
**Appendix G:
Critical Lifelines**

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Tab 1: Fuel Supply Restoration

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Table of Contents

Acronyms	G1-iii
Appendix G: Critical Lifelines – Tab 1: Fuel Supply Restoration	iii
G1-1 Introduction.....	1
G1-1.1 Purpose	1
G1-1.2 Scope	1
G1-1.3 Planning Assumptions	1
G1-1.4 Applicable Plans, Authorities, and Guidance	2
G1-2 Roles and Responsibilities	5
G1-2.1 Pacific Gas and Electric Company	5
G1-2.2 California Emergency Commission.....	5
G1-2.3 California Utility Emergency Association	5
G1-2.4 Bay Area Oil Refineries	6
G1-2.5 California Emergency Function 12 – Utilities	6
G1-2.6 Federal Emergency Support Function #12, Energy.....	6
G1-2.7 Department of Defense	7
G1-3 Information and Coordination	9
G1-3.1 Inter-Agency Coordination	9
G1-3.2 Agency Representatives/Government Liaisons	9
G1-3.3 Utilities Operations Center.....	9
G1-3.4 Energy Emergency Management Center	9
G1-3.5 State and Federal Coordination.....	10
G1-4 Restoration Objectives.....	11
G1-4.1 E to E+72 Hours	11
G1-4.2 E+72 Hours to E+14 Days.....	11
G1-4.3 E+14 Days to E+60 Days	12

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Appendix G: Critical Lifelines – Tab 1: Fuel Supply Restoration

Acronyms

Cal EMA.....	California Emergency Management Agency
CEC	California Energy Commission
DLA	Defense Logistics Agency
DoD.....	Department of Defense
E.....	event occurrence
EF-12	California Emergency Function 12 – Utilities
ESF #12	Federal Emergency Support Function #12, Energy
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
JFO	Joint Field Office
PG&E	Pacific Gas and Electric Company
REOC.....	Regional Emergency Operations Center
SEMS.....	Standardized Emergency Management System
SOC	State Operations Center
Tab 1.....	Appendix G: Critical Lifelines – Tab 1: Fuel Supply Restoration
UOC	Utilities Operations Center
USACE.....	U.S. Army Corps of Engineers

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G1-1 Introduction

Restoration of lifelines is the capability to initiate and sustain restoration activities, including facilitating the repair or replacement of infrastructure for lifelines such as oil, gas, electricity, telecommunications, drinking water, wastewater, and transportation services.

This document, Appendix G: Critical Lifelines – Tab 1: Fuel Supply Restoration (Tab 1), provides details and a concept of operations for sustaining and/or restoring the fuel supply.

G1-1.1 Purpose

The purpose of Tab 1 is to:

- Describe how governments coordinate with the refineries and other private fuel suppliers
- Identify response objectives for fuel supply restoration

G1-1.2 Scope

Tab 1 provides details regarding fuel supply restoration in the region. While many of the providers of services are private companies that keep internal operational information confidential, Tab 1 serves as a guide for supporting their efforts to restore the fuel supply and for collecting and sharing information such as impacts to the distribution system, the availability of fuel, and estimates for restoration of normal fuel distribution.

G1-1.3 Planning Assumptions

This section provides planning assumptions related to fuel supply restoration.

G1-1.3.1 Impacts on the Fuel Delivery System

The scenario earthquake causes the following impacts to the fuel delivery system:

- Damage to marine terminals, oil refineries, fuel transmission lines, and fuel dispensaries limits availability of fuel needed to support immediate and follow-on response operations, the movement of evacuees and resources, and power generation.
- Damage to Bay Area refineries and the fuel distribution and delivery infrastructure causes not only a shortage of fuel in the Bay Area but also shortages across the nation.
- The quantity of fuel needed to support response operations and other critical functions is inadequate, requiring the prioritization of fuel allocations.
- Power outages make it difficult to pump gas out of the ground at most Bay Area gas stations and wholesale gasoline suppliers.

- The resulting uncertainty caused by low fuel supplies causes people to buy more fuel than they otherwise would. Additionally, private suppliers of fuel may raise prices due to lower availability and higher demand.

G1-1.3.2 Constraints and Anticipated Needs

After the scenario earthquake, certain impacts constrain fuel supply restoration. Additionally, the region and those entities responsible for restoring fuel supplies need resources in order to restore services quickly. The region assumes the following constraints and anticipated needs:

- Because fuel pumps at stations run off electrical power and lack backup power generation, customers and first responders are unable to acquire fuel from these locations until power is restored.
- With wide-scale power outages, many critical facilities operate under generated power. Additional fuel is needed to support the extended use of generators.

G1-1.4 Applicable Plans, Authorities, and Guidance

The following plans, authorities, and guidance apply to fuel supply restoration:

- California Emergency Council, Emergency Order #6
- California Energy Commission (CEC), California Energy Emergency Response Plan, October 2006

G1-1.4.1 Emergency Order #6

Emergency Order #6 is one in a set of pre-existing orders prepared by the former California Emergency Council. Emergency Order #6 can be issued by the Governor to implement the Petroleum Fuels Set-Aside Program that empowers the CEC to hold control of petroleum stocks needed to ensure the health, safety, and welfare of the public.

G1-1.4.2 California Energy Emergency Response Plan

The California Energy Emergency Response Plan, prepared by the CEC, is the State's strategy for responding to an energy emergency. An energy emergency is an actual or potential loss of energy supply that significantly impacts the State. An energy emergency can be caused by natural disasters (such as earthquake, fire, or flood) or geopolitical events (such as war, terrorism, civil disturbance, or embargo).

G1-1.4.3 California Petroleum Fuels Set-Aside Program Applicant Handbook

The California Petroleum Fuels Set-Aside Program Applicant Handbook, prepared by the CEC, provides a description of the application process, eligibility requirements, and instructions for completing the application form when applying for fuel under the Petroleum Fuels Set-Aside Program.

This application process is used only during a state of emergency when fuel supplies are limited or unavailable to support response operations. Additionally, the program exists to support local governments in their response to an emergency and does not provide relief to businesses or individuals.

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G1-2 Roles and Responsibilities

While no single organization is responsible for managing or maintaining the entire fuel distribution system, the entities identified below have critical roles in recovering the system and/or providing alternate sources of fuel until the system is recovered.

G1-2.1 Pacific Gas and Electric Company

The Pacific Gas and Electric Company (PG&E) is a private provider of electric power and natural gas to Bay Area customers. PG&E has confidential policies and procedures for gas and electric power restoration and coordinates with local governments, Operational Areas, and the State on post-disaster restoration activities. PG&E sends liaisons to the Emergency Operations Centers (EOCs) of impacted jurisdictions and to the Regional Emergency Operations Center (REOC), State Operations Center (SOC), or the Joint Field Office (JFO) to facilitate this coordination.

G1-2.2 California Emergency Commission

The CEC administers the Petroleum Fuels Set-Aside Program. This program is implemented at the direction of the Governor only after proclamation of a state of emergency. In addition, the Governor must officially sign and announce Emergency Order #6, which empowers the Energy Commission to “hold control of petroleum stocks” as needed to ensure the health, safety, and welfare of the public.

This order gives the CEC the legal authority to provide as much fuel as necessary to support the response to the disaster. In cooperation with the California Emergency Management Agency (Cal EMA), the CEC directs oil companies to provide the fuel needed by the emergency service providers responding to the disaster.

The program exists to support local governments in their response to an emergency and does not provide relief to businesses or individuals. However, in the event of a shortage that causes extraordinary economic hardship, the program can also be used to assist with critical industry fuel shortages, such as for the California agricultural industry.

G1-2.3 California Utility Emergency Association

The California Utility Emergency Association serves as a point of contact for critical infrastructure utilities, Cal EMA, and other Governmental agencies before, during, and after an event to:

- Activate the Utilities Operations Center (UOC) at the REOC or SOC
- Facilitate communications and cooperation among member utilities, public agencies, and with non-member utilities (where resources and priorities allow)
- Provide emergency response support wherever practical for electric, petroleum pipeline, telecommunications, gas, and water and wastewater utilities

- Support utility emergency planning, mitigation, training, exercises, and education

G1-2.4 Bay Area Oil Refineries

The Bay Area is home to five oil refineries. During the scenario earthquake, they are likely to experience varying degrees of damage. The refineries have plans to respond to life safety issues occurring at their facilities first and then transition to restoring refinery operations.

The following is a list of Bay Area refineries:

- Chevron Refinery, Richmond
- Conoco Phillips Refinery, Rodeo
- Shell Oil Refinery, Martinez
- Tesoro Golden Eagle Refinery, Martinez
- Valero Refinery, Benicia

G1-2.4.1 Petrochemical Mutual Aid Organization

The Bay Area refineries are part of the Petrochemical Mutual Aid Organization, which supports planning to provide mutual aid resources to refineries when assistance is requested. Bay Area refineries that either avoid or sustain limited damage after the earthquake may be available to assist other refineries in their response and restoration activities.

G1-2.5 California Emergency Function 12 – Utilities

At the State level, the California Emergency Functions consist of an alliance of State agencies, departments, and other stakeholders with similar functional responsibilities. Each Emergency Function is organized to collaboratively mitigate, prepare for, cohesively respond to, and effectively recover from an emergency.

California Emergency Function 12 – Utilities (EF-12) provides resources and support to responsible jurisdictions and in partnership with the private sector to restore gas, electricity, water, wastewater, and telecommunications functions.

G1-2.6 Federal Emergency Support Function #12, Energy

Federal Emergency Support Function #12, Energy (ESF #12), is intended to facilitate the restoration of damaged energy systems and components when activated by the Secretary of Homeland Security for incidents requiring a coordinated Federal response. Under Department of Energy leadership, ESF #12 is an integral part of the larger Department of Energy responsibility of maintaining continuous and reliable energy supplies for the United States through preventive measures and restoration and recovery actions.

- ESF #12 collects, evaluates, and shares information on energy system damage and estimates of the impact of energy system outages in affected areas.
- Additionally, ESF #12 provides information concerning the energy restoration process such as projected schedules, percent completion of restoration, and geographic information on the restoration.
- ESF #12 facilitates the restoration of energy systems through legal authorities and waivers.
- ESF #12 also provides technical expertise to the utilities, conducts field assessments, and assists government and private-sector stakeholders to overcome challenges in restoring the energy system.

G1-2.7 Department of Defense

The Department of Defense (DoD) can be requested by the Federal Emergency Management Agency (FEMA) to provide support for the acquisition and distribution of fuel. DoD provides such support as well as resources to assist in the repair and restoration of fuel distribution systems. The following DoD agencies support the DoD role in providing this assistance.

G1-2.7.1 Defense Logistics Agency

The Defense Logistics Agency (DLA) supports FEMA in its requests for commodities. Specifically, the DLA Energy Division is the lead for the acquisition and distribution of fuel after a disaster. DLA has pre-established contracts with vendors to provide fuel to areas of the country affected by disasters.

G1-2.7.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) provides support to affected jurisdictions in various repair and restoration activities. USACE may provide support to oil and gas companies in the repair and restoration of fuel transmission lines if requested.

G1-2.7.3 California National Guard

The California National Guard may be requested to provide support to local governments for the distribution of fuel to critical facilities and first responders. It also can provide generators at gas stations to aid in the pumping of fuel.

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G1-3 Information and Coordination

The following organizations and programs have been established to support the coordination of response and restoration activities as well as to facilitate the effective flow of information.

G1-3.1 Inter-Agency Coordination

Inter-agency coordination for assessing and sharing information regarding fuel supply and distribution systems follows standard California Standardized Emergency Management System (SEMS) protocols. Local government agencies and private businesses conduct initial assessments and determine restoration priorities and resource needs. Information and requests for assistance are communicated up through SEMS levels as appropriate.

G1-3.2 Agency Representatives/Government Liaisons

The CEC is the primary point of contact for oil companies, pipeline companies, and other petroleum-related industry organizations. Direct contact between the CEC and local governments may occur when the requests have been approved by Cal EMA to better coordinate quantities, types of fuel, and delivery locations.

PG&E may send liaisons to the EOCs of affected jurisdictions, the REOC, the SOC, or the JFO, depending on the nature of the event, to promote information-sharing and to coordinate natural gas and electrical power restoration priorities.

G1-3.3 Utilities Operations Center

The UOC is comprised of the California Utilities Emergency Association and liaisons of utility companies actively supporting post-disaster response and restoration activities. In most cases, the UOC operates in the Operations Section of the SOC, but in limited cases it may directly support the REOC. To support fuel restoration operations, the UOC may have participation from PG&E, refinery representatives, CEC, and other fuel providers.

G1-3.4 Energy Emergency Management Center

The Energy Emergency Management Center provides a centralized management location for the coordination of energy emergencies.¹ This allows a more efficient structure to:

- Provide timely reports, analyses, and action recommendations
- Coordinate more effectively with Cal EMA, the California Utilities Emergency Association, and the California Independent System Operator during proclaimed emergencies

¹ California Energy Emergency Response Plan, 2006

- Ensure that the CEC can respond quickly to emergency fuel distribution missions at the request of Cal EMA
- Ensure effective operation of the Fuels Set-Aside Program
- Ensure that a separate accounting of emergency response and recovery activity is documented for reimbursement purposes

G1-3.5 State and Federal Coordination

EF-12 and ESF #12 coordinate to facilitate support for the restoration of damaged energy systems and components. The joint efforts of these functions occur at the SOC initially and then at the JFO when activated.

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G1-4 Restoration Objectives

Even though the earthquake has immediate impacts on the fuel distribution system, fuel shortages are not apparent until initial supplies are exhausted. Anticipating shortages is critical. **Section G1-4** identifies objectives for assessing impacts to the fuel distribution system and supply chain and for their restoration. The objectives are organized by phases consistent with those identified in the Regional Catastrophic Earthquake Logistics Response Plan. Those phases are: event occurrence (E) to E+72 hours, E+72 hours to E+14 days, and E+14 days to E+60 days.

G1-4.1 E to E+72 Hours

In the first 72 hours following the earthquake, priority is placed on assessing damage to the fuel distribution system and anticipating potential shortages in supply. The following objectives frame assessment and restoration activities from E to E+72 hours.

- Identify disruptions in fuel transmission lines to include natural gas, refined and unrefined fuel, and jet fuel
- Identify disruptions in the capability of local refineries to receive, refine, and distribute fuel
- Ensure that assessment team personnel can access and remain in the affected areas to complete assessment activities
- Ensure that the appropriate utility representatives are included in response and restoration planning activities
- Provide information to the public on home safety measures, service disruptions, fuel availability, and restoration activities
- Develop situational awareness concerning the demand for fuel and fuel supply restoration activities
- Identify critical facilities and response agencies whose missions are adversely affected by the loss of fuel
- Disseminate established information on regulatory relief for fuel acquisition and distribution
- Provide and coordinate alternate means for providing fuel

G1-4.2 E+72 Hours to E+14 Days

After assessments are completed and restoration activities begin, priorities shift to identifying alternate fuel supplies to meet demand and continuing restoration activities. The following objectives frame the establishment of alternative fuel supply strategies and ongoing restoration activities from E+72 hours to E+14 days.

- Identify resources required to support the restoration of the fuel supply and fuel distribution system
- Identify interdependencies among fuel and other lifelines that may impact restoration priorities

- Analyze current fuel demand and supply and request additional fuel if appropriate
- Continue to coordinate the sharing and dissemination of priority information regarding fuel supply restoration activities
- Coordinate the fuel distribution plan to support critical response activities
- Set up a system to receive and distribute fuel to critical facilities and response agencies
- Continue to develop situational awareness concerning the demand for fuel and fuel supply restoration activities
- Determine the need for Federal assistance in the acquisition of alternate fuel supplies and request support if necessary

G1-4.3 E+14 Days to E+60 Days

Many of the activities that occur from E+72 hours to E+14 days continue from E+14 days to E+60 days, but efforts in this period transition to normalizing fuel demand and distribution. The following objectives are in addition to the objectives that are ongoing from the previous phase. These objectives frame the transition to recovery of the fuel distribution system from E+14 days to E+60 days.

- Restore normal refining capabilities and the distribution of refined fuel
- Repair and restore fuel transmission lines
- Continue to evaluate the need for Federal assistance in the acquisition of alternate fuel supplies and request support if necessary
- Transition fuel distribution from government-regulated strategies to normal market-based distribution mechanisms
- Demobilize any alternate fuel distribution systems

Tab 2: Electric Power Restoration

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Table of Contents

Acronyms	G2-iii
Appendix G: Critical Lifelines – Tab 2: Electric Power Restoration.....	iii
G2-1 Introduction.....	1
G2-1.1 Purpose	1
G2-1.2 Scope	1
G2-1.3 Planning Assumptions	1
G2-1.4 Applicable Plans, Authorities, and Guidance	3
G2-2 Roles and Responsibilities	5
G2-2.1 Pacific Gas and Electric Company	5
G2-2.2 California Emergency Commission.....	5
G2-2.3 California Utilities Emergency Association	5
G2-2.4 California Independent System Operator	5
G2-2.5 California National Guard	6
G2-2.6 California Emergency Function 12 – Utilities	6
G2-2.7 U.S. Army Corps of Engineers.....	6
G2-2.8 Department of Energy	6
G2-2.9 Federal Emergency Support Function #12, Energy	7
G2-3 Information and Coordination	9
G2-3.1 Inter-Agency Coordination	9
G2-3.2 Utilities Operations Center	9
G2-3.3 Agency Representatives/Government Liaisons	9
G2-3.4 Energy Emergency Management Center	9
G2-3.5 State and Federal Coordination	10
G2-4 Restoration Priorities and Objectives	11
G2-4.1 E to E+72 Hours	11
G2-4.2 E+72 Hours to E+14 Days	12
G2-4.3 E+14 Days to E+60 Days	12

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Appendix G: Critical Lifelines – Tab 2: Electric Power Restoration

Acronyms

Cal EMA.....	California Emergency Management Agency
CEC	California Energy Commission
DOE	U.S. Department of Energy
E.....	event occurrence
EF-12	California Emergency Function EF-12 – Utilities
ESF #12	Federal Emergency Support Function #12, Energy
HAZUS.....	Hazards – U.S.
JFO	Joint Field Office
PG&E	Pacific Gas and Electric Company
REOC.....	Regional Emergency Operations Center
SEMS.....	Standardized Emergency Management System
SOC	State Operations Center
Tab 2.....	Appendix G: Critical Lifelines – Tab 2: Electric Power Restoration
UOC	Utilities Operations Center
USACE.....	U.S. Army Corps of Engineers

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G2-1 Introduction

Restoration of lifelines is the capability to initiate and sustain restoration activities, including facilitating the repair or replacement of infrastructure for lifelines such as oil, gas, electricity, telecommunications, drinking water, wastewater, and transportation services.

This document, Appendix G: Critical Lifelines – Tab 2: Electric Power Restoration (Tab 2), provides details and a concept of operations for sustaining and/or restoring electric power after the disaster.

G2-1.1 Purpose

The purpose of Tab 2 is to:

- Identify the entities responsible for post-disaster repairing, maintaining, and restoring electric power to the Bay Area
- Describe how governments coordinate after the disaster with electric power providers/maintainers
- Identify response objectives for electric power restoration
- Describe how post-disaster restoration efforts are prioritized

G2-1.2 Scope

Tab 2 provides details regarding electric power restoration in the region. While Pacific Gas and Electric Company (PG&E) is a private company and keeps internal operational information confidential, Tab 2 serves as a guide for supporting its efforts to restore electrical power and for collecting and sharing information such as impacts to the distribution system, the extent of electrical power service disruption, and estimates for restoration of normal electrical power distribution.

G2-1.3 Planning Assumptions

This section provides planning assumptions related to electric power restoration.

G2-1.3.1 Impacts on the Electric Power Grid

The scenario earthquake causes the following impacts to the electric power delivery system:

- **Table G2.1-1** shows the number of households without electricity after the earthquake.
- Many other lifelines are dependent on electric power, such as fuel distribution, economic activity, water and wastewater systems, communications, and operation of critical facilities.

Table G2.1-1. Number of households without electricity after the earthquake.

County	Total Households	Households without Electricity Post-Event			
		E+24 Hours	E+72 Hours	E+7 Days	E+30 Days
Alameda	564,200	23,600	13,700	5,400	1,200
Contra Costa	384,600	15,400	9,300	3,700	800
Marin	105,300	3,700	2,400	1,100	200
Monterey	130,300	N/A	N/A	N/A	N/A
Napa	50,300	2,000	1,200	500	100
San Benito	17,300	N/A	N/A	N/A	N/A
San Francisco	358,900	253,900	161,300	73,100	18,300
San Mateo	268,000	100,100	62,800	27,900	6,800
Santa Clara	624,700	57,100	34,300	14,400	3,400
Santa Cruz	95,800	15,500	9,600	3,900	800
Solano	140,900	5,600	3,200	1,400	300
Sonoma	182,900	60,000	40,400	19,700	5,000
Total	2,923,200	492,200	308,400	139,000	36,900

Source: Hazards – U.S. (HAZUS) analysis conducted by URS in 2009. Estimates have been adjusted, by county, for population increase since the year 2000. For Contra Costa, Napa, and Solano counties, the power loss is not accurately represented in HAZUS and is an average of losses for Alameda and Marin counties. HAZUS does not provide reliable results for Monterey and San Benito counties, but it can be assumed that there would be some power loss in these counties.

E = earthquake or scenario event

N/A = not available (HAZUS results are unreliable)

- Resources to repair and restore electric power are insufficient to meet the demand, so efforts must be prioritized.
- The need for back-up power generators exceed the demand, so available generators must be allocated to the most critical facilities first.

G2-1.3.2 Constraints and Anticipated Needs

After the scenario earthquake, certain impacts constrain electric power restoration. While PG&E has significant resources to address impacts to the electric power generation, transmission, and distribution system, it too needs assistance from outside agencies to expedite repairs to the system. The region assumes the following constraints and anticipated needs:

- Because fuel pumps at gas stations run off electric power and lack back-up power generation, customers and first responders are unable to acquire fuel from these locations until power is restored.

- With wide-scale power outages, many critical facilities operate under generated power.
- PG&E needs to coordinate restoration priorities with local governments to target those critical facilities that may have limited backup power capabilities.

G2-1.4 Applicable Plans, Authorities, and Guidance

The following plans, authorities, and guidance apply to fuel supply restoration.

- PG&E, various plans
- California Energy Commission (CEC), California Energy Emergency Response Plan, 2008

G2-1.4.1 Pacific Gas and Electric Company Emergency Response Plans

Because PG&E is a private company, its plans are considered sensitive material and are not distributed publicly, although some plans are shared with first-responder agencies to facilitate effective coordination post-disaster. These plans guide the PG&E response activities and prioritization of service restoration.

G2-1.4.2 California Energy Emergency Response Plan

The California Energy Emergency Response Plan, developed by the CEC, describes the State strategy for responding to an energy emergency. An energy emergency is an actual or potential loss of energy supply that significantly impacts the State. An energy emergency can be caused by natural disasters (such as earthquake, fire, or flood) or geopolitical events (such as war, terrorism, civil disturbance, or embargo).

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G2-2 Roles and Responsibilities

While PG&E is primarily responsible for the maintenance, repair, and restoration of the electric power generation and the transmission and distribution system, the other organizations listed below also have important roles in coordinating and assisting restoration activities.

G2-2.1 Pacific Gas and Electric Company

PG&E is a private provider of electric power and natural gas to Bay Area customers. PG&E has confidential policies and procedures for gas and electric power restoration and coordinates with local governments, Operational Areas, and the State on post-disaster restoration activities. PG&E may send liaisons to the Emergency Operations Centers of affected jurisdictions and to the Regional Emergency Operations Center (REOC), State Operations Center (SOC), or Joint Field Office (JFO) to facilitate this coordination. PG&E also deploys mobile command centers to the field to coordinate the field-level response with first responders.

G2-2.2 California Emergency Commission

Post-disaster, the CEC is responsible for information gathering, analyzing energy infrastructure impact, response coordinating, and supporting the California Emergency Management Agency (Cal EMA) as it coordinates alternate means of providing power.

Representatives of the CEC work out of the Utilities Operations Center (UOC) in the REOC or SOC to coordinate support for PG&E restoration activities.

G2-2.3 California Utilities Emergency Association

The California Utilities Emergency Association serves as a point of contact for critical infrastructure utilities and Cal EMA and other governmental agencies before, during, and after an event to:

- Activate the UOC at the REOC or SOC
- Facilitate communications and cooperation among member utilities, public agencies, and non-member utilities (where resources and priorities allow)
- Provide emergency response support wherever practical for electric, petroleum pipeline, telecommunications, gas, and water and wastewater utilities
- Support utility emergency planning, mitigation, training, exercises, and education

G2-2.4 California Independent System Operator

The California Independent System Operator is an impartial link between the electrical generating power plants and the utility companies that provide electricity to more than 30 million consumers. When the demand for electricity exceeds the

generating capacity of power plants, the California Independent System Operator must determine the manner in which limited electrical supply is distributed through the transmission and distribution network.

G2-2.5 California National Guard

The California National Guard may be requested to assist local governments to provide and set up backup power generation for critical facilities. The California National Guard also is capable of providing generators at gas stations to aid in fuel pumping.

G2-2.6 California Emergency Function 12 – Utilities

At the state level, the California Emergency Functions consist of an alliance of State agencies, departments and other stakeholders with similar functional responsibilities. Each Emergency Function is organized to collaboratively mitigate, prepare for, cohesively respond to, and effectively recover from an emergency.

California Emergency Function EF-12 – Utilities (EF-12) provides resources and support to responsible jurisdictions and in partnership with the private sector to restore gas, electricity, water, wastewater, and telecommunications utilities.

G2-2.7 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) provides support to affected jurisdictions in various repair and restoration activities. USACE coordinates emergency power team missions with power-system restoration activities to establish priorities for emergency generator installations. It may provide support to PG&E in the repair and restoration of systems in the electrical power grid if requested.

G2-2.8 Department of Energy

The Department of Energy (DOE) is the lead agency responsible for coordinating Federal Emergency Support Function #12, Energy (ESF #12). In that role, DOE:

- Serves as the focal point for issues and policy decisions related to energy response and restoration efforts
- Assesses energy system damage and monitors repair work
- Collects, assesses, and provides information on energy supply, demand, and market impacts and contributes to situation and after-action reports
- Identifies supporting resources needed to restore energy systems
- Deploys DOE response teams as needed to affected areas to assist in response and restoration efforts

G2-2.9 Federal Emergency Support Function #12, Energy

Federal Emergency Support Function (ESF) #12, Energy is intended to facilitate the restoration of damaged energy systems and components when activated by the Secretary of Homeland Security for incidents requiring a coordinated Federal response. Under DOE leadership, ESF #12 is an integral part of the larger DOE responsibility of maintaining continuous and reliable energy supplies for the United States through preventive measures and restoration and recovery actions.

- ESF #12 collects, evaluates, and shares information on energy system damage and estimates of the impact of energy system outages in affected areas.
- Additionally, ESF #12 provides information concerning the energy restoration process, such as projected schedules, percent completion of restoration, and geographic information on the restoration.
- ESF #12 facilitates the restoration of energy systems through legal authorities and waivers.
- It also provides technical expertise to the utilities, conducts field assessments, and assists government and private-sector stakeholders to overcome challenges in restoring the energy system.

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G2-3 Information and Coordination

The following organizations and programs have been established to support the coordination of response and restoration activities as well as to facilitate the effective flow of information.

G2-3.1 Inter-Agency Coordination

Inter-agency coordination for assessing and sharing information regarding fuel supply and distribution systems follows California Standardized Emergency Management System (SEMS) protocols. Local government agencies and private businesses conduct initial assessments to determine restoration priorities and resource needs. Information and requests for assistance are communicated up through the SEMS levels as appropriate.

G2-3.2 Utilities Operations Center

The UOC is operated by the California Utilities Emergency Association in conjunction with liaisons from utility companies actively supporting post-disaster response, restoration, and recovery activities. In most cases, the UOC operates as part of the Operations Section of the SOC but in limited cases may operate in direct support of a REOC. To support restoration operations, the UOC may have participation from PG&E, the CEC, and other representatives that support electric power restoration.

G2-3.3 Agency Representatives/Government Liaisons

PG&E sends liaisons to the Emergency Operations Centers of affected jurisdictions, the REOC, the SOC, or the JFO depending on the nature of the event to promote information sharing and coordinate natural gas and electric power restoration priorities. Organizations such as USACE and the California National Guard may also send liaisons to affected governments to coordinate restoration activities.

G2-3.4 Energy Emergency Management Center

The Energy Emergency Management Center provides a centralized management location for the coordination of energy emergencies.¹This allows a more efficient structure to:

- Provide timely reports, analyses, and action recommendations
- Coordinate more effectively with Cal EMA, California Utilities Emergency Association, and the California Independent System Operator during proclaimed emergencies
- Ensure that the CEC can respond quickly to emergency fuel distribution missions at the request of Cal EMA

¹ California Energy Emergency Response Plan, 2006

- Ensure effective operation of the Fuels Set-Aside Program
- Ensure that a separate accounting of emergency response and recovery activity is documented for reimbursement purposes

G2-3.5 State and Federal Coordination

EF-12, Utilities and ESF #12 – Energy coordinate to facilitate support for the restoration of damaged energy systems and components. The joint efforts of these functions occur at the SOC initially and then at the JFO when activated.

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G2-4 Restoration Priorities and Objectives

Even though the earthquake has immediate impacts on the fuel distribution system, fuel shortages are not apparent until initial supplies are exhausted. Anticipating shortages is critical. **Section G2-4** identifies objectives for assessing impacts to the fuel distribution system and supply chain and for their restoration. The objectives are organized by phases consistent with those identified in the Regional Catastrophic Earthquake Logistics Response Plan. Those phases are: event occurrence (E) to E+72 hours, E+72 hours to E+14 days, and E+14 days to E+60 days.

In general, electric power restoration efforts are guided by the following priorities:

- Protect public safety
- Assess and repair generation facilities
- Assess and repair transmission lines
- Assess and repair substations
- Assess and repair distribution lines
- Assess and repair neighborhood tap lines
- Connect individual customers

In this context, PG&E coordinates with local governments to address requests for priority restoration of:

- Hospitals
- Regional airports
- Water, wastewater treatment plants, and/or sewage pumping stations
- Other critical infrastructure, such as emergency response facilities (e.g., emergency operations centers and 911/dispatch centers)
- Emergency shelters or other high-occupancy facilities
- Facilities from which people cannot be easily relocated. (e.g., nursing homes and assisted-living facilities)

G2-4.1 E to E+72 Hours

In the first 72 hours following the earthquake, priority is placed on assessing damage to the electrical power grid and addressing hazardous situations, such as downed wires. The focus then transitions to restoring power to the largest number of customers as quickly as possible and on making repairs that restore service to critical facilities such as hospitals, water pumping stations, and police and fire departments.² The following objectives frame assessment and restoration activities from E to E+72 hours:

- Ensure assessment team personnel can access and remain in the affected areas to complete assessment activities

² As specified on PG&E's website:
www.pge.com/myhome/customerservice/energystatus/preparationandresponse/index.shtml

- Determine the extent of electric power outages
- Identify portions of the electrical power grid that pose a threat to life safety
- Identify damage to the generation facilities, substations, and transmission and distribution lines
- Ensure that the appropriate utility representatives are included in response and restoration planning activities
- Provide information to the public on home safety measures, service disruptions, and restoration activities
- Identify critical facilities and response agencies whose missions are adversely affected by the loss of electrical power
- Coordinate the request, acquisition, and prioritization of backup power generators

G2-4.2 E+72 Hours to E+14 Days

The following objectives frame the ongoing restoration activities from E+72 hours to E+14 days:

- Identify resources required to support the restoration of the electric power transmission and distribution systems
- Identify interdependencies among electric power and other lifelines that may impact restoration and backup power generation priorities
- Continue to coordinate the sharing and dissemination of priority information on electric power restoration activities
- Provide estimates for electric power restoration to aid in evacuation and sheltering planning
- Monitor electric power needs for critical facilities and provide backup power generation if necessary
- Coordinate with PG&E to determine potential resource needs
- Continue to monitor the electric power generation, transmission, and distribution system for any hazardous situations

G2-4.3 E+14 Days to E+60 Days

Many of the activities that occur from E+72 hours to E+14 days continue from E+14 days to E+60 days, but efforts in this period transition to restoring electric power to individual customers and other non-critical facilities. The following objectives are in addition to the objectives that are ongoing from the previous phase. These objectives frame the transition to recovery of the electric power generation and distribution system from E+14 days to E+60 days:

- Repair and restore normal electric power generation and distribution
- Continue to evaluate the need for Federal assistance in the acquisition of resources to repair and augment electric power service

- Transition facilities on generated power to electric power after service has been restored
- Continue to monitor the electric power generation, transmission, and distribution system for any hazardous situations

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Tab 3: Water and Wastewater Restoration

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Table of Contents

Acronyms	G3-iii
G3-1 Introduction.....	1
G3-1.1 Purpose.....	1
G3-1.2 Scope.....	1
G3-1.4 Applicable Plans, Authorities, and Guidance.....	4
G3-2 Roles and Responsibilities.....	5
G3-2.1 Local Water and Wastewater Utilities.....	5
G3-2.2 California Utilities Emergency Association.....	5
G3-2.3 California Emergency Function 12 – Utilities.....	5
G3-2.4 California Department of Water Resources.....	5
G3-2.5 California National Guard.....	6
G3-2.6 California Department of Public Health.....	6
G3-2.7 Federal Emergency Support Function #3, Public Works and Engineering.....	6
G3-2.8 Department of Defense.....	6
G3-2.9 U.S. Army Corps of Engineers.....	7
G3-2.10 U.S. Environmental Protection Agency.....	7
G3-2.11 California Resiliency Alliance.....	7
G3-3 Information and Coordination.....	9
G3-3.1 Inter-Agency Coordination.....	9
G3-3.2 Utilities Operations Center.....	9
G3-3.3 Agency Representatives/Government Liaisons.....	9
G3-3.4 Drinking Water Multi-Agency Coordinating Group.....	9
G3-3.5 California Water/Wastewater Agency Response Network.....	9
G3-3.6 State and Federal Coordination.....	10
G3-4 Restoration Objectives.....	11
G3-4.1 E to E+72 Hours.....	11
G3-4.2 E+72 Hours to E+14 Days.....	11
G3-4.3 E+14 Days to E+60 Days.....	12

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Appendix G: Critical Lifelines – Tab 3: Water and Wastewater Restoration

Acronyms

Cal EMA.....	California Emergency Management Agency
CRA	California Resiliency Alliance
CUEA	California Utilities Emergency Association
CalWARN.....	California Water/Wastewater Agency Response Network
E.....	event occurrence
EF-12	California Emergency Function 12 – Utilities
ESF #3	Federal Emergency Support Function #3, Public Works and Engineering
EOC	Emergency Operations Center
FEMA	Federal Emergency Management Agency
JFO	Joint Field Office
MACS.....	Multi-Agency Coordination System
REOC.....	Regional Emergency Operations Center
SEMS.....	Standardized Emergency Management System
SOC	State Operations Center
Tab 3.....	Appendix G: Critical Lifelines – Tab 3: Water and Wastewater Restoration
UOC	Utilities Operations Center
USACE.....	U.S. Army Corps of Engineers

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G3-1 Introduction

Restoration of lifelines is the capability to initiate and sustain restoration activities. This includes facilitating the repair/replacement of infrastructure for lifelines such as oil, gas, electricity, telecommunications, drinking water, wastewater, and transportation services.

This document, Appendix G: Critical Lifelines – Tab 3: Water and Wastewater Restoration (Tab 3), provides details and a concept of operations for sustaining and/or restoring water and wastewater systems.

G3-1.1 Purpose

The purpose of Tab 3 is to:

- Describe how government coordinates with private companies and special districts to facilitate the restoration of services
- Identify response objectives for water and wastewater restoration

G3-1.2 Scope

Tab 3 provides details regarding water and wastewater systems restoration in the region. While many of the service providers are special districts and private companies that keep internal operational information confidential, Tab 3 serves as a guide for supporting their restoration efforts and for collecting and sharing such information as impacts to water and wastewater systems and estimates for service restoration.

G3-1.3 Planning Assumptions

This section provides planning assumptions related to water and wastewater restoration.

G3-1.3.1 Impacts to Water and Wastewater Systems

The scenario earthquake causes the following impacts to water and wastewater systems in the region:

- Potable water supply systems suffer major damage because of the following:
 - Extensive damage to pipelines from ground deformation
 - Interruption of pumps and treatment due to power outages
 - Damage to treatment facilities, storage facilities, and distribution infrastructure
 - Contamination of potable water systems because of damaged lines

Table G3.1-1. Number of households without potable water after the earthquake.

County	Total Households	Households without Potable Water Post-Event			
		E+24 Hours	E+72 Hours	E+7 Days	E+30 Days
Alameda	564,200	465,000	459,800	448,200	341,800
Contra Costa	384,600	105,700	85,700	45,600	N/A
Marin	105,300	56,300	48,600	29,300	N/A
Monterey	130,300	N/A	N/A	N/A	N/A
Napa	50,300	3,900	<100	0	0
San Benito	17,300	N/A	N/A	N/A	N/A
San Francisco	358,900	340,100	336,400	326,100	N/A
San Mateo	268,000	236,900	234,300	228,100	149,700
Santa Clara	624,700	516,800	512,300	502,700	423,100
Santa Cruz	95,800	16,100	6,500	<100	<100
Solano	140,900	12,500	3,700	<100	<100
Sonoma	182,900	87,800	81,900	69,100	<100
Total	2,923,200	1,841,100	1,769,200	1,649,400	914,900

Source: Hazards – U.S. analysis conducted by URS in 2009. Estimates have been adjusted, by county, for population increases since 2000.

E = earthquake or scenario event

N/A = not available (Hazards – U.S. results are unreliable)

Table G3.1-1 shows the number of households without potable water after the earthquake:

- Damage to potable water treatment and distribution systems creates a significant challenge and makes potable water a priority commodity.
- Critical pipelines, tunnels, bypasses, pumping stations, supply lines, and feeder mains fail, negatively impacting the provision of water.
- Massive, coordinated emergency potable water distribution systems are necessary to support disaster service workers and to sustain populations in the region.
- Peninsula, South Bay, and San Francisco customers are fully or partially cut off from the Hetch Hetchy system. East, South, and North Bay aqueduct systems are equally affected.
- Most of the locally stored water supplies for fire, medical, and other critical services from tanks and small reservoirs are depleted within 72 hours after the event occurrence (E).
- Dams may fail, causing flooding, infrastructure damage, loss of water storage capacity, and increased loss of life.

- Trucks delivering treatment chemicals to water treatment plants may be delayed due to roadway damage.
- Onsite storage of treatment chemicals determines how long water treatment plants are able to treat water to bring it to potable standards; most plants are not able to function for more than 3 to 5 days.
- Partially treated raw sewage may discharge into the San Francisco Bay for up to one month due to facility and pipeline damage.
- Loss of electrical power could render pumping plants unusable, causing sewage back-ups and spills through street access holes.
- Pumping and treatment operations may be interrupted due to power outages.
- Some private companies may provide supplies of bottled water and should be incorporated into the potable water distribution system.
- Water utility companies operate based on their own water recovery and distribution plans, but water supply resources are insufficient, resulting in the request for and need to acquire water from sources outside the region.
- Resources to move the water, such as water tenders, are very limited and require prioritization.
- Chemicals needed for water treatment/decontamination may not be readily available because of hazardous materials restrictions, damage to chemical storage facilities, and transportation infrastructure damage.

G3-1.3.2 Constraints and Anticipated Needs

After the scenario earthquake, certain impacts constrain water and wastewater system restoration. Additionally, the region and those entities responsible for restoring the water and wastewater system need resources in order to quickly restore services. The region assumes the following constraints and anticipated needs:

- Because pumping stations and wastewater treatment facilities operate on electric power and have limited backup power generation, customers and first responders may be unable to acquire water at least until power is restored even if the pumping stations and pipes avoid significant damage.
- With wide-scale power outages, many critical facilities in the water and wastewater system operate under generated power. Additional fuel is needed to support the extended use of generators at these facilities.
- Expected major needs related to water and wastewater systems are:
 - Electricity/generators for sewage lift stations.
 - State and Federal environmental sewage discharge waivers.
 - Large and/or specialized repair parts (that are not on hand), such as valves and pipes.
 - Fuel for vehicles, equipment, and wastewater treatment plants.

- Chemicals to treat wastewater; procurement should be initiated within 96 hours. Wastewater utilities estimate that local supplies of wastewater-treatment chemicals are exhausted within 7 days.
- Equipment and qualified personnel.
- An estimated 5 million gallons per day of potable water.
- Water for facilities critical to response operations, including hospitals and shelters.

G3-1.4 Applicable Plans, Authorities, and Guidance

The following plans, authorities, and guidance apply to water and wastewater system restoration:

- California Emergency Management Agency (Cal EMA) Emergency Planning Guidance: Public and Private Water Utilities, 1999
- California Government Code Section 8607.2(c)
- California Water/Wastewater Agency Response Network (CalWARN) Mutual Aid/Assistance Operational Plan, 2009
- San Francisco Bay Area Earthquake Readiness Response: Concept of Operations Plan, 2008
- Association of Bay Area Governments, Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, 2010

G3-2 Roles and Responsibilities

While no single organization is responsible for managing or maintaining water and wastewater treatment systems, the entities identified below have critical roles in providing emergency response support and assisting with system repairs and service restoration.

G3-2.1 Local Water and Wastewater Utilities

Local water and wastewater utilities manage and coordinate the utility emergency response and recovery activities in their service boundaries. The utility may be a private utility, a city or county department, or an independent special district.

During an emergency that impacts the normal water distribution system, the local water utility is also responsible for procuring and distributing alternate emergency drinking water for populations in the jurisdiction, provided local alternate water sources are available and local utility resources are available to manage it. When the local water utility's capacity to maintain lead responsibility for alternate drinking water supplies is exceeded, a Multi-Agency Coordination System (MACS) group may be established to manage the delivery of emergency water.

G3-2.2 California Utilities Emergency Association

The California Utilities Emergency Association (CUEA) facilitates communications and coordination between members and public agencies and with non-member utilities when resources and priorities allow. During an emergency response, the CUEA collects damage assessments, coordinates mutual aid/assistance requests, and facilitates the restoration of water utilities. The CUEA also activates the Utilities Operations Center (UOC) to coordinate support to local utility service providers.

G3-2.3 California Emergency Function12 – Utilities

At the State level, the California Emergency Functions consist of an alliance of State agencies, departments, and other stakeholders with similar functional responsibilities. Each Emergency Function is organized to collaboratively mitigate, prepare for, cohesively respond to, and effectively recover from an emergency.

California Emergency Function 12 – Utilities (EF-12) in partnership with the private sector, provides resources and support to responsible jurisdictions to restore gas, electric, water, wastewater, and telecommunications. The California Natural Resources Agency is the lead for EF-12.

G3-2.4 California Department of Water Resources

The California Department of Water Resources implements emergency protective measures, such as the stabilization and repair of breaches, to reduce infrastructure damage due to failure of levees in the Sacramento Delta and to protect the State's

water supply. The Department of Water Resources also assesses damage to dams and makes determinations regarding their safety and operation.

G3-2.5 California National Guard

The California National Guard may be requested to provide support to local governments for the transport and distribution of bottled water. The National Guard can also provide:

- Engineers and equipment to support water and wastewater utilities in the restoration of water distribution systems
- Generators for use at pumping stations and wells
- Reverse osmosis water purification units

G3-2.6 California Department of Public Health

The California Department of Public Health Division of Drinking Water and Environmental Management regulates public drinking water systems. Following the earthquake, the Drinking Water Program assists utilities with obtaining drinking water system testing and may also analyze samples. The Drinking Water Program uses out-of-region offices to staff assessment teams. Additionally, water systems can use CalWARN and California Rural Water Association for mutual aid and recovery assistance and to engage assessment teams from out-of-region water districts (there are approximately 8,000 water districts in the State).

G3-2.7 Federal Emergency Support Function #3, Public Works and Engineering

Federal Emergency Support Function #3, Public Works and Engineering (ESF #3), provides support for emergency repair of damaged infrastructure and critical public facilities (temporary power, emergency water, and sanitation systems). It also supports the restoration of critical navigation, flood control, and other water infrastructure systems, including drinking water distribution and wastewater collection systems.

G3-2.8 Department of Defense

The Federal Emergency Management Agency (FEMA) can request the Department of Defense to provide support for the restoration of services. The Department of Defense can provide:

- Engineering teams and heavy equipment, such as the U.S. Navy Construction Force, to perform emergency repairs and construct temporary facilities
- Resources to support fuel transportation and distribution
- Resources for transportation of critical equipment
- Base camps for assessment teams and repair crews

G3-2.9 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) provides support to impacted jurisdictions for various engineering and construction-related repair and restoration activities. USACE may provide support to water and wastewater utilities in the repair and restoration of water and wastewater systems if requested by the State and if mission-requested by FEMA.

G3-2.10 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency provides assessments of potable water systems and wastewater systems, regulatory oversight and waivers for water and wastewater systems, hazardous materials monitoring, hazardous materials response, and support for responder safety.

G3-2.11 California Resiliency Alliance

The California Resiliency Alliance (CRA) is a 501(c)(3) non-profit organization. It facilitates local partnerships between business and government to fill important gaps in all phases of emergency management. It works closely with Cal EMA, other State agencies, local governments, and with its business and trade association members.

Upon request from Cal EMA, the CRA reports to the Business Operations Center. The CRA has also identified seven private-sector liaisons who can report to Operational Area Emergency Operations Centers (EOCs) in the Coastal Region. In these venues, CRA representatives assist by communicating information to and from the private sector and by providing access to private-sector resources. In past emergencies, the CRA has been successful in procuring bottled water for distribution to affected communities.

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G3-3 Information and Coordination

The following organizations and programs have been established to support the coordination of response and restoration activities as well as to facilitate the effective flow of information.

G3-3.1 Inter-Agency Coordination

Inter-agency coordination for assessing and sharing information regarding fuel supply and distribution systems follows Standardized Emergency Management System (SEMS) protocols. Local government agencies and private businesses conduct initial assessments and determine restoration priorities and resource needs. Information and requests for assistance are communicated up through the SEMS levels as appropriate.

G3-3.2 Utilities Operations Center

The UOC is comprised of the CUEA and liaisons of utility companies actively supporting post-disaster response and restoration activities. In most cases, the UOC operates in the Operations Section of the State Operations Center (SOC), but in limited cases it may operate in direct support of the Cal EMA Regional Emergency Operations Center (REOC). To support water and wastewater system restoration operations, the UOC may have participation from utility representatives, CUEA, and other agencies that can support restoration efforts or provide alternate means of water distribution.

G3-3.3 Agency Representatives/Government Liaisons

Water and wastewater utilities may send liaisons to the EOCs of impacted jurisdictions, the REOC, the SOC, or the Joint Field Office (JFO), depending on the nature of the event, to promote information sharing and coordination of water and wastewater system restoration priorities.

G3-3.4 Drinking Water Multi-Agency Coordinating System Group

When multiple water utilities or local jurisdictions are affected by the disaster, a MACS group specific to drinking water may be established; it could be established at any level of the SEMS organization and include representatives from the affected water utilities, local government and Operational Areas, California Health and Human Services, Cal EMA, FEMA, CUEA, and volunteer or private organizations as necessary.

G3-3.5 California Water/Wastewater Agency Response Network

Water and wastewater utilities in the State have established CalWARN to improve the flow of mutual aid/assistance among the signatory utilities throughout the State. Resources may be requested directly from one utility to another and do not require

the declaration of an emergency. Public and private resources are available through the system. The methods for activating the system and accessing resources can be accessed by members online at www.calwarn.org.

CalWARN is organized according to the six Cal EMA mutual aid regions. During major events where multiple utilities are affected and assistance is required to coordinate the number of requests, a CalWARN response team consisting of pre-trained utility personnel from unaffected utilities may be called on to support coordination efforts at the REOC, SOC, or JFO.

G3-3.6 State and Federal Coordination

EF-12 and ESF #3 coordinate to facilitate support for the restoration of damaged water and wastewater systems. The joint efforts of these functions occur at the SOC initially and then at the JFO, when it is activated.

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G3-4 Restoration Objectives

Section G3-4 identifies objectives for assessing impacts to the water and wastewater systems and for their restoration. The objectives are organized by phases consistent with those identified in the Regional Catastrophic Earthquake Logistics Response Plan. Those phases are E to E+72 hours, E+72 hours to E+14 days, and E+14 days to E+60 days.

G3-4.1 E to E+72 Hours

In the first 72 hours following the earthquake, priority is placed on assessing damage to the water and wastewater systems and anticipating potential disruptions in service. The following objectives frame assessment and restoration activities from E to E+72 hours:

- Assess water and wastewater infrastructure (i.e., pumping stations, wastewater treatment plants, pipelines, wells, reservoirs, and dams) to identify damage and service disruptions
- Ensure that assessment team personnel can access and remain in the affected areas to complete assessment activities
- Ensure that the appropriate utility representatives are included in response and restoration planning activities
- Determine capabilities to restore the water and wastewater systems and request assistance if needed
- Provide information to the public on water safety, service disruptions, alternate water sources, and restoration activities
- Share and disseminate priority information on water and wastewater system restoration activities
- Develop situational awareness concerning water quality and the demand for potable water
- Identify critical facilities and response agencies with missions that are adversely affected by the loss of water and/or sanitation
- Provide and coordinate alternate means for providing water and sanitation

G3-4.2 E+72 Hours to E+14 Days

After assessments have been completed and restoration activities have begun, priorities shift to identifying alternate means of distributing water to meet the demand and to continuing restoration activities. The following objectives frame the establishment of alternative fuel supply strategies and ongoing restoration activities from E+72 hours to E+14 days:

- Conduct assessments of water quality for functioning distribution systems
- Identify interdependencies among water and wastewater systems, electrical power, fuel, and other lifelines that may impact restoration priorities

- Evaluate current potable water availability versus demand and request additional potable water if appropriate
- Continue to coordinate the sharing and dissemination of priority information on water and wastewater system restoration activities
- Coordinate the water distribution plan to support critical response activities
- Set up a system to receive and distribute water and sanitation supplies to impacted communities and response agencies
- Continue to develop situational awareness concerning the demand for water as well as water and wastewater system restoration activities
- Determine the need for Federal assistance in the acquisition of alternate water and sanitation supplies and request support if needed
- Locate and/or repair damaged water and wastewater pipes, pumping stations, wells, and aqueducts

G3-4.3 E+14 Days to E+60 Days

Most of the activities that occur from E+72 hours to E+14 days continue from E+14 days to E+60 days, but efforts in this time frame transition to normalizing water demand and distribution. The following objectives are in addition to the objectives that are ongoing from the previous phase. These objectives frame the transition to recovery of the water distribution system from E+14 days to E+60 days:

- Restore normal water distribution and wastewater services
- Continue to locate and repair water and wastewater pipes
- Continue to repair pumping stations, wells, and aqueducts
- Continue to evaluate the need for Federal assistance in the acquisition of alternate water and sanitation supplies; request support if necessary
- Demobilize any alternate water and sanitation distribution systems