life-sustaining activities, cascading impacts, and engage governmental, private, and civic sector resources within and outside of the affected area to meet basic human needs, stabilize the incident, and facilitate the integration of recovery activities.

Logistics and Supply Chain Management

Objective:
Deliver essential commodities, equipment, and services in support of impacted communities and survivors, to include emergency power and fuel support, as well as the coordination of access to community staples. Synchronize logistics capabilities and enable the restoration of impacted supply chains.

Critical Tasks:
1. Mobilize and deliver governmental, nongovernmental, and private sector resources within and outside of the affected area to save lives, sustain lives, meet basic human needs, stabilize the incident, and facilitate the integration of recovery efforts, to include moving and delivering resources and services to meet the needs of disaster survivors.
2. Enhance public and private resource and services support for an affected area.

Organization

Mobilization

Water

No Washington state agency or department holds authority over local drinking water systems outside of issues surrounding water quality and environmental impacts. Authority for the operation and prioritizations of local water systems resides at the local levels and coordination will be established through county emergency management. For incidents involving the following topics, these state agencies will respond:

State-Involvement with Public and Private Water Systems		
Impacted Function	Agency/ Department Responsible	ICS Position
Water Quality	Department of Health -Office of Drinking Water	ESF 8
Environmental Impacts (Wastewater)	Department of Ecology	ESF 3
Water Services [8]	SEOC Logistics and the Department of Enterprise Services	SEOC Logistics and ESF 7

Table 1 - Impacted Function to Responsible State Agency

State operations can assist local emergency management by participating in the coordination of the Washington Water and Wastewater Response Network (WAWARN) and through collaboration with regional and sub-regional groups. WAWARN utilizes the membership of water and wastewater providers to participate in both response and non-response activities. Regional and sub-regional groups can provide an invaluable mechanism in gathering neighboring utilities together to collectively seek information, relay information, collectively inform, and assess Community Lifeline impacts. Due to the high number of water providers, it is impractical to manage the number of impacted organizations without establishing a mechanism to manage span of control.

Known Regional / Sub Regional Groups	
Organization Name	Membership Area
Water Supply Forum	Snohomish, King, and Pierce counties
Cascade Water Alliance	Bellevue, Issaquah, Redmond, Sammamish, Tukwila, and parts of unincorporated King County.

Table 2 - Regional and Sub-Regional Water Infrastructure Groups

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[8] Water Services refers to utilizing state Master Contracts to locate and purchase potable water resources.

Mobilization for the impacts of a significant incident will require a complex series of interactions between the Policy Group, UCG, SEOC Operations & Logistics Section, and Local EM to navigate the ability of the state to provide support for local government and potentially private sector resource requestors.

Structure

Infrastructure Systems response operations fall within the Business and Infrastructure Branch of the Operations Section. The appropriate ESFs should be activated based on all-hazards response and should also include and make space for the local groups and organizations who possess resources or offer unique collaboration.
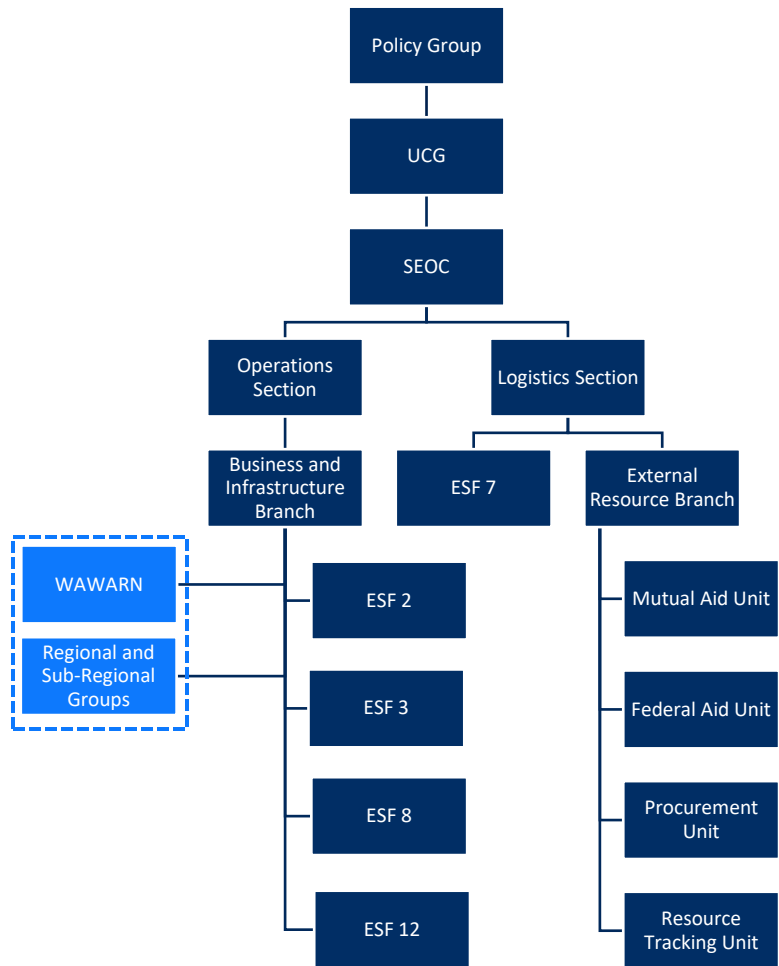
Figure 5 - Response Structure for Incidents Involving Water Infrastructure

Direction, Control & Coordination

General

Vertical and horizontal coordination for infrastructure will present challenges for emergency response due to the jurisdictional levels it is located within, the ownership of the infrastructure (i.e., public vs. private), the type of assistance required, and the level of responsibilities and resources the state can use to assist. Catastrophic incidents impacting the critical infrastructure sectors addressed in this plan will rely heavily on private sector participation and federal resource assistance to stabilize the incident.

Unified Coordination Group and Policy Group

The UCG and Policy Group will be responsible for providing the overall direction of Infrastructure Systems priorities and should clearly establish and communicate leadership's intent and strategic goals to response personnel.

Water Infrastructure

Coordination between local emergency management will be essential in providing the input for a restoration plan following a significant disruption to water infrastructure. Water infrastructure must be repaired to not only meet incident stabilization goals but the primary driver for coordination should center in the fact that a disruption also presents a constant threat to the life safety and sustainment of impacted communities.

Through the information collection of local emergency management, WAWARN, and regional groups the Policy Group, can be presented with the policy decisions necessary to allow restoration and support options to proceed. This information will then need to flow back down through local levels for approval on any direct support being provided.
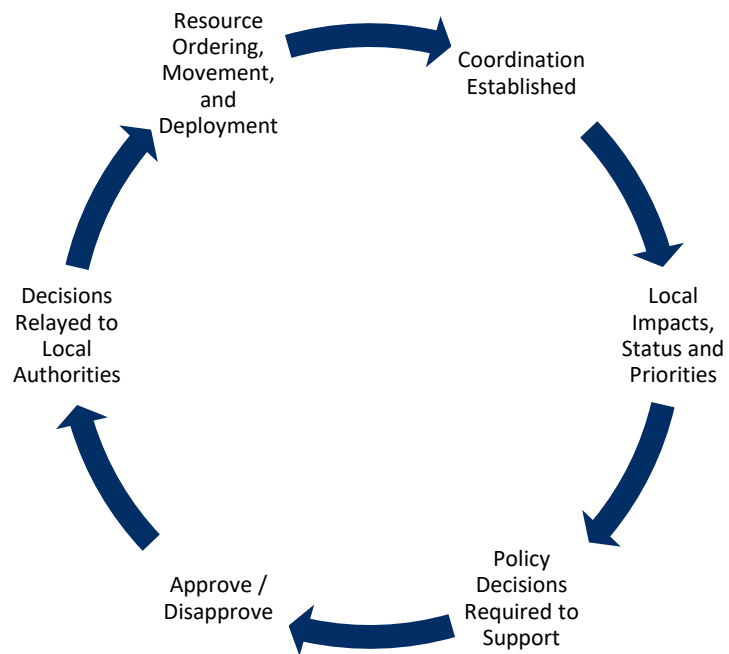

Figure 6 - Decision Making Process for Requests Involving Local and Privately Owned Infrastructure

Utility Ownership Structures

There are many different ownership structures for water providers across the state. Communities may not be provided water directly from the jurisdiction they reside in. Structures may fall into several categories:

- Water District
- Special purpose district
- Non-profits/For Profit
- Tribal
- Municipal
- Counties
- Public Utility Districts
- Government/Non-government

Federal Lines of Effort (LOE)

A Line of Effort (LOE) is a focused area of critical action that is required for stabilizing or restoring a specific Community Lifeline. Lifelines therefore identify the source of service instability while LOEs address the specific solutions required to resolve lifeline instability[9]. Note that these Lines of Effort are a component of FEMA Region 10 plans and are presented here for reference and identification of the actions and activities undertaken through a federal response.

Line of Effort	Purpose	End State
Commodities Distribution	Coordinate support for the distribution of resources at appropriate sites (State Staging Areas [SSAs], points of distribution [PODs], etc.)	Commodity distribution is no longer required; private sector distribution systems are re-established.
Damage Assessment	State or tribal governments request joint Preliminary Damage Assessments (PDAs).	Decision is made as to whether to request a disaster declaration.
Debris Removal	Provide federal assistance to support clearance, removal, and disposal of debris that impacts the emergency response and community functionality.	Debris no longer poses an immediate threat to lives, public health, or safety; the immediate threat of significant damage to public or private property has

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[9] This information is a selection from the FEMA Region 10 CSZ Earthquake and Tsunami Plan (2022). While information in this Tab is not incident-specific, it is likely that these LOEs would be employed following approval for federal assistance concerning Mass Care Services operations.

		been eliminated; debris does not impact the economic recovery of affected areas.
Emergency Repairs or Augmentation to Infrastructure	Provide federal assistance for the temporary support of eligible critical facilities that are degraded and where alternative sites are insufficient.	Temporary repairs or alternate approaches are in place, stabilizing critical infrastructure and providing minimum required functionality; a plan for permanent repairs is in place.
Mass Care – Food and Water	Support food and water operations for the impacted populations.	Federal assistance is no longer required to support food and water distribution
Private Sector Coordination	Provide federal assistance in support of private sector operations; help infrastructure owners and operators, businesses, and their government partners coordinate cross-sector operations.	Private sector is supporting survivor-centric requirements without federal intervention; collaboration and information sharing is established with the private sector, allowing for business-led restoration and long-term recovery efforts
Public Information and Warning	Share coordinated, timely, precise, and actionable information with survivors and partners.	Federal assistance is no longer required to support states and/or tribes in informing the public.
Restoration of Public Infrastructure	Provide federal assistance to support the repair and restoration of critical infrastructure.	Permanent repairs to critical infrastructure have begun and estimated completion dates are established
Temporary Emergency Power	Implement temporary emergency power generation to support mission-essential operations and critical facilities.	Utility power and/or facility generation has been restored to critical infrastructure; systems and services are available to the community; emergency spot power generation is no longer needed.

Information Collection, Analysis, & Dissemination

The following section outlines the Essential Elements of Information (EEI) needed to determine the effects on Community Lifeline subcomponents. The status of lifeline subcomponents directly affects the condition of the main lifeline. After the lifeline conditions are assessed, they can be used to inform activated ESFs to determine impacts and develop courses of action for an operational period's objectives. The conditions of the lifelines can also be developed into Senior Leadership Briefs (Tiers 1 & 2) to inform response personnel and senior leadership/decision-makers.

Lifeline EEIs > Lifeline Subcomponent Condition > Lifeline Component Status > SLB 2 > SLB 1
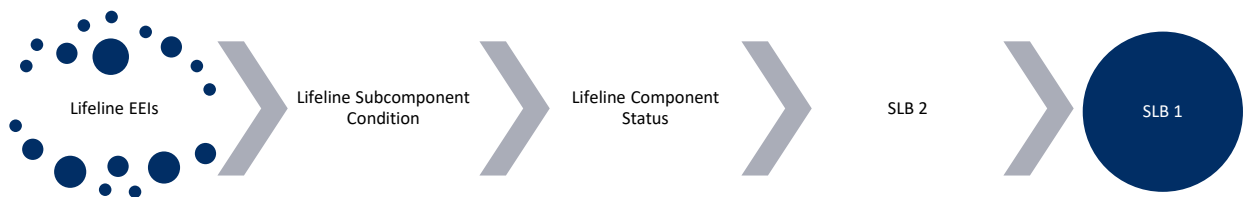
Figure 7 - Information Collection and Dissemination

Information Collection

Water Infrastructure Essential Elements of Information (EEIs)

Community Lifeline	Lifeline Component	Lifeline Subcomponent	Essential Element of Information
Food, Water, Shelter	Water	Drinking Water Utilities (Intake, Treatment, Storage, and Distribution)	• Condition of system • # of customers impacted • Estimated restoration • Known contamination • Water quality testing required • Water remaining in system (hours, days, etc.)
		Wastewater Systems	• Damage to reservoirs or storage • Resource shortfalls • Debris clearance needs • Status of power • Fuel requirements
		Commercial Water Supply Chain	• Vendors available • Quantities available • Inventory burn rate • Delivery capabilities • Condition of water connection to facilities

		Commodity Distribution	• Ice/Water commodities requirements based on estimates of affected population • Burn rate for water resources • Calculate water needs for evacuees • Resource requirements for water trees or Points of Collection
	Shelter	Housing (e.g., Homes and Shelters)	• Condition of water connection • Water resource needs
		Commercial Facilities (e.g., Hotels)	
	Agriculture	Animals and Agriculture	• Condition of water connection • Water resource needs
Safety and Security	Law Enforcement / Security	Police Stations	• Condition of water connection • Water resource needs
		Correctional Facilities	
	Fire Service	Firefighting Resources	• Fireflow conditions • Areas without coverage • Access to alternative sources or source water
	Government Service	Emergency Operations Centers	• Condition of water connection
		Essential Government Functions	
		Government Offices	
		Schools	
	Community Safety	Flood Control	• Damage to water infrastructure which poses a threat (e.g., reservoirs and dams) to life safety
		Other Hazards	
		Protective Actions	• Protective actions or advisories issued
Health and Medical	Medical Care	Hospitals	• Condition of water connection • Water resource needs
		Dialysis	
		Pharmacies	

		Long-Term Care Facilities	• Impacts to larger facilities due to consolidation[10]
		Veterinary Services	
		Home Care	
	Fatality Management	Mortuary and Post-Mortuary Services	• Condition of water connection • Water resource needs
	Public Health	Laboratory	• Condition of water connection
Energy	Fuel	Refineries/ Fuel Processing	• Condition of water connection • Impacts to refinement
Communications	Infrastructure	Data Centers/ Internet	• Condition of water connection • Impact to cooling systems
	911 and Dispatch	Public Safety Answering Points	• Condition of water connection • Water resource needs
Hazardous Materials	HAZMAT, Pollutants, Contaminant	Oil/ HAZMAT/ Toxic Incidents from Non-Fixed Facilities	• Treatment chemical incidents • Wastewater contamination

[10] Smaller sites, facilities, and specialty settings that now require patients to visit larger medical facilities due to damage to the facility or its supporting infrastructure which prevents care.

Information Analysis

The graphic below displays the relationship of ESFs associated with information collection and analysis activities. Information collected through impacts to Community Lifelines can then be analyzed by these ESFs to inform new or ongoing response objectives.
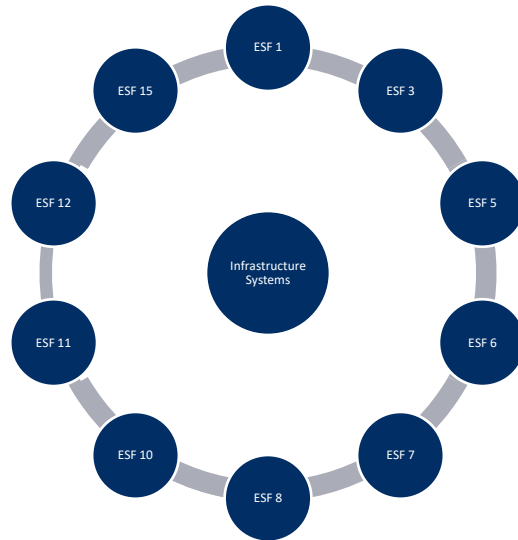

Figure 8 - Infrastructure Systems Information Analysis

Information Dissemination

Information analysis will result in contributions to the Tier 1 Senior Leadership Brief (SLB) provided to the UCG. Additionally, the more detailed information not necessary for executive level response decision making will be supplied for the creation of the Tier 2 Senior Leadership Brief (or Community Lifeline Overview) for use in tracking conditions and informing response personnel.

Responsibilities

The table below outlines the responsibilities of the entities involved with this Tab. These actions are tied to executing the Critical Tasks noted in the Concept of Operations section, which contribute to the primary and supporting Core Capabilities.

Phase 1 (Prepare)

Phase 1	
Infrastructure Systems	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.
General	

Water Systems and Services
 • Work with local jurisdictions to decrease threats pre-incident. Actions taken pre-incident to decrease threats are:
     o Harden infrastructure
     o Installing a dedicated, earthquake-resistant pipe from hospitals to the water system
     o Identify joint stockpiles
     o Identify multiple vendors and contractors
     o Establishing Isolated Wells for Hospitals (sinking a Well)
     o Installation of systems with automatic shut-off functions (i.e., ShakeAlert)
 • Identify how water services can be employed to meet the specific needs of each Tribe, region, county, city, or town for life saving and lifesaving objectives.
 • Identify local water systems that will require priority restoration of water infrastructure to meet the needs of incident stabilization.	

Operational Coordination	
Water Systems and Services • Establish mechanism for coordination between the state, local emergency management, and regional and sub-regional water utility groups	
Operational Communications	
Water Systems and Services • Work with local jurisdictions to raise awareness of the importance of redundant communication systems between local emergency management and water providers.	
Logistics and Supply Chain Management	
Water Systems and Services • Identify the needs of each region for specialized resources following a catastrophic incident • Identify local water resources available to meet needs (bottled water, RUPUs, water trailers, etc.)	

- Seek to identify community collection points that local populations can go to for water.

Situational Assessment

Water Systems and Services
- Receive feedback on self-assessments for jurisdiction's capability to simultaneously provide water services and restore prioritized water systems.
- Pre-identify any densely populated urban settings as being vulnerable to water infrastructure impacts.
- Identify interdependencies across water infrastructure.
- Identify water infrastructure that supplies major hospitals (to include its resiliency).
- Identify geographic areas that may experience long-term water outages.

Phase 2a (Initial Response)

Phase 2a	
Infrastructure Systems	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.

Operational Coordination

Water Systems and Services
- In coordination with the SEOC Operations Section and the Business and Infrastructure Group, establish coordination between infrastructure partners who share dependencies with impacted systems (water systems require fuel/electricity; transportation repairs may require water; fuel refinement requires potable water)

Operational Communications

Water Systems and Services
- In coordination with ESF 15, ensure the capability to provide the public with timely warning and emergency information concerning water resources.

Logistics and Supply Chain Management

Water Systems and Services
- In coordination with the SEOC Logistics Section, identify additional water resources available to support local resources to meet needs (bottled water, RUPUs, water trailers, etc.)

Situational Assessment

Water Systems and Services
- In coordination with ESF 1, identify impacts to the transportation system delaying or preventing the movement of water resources.
- In coordination with ESF 5 and ESF 6, identify local CPODs requiring water resources

Phase 2b (Employment Resources)

Phase 2b	
Infrastructure Systems	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.
Operational Coordination	

Water Systems and Services
- In coordination with the SEOC Operations Section and the Business and Infrastructure Group, establish response objectives that reflect the coordination between infrastructure partners who share dependencies with impacted systems (water systems require fuel/electricity; transportation repairs may require water; fuel refinement requires potable water)
- In coordination with the Business and Infrastructure Group, Policy Group, and UCG, coordinate regulatory waivers and exemptions.
- In coordination with ESF 1, assist local jurisdictions with accessing water infrastructure sites which have experienced damage to transportation access (to include aerial support)

Operational Communications

Water Systems and Services
- In coordination with ESF 2, partner with private sector providers to restore commercial voice and data communications capabilities in support of water infrastructure and water services
- In coordination with ESF 2 and ESF 15, assist local jurisdictions with communications capabilities to inform the public regarding the status of water systems, available resources, and public health notices (e.g., boil water advisories, etc.)

Logistics and Supply Chain Management

Water Systems and Services
- In coordination with the Business and Infrastructure Group, Policy Group, and UCG, consider waiving certification requirements for select personnel with expired(ing) credentials in order to address resource gaps or the inability to recertify
- In coordination with the SEOC Logistics Section and ESF 6, identify local CPODs and staging areas which require water resource support
- In coordination with ESF 12, identify and coordinate fuel needs for water infrastructure (i.e., on-site generators)
- In coordination with the SEOC Logistics Section, ESF 7, and ESF 6, procure, coordinate, and request additional water resources to support local resources to meet needs (bottled water, RUPUs, water trailers, etc.)

- In coordination with ESF 7, identify state contracts that can utilized to support local water system repair or to supply water services over an extended timeframe

Situational Assessment

Water Systems and Services
- In coordination with ESF 3 and ESF 8, monitor and report the status of and damage to major water and wastewater providers covering large populations
- In coordination with SEOC Logistics and ESF 6, monitor for portable generator requirements for sites providing water to impacted communities
- In coordination with the Business and Infrastructure Group, ESF 3, and ESF 7, identify supply chain deficiencies and shortfalls in supporting water infrastructure repair (based on local feedback of supply chain bottlenecks)
- In coordination with ESF 11, identify water resource needed for agriculture and livestock

Phase 2c (Transition to Recovery)

Phase 2c	
Infrastructure Systems	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.
Operational Coordination	

Water Systems and Services
- In coordination with the Business Infrastructure Group, ESF 3, and ESF 8, provide longer term coordination for the restoration and recovery of affected water infrastructure
- Transition response activities from ESFs to RSFs
- Transition response from the CIA to WRF

Operational Communications

Water Systems and Services
- Ensure the capabilities to communicate with recovery personnel and field operations

Logistics and Supply Chain Management

Water Systems and Services
- Demobilize resources as they are no longer required
- Close out State Staging Areas

Situational Assessment

Water Systems and Services
- In coordination with ESF 3 monitor status of repairs and new construction
- Maintain reporting statuses of lifelines until all lifelines are stabilized

References and Supporting Guidance

Water RRAP

The Northwest Washington Water Resiliency Assessment occurred over a 3-year period beginning in August 2019. Initial scoping activities refined the project focus and identified central research questions. Since the project contemplated partnering with a set of drinking water utilities in each of the seven counties, the DOH developed a preliminary set of candidate water systems based primarily on population served. Geospatial analyst took those preliminary selections, mapped the utilities' service areas and assets, including treatment plants, finished water storage tanks, wells, interconnects, and intakes and overlaid CSZ M9 and local fault shake maps, liquefaction susceptibility zones, and tsunami inundation zones. Infrastructure analysts used these geospatial products to evaluate candidate utilities based on critical asset locations in or near areas of high liquefactions susceptibility and intensity of shaking. The team selected utilities that optimized population served, geographical dispersal, and source water diversity. Ultimately 44 water utilities participated in the RRAP project from the 7-county area of study: Whatcom, Skagit, San Juan, Island, Snohomish, King, and Pierce counties.

Terms and Definitions

Critical Consumers

A person or organization that produces a commodity or enables a service vital to a community's safety, security, and public health.

Critical Infrastructure

Critical infrastructure includes those assets, systems, networks, and functions—physical or virtual—so vital to the State that their incapacitation or destruction would have a debilitating impact on security, economic security, public health or safety, or any combination of those matters.