

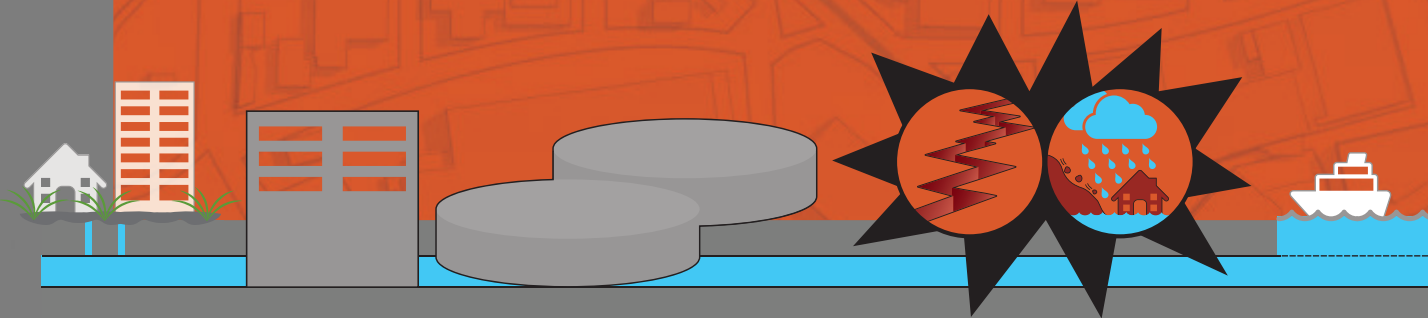
Recommendations to Enhance the Resiliency and Recovery of King County's Regional Wastewater Treatment Facilities

FINAL
**PREPAREDNESS
AND RECOVERY
RECOMMENDATIONS**



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2018



King County

Department of
Natural Resources and Parks
Wastewater Treatment Division



Task 500 Preparedness and Recovery Recommendations

April 2018

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King County

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Alternate Formats Available

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List of Acronyms

AFI	Allowance for Indeterminates
BWTP	Brightwater Treatment Plant
CADD	Computer Aided Design and Drafting
CCTV	Closed-Circuit Television
CEMP	Comprehensive Emergency Management Plan
COOP	Continuity of Operations Plan
CSO	Combined Sewer Overflow
County	King County
DIRECT	Division Incident Response and Emergency Coordination Team
DNRP	Department of Natural Resources and Parks
EM	Emergency Management
EMAC	Emergency Management Assistance Compact
EOC	Emergency Operations Centers
ERP	Emergency Response Plan
ESF	Emergency Support Functions
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HMGP	Hazard Mitigation Grant Program
HR	Human Resource
HUD	United States Department of Housing and Urban Development
ICS	Incident Command System
IT	Information Technology
JOC	Job Order Contracting
LOE	Level of Effort
MEP	Mechanical, Electrical, Piping
NIMS	National Incidence Management System
O&M	Operations and Maintenance
PA	Public Assistance
PRA	Public Records Act
RCW	Revised Code of Washington
ROI	Return on Investment
RTO	Recovery Timeline Objectives
SCADA	Supervisory Control and Data Acquisition
STP	South Treatment Plant
TBD	To be Decided
WPTP	West Point Treatment Plant
WTD	Wastewater Treatment Division

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Executive Summary

The King County Wastewater Treatment Division (WTD) proactively addresses risks associated with natural and man-made disasters through both preparedness and mitigation activities. These efforts align with the *King County Strategic Plan, 2010–2014: Working Together for One King County (Strategic Plan)*, which envisions “a diverse and dynamic community with a healthy economy and environment where all people and businesses have the opportunity to thrive.” This broad county-level vision compels each county agency and department to consider the long-term ramifications of a major catastrophe or natural disaster on the health and welfare of King County (County) citizens, visitors, employees, customers, and the communities they serve. Part of this consideration is developing a set of comprehensive strategies for implementation before a disaster that are designed to drive timely, efficient, and safe recovery of the wastewater treatment system following a major event. According to the *Strategic Plan*, “Long-term recovery planning provides an opportunity to shape the built, natural, and social environments that will enable our recovery, and to foster the swiftest return to prosperity and the quality of life we cherish.”

In 2013, the King County Executive launched the "Resilient King County" initiative, designed to craft a comprehensive long-term strategy for recovery following a major earthquake or flooding event. This system-wide *Preparedness and Recovery Recommendations* report directly supports the *Strategic Plan's* stated objectives and contributes to desired resiliency outcomes identified in the Resilient King County initiative. This document is to be used by WTD's leadership team and senior management to direct activities that will improve the division's ability to continue operations and recover from a large-scale seismic or flooding event as well as smaller events.

This document, *Preparedness and Recovery Recommendations*, suggests implementation of seven high-level preparedness strategies to improve WTD's ability to recover from a large-scale earthquake, landslide, flooding, or severe weather event. These high-level preparedness strategies are supported through a gap analysis, and they include additional information or guidance to support implementation activities.

Appendix B of this document provides detailed information and implementation suggestions regarding the establishment of an Emergency Recovery Working Group, which represents the primary mechanism to improve the reconstruction that occurs during the recovery phase of a disaster. The implementation of the high-level preparedness strategies and establishment of a functional Emergency Recovery Working Group to align with applicable WTD processes and policy would lead to improved resiliency, reduced recovery schedules, and improved fiscal management associated with an event.

Additional studies, projects, internal work group activities, and staff education would be required to fully implement these strategies. The strategies reach across the organization and require senior management support with respect to prioritization, scheduling, resource allocation, and performance measurements to ensure efficient implementation, appropriate return on investment, reduction of risks, and improved organizational resiliency.

In December 2016, WTD began a master planning effort to model and assess natural hazard risks of concern to WTD facilities and pipelines in its service area, with the goal of identifying, mitigating, and recovering from system-wide impacts. These hazards include significant seismic, liquefaction, landslide, flooding, and extreme weather events, and required a definition of WTD's critical facility components and service goals, considering four major criticality factors: life safety, public health, consequent damage, and the environment. This study used desktop assessments to determine the highest risk facilities (based on probability of failure and consequence of failure) to prepare initial risk ratings and identify sites for additional field screening. The desktop and field assessments yielded insights to probable damage from significant natural hazard events in WTD's service area, and the system-wide impacts that could be expected. The high-level hazard evaluation provides additional boundaries for recovery planning and expectations with respect to anticipated loss. Through a series of meetings and workshops, the HDR Engineering, Inc., team (HDR Team) and WTD staff collaborated to develop the strategies, concepts, and processes identified in this *Preparedness and Recovery Recommendations* report, in addition to the capital and programmatic concepts developed during a parallel effort discussed further in the Introduction.

This document builds on the insights and previous efforts of numerous WTD employees that have led the County's Operations, Emergency Management, Safety, and Resiliency effort to date. This group of professionals has developed a sound body of work and standard of practice for County residents with respect to safety, resiliency, and operational efficiencies. The HDR Team's effort included building from existing policy, plans, processes, and procedures to continue improving WTD's ability to recover from a major disaster in the future.

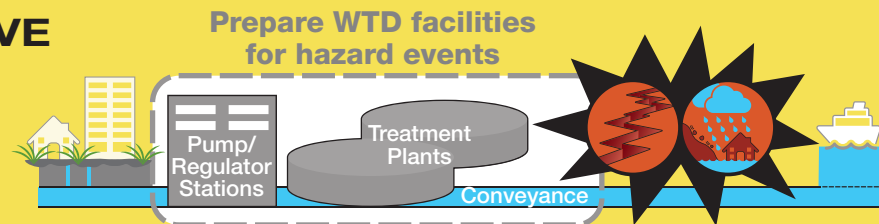
Implementation of these strategies may help to ensure WTD maintains a leadership position in best practices associated with preparedness for large-scale catastrophes by a public utility. In addition, should an event occur, the County and the communities served would directly benefit through improved recovery timelines and reduced long-term economic, community, and health impacts. This would lead to a more timely return of the County's ability to prosper economically, environmentally, and socially while managing economic and political risks following a large-scale catastrophe.

RESILIENCY & RECOVERY PROGRAM OVERVIEW

OBJECTIVE

Develop a comprehensive strategy for preparing King County's

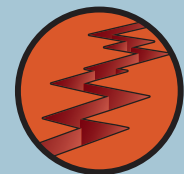
Wastewater Treatment Division's (WTD) conveyance and treatment facilities for the impacts of a major earthquake, flooding, landslides or extreme weather events.



The intent of this project is to:

- 1 Identify risks** in WTD's collection and treatment systems from natural hazard related damage.
- 2 Identify mitigation actions** that can be taken before and after an emergency event to reduce impacts on the system.
- 3 Develop remediation and resilience strategies** for the benefit of ratepayers, system partners, employees, and residents.

HAZARDS



Seismic/Liquifaction Scenarios

- Cascadia Subduction Zone (CSZ)**
 - Magnitude 9.0
 - Approximately 500-year recurrence interval
- Seattle Fault (SF)**
 - Magnitude 7.2
 - Approximately 5,000- to 6,000-year recurrence interval
- South Whidbey Island Fault (SWIF)**
 - Magnitude 7.4
 - Approximately 4,000- to 5,000-year recurrence interval



Natural Hazards

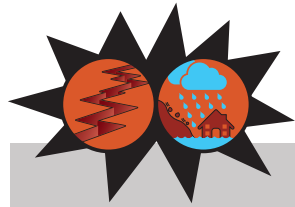
- Extreme Weather**
 - Windstorms, lightning, tornadoes/funnel clouds
 - Significant snowfall, ice, and/or freezing rain
- Flooding**
 - Riverine, Urban, and Mechanical Flooding
- Landslides**
- Tsunami (SF)**

EMERGENCY PREPAREDNESS

Recovery operations begin as soon as possible after a disaster. There is no clearly defined separation between response and recovery. In essence the recovery document is an extension of the emergency response plan. It explains how the organization will reinforce its initial responders, repair damage and work towards the restoration of services. Depending on the severity of the disaster and extent of the damage, recovery could take months or even years.



KING COUNTY WASTEWATER TREATMENT DIVISION (WTD) RESILIENCY & RECOVERY PROGRAM



RECOVERY APPROACH

King County WTD proactively addresses risks associated with natural and man-made disasters through both preparedness and mitigation activities.

Preparedness and Recovery Recommendations:

This document suggests a set of comprehensive strategies for implementation before a disaster, which are designed to drive timely, efficient, and safe recovery of the wastewater treatment system following a major event.

Strategies reach across the organization and require Division Leadership support with respect to prioritization, resource allocation, and performance measurements to ensure efficient implementation, appropriate return on investment, reduction of risks, and improved organizational coordination.

Actions performed will improve resiliency, reduce recovery schedules, and lead to improved fiscal management when dealing with an event.



Preparedness Strategies



• **WTD Continuity of Operations Plan** – Covers all critical operations and essential functions



• **Designated Emergency Management Program Coordinator** – Charged with a continued focus on development and implementation of a comprehensive EM program



• **Employee Training and Capacity Development** – Develops an enhanced multi-year EM-training program to build capacity and capabilities around response and recovery



• **Contracting & Procurement** – Establishes pre-positioned contracts for critical services, materials or supplies

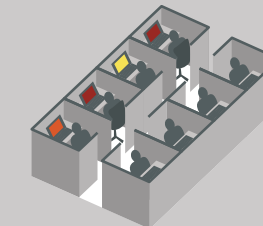


• **System-wide Information & Documentation** – Implements additional system monitoring at critical points, as-needed, in the system likely to sustain damage improving situational awareness



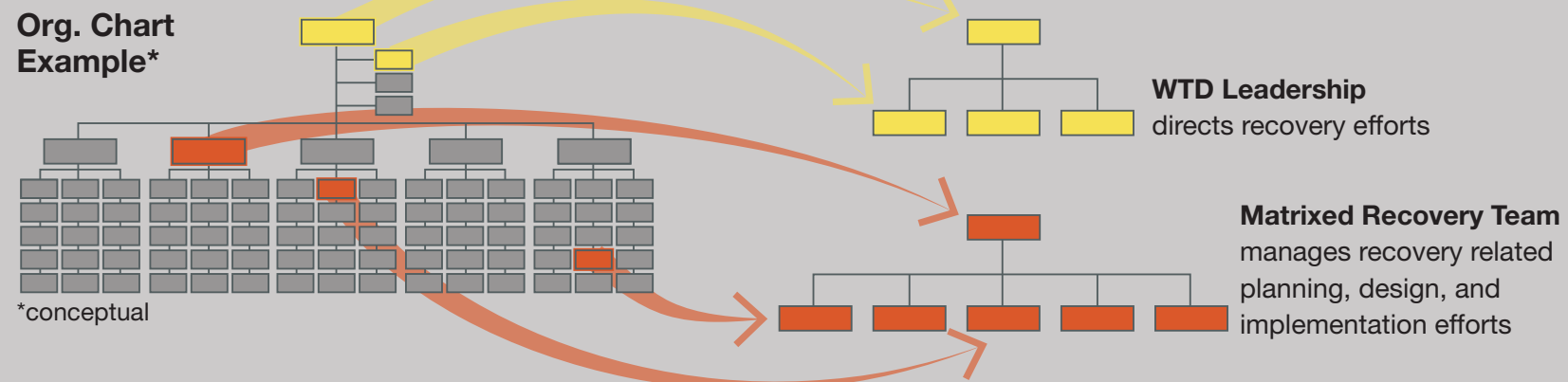
• **Financial Risk Management** – Conducts recurring exercises to identify WTD fiscal health risks and impacts from a large event

• **Emergency Recovery Working Group** – Provides efficient management of recovery activities and drives system-wide restoration



- Activated after a major event
- Uses existing staff matrixed to Recovery Team

WTD Org. Chart Example*



KING COUNTY WASTEWATER TREATMENT DIVISION (WTD) RESILIENCY & RECOVERY PROGRAM



1 Introduction

1.1 Background and Study Context

1.1.1 Existing King County Resiliency Policy and Initiatives

In 2010, the King County (County) Council adopted the *King County Strategic Plan, 2010–2014: Working Together for One King County (Strategic Plan)* that directs its departments and divisions to consider long-term impacts associated with a major natural disaster. In 2013, the County Executive launched the “Resilient King County” initiative to develop a plan to guide recovery following a major earthquake or disaster. During that same year, the King County Office of Emergency Management completed a capabilities assessment that identified the need for additional long-term recovery planning across the County departments. The *Department of Natural Resources and Parks (DNRP) Continuity of Operations Plan (2017 DNRP COOP)*, updating an earlier version, provides guidance with respect to response management. The *Preparedness and Recovery Recommendations* report (this document), directly supports the *Strategic Plan’s* stated objectives, addresses long-term planning gaps, and contributes to the desired resiliency outcomes identified in the Resilient King County initiative. This document also supports implementation of the recovery management approach and other related requirements outlined in the *2017 DNRP COOP*.

1.1.2 King County Resiliency Priorities and Limitations

The County relies on its Wastewater Treatment Division (WTD) to restore and maintain normal day-to-day wastewater treatment services to the public and businesses in the aftermath of a disaster. WTD restoration activities will likely be prioritized based on direction from the DNRP Recovery Manager, the WTD Director, and Division Leadership Team along with federal, state, and local agencies or groups involved in managing the recovery phase of an event. WTD will focus efforts that protect the health of County employees, visitors, residents, and key customers that depend on the delivery of WTD services. This includes restoration to enable customers to accomplish their essential functions and to protect public safety, the environment, and community health. Prioritization activities also include the prevention of continuing damage to related critical infrastructure following the event. WTD seeks to plan beyond the initial response and develop an approach to recovery of the system, leading to restoration of service and meeting continuity of operations priorities following a disaster.

WTD has service priorities that influence the development of recommendations made in this report. These priorities are as follows:

- Employee and individual life, health, and safety
- Public environmental health through minimizing direct exposure to untreated wastewater
- Protection of other critical public infrastructure that could be damaged by failure of WTD’s facilities
- Protection of the environment from the release of untreated wastewater
- Social and environmental justice associated with priority of repairs and flow shedding

It should be noted that WTD priorities may become subordinate to other County-wide life, health, and safety priorities when allocating resources. Ideally, the WTD Emergency Recovery Working Group operations occur once the immediate life and safety threats have been controlled and the response phase is well under way, enabling recovery to begin in parts of the impacted areas where the hazards are controlled.

1.1.3 WTD System and Facility Analysis

WTD proactively manages risks associated with natural disasters through the implementation of existing plans and assigned resources. Beginning in December 2016, WTD engaged in a comprehensive planning

effort to assess natural hazard risks to WTD facilities and pipelines in its service area. The work was conducted in conjunction with the development of this *Preparedness and Recovery Recommendations* report, and has contributed to its development. A schematic of the major components of the overall effort, including this *Preparedness and Recovery Recommendations* report (Task 500) is provided in Figure 1.



**Note: Task 100 is project management and Task 300 is a related, but separate digester inspection effort that will be completed after the West Point Treatment Plant (WPTP) digesters are accessible for inspection. The Task 300 Final Report will provide recommendations for improvements specific to the South Treatment Plant and WPTP digesters.*

Figure 1. Resiliency Project Work Plan and Sequence

The comprehensive planning study that resulted in the *Preparedness and Recovery Recommendations* and *Resiliency Recommendations* reports used desktop assessments to determine the highest risk facilities, based on vulnerability and consequence of failure, to prepare initial risk ratings, and to identify sites for additional field screening. The desktop and field assessments yielded insights to probable damage from significant seismic, liquefaction, landslide, flooding, and extreme weather events, and the system-wide impacts that could be expected. The high-level hazards evaluation provides additional boundaries for recovery planning and expectations with respect to anticipated loss. Through a series of meetings and workshops, the Consultant team and WTD staff collaborated to develop the strategies, concepts, and processes identified in this *Preparedness and Recovery Recommendations* report.

This report provides recommendations to improve WTD's ability to recover from service disruption associated with damage from the significant natural hazard events studied. These preparedness recommendations are intended to enhance existing capabilities and processes to enable responsive and effective recovery and reconstruction of WTD's capabilities, which are managed by an Emergency Recovery Working Group. The concept of the Working Group is detailed in Appendix B of this report. These recommendations for enhancements to the Emergency Recovery Working Group are aligned with the existing framework and associated documents outlined below. Future internal alignment activities would be led by WTD staff.

1.1.4 Existing King County Emergency Response and Continuity Plans

Currently, County emergency response, continuity of government, and continuity of operations procedures are outlined in the following plans:

King County Comprehensive Emergency Management Plan (December 2016):

- *Comprehensive Emergency Management Plan (CEMP)* guides and supports the response of King County government to emergency situations that impact regional services provided by the County. It impacts multiple King County cities, the general public, and/or neighboring counties. The *CEMP* delegates the responsibility for the County's preparedness and response to its departments and divisions.
- Impacts County departments and divisions.

WTD Emergency Response Plan:

- Directs activities in emergency situations, including how WTD operates under the National Incident Management System (NIMS) Incident Command System (ICS). Each WTD section is responsible for responding to and managing their areas of service. In larger scale emergencies, the *Emergency Response Plan (ERP)* specifies the activation of WTD's Incident Response & Emergency Coordination Team (DIRECT).
- Helps support essential plant operations and their response efforts. Nonoperational sections provide support, which is coordinated and allocated through DIRECT. The WTD Safety Office maintains the following ERPs:
 - *West Section ERP (January 2017)* – covers the treatment plant and its facilities and conveyance system
 - *East Section ERP (June 2010)* – covers the treatment plant and its facilities and conveyance system
 - *Brightwater Treatment Plant ERP (July 2013)* – a subplan of the *East Section ERP* that covers the specific procedures to be followed at the treatment plant and its facilities and conveyance system
 - *West Point Treatment Plant Emergency Access Response Plan (January 2017)*
 - *WTD Overflow Manual (October 2016)* – response plan for offsite facilities and the conveyance system

King County Continuity of Government/Continuity of Operations Plan (January 2017):

- Sets the parameters for continuity of government and delegates the responsibility for maintaining continuity of operations to the County's departments.

DNRP Continuity of Operations Plan (February 2017):

- Applies to the functions, operations, and resources necessary to ensure the continuation of DNRP's essential functions in the event normal operations are disrupted or threatened with disruption. The plan is broken down into four phases:
 - Phase I – Readiness and Preparedness
 - Phase II – Activation and Relocation
 - Phase III – Continuity of Operation
 - Phase IV – Recovery and Reconstitution – identifies and outlines a framework for recovering from an emergency or disaster situation with widespread damage while continuing operation and provision of services at intact facilities.

The previously listed plans work together to provide the policy and system response during a catastrophic event. Table 1 below demonstrates how the plans work together.

Table 1. King County Emergency Response and Continuity Plans

Plan	Preparedness	Response	Recovery
King County Comprehensive Emergency Management Plan	X	X	
Wastewater Treatment Division Emergency Response Plans		X	
King County Continuity of Government/Continuity of Operations Plan			X
DNRP Continuity of Operations Plan			X

1.2 King County Emergency Response and Continuity Plans

Together, the existing plans discussed in Section 1.1.4 focus mainly on the response aspect of the event, with some recovery and COOP considerations. The development of this system-wide *Preparedness and Recovery Recommendations* report is intended to drive efficient recovery following natural hazard events considered in this planning study, as described in the previous section.

The development effort for the report took into consideration input from key WTD staff and included reviewing select documents shared by WTD to support development of strategies and the recovery approach. This activity was not intended to be a full literature review, given the sheer volume of material available for consideration and the subsequent costs associated with such an effort. The work group reviewed the following documents during development of this report:

- *National Disaster Recovery Framework*
- *Resilient Washington State*
- *Resilient King County Initiative*
- *King County Continuity of Operation Plan*
- *West Point Treatment Plant – Emergency Access Response Plan*
- *Washington Restoration Framework*
- *West Section Emergency Response Plans – Section 1 Incident Response and Emergency*
- *King County Department of Natural Resources Continuity of Operations Plan*
- *West Point Treatment Plant Independent Assessment*
- *Seattle Disaster Readiness and Response Plan*

1.2.1 WTD Facilities and System

This preparedness document serves as a high-level guide outlining key preparedness recommendations to enable the primary recovery strategy. The *Preparedness and Recovery Report* covers WTD employees and infrastructure associated with the County's wastewater treatment system, including the following:

- Three large regional wastewater treatment plants (West Point Treatment Plant [WPTP] in the City of Seattle, South Treatment Plant [STP] in the City of Renton, and Brightwater Treatment Plant [BWTP] in the City of Woodinville)
- Two small wastewater treatment plants (one on Vashon Island and one in the City of Carnation)
- One community septic system (Beulah Park and Cove on Vashon Island)
- Four combined sewer overflow (CSO) treatment facilities (Alki, Carkeek, Mercer/Elliott West, and Henderson/Norfolk—all in the City of Seattle)
- Over 391 miles of sewer pipelines

-
- Twenty-five regulator stations
 - Forty-seven pump stations
 - Thirty-nine combined sewer overflow outfalls

1.3 Limitations and Report Use

In the event of an emergency, please refer to the applicable document(s) associated with the impacted operation and site. This is a recommendation report and not an operational document designed to guide emergency response, continuity of operations or recovery actions during an event. This document may be used by the King County WTD Director to direct activities to improve WTD's ability to recover from a large-scale seismic event. The strategies developed are based on the available information provided by the County, input from WTD staff, and current standards of practice in force at the time of the report's publication.

Portions of this report may be exempt from public disclosure under the Washington State Public Records Act (PRA), Chapter 42.56 Revised Code of Washington (RCW). King County's Department of Executive Services will distribute copies of the *2017 DNRP COOP* and customized versions for WTD and other divisions (if produced) on a need-to-know basis. Portions of this *Preparedness and Recovery Recommendations* report may be distributed to other organizations as necessary to promote information sharing and facilitate a coordinated interagency continuity effort.

Organizations in receipt of this report that find it potentially responsive to a public records request under the PRA (or similar law) are requested to notify the WTD Public Disclosure Officer, as an agency affected by the request, and allow WTD adequate time to determine whether any of the information requested is exempt from disclosure, and evaluate whether to seek court protection of public records under RCW 42.56.540 (or other applicable law) prior to release of the record.

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2 Preparedness Strategies, Gap Analysis, and Recommendations that Impact Recovery

The recommended preparedness strategies suggested in this section are intended to augment existing plans and procedures. Some existing policies, documents, and plans will require updating and alignment to effectively implement these new or revised strategies. Specifically, strategies have been developed to improve situational awareness and expedite movement from the response phase to the recovery phase. These strategies and suggestions are outcomes from meetings conducted through the course of the project, analysis of performance of past incidence, and review of various County documents.

The Consultant team recognizes that in July 2017, AECOM conducted an important independent assessment of the WPTP flooding incident. The assessment was reviewed as part of this *Preparedness and Recovery Recommendations* report gap analysis and to affirm that recommendations align with AECOM findings. The assessment's findings and recommendations are specific to WPTP; however, many may apply to the WTD system as a whole and be relevant to preparedness and recovery strategies at the County's other treatment plants. As the County moves forward with WPTP resiliency improvements as a result of the AECOM findings, it is recommended that the findings and recommendations also be considered during implementation of this *Preparedness and Recovery Recommendations* document.

2.1 WTD Continuity of Operations Plan

2.1.1 Introduction and Gap Analysis

As stated in the *2013 King County Continuity of Operations (2013 King County COOP) Plan*, "This is one of the most important documents for managing events after an emergency in King County." The County's departmental and divisional ability to maintain and resume essential functions directly impacts its ability to conduct emergency operations and begin recovery from all levels of interruptions. COOP planning is entity-specific in that the process includes identifying vulnerabilities and risk, specific essential functions, recovery time objectives of those functions, and the personnel and resources needed for resumption. In addition, COOP planning considers key vendor requirements and identifies internal interdependencies, key personnel, human resources, and internal/external communications strategies.

The *2013 King County COOP* identifies departmental roles, responsibilities, and expectations. In similar fashion, the *2017 DNRP COOP* identifies specific roles, responsibilities, and expectations of the divisions within DNRP. The COOP document hierarchy is presented in Figure 2. Currently, WTD does not have a standalone division-level COOP Plan. As of development of this *Preparedness and Recovery Recommendations* report, it is yet to be determined if WTD meets the requirements outlined in the *2017 DNRP COOP*. The *King County and DNRP COOP* plans adopt the same methodology, are aligned and integrated, and are in keeping with industry guidelines, standards, and practices.

King County WTD would be well served to develop a divisional COOP plan aligned and in accordance with the *2017 DNRP COOP*. This could be accomplished through the division's commitment of personnel and resources to achieve compliance with the expectations identified in the *2017 DNRP COOP*. Specific

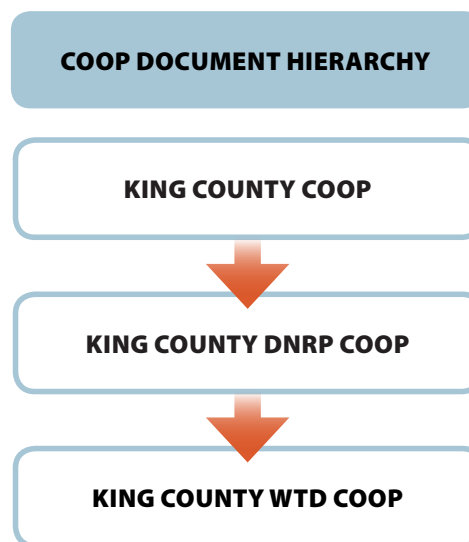


Figure 2. COOP Document Hierarchy

WTD activities and documentation required for compliance are identified in a *DNRP COOP* WTD checklist found in Appendix A.

2.1.2 Recommendations

- It is suggested that WTD develops and implements a COOP plan that covers all critical operations and essential functions, as follows:
 - Create a COOP Development Work Group
 - Use the *2017 DNRP COOP* checklist (see Appendix A)
 - Confirm essential functions and recovery time objectives
 - Engage WTD senior management as needed
 - Engage functional groups (accounting, finance, information technology (IT), etc.)
- King County WTD Strategy Steward/Leader: WTD Safety Office
- Key Milestones:
 - Form work group and identify essential functions
 - Develop WTD COOP
 - Implement WTD COOP and annexes
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.1.3 Insights and Considerations

Development of a COOP for WTD would be a complex task; WTD should consider forming a COOP Development Work Group. This group would be comprised of representatives from WTD to enable meeting the intent of the *2017 DNRP COOP* requirements. A suggested model of governance would be leadership by a development leader with support from each key area in the department. It is suggested that initially the work group walk through the *2017 DNRP COOP* using its checklist (Appendix A of this report) to understand possible gaps and develop WTD-wide solutions as well as plan structure. This group would need to engage senior management to consider the actions and/or support required to meet the expectation of the *2017 DNRP COOP* while working within their various resource constraints.

The COOP development leader and members of the work group would then engage with each of WTD's functional groups (project management, operations and maintenance, construction management, safety, accounting, finance, IT, etc.) to help them identify their unique essential functions and recovery time objectives (RTOs). Depending on each functional group's complexity, staff capabilities, and the overall WTD COOP plan document structure, each group would consider a specific annex they could attach to a broader WTD-wide COOP plan. These annexes, which exist in the form of an attachment, would be used in times of disruption to ease overall administrative management of the document.

WTD would prioritize and schedule the development of annexes over the next several years to manage workload and drive systematic progress. This effort would involve substantial time for the development leader and work group, including several planning sessions with each group to identify and confirm essential functions and RTOs. After this, meetings would follow to help each group develop and implement solutions to enable them to maintain or quickly restore essential functions within their set RTO. The information, including assigned responsibilities, would be contained in each group's annex.

2.2 Designated Emergency Management Program Coordinator

2.2.1 Introduction and Gap Analysis

WTD is a large, complex organization when it comes to preparing for and managing emergencies. Emergency events vary in size and complexity as well as frequency. WTD chooses a decentralized approach rather than a designated full-time emergency management (EM) program coordinator to develop and implement plans across the WTD organization as well as coordinate with broader County-level EM planning activities and/or initiatives. Key EM functions are assigned to a variety of staff and across the geographic area WTD serves. Safety, operations, and senior leadership all play roles in developing and implementing the program, as outlined in various documents discussed in Section 1. While this leads to a larger group of staff trained in emergency response and preparedness, this may also lead to differing priorities and inconsistent implementation of program policy and requirements.

Operational, engineering, and construction management staff can be constrained by meeting daily demands as well as various challenges that present themselves, resulting in less time and resources to update documents and drive training activities.

Collectively these constraints may manifest as resource gaps around development or updating of plans, limited training and exercises, and overall limitations in readiness, creating potential risks if an event does occur. This is not a failure of any organization nor any specific individual, but a reflection of the need to resource and prioritize EM-focused tasks.

2.2.2 Recommendation

WTD should consider training or hiring an experienced, in-house staff for EM program coordination and support further staff development in implementation of a more comprehensive EM program. This would cover all aspects of emergency management, including preparedness, response, recovery, mitigation planning, and training and exercise. Additional support staff may be needed to assist with data collection, document development, field audits, policy development, event tracking, and employee training.

2.2.3 Insights and Considerations

For this EM program coordinator position to be successful, the role should be properly authorized within the organization to manage a program. This includes the ability to influence policy and processes associated with preparedness, response, recovery, and mitigation planning or activities.

This position would address the following expected outcomes:

- Aligning the various plans and processes
- Coordinating the COOP, ERP, and safety plans as interconnected documents and processes to improve efficiencies and avoid conflicts or confusion
- Training in effective emergency operations and communications with staff, the public, leaders, and other organizations
- Proactively working with operations and administrative leadership to revise, update, and change current policy, programs, and processes

Essential skills would include a deep knowledge of EM best practices and the ability to draw upon relevant experience to shape an effective program for WTD, working within given resources and existing culture.

Additional recommendations and potential pitfalls for WTD's consideration:

- Care should be given to ensure operations and leadership prioritize the assignment of resources.
- Decisions on tactical emergency response activities will fall to the leadership of the specific activity/function per WTD protocol.
- The concept of finding one person to fill all aspects of the EM program with all the personal attributes and technical skills can be difficult at best. Emphasis on planning and program development might be the focus at this stage of the program.
- WTD should consider leveraging the attributes and skills of several designated operational and/or engineering leaders, supported by appropriate training and exercises, to be prepared to fill the incident commander role. Note that under ICS, rank, grade, and seniority are not the factors used to select the incident commander. The incident commander is always a highly qualified individual trained and willing to lead the incident response.

2.3 Employee Training and Capacity Development

2.3.1 Introduction and Gap Analysis

Based on various meetings with WTD staff, there appears to be consensus regarding room to improve training across the organization with respect to EM and disaster preparedness. The challenge is the shortage of staff at some sites or in key functions limiting the opportunity for supervisors or management to remove staff from their day-to-day functions.

During a significant event, everyone has a role to play, as described below.

On-the-ground staff:

The ability of staff to implement processes and protocols in a safe and timely manner is essential to successfully stabilize sites during the response phase. The ability to conduct effective damage assessments along with implementing a COOP plan will directly impact recovery activities, including the schedule. The activation of emergency shut-offs, site emergency repairs, appropriate flow shedding, emergency power, and related procedures to maintain operations, prevent continuing damage, and protect the public and environment is essential for moving from the response phase to the recovery phase, where long-term repairs occur.

Support staff:

Other staff have supporting roles and expectations that are not directly charged with operating treatment or conveyance sites, but do require specialized training. These staff enable recovery to occur through the variety of essential functions they provide to WTD. For example, engineering staff involved in preliminary damage assessment need specialized training such as the Applied Technology Council's *Field Manual: Postearthquake Safety Evaluation of Buildings* (ATC 20-1). Asset Management, Operations and Maintenance, Conveyance Inspection and Flow Monitoring, and geographic information system (GIS) staff would all benefit from training that supports improved situational awareness, knowledge of documentation requirements, and training related to monitoring and reporting of suspected post-event issues. Other staff training should include those employees associated with compliance of federal grant management requirements such as design, contracting, and accounting, or administrative staff involved in emergency repair design, emergency procurement, and cost recovery efforts. All staff would directly benefit from training associated with grant or claims management.

Training and practice keeps staff on-task during an event. Regular training and practice exercises are key to building and sustaining the required skills that are crucial to reacting during and after an emergency.

Best practices for preparedness training include the following:

- Full commitment and support of executive and leadership teams

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- Execution prior to the events
 - Application of adult learning theory
 - Refresher training
 - An annual exercise to maintain not only minimum capabilities, but ensure capacity in the event of loss of staff, reassignments, and promotions
 - Content aligned with current process and made site specific and appropriate to each position

2.3.2 Recommendation

- Consider implementing a comprehensive multiyear, EM-focused training program to build staff-wide capacity and capabilities required to implement applicable plans and procedures.
- Consider forming a crosscutting committee to assess training needs for each group, site, and position based on assignments and plan requirements.
- Consider developing a training plan to meet identified needs and a training schedule that may be implemented over the next five years.
- King County Strategy Steward/Leadership: Jointly led by Operations and Safety
- Key Milestones:
 - Form workgroup and develop approach
 - Conduct needs assessment
 - Develop or procure materials or services
 - Deliver training
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.3.3 Insights and Considerations

An initial committee representing all aspects of WTD may be required to assess training needs and requirements. This would be a large and likely ongoing effort that could delay advancement if not segmented, prioritized, and actively managed. Consideration might be given to prioritize essential WTD staff based on job assignment, essential function, and their criticality to both response and recovery activities. Alternatively, each internal group might be required to simply perform a self-assessment using guidance from management as well as the COOP Plan data and ERP roles as baselines, then report back these internal group self-assessment findings within a given time period. This information would then need to be analyzed and organized into a training program. **Regardless of the method, decision makers would require access to various plans and job descriptions to identify skills and understand which employees need particular training based on assigned responsibilities.**

A working group of supervisors and others should be assembled to address the process of delivering training within the current constraints they face in meeting daily operational demands. Consideration should be given to other training delivery methods beyond a classroom approach for training, such as multimedia online training courses, webinars, computer based training, peer-to-peer training, and on-site training delivery. Record keeping and tracking is essential to measure overall compliance and assess organizational readiness.

WTD should also develop a “quick guide” for employees to reference during an emergency. This would be incorporated into staff training as a tool for future reference and ideally minimize confusion that is anticipated with a crisis environment. The quick guide would be designed to answer the big questions regarding “what am I supposed to do” and “how do I get more information.” The quick guide would align with other documents, training materials, key processes, and associated WTD policies to serve as a

valuable resource in times of need. This quick guide could be in the form of a PowerPoint presentation that is also used for a refresher training.

2.4 Contracting and Procurement

2.4.1 Introduction and Gap Analysis

Effective contracting and procurements are essential functions throughout the response and recovery phase of most events. County code and policies guide WTD contracting procedures during emergency events. WTD has an advanced procurement capability and capacity, providing value to response and recovery activities.

Building flexibility into existing contract types such as work orders, job order contracting (JOC) construction contracts, and materials procurement contracts would enable procurement of parts for temporary repairs of the conveyance pipes or structures critical to stop flow shedding and minimize environmental impacts until the permanent reconstruction can be completed.

Best practices across the industry and recommendations from federal granting agencies such as the Federal Emergency Management Agency (FEMA) or the United States Department of Housing and Urban Development (HUD) encourage awarding, prior to an event, competitively bid contracts that can support response and recovery activities.

For professional services, this may be as simple as incorporating an element in the scope of work that includes support during an emergency. Construction contracts pose significantly more complex challenges and risks, but inclusion of appropriate support scope in work order and JOC contracts is one approach that can be taken. Equipment and material supply contracts appear to be easier, with terms set for unit prices plus some consideration for freight charges and delivery, which could be highly variable depending on the event. The objective is to ensure WTD has timely access to the resources required at a fair price.

County Procurement supported by WTD could benefit from the development of an emergency contracting process, capability, and capacity to quickly award contracts following an event to obtain needed services and resources. To expedite the award process, the County could develop FEMA-compatible templates containing various draft statements of work to meet anticipated needs but lacking site or project specifics. These templates could be quickly modified or finalized by appropriate staff to reduce contracting timelines. This approach implies that knowledgeable staff required to technically modify the statement of work and contract are available and reachable in a timely manner. This includes not only executions of the contracting process, but participation in selection, award, and kick-off activities. In 2017, hurricane events in Puerto Rico, Florida, and Texas clearly illustrated the difficulties and risks in contracting under emergency conditions, especially where communications are challenging.

WTD has a County process to request an emergency declaration for procurement. These contracts typically authorize limited activities associated with emergency and protective measures required to protect public safety, community health, the environment, and WTD property under strict duration and condition restrictions. Implementation of emergency declarations and waivers can expedite contracts and procurement after events. For compliance with grant guidelines, it may be necessary though to procure new contracts for continuing services beyond the emergency protective measure stage.

FEMA has consistently denied reimbursement for projects where procurement methods and practices did not comply with FEMA guidance.

FEMA and HUD grant management are complex and evolving through precedence set on recent disasters and policy interpretations on past claims. It is not reasonable for WTD staff to stay current on new FEMA or HUD grant program requirements or expected practices without ongoing training. This creates a critical knowledge gap that should be filled prior to a disaster.

Gap Analysis

At this time, WTD likely lacks sufficient contracting mechanisms to access required services, materials or supplies to adequately support COOP implementation and timely response and recovery activities. An important consideration is that having contracts in place enables WTD to seek reimbursement from federal grant programs during federally declared disasters if compliant with Federal Terms.

2.4.2 Recommendation

- Consider establishing pre-positioned contracts wherever possible for critical services, equipment, materials or supplies required to drive efficient response and recovery. These contracts may be re-competed on a 1 to 3 year cycle.
- Consider developing a template scope of work and procurements packages for services, materials or supplies that cannot be effectively procured and managed through a pre-positioned contract.
- Consider creating a system to gain access to staff or professional services with appropriate training and recent experience in FEMA and HUD grant management to support compliance and reimbursement.
- Consider partnering with other agencies or cities that may not be affected by a large-scale King County disaster. This mutually beneficial partnership would include enabling County access to the partnering agency's FEMA compliance contracts under emergency situations via a cooperative purchasing agreements.
- King County Strategy Steward/Leadership: Operations/Project Management, and Project Control and King County Procurement. This work would likely include involvement of the County's Finance and Business Operations Division.
- Key Milestones:
 - Form work group and develop approach
 - Identify, develop, and award contracts
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.4.3 Insights and Considerations

King County Procurement and WTD should review existing contracting processes and County Code to assess the ability to better meet emergency needs and comply with FEMA and HUD contracting requirements. WTD should also focus on identifying additional contracting requirements through the implementation of a work group that analyzes procurement needs and gaps and recommends solutions that fill those needs and gaps and aligns with processes. Significant gaps that occur between the contracting process and field expectations typically result in negative recovery impacts that should be minimized or avoided. The COOP planning process, recommended above, should identify essential functions that require procurement support. It is recommended that the work group have appropriate representatives from operations, engineering, and project management to assess needs and the likely effectiveness of any proposed solutions. The use of a tabletop exercise is recommended to assess needs from a capability and capacity standpoint as well as look at recent lessons learned from hurricanes Matthew, Irene, Harvey, and Maria in 2016 and 2017.

It is recommended that WTD use the following suggested list of contract categories to consider during the evaluation:

- Professional Services – Engineering, science, and staff augmentation to meet design, resident engineering, environmental compliance, and construction management service needs. Other needs could be administrative, IT, grant management, site security, and other office professionals working in various parts of WTD.

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- Construction – General contracts that can repair the various types of facilities, including architectural, civil, structural, electrical, plumbing, and mechanical repair capabilities. Ability to remove debris, repair roads, restore power, and rebuild the various facilities that WTD operates. Specialty contractors may be required to address waste disposal, hazardous materials, and abatement/remediation services.
 - Logistics – Transportation, housing, temporary office space, food, water, fuel, emergency generators, fencing, access control, temporary pumps, and so on.
 - Supplies and Materials – Specialty process equipment, electro-mechanical equipment, piping, replacement pumps, and so on.

WTD should look to the County and other utilities for processes and example contracts to support this effort. This would result in some efficiencies and reduced workload associated with development of each procurement. It is also recognized that during a federally-declared disaster some resources will become available through the Emergency Management Assistance Compact (EMAC) mutual aid agreements, cooperative purchasing agreements and various agencies assigned with the execution of specific Emergency Support Functions (ESF) as designed via NIMS. During large-scale disasters, a WTD representative would be involved in working with King County Emergency Management staff, enabling the request and/or coordination of additional resources.

2.5 System-Wide Information, Communication and Documentation

2.5.1 Introduction and Gap Analysis

Timely access to system-wide information representing the state of facilities during and following disaster is critical to support decision-making and response planning. The County uses a supervisory control and data acquisition (SCADA) system and an OSIsoft PI enterprise infrastructure for management of real-time data and events. These systems use electronic data collected and transmitted by sensors measuring conditions such as levels, flows, pump status, and pressure. Portions of the current communication system are based on older technology and are limited in their redundancy. Not all WTD facility operations are dependent upon immediate understanding of field conditions; however, with older technology, dissemination of remote site parameters from critical pump stations and CSO facilities to end users can cause limitations in situational awareness and time-critical decision making.

Underground conveyance structures and pumping equipment are nearly impossible to inspect or observe in a timely or safe manner during or immediately following an event. Access to sites may also be restricted to certain areas because of damage to roads or bridges following an emergency event. Flooding may cause road closures and access restrictions as well. Parameters such as flow data are essential in setting damage assessment observation priorities in areas impacted by the event.

The ability to collect and maintain data that document damage associated with an event is critical to substantiate reimbursement claims. Asset management data that describe probable site conditions prior to the event are critical and typically involve validation that appropriate maintenance activities have occurred. This includes condition inspections, repair orders, maintenance logs, and other data. This asset management information may be compared to the damage assessment report to justify reimbursement.

Gap Analysis

WTD lacks sufficient staff to quickly visually observe the overall system to identify damage or impacts after a large-scale event. WTD's staff have indicated that the communication system is built on older technology, has redundancy issues, has server data and communication bandwidth limitations, and could more efficiently disseminate information to the required individuals. Improving the technology used to connect critical remote sites such as certain pump stations and CSO facilities into the overall system while improving current redundancy issues would allow the overall system to be used for visual observation to identify damage and/or impacts.

2.5.2 Recommendation

The challenge with making significant changes to the effectiveness of communications and documentation systems is the cost of new technology and its installation. WTD has been monitoring technological advances, but at this time has concluded that the value provided by a system-wide revision is not apparent given the low return on investment and the likelihood that communication lines would even be operable immediately following a major event, considering power and telecommunication outage probabilities. For this reason, it is recommended that WTD continue to monitor technological advances in communication, SCADA, and documentation systems to identify opportunities to improve the system in use based on return on investment and likelihood of operability of supporting resources. Potential actions upon finding the suitable return on investment (ROI) point include the following:

- Continue consideration of a communication system with redundancy for additional system monitoring to improve situational awareness and provide additional sensors in the conveyance system at critical points likely to sustain damage in a major event. Refer to earlier WTD studies of communication alternatives and update with new findings to identify two independent communication technologies for replacing the existing system, which currently involves all remote sites to the wastewater treatment plants.
- Recognizing that various groups at WTD are currently in the process of responding to recommendations from the July 2017 AECOM independent assessment of the WPTP flooding incident, it is recommended that a more coordinated effort be conducted for the consideration of a monitoring system that includes installation of sensors to measure flow and other critical parameters indicating system impacts and expected performance. Communication system improvements could be aligned with these sensors to enable the transmission of data to a control center or other unit to allow timely data collection and processing. These sensors could be near real time (i.e., information transmitted may be delayed a few seconds to a few minutes depending on settings and other factors) and protect WTD employees from having to enter unsafe structures or areas too risky to visually observe. During normal daily operations, these sensors and an improved communication system would result in savings associated with operational and system administration activities and improve overall performance. The ability to detect high or abnormal flow may improve the ability to mitigate damage associated with flooding or related events (e.g., the earlier detection of significantly increasing flows would enable plant operators to facilitate overflow or bypass procedures before negative impacts occur inside the plant). These new sensors would need to be integrated into the overall system operations, including prioritization of alarms.
- Consider providing a mechanism through software to better disseminate data to designated users remote to the wastewater treatment plants. Collect and maintain facility condition assessment information and maintenance data to reasonably prove damage caused by the event to support claims and reimbursement management. This includes design and as-built drawings, GIS inventory files, condition assessment data, and maintenance records for existing facilities that are organized and readily accessible. Additional resources may be required to conduct assessments and consistently update the documents detailing the current state. For example, this applies to facilities manuals, as-builts, on-line diagrams, and so on. This strategy's implementation should recognize existing activities currently underway by WTD Asset Management regarding advancement of the current document management system and efforts to create synergy across all of these information sources and systems (GIS with MainSaver and closed-circuit television [CCTV], etc.).
- When researching communication system improvements, consider the ability to integrate WTD systems with earthquake early-warning systems under development such as the United States Geologic Survey (USGS) *ShakeAlert: An Earthquake Early Warning System for the West Coast of the United States*, and their partners.

While continuing to monitor communications, SCADA, and documentation technology for an opportunity to maximize ROI, it is suggested that the County develop specifications for opportunistic improvements in the system related to repair and replacement activities. These specifications would allow the County the option to perform upgrades among facilities using compatible products, resulting in consistent training of maintenance staff and efficient sourcing and warehousing of replacement components.

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- King County Strategy Steward/Leader: (Name to be decided [TBD] by WTD), Operations, GIS, Engineering, Asset Management, Modeling, Conveyance Inspection, and Flow Monitoring
 - Key Milestones:
 - Form work group and develop approach
 - Acquire and install equipment
 - Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.5.3 Insights and Considerations

The formation of a work group to design an improved monitoring system should include staff from Operations, GIS, Engineering, IT, Conveyance Inspection and Flow Monitoring, and Asset Management. This project should align with the WTD Asset Management group's planned activities and ideally be integrated into their overall system to drive efficiencies and consistency of information. Additionally, this data should feed respective operational controls staff and leadership for monitoring.

It is recognized that sensing and communication technology is constantly evolving. It is not expected nor likely necessary to install sensors everywhere, all at once, to achieve the intent. Consideration should be given to program the installation of sensors over a longer period of time. This approach should focus on leveraging both capital and operations and maintenance (O&M) project funds to systematically improve WTD's ability to collect data. Sections of conveyance piping and specific facilities that have been determined to incur a high likelihood of damage because of a seismic or flood incident should be prioritized for monitoring. This determination of likelihood of damage is a product of modeling specific events combined with anticipating a facility's or conveyance pipe section's response to the forces to which it is subjected. This risk assessment would result in prioritization of sensor placement, which could then be scheduled based on budget and the planning of construction or repair activities. Consideration regarding the ability to visually observe conveyance piping or key underground structures should play into the prioritization decision.

During an event, the data generated from the sensors along with other SCADA information should be collected and analyzed in a timely manner. The analysis should be provided to Operations and the incident commander for action, and should include prioritization of damage assessment assignments and repairs.

Damage Assessment teams should leverage this information during site visits to support their observations and activities. In addition, these sensors would likely provide additional information following reconstruction regarding system performance and the adequacy of the repairs.

In the recovery phase, this information would become valuable to the Emergency Recovery Working Group in monitoring the progress of construction projects and their impacts on the overall system's performance. Indications of other previously undetected repair needs or issues could also surface through tracking and analysis of this data. It is recognized that some types of failure modes take extended periods of time to manifest or might be masked until upstream flows are corrected. Remote sensing and data analysis would likely aid in detection of continuing failures and/or areas that failures occurred, but were simply not observable prior to receiving flow.

2.6 Financial Risk Management

2.6.1 Introduction and Gap Analysis

The cash flow associated with a large federally-declared disaster event is immense, and may require several hundred million to over a billion dollars to get through the recovery process. Federal grants take time and require WTD to first spend funds to receive reimbursement, placing stress on cash reserves. Generally, costs must be incurred, or at least obligated, prior to eligibility under FEMA guidelines. It takes a substantial amount of time for county, state, and federal agencies to validate and process FEMA project

worksheets, further delaying reimbursement. A simple error can cause months of delay to resolve. During large events, FEMA simply does not have the resources to quickly process requests, as evident in the delays associated with recent hurricanes and flooding.

Gap Analysis

WTD may not have appropriate fiscal mitigation strategies and tools in place to address risks associated with a large-scale disaster.

2.6.2 Recommendations

- Consider conducting a financial tabletop discussion-based exercise to identify risks and evaluate impacts from a large event on WTD fiscal health. WTD should consider developing and implementing strategies to manage and/or mitigate risks. This would include ensuring that cash flow demands could be met and operations, restoration, and construction could be funded throughout the response, recovery, and reconstruction timeline.
- King County Strategy Steward/Leader: Project Management, Finance, Project Control
- Key Milestones:
 - Develop work group and conduct workshops
 - Implement workshop recommendations
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.6.3 Insights and Considerations

Reimbursement payments, whether associated with an insurance claim or a federal grant program, are directly related to the ability to provide the appropriate documentation and evidence to justify the release of funds. This includes documentation of eligibility and compliance with policy and/or grant program requirements. Leveraging industry expertise to support claims management and reimbursement is prudent when dealing with large and/or complex situations.

It is suggested that a work group be formed to analyze the potential cash obligations associated with an event and to understand reimbursement timelines. A model event may help this analysis, combined with reviewing historical claims (if available) to gain insights. Inclusion of outside experts to support the session may be required to identify and analyze various financial instruments, risk management strategies, and policies that WTD may consider through this process. Clear processes and policy should be in place to guide activities in a manner that enables federal reimbursement.

2.7 Emergency Recovery Working Group

2.7.1 Introduction and Gap Analysis

Management of recovery operations following a large event offers significant challenges to any agency or utility. Often, recovery and reconstruction activities may take years to complete with reimbursement, extending this timeline, depending on the complexities associated with the projects. Even small events can tie up critical staff for extended periods of time as they manage design, repairs, and/or construction aspects of the project. Efficient management of reconstruction activities is critical to returning the system to normal operations, restoring full services, and controlling recovery costs. The ability to comply with complex grant management guidelines and maintain appropriate documentation is essential through project close-out.

The normal demands associated with operating a large, complex wastewater treatment system are never-ending. Staff have full-time positions prior to the event and those same demands will return quickly after the event subsides and customers return to the service area. To that end, staff working under a focused

structure designed to drive restoration projects is a key success factor in meeting anticipated demands. The *2017 DNRP COOP*, Phase IV, pages 26 to 27, provides limited guidance on establishing a structure to address response and recovery activities. The document provides a list of responsibilities, some of which are recovery in nature. Additional planning and focused training regarding assigned recovery responsibilities would enable designated staff to meet the identified recovery responsibilities outlined in the document.

The activation of an Emergency Recovery Working Group represents a strategy WTD might implement to improve recovery following a large-scale event. This Working Group would form the structure that could also be used to manage smaller events at the discretion of the Division Director. Activation of the Emergency Recovery Working Group on smaller, but more frequent events would help build and maintain key reconstruction core skill sets and processes as well as provide a scalable operational structure.

Gap Analysis

WTD does not use a centralized approach to managing a large reconstruction effort following a large-scale disaster.

2.7.2 Recommendation

It is recommended that WTD establish an Emergency Recovery Working Group strategy to manage large event recovery activities and drive system-wide restoration.

- King County Strategy Steward/Leader: (Name TBD Recovery Program Manager by WTD), Operations, Project Management, WTD Management, Directors Office
- Key Milestones:
 - Form implementation team and develop management plan
 - Appoint staff to the Emergency Recovery Working Group
 - Conduct training and exercises
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

2.7.3 Insights and Considerations

The concept of operations for an Emergency Recovery Working Group is further detailed in Appendix B of this *Preparedness and Recovery Recommendations* report. Significant effort would be required to align the Emergency Recovery Working Group concept with existing processes outlined in various documents, including the ERPs, COOP, and related operational plans. This would require an implementation team to develop a management plan to support the organization, activation, authorization, and scaling of this improved capability. Ideally, a seasoned WTD leader would be charged with managing the implementation team in development of a management plan and its implementation.

The work group and implementation team would address the guidance provided in the *2017 DNRP COOP*, pages 26 to 27. At a minimum, it is recommended that the implementation team focus on developing an Emergency Recovery Working Group that accomplishes the recovery-related responsibilities called out in the *2017 DNRP COOP*. Ideally, the responsibilities associated with Phases I through III of the plan would be addressed through other mechanisms, documents, and processes.

3 Recovery Strategy Implementation Planning

3.1 Implementation Approach

It is recommended that WTD assign resources to the implementation of the seven strategy suggestions in this *Preparedness and Recovery Recommendations* report. A project manager or other lead role could be assigned to organize strategy implementation teams, drive action, track progress, coordinate activities, resolve conflicts, and update this *Preparedness and Recovery Recommendations* report as external/internal conditions evolve or change.

The subject matter expert would work with the organization to form strategy implementation teams to further define and craft each strategy. A primary leader for each team would be assigned to drive meetings and team actions. It is suggested that each team align the proposed strategy with existing plans, processes, and procedures and resolve impediments to ease implementation. Teams would work with both internal and external resources to develop additional information to facilitate implementation. Each team would not only be charged with design, but also with leading implementation of the strategy and any associated plans, training or activities. Team leads would report to the project manager regarding progress, resources needs, and challenges that require executive leadership support to resolve. The project manager would work with each team to address staffing needs and obtain required resources or management decisions to promote an efficient work environment.

3.2 Recommendation Priority Ranking

The recommendations identified above have been ranked based on the professional opinions of the consultant and County operations and management team members to give an example of a potential implementation process. The rankings are based on the recommendations' impact and significance to achieve overall project goals. Considerations include sequencing, risk reduction impacts, and interdependencies. Changes in conditions, WTD priorities, addition of new strategies, and the evolving operating environment will impact the relative rankings shown in Table 2 and should be periodically reviewed by senior management.

Table 2. Initial Relative Ranking of Recommendations

Strategy	Priority Ranking	Ranking Considerations
E-1) WTD Continuity of Operations Plan	A	Critical to understand essential functions and have processes to implement to meet minimal service objectives. Enables organization to move from response mode to recovery mode with respect to projects the recommended Emergency Recovery Working Group will be charged with executing.
E-2) Designated Emergency Management Program Coordinator	A	This position is recommended for WTD to advance both their emergency management program and directly impact overall WTD preparedness and resiliency. Leader and technical expert to drive WTD COOP planning activities.
E-3) Employee Training & Capacity Development	A	Well-trained employees are a key component of building organizational resiliency that drives efficient response and recovery activities.
E-4) Contracts & Procurement	B	WTD currently has the ability to award contracts and this effort will fill in gaps that impact recovery. Additional requirements will be surfaced through recommended COOP planning activities and organization of the recommended Emergency Recovery Working Group.
E-5) System-Wide Information, Communication and Documentation	B	WTD may or may not have the ability to gain situational awareness after an event. This recommendation will improve that process and capability. Additional requirements will be surfaced through other resiliency studies, planned projects and recommended COOP planning activities.

Strategy	Priority Ranking	Ranking Considerations
E-6) Financial Risk Management	C	This activity addresses long-term risks after an event.
E-7) Emergency Recovery Working Group	A	Primary strategy to improving WTD recovery capacity and capabilities to reconstruct severely damaged facilities and/or address the influx of numerous smaller projects that overwhelm WTD resources.

3.3 System-Wide Preparedness and Recovery Strategy Concept Sheets for Implementation Recommendations

The recommended strategies to address WTD system-wide preparedness and recovery were developed into conceptual level descriptions and conceptual level programmatic cost estimates to aid the County in its planning efforts. Subject to available funds and priorities, moving forward with the recommendations presented in this report, it is expected that it would take up to 2 years to organize implementation teams and develop implementation plans and schedules for the recommendations.

Standardized concept and cost sheets describing the issues, recommendations, advantages, disadvantages, and other pertinent factors can be found in Appendix C. Recovery Strategy Conceptual Development and Conceptual Cost Sheets. These sheets were developed following the general methodology and assumptions used to develop the concept sheets found in the Task 600 *Resiliency Recommendations* report. If referencing that report for methodology details, go to its Appendix C: Conceptual Mitigation and Costs Technical Memorandum (HDR Team, January 2018).

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Appendix A
King County Department of Natural Resources
and Parks, Continuity of Operations Plan
Checklist

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King County DNRP COOP Checklist

2017 DNRP COOP Section	Requirement/Expectation	Responsibility	Notes/Approach
VI. Functional Roles and Responsibilities pg. 8,9	<ul style="list-style-type: none"> Minimize disruption to essential government services (to the degree possible). Maintain a list of Essential and Critical Services and requirements. Maintain a list of Key and Essential employees with contact information. Maintain equipment needed to implement COOP. Support employee personal preparedness. Request resources or assistance for movement to alternate operations or to maintain alternate operations. 	Division Manager	
	<ul style="list-style-type: none"> Notify staff of their emergency designations upon hire. Remind staff of their emergency designations annually. Issue emergency telecommuting agreements so that they are in place prior to an emergency. Triage human resources and labor issues during an event. 	Division Human Resources Managers	
	<ul style="list-style-type: none"> Update Continuity Plan annually or after an incident, or when needed by staff or other changes. Develop and maintain organization-specific plans and associated appendices. Update telephone rosters quarterly or when there are staff changes. Conduct alert and notification tests. Update contact information in County Inform system as needed. Review status of vital records, files, and databases. Maintain plans according to maintenance schedule and process. Conduct COOP training, testing and review. 	1 lead emergency preparedness planner per division/department.	
	<ul style="list-style-type: none"> Provide current contact information to lead emergency preparedness planner for division. Be familiar with the COOP and understand individual roles and responsibilities in the event it is activated. Participate in continuity training and exercises as directed. Review the mobile kits annually or whenever they are used to ensure materials and supplies are up to date. Be prepared to deploy and support organization essential functions in the event of COOP implementation. 	All personnel; pre-event	

2017 DNRP COOP Section	Requirement/Expectation	Responsibility	Notes/Approach
Section IX A. Essential Positions Pg. 11,12	<ul style="list-style-type: none"> The detailed list of essential employees is included in an employee designations list that is maintained by each division's human resources manager and division director. 	Division Human Resources Manager	
B. Lines of Succession	<ul style="list-style-type: none"> WTD Management Line of Succession 		
Section X. Concept of Operations A. Phase I Readiness and Preparedness Pg. 18,19	<ul style="list-style-type: none"> Minimizing sources of disruption to essential government services. (Mitigation) Maintaining a list of Essential and Critical Services and requirements. (Preparedness) Maintaining a list of Key and Essential Employees with contact information. (Preparedness) Maintaining equipment needed to implement COOP. (Mitigation-Preparedness) Assisting with development and maintenance of the Basic COOP. (Preparedness) Coordinating COOP efforts through EM Command and Control, EM Operations Center, etc. (Preparedness) Developing and maintaining COOP implementing procedures. (Preparedness) Ensuring LOS and delegation of authority is established and current. (Preparedness) Training, cross training, and testing the COOP annually. (Preparedness) Developing and maintaining communications plans (Preparedness) Supporting employee personal preparedness. (Preparedness) Identifying location(s) from which to direct COOP for the agency. (Preparedness) Identifying alternate service delivery location requirements, strategies, and contingencies. (Preparedness) 		
Alert and Notification Procedures pg.21	<ul style="list-style-type: none"> DNRP's divisions and the department as a whole maintain plans and procedures for communicating and coordinating activities with personnel before, during, and after a COOP event. 		

Appendix B

Emergency Recovery Working Group Concept of Operations

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Emergency Recovery Working Group Concept of Operation

Introduction

The *Department of Natural Resources and Parks (DNRP) Continuity of Operations Plan (2017 DNRP COOP)* contains references that address recovery and list requirements each division must consider in their recovery efforts. The plan indicates DNRP will form a “recovery team” that will oversee the restoration of damaged facilities and functions following an emergency or disaster that causes widespread damage to the DNRP. Furthermore, DNRP directs WTD to designate a “Recovery Manager” to lead WTD’s recovery efforts and participate as the WTD representative on the DNRP recovery team. Per the *2017 DNRP COOP Plan*, “the Department Director will designate an overall Department Recovery Manager to oversee the team as well as a DNRP Media Relations representative to provide liaison with the King County Joint Information Center.” The DNRP Recovery Manager, along with the Planning and Coordination Team, has assigned duties and is charged with coordination of the overall recovery management.

The *2017 DNRP COOP* is a high-level document. The many details regarding implementation and processes required to turn the mandates into reality are left to the divisions to develop. This section outlines a concept of operation and implementation considerations to assist WTD in developing an approach to meet the *2017 DNRP COOP* requirements associated with recovery. It includes providing additional detail to build an Emergency Recovery Working Group that enables the assigned Divisional Recovery Manager to succeed and meet

“Each division will designate a Recovery Manager who will be assisted by a division-level Planning and Coordination Team made up of the division's recovery work groups.” Source: *2017 DNRP COOP*, Phase IV, page 26.

WTD’s unique operating requirements, service goals, and recovery objectives. These recovery objectives may include priorities that flow down to WTD from the Department Recovery Manager. This section provides additional clarity regarding the referenced division-level planning and coordination team, along with required assets to accomplish assigned projects.

The Concept of Operation for the WTD Emergency Recovery Working Group is based on the requirement outlined in the *2017 DNRP COOP* and assumes the implementation of preparedness strategies identified in Section 2 of this document. In addition, the WTD Emergency Recovery Working Group should align with the WTD East Section and West Section Emergency Response Plans. The Emergency Recovery Working Group may be in operation for years, completing hundreds of projects across the system following a major event, only ceasing operation once WTD receives eligible reimbursement and all projects achieve close-out. The division may not have sufficient staffing capacity and, in some cases technical capabilities, to fully fulfill all the needs the Emergency Recovery Working Group will require. It is expected that WTD may rely on contracted resources to meet variable demands and fill technical gaps.

The WTD Emergency Recovery Working Group is not an emergency response organization and does not fill in the role or function of incident commander or Emergency Operations Center (EOC) during the response phase. Those functions are outlined under the WTD ERPs and will likely be addressed in the yet-to-be developed WTD COOP Plan. The WTD Emergency Recovery Working Group is not charged with driving implementation of COOPs or ERP protocols. This WTD Emergency Recovery Working Group is a construction project management office and grant management entity that is activated when conditions are permissive to commence reconstruction after the response phase activities are substantially completed on project sites. Therefore, the WTD Emergency Recovery Working Group will not drive preliminary damage assessments, damage assessment, emergency repairs, and/or protective measures, which occur in the response phase but will benefit from the information and projects generated through these activities.

Emergency Recovery Working Group Organization

The WTD Emergency Recovery Working Group is intended to not only lead WTD recovery efforts from a large event, but to also be scalable to support various smaller size recovery efforts that may impact WTD. This group will be led by a limited number of WTD employees including a WTD-appointed Recovery Manager and representatives from each recovery work group. Per the DNRP, WTD will organize initial recovery efforts around three key areas:

- Operations & Maintenance
- Engineering Technical Support
- Finance/Administration

The WTD Emergency Recovery Working Group will have a specific mission and the authority to accomplish assigned projects and related program or grant management activities. The WTD Emergency Recovery Working Group is focused on executing assigned projects based on set priorities and reducing the workload to the balance of the organization that must return to normal operations to serve customers.

The Emergency Recovery Working Group will be led by WTD employees, likely supported by a special assignment of existing WTD employees, temporary team or contracted staff focused on recovery and reconstruction efforts. This will impact other WTD staff & daily operations and planned projects separate from the recovery projects and this secondary effect must be planned for in the recovery efforts. The Emergency Recovery Working Group is dedicated to recovery projects and tasks associated with the specific event. Other non-emergency projects will not be assigned for execution through this working group. Mixing of these types of projects could cause accounting issues associated with allocation of costs around reimbursement. The Emergency Recovery Working Group staff will be augmented with specialty consultants, providing WTD a scalable solution that will adjust to fluctuating workloads and changing skill requirements.

The Emergency Recovery Working Group will be led by a designated Recovery Manager who will oversee day-to-day efforts of three major groups. These key positions will likely need to be staffed by seasoned and trained WTD Managers given the authority and experience they will need to meet their assigned roles and responsibilities. The 2017 DNRP COOP outlines responsibilities for each position on page 27. The recommended Emergency Recovery Working Group represents the Division’s Planning and Coordination Team, as referenced in the 2017 DNRP COOP.

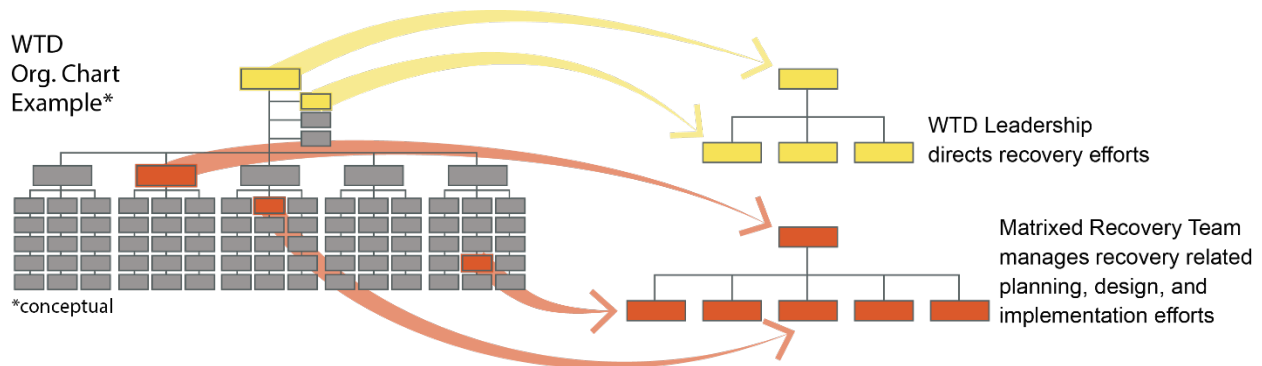


Figure 1. Organizational Chart for Emergency Recovery Working Group

Management Plan and Implementation

An implementation team should be formed to develop an Emergency Recovery Working Group management plan. Implementation of the plan by this team will fill in the many gaps between the concepts and requirements outlined in the 2017 DNRP COOP and the expectation to quickly establish a functioning Emergency Recovery Working Group when needed. The implementation team may be

involved in identification of areas where DNRP or WTD policy, procedures, and plan modifications or changes are required to enable the Emergency Recovery Working Group to be an effective mechanism to facilitate timely recovery efforts.

In addition, the implementation team will need to identify requirements associated with training, contracting, and exercise participation to build organization capacity and capabilities. During times of calm, one of the trained managers, one deputy, and select staff will be charged with maintaining WTD's capacity and ability to activate the Emergency Recovery Working Group in times of need. These will be considered collateral duties and not designed as full time or new positions. Following implementation plan approval, WTD will allocate sufficient resources to ensure the Emergency Recovery Working Group can success implement the plan and meet performance objectives.

Program management will develop reimbursement strategies associated with the target grant sources as soon as the Emergency Recovery Working Group is activated. It is likely the primary source of recovery grant funds will be the FEMA Public Assistance (PA) program, but other sources may become available. This may include the use of a grant management contractor that is experienced with the target funds and has a current working knowledge of the requirements based on recent experience to support this effort. The Emergency Recovery Working Group management team, working with DIRECT and the activated EOC leadership, will prioritize projects based on the damage assessment and determine the available funding sources at a local, state, and federal level. Document management will be critical to the success of these efforts, including access to readily available as-built plans and asset management data, the use of appropriate cost-tracking practices, and the employment of effective activity documentation and financial accounting processes.

Activation Process

A clear and concise activation process should be developed and implemented to avoid confusion or delays. The activation decision may involve a combination of considerations, including, but not limited to, the event's magnitude, complexity of recovery operations, internal staffing constraints, and/or overall anticipated recovery schedule. The Emergency Recovery Working Group should be activated by the WTD Director through the appointment of a WTD Recovery Manager required to respond to a significant event. This would be consistent with the *2017 DNRP COOP* requirements and likely will required several staff to be reassigned to support Recovery Manager on a temporary basis. Therefore, a broader activation scheme should be considered regarding the "who" and "how" to reach the core staff and provide the location of the Emergency Recovery Working Group. Generally, these events will require additional WTD staff and support contracts to manage the recovery projects for an extended period of time. Backfilling key WTD staff assigned to the Emergency Recovery Working Group to manage recovery projects should be considered, planned, and documented in a protocol. Selected staff and their managers should be provided clear direction and protocol to align expectations and enable effective preparation. Obviously, human resources, information technology, and other key elements of the WTD organization will be required to take action to enable quick activation, site access, and reassignment of key WTD staff. In the end, the decision to activate has broad implication and creates a workflow that should be carefully planned and monitored.

Staff Resources

Development of position descriptions will be required to align the work group activities internally and to avoid confusion. The *2017 DNRP COOP* provides high-level responsibilities for four identified positions that cover a broad area of technical knowledge and span of control. Analysis indicates the required depth and breadth of knowledge each position requires could be beyond the reasonable means of available staff. Therefore, we recommend breaking down each position where needed into more workable and natural support positions that an individual may succeed at if assigned. WTD staff can then be trained to meet specific responsibilities identified in these positions that support the four high-level positions identified in the *2017 DNRP COOP*. This will break the work down into manageable segments and afford sufficient capacity to accomplish the assigned responsibilities. Attachment 1 outlines sample positions the implementation team might consider when developing a management plan.

Training, Exercise and Capacity Development

Training and exercise will play a critical role in how effectively the Emergency Recovery Working Group operates. It is recommended that the implementation team consider the minimum knowledge requirements for each position to be successful. This can initially be accomplished through a screening of the positions by the implementation team. This information should then be refined and validated through an actual exercise where the participants play their assigned roles through a simulated event. Each exercise participant would help complete the list of information and skills as well as equipment required to be successful. This information should then be turned into a training plan and position reference guides to enable capacity develop and on-boarding of new team members. Training of the positions may include internal courses as well as courses offered through FEMA and other external providers. These training requirements should be included in requests for proposals with firms that may be required to support the Emergency Recovery Working Group during an activation. Access to electronic copies of the training and education materials can be made free of charge to selected contractors once contracts are awarded. This will reduce cost impacts and enable training to be delivered to their staff in the most favorable manner.

Staff turnover is always a challenge and the ability to rapidly on-board a new member is valued. The use of multimedia training, reference guides, and a set approach to on-boarding training will increase overall operational efficiencies. These materials need to be stored in both a physical and electronic location that can be accessed rapidly once activation occurs. The goal should be to produce the least amount of materials required to be successful, which will reduce development cost and update efforts.

Dedicated Work Space

One key to operation initiation will be mobilizing resources to a functioning work space that can be controlled but connected to WTD's systems. Given that the team will likely be a mix of WTD staff from various parts of the organization plus outside contractors or new hires, having a common work space would be helpful to develop a high performing team and enable WTD more control over the assigned resources. The team will work collaboratively with WTD operations and project staff so proximity would be a consideration when selecting a location. The general or exact location should be selected ahead of time in an area that is least likely to be impacted by an event and has reasonable access to transportation, communication systems, and reliable critical services. A secondary location should be identified in the event that the primary site is not available and/or accessible following a large scale event. For smaller, short-term events, consideration will be given for the use of a conference room space and/or existing office space.

The Emergency Recovery Working Group is a likely outgrowth of the command center established for incident response during the response phase and could be located at one of the three main plants. Regardless, the space will require the staff to have appropriate access to WTD documentation, system files, and communications technology, and also meet security requirements. Space management is generally a challenge as staffing levels fluctuate, file storage grows, meeting space requirements evolve, and priorities change over time. The reality of moving from temporary space to a more permanent location is a possibility if the recovery effort will likely take years.

Attachment 1: Emergency Recovery Working Group Staffing
Considerations: Sample Position Descriptions

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Attachment 1: Emergency Recovery Working Group Staffing Considerations: Sample Position Descriptions

WTD Recovery Manager – This position is responsible for leading the Emergency Recovery Working Group and overseeing all operations, safety, performance, and compliance. It is recommended that this position report to the WTD Director and DIRECT, given the high-profile nature and impacts this leader will have on the WTD organization and customers. The position will be required to obtain and allocate significant resources, resolving complex, visible challenges, and will impact service delivery. The WTD Recovery Manager will likely interact with senior County officials, department leaders, community members, and federal and state agencies on regular basis. This position will have impacts on the WTD public image and brand.

Per the 2017 DNRP COOP, the WTD Recovery Manager has assigned responsibilities that cover both response and recovery. Table 1 below offers additional insights into the responsibility statements and assigns that specific responsibility to an appropriate disaster event phase. The table comments add to implementation insights and highlight key knowledge assumptions associated with that requirement. This table is a tool to identify responsibilities that would likely be addressed through the Emergency Recovery Working Group, where that responsibility occurs in the recovery phase. Consider this table a tool to clarify which responsibilities would be associated with the WTD Emergency Recovery Working Group.

Table 1. WTD Recovery Manager Responsibilities - Sample

Responsibilities	Disaster Event Phase	Comment
Analyze and document situation status.	Response	<ul style="list-style-type: none"> Requires the ability to gain good situational awareness immediately following the event and through the recovery phase. Requires access to system monitoring data, damage assessment reports, operational status, daily reports and project tracking information. Implies ability to be quickly activated following an event with connection to required information sources. Implies ability to be quickly activated following an event. Generally not part of an Emergency Recovery Working Group.
Establish division recovery strategy.	Response/Recovery	<ul style="list-style-type: none"> Ability to understand recovery needs, prioritize projects, obtain resources and execute projects. During response, the implementation of the ERP and COOP would be the priority. For recovery, the primary strategy is the activation of the Emergency Recovery Working Group to execute reconstruction projects and meet assigned recovery phase responsibilities.
Prioritize actions and allocate resources.	Response/Recovery	<ul style="list-style-type: none"> Significant knowledge about EM practices and construction processes to be successful. Good situational awareness and understanding of WTD operations, capabilities and priorities. Ability to incorporate the DNRP priorities and adjust accordingly as the situation evolves.
Plan and coordinate actions.	Response/Recovery	<ul style="list-style-type: none"> Clear authority to drive actions is required, backed by the support of WTD leadership. Significant knowledge about EM practices and construction processes to be successful. Good situational awareness and understanding of WTD operations, capabilities and priorities. Ability to incorporate the DNRP priorities and adjust accordingly as the situation evolves.

Responsibilities	Disaster Event Phase	Comment
Integrate mitigation strategies for future events into recovery actions.	Recovery	<ul style="list-style-type: none"> • Significant knowledge about EM practices and construction processes to be successful. • Understanding of FEMA funding requirements and limits when integrating mitigation strategies into PA projects. • This involves understating how to develop project worksheets and funding to access not only FEMA PA grant, but FEMA Hazard Mitigation Grant Program (HMGP) funds. • This includes understanding how to apply Section 404 and 406 grants to enable mitigation activities. • Appropriate project scoping, documentation, pre-approval and overall grant management coordination is a requisite for success.

WTD Deputy Recovery Manager – This position is given the overall responsibility of the Recovery Manager, it would be prudent to support that position with a deputy to provide sufficient capacity to enable the Emergency Recovery Working Group to run efficiently. The deputy should have the ability to step into the WTD Recovery Manager role when needed and serve as an Acting WTD Recovery Manager when the Recovery Manager is not available. Other duties as assigned by the Recovery Manager might include authority to make various decisions, conduct briefings, represent the office, track operational metrics, and support problem resolution.

Operations Lead – Limited guidance is provided in the *2017 DNRP COOP* beyond a list of responsibilities to which this position is assigned. The list offered is long and spans both the Response and Recovery phases. Table 2 below offers additional insights into the responsibility statements and assigns that specific responsibility to an appropriate disaster event phase. The table comments add to implementation insights and highlight key knowledge assumptions associated with that requirement. Consider this table a tool to clarify which responsibilities would be associated with the WTD Emergency Recovery Working Group. These identified responsibilities include:

Table 2. WTD Emergency Recovery Working Group Responsibilities for Operations Lead Role - Sample

Responsibilities	Disaster Event Phase	Comment
Conduct field assessments and coordinate response.	Response	<ul style="list-style-type: none"> • Implies ability to be quickly activated following an event. Significant effort to organize and manage this activity following an event. • Requires organizing knowledgeable teams working through a set process. • Understanding of FEMA PA and other grant program requirements and documentation is a requisite for success. • Data management and evaluation is key to gain appropriate situational awareness to enable decision making and justify actions. • Generally not part of an Emergency Recovery Working Group.

Responsibilities	Disaster Event Phase	Comment
Make initial facility damage assessments.	Response	<ul style="list-style-type: none"> • Implies ability to be quickly activated following an event and gain situational awareness. • Significant effort to organize and manage this activity following an event. • Requires organizing knowledgeable teams working through a set process. Professional engineers, safety professions, industrial hygienists, and environmental staff may be required to assess sites and evaluate damage. • Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA. • Generally not part of an Emergency Recovery Working Group.
Restore essential operations.	Response	<ul style="list-style-type: none"> • These actions and processes should be identified in the WTD COOP and annexes. • Significant effort to restore essential operations and implies those functions have been identified. • Generally not part of an Emergency Recovery Working Group.
Repair and salvage equipment.	Response/Recovery	<ul style="list-style-type: none"> • Likely a response activity conducted as an Emergency and Protective Measure when considering grant or other private insurance reimbursement. • Understanding of federal grant and private insurance policy requirements is a requisite for success. • Generally not part of an Emergency Recovery Working Group.
Procure recovery supplies and equipment.	Response/Recovery	<ul style="list-style-type: none"> • Likely Emergency Recovery Working Group lead function tied to specific projects. • Procurements need to be in accordance with appropriate guidelines to enable reimbursement or settle claims. • Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA.
Oversee facility restoration.	Recovery	<ul style="list-style-type: none"> • Likely Emergency Recovery Working Group lead function tied to specific projects. • Work needs to be in accordance with appropriate guidelines to enable reimbursement or settle claims. • Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA.
Arrange logistics for operations personnel and vehicles.	Response/Recovery	<ul style="list-style-type: none"> • Procurements, cost allocation, and documentation need to be in accordance with appropriate guidelines to enable reimbursement or settle claims. • Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA.
Document personnel hours, activities, and recovery costs.	Response/Recovery	<ul style="list-style-type: none"> • Documentation and cost allocations need to be in accordance with appropriate guidelines to enable reimbursement or settle claims. • Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA.

The Emergency Recovery Working Group position is heavily engaged in both response and recovery activities and charged with many time-sensitive responsibilities. This role will require the support of a well-trained staff and supporting resources ready to address the broad range of responsibilities listed in the *2017 DNRP COOP*. Implicit in the role is a deep understanding of EM response and recovery practices, processes, and protocols. This includes key processes such as damage assessment as well as grant management and compliance. The ability to work effectively with COOP plans to support the restoration of essential functions and transition from response to recovery mode is critical. The work group should decompose each responsibility to identify what resources are required to enable success and what should be accomplished through the WTD Emergency Recovery Working Group.

Engineering and Technical Support Lead - Limited guidance is provided in the *2017 DNRP COOP* beyond a list of responsibilities to which this position is assigned. The list offered is long and cuts across both the Response and Recovery phases. Table 3 below offers additional insights into the responsibility statements and assigns that specific responsibility to an appropriate disaster event phase. The table comments add to implementation insights and highlight key knowledge assumptions associated with that requirement. This is a tool to identify responsibilities that would likely be addressed through the Emergency Recovery Working Group, where that responsibility occurs in the recovery phase. Consider this table a tool to clarify which responsibilities would be associated with the WTD Emergency Recovery Working Group.

Table 3. WTD Emergency Recovery Working Group Responsibilities for Engineering and Technical Support Lead Role - Sample

Responsibilities	Disaster Event Phase	Comment
Technical follow-up and procurement.	Response	<ul style="list-style-type: none"> • Technical follow-up is not a clear requirement and should be further defined to avoid confusion or loss of critical recovery function. • All procurements should occur in a manner that meets applicable grant guidelines, unless extenuating circumstances require otherwise.
Conduct engineering inspections.	Response/Recovery	<ul style="list-style-type: none"> • Implies ability to be quickly activated following an event. • Significant effort to organize and manage this activity following a large scale event. • Requires organizing knowledgeable teams working through a set process. • Professional engineers, safety professions, industrial hygienists, and environmental staff may be required to assess sites and evaluate damage. • Understanding of federal grant and private insurance policy requirements is a requisite for success.
Prepare preliminary damage assessments, then follow with detailed repair cost estimates.	Response/Recovery	<ul style="list-style-type: none"> • Implies ability to be quickly activated following an event. • Significant effort to organize and manage this activity following an event. • Requires organizing knowledgeable teams working through a set process. • Professional engineers, safety professions, industrial hygienists, and environmental staff may be required to assess sites and evaluate damage. • Understanding of FEMA PA, hazard mitigation, and related grant program requirements. Private insurance may play a factor too. • Specific formats, guidelines, and requirements for cost estimating projects and ability to generate appropriate documentation is a requisite for success.
Prepare restoration plans and specs.	Recovery	<ul style="list-style-type: none"> • Ability to develop project worksheets and/or provide critical input for others to develop project worksheets. • Professional engineers, safety professions, industrial hygienists, and environmental staff may be required to develop the plans and specifications. • Understanding of FEMA PA, hazard mitigation, and related program requirements to insure plans and specification drive projects that are eligible for appropriate reimbursement. • Ability to generate appropriate documentation is a requisite for success.

Responsibilities	Disaster Event Phase	Comment
Arrange for emergency contracting.	Recovery	<ul style="list-style-type: none"> All procurements must occur in a manner that meets federal grant requirements, such as FEMA PA guidelines.
Construction inspection and management.	Recovery	<ul style="list-style-type: none"> All projects must be executed in a manner that meets the granting agency guidelines. This includes addressing changes in scope, change order management, fair pricing, management costs and project documentation.
Arrange logistics for engineering personnel and vehicles.	Recovery	<ul style="list-style-type: none"> Procurements, cost allocation, and documentation need to be in accordance with appropriate guidelines to enable reimbursement or settle claims. Understanding of federal grant requirements and documentation is a requisite for success, e.g., FEMA PA.
Document personnel hours, activities, and recovery costs.	Recovery	<ul style="list-style-type: none"> Procurements, cost allocation, and documentation need to be in accordance with appropriate grant guidelines to enable reimbursement or settle claims. Understanding of FEMA or other granting agency requirements and documentation mandates is a requisite for success.

This position is heavily engaged in both response and recovery phases, covering a broad range of activities. This will require a trained staff and supporting resources to address these responsibilities. Implicit in the role is a deep understanding of EM response and recovery practices. This includes key processes such as damage assessment, damage cost estimating, and scope development. All of this will need to be accomplished based on a clear understanding of grant management compliance and eligibility requirements. The work group should decompose each responsibility to identify what resources are required to enable success and what should be accomplished through the WTD Emergency Recovery Working Group.

Finance and Administration Lead – Consistent with the other positions identified in the *2017 DNRP COOP*, limited guidance is offered beyond a list of responsibilities to which this position is assigned. The list offered is long and spans the Response and Recovery phases. Table 4 below offers additional insights into the responsibility statements and assigns that specific responsibility to an appropriate disaster event phase. The table comments add to implementation insights and highlight key knowledge assumptions associated with that requirement. This is a tool to identify responsibilities that would likely be addressed through the Emergency Recovery Working Group, where that responsibility occurs in the recovery phase. Consider this table a tool to clarify which responsibilities would be associated with the WTD Emergency Recovery Working Group.

Table 4. WTD Emergency Recovery Working Group Responsibilities for Finance and Administration Lead Role - Sample

Responsibilities	Disaster Event Phase	Comment
Gather recovery documentation.	Response/Recovery	<ul style="list-style-type: none"> “Gather recovery documentation” is not a clear requirement and should be further defined to avoid confusion or loss of critical recovery function. Implies ability to be quickly activated following an event. Documentation is an essential element to recovery to record decisions, document compliance, justify reimbursement, and support audits. This must occur in a manner that meets granting agency guidelines. Consideration regarding documents retention, organization, cataloging, and validation are key components. Many audits do not occur for over decade, after many, if not all, of the employees involved are no long available to help justify actions.

Responsibilities	Disaster Event Phase	Comment
Track division-wide recovery costs.	Response/Recovery	<ul style="list-style-type: none"> Implies ability to quickly activate following an event to be able to collect critical information. WTD must have the electronic or paper systems, processes, and capacity to collect, store, and retrieve recovery cost information. Many of these systems rely on power, IT systems, and web access, which could be disrupted. It is critical to track forced labor accounts, procurements, and project cost associated with the event. The ability to provide backup documentation and align damage assessments, project scopes, timesheets, invoices, and related documents to justify reimbursement is crucial.
Prepare cost reports and waivers for council.	Response/Recovery	<ul style="list-style-type: none"> Implies ability to be quickly activated following an event and collect data discussed above. Significant effort to organize and manage this activity following an event in times of chaos.
Process claims.	Recovery	<ul style="list-style-type: none"> Ability to develop correct project worksheets and/or provide critical input for other to develop project worksheets. Professional engineers, safety professions, industrial hygienists, and environmental staff may be required to develop the plans and specifications. Understanding of federal grant and private insurance claims process and requirements is crucial. Ability to generate appropriate documentation is a requisite for success.
Prepare FEMA cost recovery documentation.	Recovery	<ul style="list-style-type: none"> Requires FEMA grant management expertise combined with accounting expertise to accomplish this responsibility. Access to the correct and appropriate data as discussed above. Understanding of FEMA PA, hazard mitigation, and related grant program documentation requirements.
Prepare restoration budget.	Response/Recovery	<ul style="list-style-type: none"> Ability to obtain accurate and timely information from damage assessment teams and project management teams in a consistent format. Collaboration with the other leaders to develop the budget based on various estimates or assumptions.
Salvage and restore records and databases.	Response	<ul style="list-style-type: none"> Primary element of the WTD COOP Plan yet to be developed. The WTD COOP Plan and appropriate annex must address this essential function quickly.
Restore computer networks.	Response	<ul style="list-style-type: none"> Primary element of the WTD COOP Plan yet to be developed. The WTD COOP Plan and appropriate annex must address this essential function quickly.

This position is heavily engaged in both response and recovery phases covering a broad range of activities. This will require a trained staff and supporting resources to address this broad range of responsibilities. Implicit to the role is a deep understanding of grant management and compliance. The ability to effectively work with COOP plans to support the restoration of essential functions associated with IT is key. The work group should decompose each responsibility to identify what resources are required to enable success and what should be accomplished through the WTD Emergency Recovery Working Group.

Leadership Staffing

The Emergency Recovery Working Group will be managed by a WTD Recovery Manager appointed by the WTD Director. The WTD Director will reassign one of the existing full-time WTD senior managers who has been properly trained to fill this role. It is recommended that two or three senior managers, along with deputies, be trained to fill this role to ensure capacity and provide some staffing flexibility. Ideally, the selected leaders will be appointed for a minimum three-year period to enable training, development of relevant experience, and realization of operational efficiencies. The appointee will have a deputy manager that can step in should a leadership void be created because of unforeseen circumstances and that can support a succession plan. Ideally, the WTD Recovery Manager will be a part of DIRECT when activated and will also be a part of the DNRP Recovery Team.

In accordance with the 2017 DNRP COOP, WTD is responsible for establishing a Planning and Coordination Team to support the Recovery Manager. This implies that three more WTD staff will be required to operate the Emergency Recovery Working Group. Like the Recovery Manager, these individuals will need to be identified from within WTD prior to activation and prepared to execute the role assigned in short notice. This preparation will require training and awareness prior to activation to an event including knowledge of various plans and processes that guide the Emergency Recovery Working Group. It is recommended that these members, along with a deputy, be a part of any implementation team assembled to develop the Emergency Recovery Working Group Management Plan. These three positions will likely be a full-time effort for some period of time following a large scale event. Depending on the size and duration of the recovery event, these three key leadership staff would be moved into their assigned Emergency Recovery Working Group role as a full-time function and their other existing roles would need to be backfilled with temporary selections. Ideally, these temporary selections would be worked out pre-event so the movement can be relatively smooth and efficient.

The assignment and training of these four positions is one of the most critical factors to establishing a successful Emergency Recovery Working Group that can be effective when activated. Waiting to assign these positions following an event may result in confusion, delays, and significant negative impacts to WTD's ability to respond and recover from a major event. Ideally, these four members can be activated on much smaller disruption events, where they can learn and improve their individual skills and competencies. Training of the positions may include internal courses as well as courses offered through FEMA and other external providers.

Additional Staffing Capability Insights

Below is a list of other key positions that should be considered by the work group and implementation teams. These positions will be used to develop a comprehensive and scalable organization chart for the Emergency Recovery Working Group. WTD staff should be identified to fill these positions and ideally trained to some degree of competence prior to an activation as the primary approach to staffing the Emergency Recovery Working Group. Once again, training of these positions may include internal courses as well as courses offered through FEMA and other external providers.

Depending on the size and duration of the recovery effort, consideration regarding filling positions through a temporary hire or a contractor may be a prudent approach. Some roles may be very short duration and handled as a collateral duty while other roles may be full-time and last for many years. This factor, combined with position authority, decision-making, and related role requirements should be part of the decision process and staffing strategy outline in the management plan. Supervisory roles are not identified below and may be needed depending on the number of staff assigned to the Emergency Recovery Working Group.

Environmental Health and Safety Coordinator – Safety will be a primary concern on all response and recovery projects. Leaders may be faced with making complex choices around site entry and protecting the health of WTD employees. We recommend that a project environmental health and safety officer be assigned to drive a safety culture, enforce policy, and manage risks in this high priority, evolving work environment. This role may be a part-time or full-time position, depending on the scale of recovery efforts, project risks, and duration of projects. Deep understanding of applicable regulations, WTD policy, and WTD programs should be valued.

Environmental Compliance, Cultural and Historical Resource Coordinator – It is critical that all project and recovery actions seeking federal reimbursement include a screen for environmental, cultural and historical resources compliance issues. Failure to successfully identify, mitigate, and manage these areas has resulted in loss of significant reimbursement funding. This role may be a part-time or full-time position, depending on the scale of recovery efforts and duration of projects. Experience with local agencies, applicable regulations, and grant requirements will be important.

Grant Management Leader and Support Team – Federal and state grant management is a complex and evolving area that requires regular practice to stay current with requirements. Grant management professionals specialize in specific agency grant programs given the complexity and sheer volume of knowledge required. Quick access to a team of grant management professionals is needed to properly

address all the areas. Furthermore, grant managers should review activities, project scopes of work and all documentation to assess compliance and minimize losses. For a large scale event, it is recommended that WTD contract with a firm that has the resources to support a large response and recovery effort and recent experience with federal grants.

Human Resources – WTD will need a responsive human resource (HR) professional to support this team. This person will need to help coordinate recruiting and on-boarding to quickly fill key positions due to turnover and fluctuation in staffing needs. The response and recovery work environment can result in high levels of stress, manifesting various human resource challenges. A trained and prepared HR representative can help get ahead of issues, mitigate challenges, and address change where needed. This role may likely be a part-time position, depending on the scale of recovery efforts and duration of projects. Deep understanding of applicable regulations, WTD policy, and WTD programs should be valued.

Contracting & Procurement – The ability to quickly issue task orders on existing contracts and manage change orders is crucial in the recovery phase. Issues arise around performance, scope of work, and costing that require a contracting professional's skills and authority to resolve. Developing new contracts and statements of work under very tight schedules and in a collaborative manner is valued. Driving the timely procurements of goods and services is critical. Ensuring compliance with grant management requirements and various WTD policies will be a key to successful recovery. Clear understanding of applicable grant requirements, procurement regulations, WTD policy, and WTD programs should be valued.

Billing & Reimbursement Coordinator – Billing and invoicing for reimbursement for federal grants takes focus and understanding of the processes, documentation requirements, and format. The selected person should be closely aligned with the accounting and finance staff as well as the project staff to be able to quickly resolve billing challenges. This position would partner with the grant management team to issue invoices, answer auditor questions, and resolve issues in a timely manner. This arrangement will avoid delay in payments and rejection of payment requests. Working knowledge of applicable grants, regulations, WTD programs, and WTD financial systems should be valued.

Information Technology – WTD will need a responsive IT professional to support this team. This person will coordinate IT service delivery to set up the operation and on-board a fluctuating staff load. The response and recovery work environment depends on communication and information access. A high level of stress can manifest quickly when staff cannot obtain IT support to resolve issues quickly. A trained and prepared IT representative can help get ahead of issues, mitigate challenges, and address change, where needed, in an effective manner. This role may likely be a part-time position on average, depending on the scale of recovery efforts and duration of projects. Working knowledge of WTD IT systems, policies, security access, and WTD systems should be valued, along with strong customer service skills and help desk skills with the ability to resolve issues quickly.

Multidiscipline Engineering and Technical Support Staff – WTD will need access to professionals from many disciplines that are appropriately licensed or certified in the state. These professionals will be in high demand and may serve as constraint to executing recovery projects. WTD should make sure they have access to a sufficient number of Washington State professional engineers through in-house and contracted resources to meet the needs around damage assessments, project design, and construction management. In addition, WTD should assess the need for other professionals required to execute recovery projects, including, but not limited to: survey, computer aided design and drafting (CADD), permitting, environmental compliance, right-of-way, cost estimating, administration, inspection, specification writing, and related project delivery professionals. This staff may be primarily contracted professionals through an architectural/engineering (AE) procurement and/or staffing agency procurement. The work group would have to develop a structure to enable effective management of these resources and position descriptions. It is recommended that WTD consider a focused training program for contractors to take after selection that will enable them to on-board new staff quickly, as well as the establishment of a protocol to quickly activate them when needed.

Resiliency Leader – It should be noted that the opportunity to improve WTD resiliency will be available through the implementation of revised design standards that could include new materials, construction methods, and improved designs. A resiliency leader should be designated to help develop these codes and changes in the specifications. Caution will be required to insure projects are structured in a manner to enable reimbursements which requires planning around scoping, cost estimating, and project planning. Deep understanding of applicable grant requirements to assess the eligibility of solutions for reimbursement, combined with project engineering and/or construction experience to enable technical evaluation of concepts should be valued.

Social Justice Advisor – This role provides the opportunity to consider social justice in the decision-making process for all projects and the overall prioritization response and recovery actions. This role could help surface bias in the team's setting priorities, approaches or proposed solutions. The social justice advisor may track and guide WTD in addressing concerns surfaced by communities, external groups or individuals in a proactive manner. Working knowledge of local community issues, current practices, applicable regulations, and WTD programs should be valued.

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Appendix C

Recovery Strategy Conceptual Development and Conceptual Cost Sheets

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MITIGATION CONCEPT SUMMARY

Issue No. E-1	Issue Title DNRP Continuity of Operations Plan Compliance Issues	Priority Rating A
Idea Code E-1	Concept Title WTD Continuity of Operations Plan	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below)	<input checked="" type="checkbox"/> MEP	<input checked="" type="checkbox"/> Public Health
	<input checked="" type="checkbox"/> SCADA	<input checked="" type="checkbox"/> Consequent Damages
	<input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume
		<input checked="" type="checkbox"/> Equity and Social Justice
		<input checked="" type="checkbox"/> System Downtime
		<input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input type="checkbox"/> < \$1M
	<input checked="" type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

The 2013 King County Continuity of Operations Plan (COOP) identifies departmental roles, responsibilities, and expectations. Similarly, the Department of Natural Resources and Parks (DNRP) Continuity of Operations Plan (2017 DNRP COOP) identifies specific roles, responsibilities, and expectations of the Divisions within DNRP. The King County and DNRP COOP plans adopt the same methodology, are aligned, integrated, and are in keeping with industry guidelines, standards, and practices. Currently, WTD does not have a standalone division-level COOP as mandated as well as consistent with industry best practices. As of this report, it is uncertain if WTD meets the requirements outlined in the 2017 DNRP COOP.

Risk if not Addressed:

Without a division-specific plan, there may be a lack of consistency between WTD and DNRP/King County continuity of operations methods. This lack of consistency could pose significant risk of prolonged or avoidable disruption of critical services or organizational capability.

MITIGATION CONCEPT SUMMARY

Description of Mitigation Concept:

Development of a COOP plan for WTD would be a complex task; WTD should consider forming a COOP Development Work Group. This group would be comprised of representatives from WTD to enable meeting the intent of the *2017 DNRP COOP* requirements. A suggested model of governance would be leadership by a development leader with support from each key area in the department. It is suggested that initially the work group walk through the *2017 DNRP COOP* and use its Checklist (shown in Appendix A of this *Preparedness and Recovery Recommendations*) report to understand possible gaps and develop WTD-wide solutions as well as plan structure. This group would need to engage senior management to consider the actions and/or support required to meet the expectation of the 2017 DNRP COOP while working within their various resource constraints.

The COOP development leader and members of the work group would then engage with each of WTD's functional groups (project management, operations and maintenance, construction management, safety, accounting, finance, IT, etc.) to help them identify their unique essential functions and recovery time objectives (RTOs). Depending on each functional group's complexity, staff capabilities, and the overall WTD COOP plan document structure, each group would consider a specific annex they could attach to a broader WTD-wide COOP plan. These annexes, which exist in the form of an attachment, would be used in times of disruption to ease overall administrative management of the document.

WTD would prioritize and schedule the development of annexes over the next several years to manage workload and drive systematic progress. This effort would involve substantial time for the development leader and work group, including several planning sessions with each group to identify and confirm essential functions and RTOs. After this, meetings would follow to help each group develop and implement solutions to enable them to maintain or quickly restore essential functions within their set RTO. The information, including assigned responsibilities, would be contained in each group's annex.

King County WTD Strategy Steward/Leader: WTD Safety Office

The list below summarizes the above development recommendations:

- Create a COOP Development Work Group
- Use *2017 DNRP COOP* Checklist (Appendix A)
- Confirm essential functions and recovery time objectives
- Engage WTD senior management as needed
- Engage functional groups (accounting, finance, IT, etc.)

Advantages:

- Alignment with King County and DNRP COOP plans
- Reduced risks of service disruption and improved resiliency
- Ability to reduce recovery schedules
- Ability to improve organizational preparedness

Disadvantages:

- Substantial time commitment from the proposed work group

Main Benefit:

- Reduced service disruptions and improved resiliency
- Critical needs addressed: understanding of essential functions and identification of processes to implement to meet minimal service objectives. Enables organization to move from response mode to

MITIGATION CONCEPT SUMMARY

recovery mode with respect to projects the recommended Emergency Recovery Working Group will be charged with executing.

- Improved understanding of key dependencies between various parts of the organization

Discussion of Schedule:

- Key Milestones:
 - Form work group and identify essential functions
 - Develop WTD COOP plan
 - Implement WTD COOP plan and annex
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability
- Report Progress: Quarterly update to the WTD executive team regarding progress against goals with distribution to the WTD leadership team

Discussion of Risk:

This task would lead to the identification of critical service disruption risks and potential failure modes that are linked to consequences. Delayed implementation of timely and effective risk mitigation/management solutions following awareness does pose some level of concern should an avoidable service failure occur. In the event of a serious event, evaluation and tracking of budget constraints and prioritization of actions will be required to document that WTD acted in a responsible manner with resources available to manage this risk.

This task would result in documentation of WTD system weaknesses and would need to be controlled to avoid potential use by outside actors seeking to harm WTD, Government and/or the community.

Assumptions and Calculations:

The mitigation concept-level cost estimate is restricted to the effort to form a work group, identify essential functions and develop a WTD plan. The cost of WTD COOP plan implementation is not calculated at this time because of too many unknowns associated with the development of recommendations or requirements in the WTD COOP Plan. The first two tasks costs are based on the following assumptions:

Planning Step 1 – Form Workgroup and Identify Essential Functions (Six Months):

- All Level of Effort (LOE) % applied to 1,040 work hours in 6 months
- County Planning Project Manager – Assume 20% of workload
- County Section Leads – Assume 5% of workload
- County Section Mgr. Assistance – Assume 10% of workload
- Consultant (Support Leadership) – Assume 10% of workload
- Consultant (Support Staff) – Assume 25% of workload

Planning Step 2 - WTD COOP Plan Development (Six Months):

- All LOE % applied to 1,040 work hours in 6 months
- County Planning Project Manager – Assume 25% of workload
- County Section Leads – Assume 5% of workload
- County Section Mgr. Assistance – Assume 10% of workload

MITIGATION CONCEPT SUMMARY

- Consultant (Support Leadership) – Assume 10% of workload
- Consultant (Support Staff) – Assume 30% of workload

Concept-Level Cost Estimate (E-1)

Estimate - AACEI Class 5					
Concept Title:	King County Waste Water Division Continuity of Operations (COOP) Plan	Date:	2/21/2018		
Location:	Multiple Locations	Estimator:	Eric Benton, CPE		
Description:		Idea Code:	E-1		
DIRECT: SUBTOTAL COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1	Planning Step 1 - Six Months				
2	KC Planning Project Manager	208	HRS	\$ 150	\$ 31,200
3	KC Section Leads (5 Sections Operations + 5 Sections downtown)	520	HRS	\$ 150	\$ 78,000
4	KC Section Mgr. Assistance (10 Sections w/2 people each)	2,080	HRS	\$ 150	\$ 312,000
7	Consultant - Support Leadership	208	HRS	\$ 210	\$ 43,680
8	Consultant - Support Staff	780	HRS	\$ 210	\$ 163,800
9					
10	Planning Step 2 - Six Months				
11	KC Planning Project Manager	260	HRS	\$ 150	\$ 39,000
12	KC Section Leads (5 Sections Operations + 5 Sections downtown)	520	HRS	\$ 150	\$ 78,000
13	KC Section Mgr. Assistance (10 Sections w/2 people each)	2,080	HRS	\$ 150	\$ 312,000
14	Final Report	240	HRS	\$ 150	\$ 36,000
17	Consultant - Support Leadership	208	HRS	\$ 210	\$ 43,680
18	Consultant - Support Staff	936	HRS	\$ 210	\$ 196,560
19					
Subtotal Costs					\$ 1,330,000
INDIRECT COSTS					
Design and Construction Consulting					n/a
Other Consulting Services					n/a
Permitting & Other Agency Support					n/a
Right-of-Way					n/a
Misc. Service & Materials					\$ 3,990
Non-WTD Support					n/a
WTD Staff Labor					n/a
Subtotal Indirect Costs					\$ 1,333,990
Project Contingency					\$ 133,399
Initiatives					n/a
TOTAL INDIRECT COSTS					\$ 1,467,000
TOTAL PROJECT COST					\$ 1,467,000

Notes:

Given the highly conceptual nature of the mitigation concepts, the estimating team used an allowance for indeterminates (AFI) of 40%.

The costs represented in this document are Opinions of Probable Cost provided by the Engineering Team. The accuracy of the associated cost estimate is dependent upon the various underlying assumptions, inclusions, available information, and exclusions described herein.

MITIGATION CONCEPT SUMMARY

Actual project costs may differ and can be significantly affected by factors such as changes in the external environment, the manner in which the project is executed and controlled, material labor cost increases, competitive bidding methods, market conditions, and other factors that may impact the estimate basis or otherwise affect the project. Estimate accuracy ranges are only assessments based upon the cost estimating methods and data employed in preparing the estimate and are not a guarantee of actual project costs.

MITIGATION CONCEPT SUMMARY

Note: A Mitigation Concept Summary Sheet for Recommendation E-2, Designated Emergency Management Program Coordinator, was not prepared for this report. Refer to the recommendation discussion in Section 2.2.

MITIGATION CONCEPT SUMMARY

Issue No. E-3	Issue Title WTD Staff Training Improvement Needs and Lack of Sufficient Internal Capacity	Priority Rating A
Idea Code E-3	Concept Title Employee Training and Capacity Development	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below) South Treatment Plant	<input checked="" type="checkbox"/> MEP <input checked="" type="checkbox"/> SCADA <input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Public Health <input checked="" type="checkbox"/> Consequent Damages <input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume <input checked="" type="checkbox"/> Equity and Social Justice <input checked="" type="checkbox"/> System Downtime <input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input checked="" type="checkbox"/> < \$1M
	<input type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

Based on various meetings with WTD staff, there appears to be consensus to improve training across the organization with respect to emergency management and disaster preparedness. Improved internal staff technical capabilities and capacity to implement identified strategies will be required and may be achieved through a focused training initiative.

Risk if not Addressed:

- Potential for inability to implement various plans that reduce service disruptions and improve response and recovery actions. Training directly affects WTD's ability to return to service in an efficient manner.
- Potential for safety and health concerns with staff that are not adequately trained.
- Potential for loss of operational efficiencies associated with staff that lack adequate training and skills maintenance.
- Possibility of elongated recovery time and negative outcomes because of insufficiently trained staff available to respond to an emergency can lead to elongated recovery time and negative outcomes

MITIGATION CONCEPT SUMMARY

- Possibility of inconsistent Emergency Management information across positions regarding post-event procedures

Description of Mitigation Concept:

It is recommended that WTD consider the following steps:

- Implement a comprehensive multiyear EM-focused training program to build staff-wide capacity and capabilities required to implement applicable plans and procedures
- Form a crosscutting committee to assess training needs for each group, site, and position based on assignments and plan requirements
- Develop a training plan to meet identified needs and training schedule that may be implemented over the next five years

An initial committee representing all aspects of WTD may be required to assess training needs and requirements. This would be a large and likely ongoing effort that could delay advancement if not segmented, prioritized, and actively managed. Consideration might be given to prioritize essential WTD staff based on job assignment, essential function, and their criticality to both response and recovery activities. Alternatively, each internal group might be required to simply perform a self-assessment using guidance from management as well as the COOP Plan data and ERP roles as baselines, then report back these internal group self-assessment findings within a given time period. This information would then need to be analyzed and organized into a training program. Regardless of the method, decision makers would require access to various plans and job descriptions to identify skills and understand which employees need particular training based on assigned responsibilities.

A working group of supervisors and others should be assembled to address the process of delivering training within the current constraints they face in meeting daily operational demands. Consideration should be given to other training delivery methods beyond a classroom approach for training, such as multimedia online training courses, webinars, computer based training, peer-to-peer training, and on-site training delivery. Record keeping and tracking is essential to measure overall compliance and assess organizational readiness.

WTD should also develop a “quick guide” for employees to reference during an emergency. This would be incorporated into staff training as a tool for future reference and ideally minimize confusion that is anticipated with a crisis environment. The quick guide would be designed to answer the big questions regarding “what am I supposed to do” and “how do I get more information.” The quick guide would align with other documents, training materials, key processes, and associated WTD policies to serve as a valuable resource in times of need. This quick guide could be in the form of a PowerPoint presentation that is also used for a refresher training.

King County Strategy Steward/Leadership: Jointly lead by Operations & Safety.

Advantages:

- Increased operational efficiencies following a disruption because staff better understand their responsibilities before, during and after an event, as well as have better base skills to execute assigned tasks or functions
- Avoided or reduced impacts associated with events because of ability to effectively implement plans, procedures and processes
- Improved health, safety and moral
- Inter-positional capability redundancy and improved organizational resiliency

Disadvantages:

- Time and resources dedicated to training delivery

MITIGATION CONCEPT SUMMARY

Main Benefit:

- Having well-trained employees, which are a key component of building organizational resiliency that drives efficient response and recovery activities

Discussion of Schedule:

- Key Milestones
 - Form workgroup and develop approach
 - Conduct needs assessment
 - Develop or procure materials or services
 - Deliver training
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

Discussion of Risk:

One significant challenge is the shortage of operational staff at some sites or in key functions limiting the opportunity for supervisors or management to remove staff from their day-to-day functions to attend training. Sending staff to training may place some risk on operations with respect to adequately covering daily tasks and shifts.

Failure to train staff may be seen as a compliance issue and safety risk once needs are identified and policy or plans developed.

Many skills are perishable and reoccurring training is required to maintain individual skills and competencies.

Assumptions and Calculations:

The mitigation concept-level cost estimate includes the following assumptions:

Current cost estimate only covers the initial task of formation of a workgroup and development of an approach. This is a complex initiative that would be interactive with other strategies, plans, and various safety requirements as part of implementation. Alignment with existing training activities and recovery strategy implementation would be required as part of the planning process.

Direct Costs:

- Implementation Work Group - 6 Leads (includes Project Manager) at 20% workload each
- Coaching/Mentoring (Consultant) - 3 Consultant team members at 20% workload each

Indirect Costs:

- Project Contingency – Assume 10%
- Misc. Service and Materials – Assume 0.3%

MITIGATION CONCEPT SUMMARY
Concept-Level Cost Estimate (E-3)

Estimate - AACEI Class 5					
Concept Title:	Employee Training and Capacity Development			Date:	2/21/2018
Location:	Multiple Locations			Estimator:	Eric Benton, CPE
Description:				Idea Code:	E-3
DIRECT: SUBTOTAL COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1	Implementation Work Group	1,248	HRS	\$ 150	\$ 187,200
2	Coaching/Mentoring (Consultant)	624	HRS	\$ 210	\$ 131,040
3					
4					
5					
6					
7					
8					
Subtotal Costs					\$ 320,000
INDIRECT COSTS					
Design and Construction Consulting					n/a
Other Consulting Services					n/a
Permitting & Other Agency Support					n/a
Right-of-Way					n/a
Misc. Service & Materials					\$ 960
Non-WTD Support					n/a
WTD Staff Labor					n/a
Subtotal Indirect Costs					\$ 320,960
Project Contingency					\$ 32,096
Initiatives					n/a
TOTAL INDIRECT COSTS					\$ 353,000
TOTAL PROJECT COST					\$ 353,000

Notes:

Given the highly conceptual nature of the mitigation concepts, the estimating team used an AFI of 40%.

The costs represented in this document are Opinions of Probable Cost provided by the Engineering Team. The accuracy of the associated cost estimate is dependent upon the various underlying assumptions, inclusions, available information, and exclusions described herein.

Actual project costs may differ and can be significantly affected by factors such as changes in the external environment, the manner in which the project is executed and controlled, material labor cost increases, competitive bidding methods, market conditions, and other factors that may impact the estimate basis or otherwise affect the project. Estimate accuracy ranges are only assessments based upon the cost estimating methods and data employed in preparing the estimate and are not a guarantee of actual project costs.

MITIGATION CONCEPT SUMMARY

Issue No. E-4	Issue Title WTD Would Benefit from Additional Contracting Mechanisms to Support Recovery Strategy Implementation	Priority Rating B
Idea Code E-4	Concept Title Contracting and Procurement	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below) South Treatment Plant	<input checked="" type="checkbox"/> MEP <input checked="" type="checkbox"/> SCADA <input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Public Health <input checked="" type="checkbox"/> Consequent Damages <input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume <input checked="" type="checkbox"/> Equity and Social Justice <input checked="" type="checkbox"/> System Downtime <input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input checked="" type="checkbox"/> < \$1M
	<input type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

At this time, WTD likely lacks sufficient contracting mechanisms to access required services, materials or supplies to adequately support Continuity of Operations Plan (COOP) implementation and timely response activities. Having contracts in place enables WTD to seek reimbursement from federal grant programs during federally declared disasters if compliant with Federal Terms.

Risk if not Addressed:

- Possible denial of reimbursement from FEMA due to non-compliance with FEMA guidance
- Potential inefficiencies and unnecessarily high costs in emergency on-call contracts
- Potential inability to implement recovery strategies

Description of Mitigation Concept:

It is recommended that WTD consider the following steps:

- Establish pre-positioned contracts where possible for critical services, materials or supplies required to drive efficient response and recovery. These contracts may be re-competed on a 1 to 3 year cycle.

MITIGATION CONCEPT SUMMARY

- Develop template scope of work and procurements packages for services, materials or supplies that cannot be effectively procured and managed through a pre-positioned contract
- Create a system to gain access to staff or professional services with appropriate training and recent experience in FEMA and HUD grant management to support compliance and reimbursement
- Partner with other agencies of cities that may not be affected by a large-scale King County disaster. This mutually beneficial partnership would include enabling King County access to the partnering agency's FEMA compliance contracts under emergency situations via a cooperative purchasing agreements.

King County Procurement and WTD should review existing contracts to assess the ability to meet emergency needs and comply with FEMA and HUD contacting requirements. WTD should also focus on identifying additional contracting requirements through the implementation of a work group that analyzes procurement needs/gaps and recommends solutions that fill those needs/gaps and aligns with processes. Significant gaps that occur between the contracting process and field expectations typically result in negative recovery impacts that should be minimized or avoided. The COOP planning process, recommended above, should identify essential functions that require procurement support. It is recommended that the work group have appropriate representatives from operations, engineering, and project management to assess needs and the likely effectiveness of any proposed solutions. The use of a tabletop exercise is recommended to assess needs from a capability and capacity standpoint as well as look at recent lessons learned from hurricanes Matthew, Irene, Harvey, and Maria in 2016 and 2017.

It is recommended that WTD use the following suggested list of contract categories to consider during the evaluation:

- Professional Services – Engineering, science, and staff augmentation to meet design, resident engineering, environmental compliance, and construction management service needs. Other needs could be administrative, IT, grant management, site security, and other office professionals working in various parts of WTD.
- Construction – General contracts that can repair the various types of facilities including architectural, civil, structure, electrical, plumbing, and mechanical repair capabilities. Ability to remove debris, repair roads, restore power, and rebuild the various facilities that WTD operates. Specialty contractors may be required to address waste disposal, hazardous materials, and abatement/remediation services.
- Logistics – Transportation, housing, temporary office space, food, water, fuel, emergency generators, fencing, access control, temporary pumps, and so on.
- Supplies and Materials – Specialty process equipment, electro-mechanical equipment, piping, replacement pumps, and so on.

WTD should look to the County and other utilities for processes and example contracts to support this effort. This would result in some efficiencies and reduced workload associated with development of each procurement. It is also recognized that during a federally-declared disaster some resources will become available through the Emergency Management Assistance Compact (EMAC) mutual aid agreements and various agencies assigned with the execution of specific Emergency Support Functions (ESF) as designed via NIMS. During large-scale disasters, a WTD representative would be involved in working with King County Emergency Management staff, enabling the request and/or coordination of additional resources.

King County Strategy Steward/Leadership: Operations/Project Management, and Project Control and King County Procurement. This work would likely include involvement of the County's Finance and Business Operations Division.

Advantages:

- Improved response and recovery capabilities
- Compliance with grant reimbursement requirements

MITIGATION CONCEPT SUMMARY

- Effective cost recovery

Disadvantages:

- Internal staff time required to scope and award contracts
- Some internal staff time required to manage contracts that may only be activated in the case of a large event.

Main Benefit:

- Improved organizational resiliency and reduced disruption associated with events

Discussion of Schedule:

- Key Milestones:
 - Form workgroup and develop approach
 - Identify, develop, and award contracts
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

Discussion of Risk:

Not Applicable

Assumptions and Calculations:

Total cost of implementation is unknown until the number and nature of new contract vehicles or modifications to existing contract mechanisms required to implement the recommended strategies and associated plans has been assessed. The mitigation concept-level cost estimate includes the following assumptions:

Direct Costs:

- Implementation Work Group – Assume 1% of workload

Indirect Costs:

- Project Contingency – Assume 10%
- Misc. Service and Materials – Assume 0.3%

MITIGATION CONCEPT SUMMARY
Concept-Level Cost Estimate (E-4)

Estimate - AACEI Class 5					
Concept Title:	Contracts and Procurement	Date:	2/21/2018		
Location:	Multiple Locations	Estimator:	Eric Benton. CPE		
Description:		Idea Code:	E-4		
DIRECT: SUBTOTAL COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1	Implementation Work Group	312	HRS	\$ 150	\$ 46,800
2					\$ -
3					\$ -
4					\$ -
5					\$ -
6					\$ -
7					\$ -
8					\$ -
Subtotal Costs					\$ 50,000
INDIRECT COSTS					
	Design and Construction Consulting				n/a
	Other Consulting Services				n/a
	Permitting & Other Agency Support				n/a
	Right-of-Way				n/a
	Misc. Service & Materials			\$	150
	Non-WTD Support				n/a
	WTD Staff Labor				n/a
	Subtotal Indirect Costs			\$	50,150
	Project Contingency			\$	5,015
	Initiatives				n/a
TOTAL INDIRECT COSTS					\$ 55,000
TOTAL PROJECT COST					\$ 55,000

Notes:

Given the highly conceptual nature of the mitigation concepts, the estimating team used an AFI of 40%.

The costs represented in this document are Opinions of Probable Cost provided by the Engineering Team. The accuracy of the associated cost estimate is dependent upon the various underlying assumptions, inclusions, available information, and exclusions described herein.

Actual project costs may differ and can be significantly affected by factors such as changes in the external environment, the manner in which the project is executed and controlled, material labor cost increases, competitive bidding methods, market conditions, and other factors that may impact the estimate basis or otherwise affect the project. Estimate accuracy ranges are only assessments based upon the cost estimating methods and data employed in preparing the estimate and are not a guarantee of actual project costs.

MITIGATION CONCEPT SUMMARY

Issue No. E-5	Issue Title WTD Would Benefit from Additional System Monitoring and Communication System Capabilities to Adequately Support Response and Recovery Activities	Priority Rating B
Idea Code E-5	Concept Title System-Wide Information, Communication and Documentation	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below)	<input checked="" type="checkbox"/> MEP	<input checked="" type="checkbox"/> Public Health
South Treatment Plant	<input checked="" type="checkbox"/> SCADA	<input checked="" type="checkbox"/> Consequent Damages
	<input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume
		<input checked="" type="checkbox"/> Equity and Social Justice
		<input checked="" type="checkbox"/> System Downtime
		<input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input type="checkbox"/> < \$1M
	<input checked="" type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

WTD lacks sufficient staff to quickly visually observe the overall system to identify damage or impacts after a large-scale event. WTD's staff have indicated that the communication system is built on older technology, has redundancy issues, has server data and communication bandwidth limitations, and could more efficiently disseminate information to the required individuals. Improving the technology used to connect critical remote sites such as certain pump stations and CSO facilities into the overall system while improving current redundancy issues would allow the overall system to be used for visual observation to identify damage and/or impacts.

Risk if not Addressed:

- Key system impacts after an event may not be found quickly
- WTD staff may have to inspect dangerous locations that could otherwise be remotely monitored
- Lack of sufficiently robust communication backbone reduces ability to collect and send critical data to assess system performance

MITIGATION CONCEPT SUMMARY

Description of Mitigation Concept:

The challenge with making significant changes to the effectiveness of communications and documentation systems is the cost of new technology and its installation. WTD has been monitoring technological advances, but at this time has concluded that the value provided by a system-wide revision is not apparent given the low return on investment and the likelihood that communication lines would even be operable immediately following a major event considering power and telecommunication outage probabilities. For this reason, it is recommended that WTD continue to monitor technological advances in communication, SCADA, and documentation systems to identify opportunities to improve the system in use based on return on investment and likelihood of operability of supporting resources. Potential actions upon finding the suitable ROI point include the following:

- Continue consideration of a communication system with redundancy for additional system monitoring to improve situational awareness and provide additional sensors in the conveyance system at critical points likely to sustain damage in a major event. Refer to earlier WTD studies of communication alternatives and update with new findings to identify two independent communication technologies for replacing the existing system, which currently involves all remote sites to the wastewater treatment plants.
- Recognizing that various groups at WTD are currently in the process of responding to recommendations from the July 2017 AECOM independent assessment of the WPTP flooding incident, it is recommended that a more coordinated effort be conducted for the consideration of a monitoring system that includes installation of sensors to measure flow and other critical parameters indicating system impacts and expected performance. Communication system improvements could be aligned with these sensors to enable the transmission of data to a control center or other unit to allow timely data collection and processing. These sensors could be near real time (i.e., information transmitted may be delayed a few seconds to a few minutes depending on settings and other factors) and protect WTD employees from having to enter unsafe structures or areas too risky to visually observe. During normal daily operations, these sensors and an improved communication system would result in savings associated with operational and system administration activities and improve overall performance. The ability to detect high or abnormal flow may improve the ability to mitigate damage associated with flooding or related events (e.g., the earlier detection of significantly increasing flows would enable plant operators to facilitate overflow or bypass procedures before negative impacts occur inside the plant). These new sensors would need to be integrated into the overall system operations, including prioritization of alarms.
- Consider providing a mechanism through software to better disseminate data to designated users remote to the wastewater treatment plants. Collect and maintain facility condition assessment information and maintenance data to reasonably prove damage caused by the event to support claims and reimbursement management. This includes design and as-built drawings, GIS inventory files, condition assessment data, and maintenance records for existing facilities that are organized and readily accessible. Additional resources may be required to conduct assessments and consistently update the documents detailing the current state. For example this applies to facilities manuals, as-builts, on-line diagrams, and so on. This strategy's implementation should recognize existing activities currently underway by WTD Asset Management regarding advancement of the current document management system and efforts to create synergy across all of these information sources and systems (GIS with MainSaver and CCTV, etc.).
- When researching communication system improvements, consider the ability to integrate WTD systems with earthquake early-warning systems under development such as *ShakeAlert: An Earthquake Early Warning System for the West Coast of the United States*, and their partners.

While continuing to monitor communications, SCADA, and documentation technology for an opportunity to maximize ROI, it is suggested that the County develop specifications for opportunistic improvements in the system related to repair and replacement activities. These specifications would allow the County the option to perform upgrades among facilities using compatible products, resulting in consistent training of maintenance staff and efficient sourcing and warehousing of replacement components.

MITIGATION CONCEPT SUMMARY

Note that this concept summary has similarities and may overlap with the Task 600 Resiliency Recommendations report and another current consultant project. Both areas of overlap are noted as follows:

1. See Task 600 Resiliency Recommendations Concept (Project ID SP-4 Evaluate Seismic Monitoring Technologies in Appendix C, Attachment D-1): Improve System-Wide communication technology to facilitate timely and robust information exchange and system control.
2. See King County On-Call Technical Review Contract with HDR, Work Order 11 – Operations Record Drawing and Plant Drawing Management: Collect and maintain facility condition assessment information and maintenance data to reasonably prove damage caused by the event to support claims and reimbursement management. This includes design and as-built drawings, GIS inventory files, condition assessment data, and maintenance records for existing facilities that are organized and readily accessible.

The formation of a work group to address this mitigation concept should include staff from Operations, GIS, Engineering, and Asset Management. This work should align with the WTD Asset Management group's planned activities and ideally be integrated into their overall system to drive efficiencies and consistency of information. Additionally, this data should feed respective operational controls staff and leadership for monitoring.

It is not expected nor likely necessary to install sensors or improved communication upgrades everywhere, all at once, to achieve the intent. Rather, consideration should be given to program the installation of sensors and communication system upgrades over a longer period of time. This approach should focus on leveraging both capital and O&M project funds to systematically improve WTD's ability to collect data. Sections of conveyance piping and specific facilities that have been determined to incur a high likelihood of damage because of a seismic or flood incident should be prioritized for monitoring. Sensor placement can then be scheduled based on budget and the planning of construction or repair activities. Consideration regarding the ability to visually observe conveyance piping or key underground structures should also play into the prioritization decision. Communication system improvement should align with data collection requirements and critical operational tasks.

During an event, the data generated from the sensors along with other SCADA information would need to be collected and analyzed in a timely manner. The analysis should be provided to Operations and the incident commander for action, and should include prioritization of damage assessment assignments and repairs.

Damage Assessment teams may leverage this information during site visits to support their observations and activities. In addition, these sensors would provide additional information following reconstruction regarding system performance and the adequacy of the repairs.

In the recovery phase, this information would become valuable to the Emergency Recovery Working Group in monitoring the progress of construction projects and their impacts on the overall system's performance. Indications of other previously undetected repair needs or issues could also surface through tracking and analysis of this data. It is recognized that some types of failure modes take extended periods of time to manifest or might be masked until upstream flows are corrected. Remote sensing and data analysis would likely aid in detection of continuing failures and/or areas that failures occurred, but were simply not observable prior to receiving flow.

King County Strategy Steward/Leader: (Name TBD by WTD), Operations, GIS, Engineering, Asset Management, Modeling, Conveyance Inspection, and Flow Monitoring

Advantages:

- Improved daily operations and system resiliency
- Reduction of site visits to hazardous areas
- Near real-time monitoring of system performance and event impacts
- Greater ability to monitor and control the system at large

MITIGATION CONCEPT SUMMARY

- Improved ability to mitigate impacts following or during a large storm event
- Improved documentation which supports the ability to obtain timely fiscal reimbursement associated with various grant programs or insurance claims.

Disadvantages:

- Constantly changing technology
- System maintenance requirements and possibility of failures

Main Benefit:

- Improved resiliency and reduced risks
- WTD currently has the ability to gain situational awareness after an event. This recommendation will improve that process and capability. Additional requirements will be surfaced through other resiliency studies, planned projects, and recommended COOP planning activities.

Discussion of Schedule:

- Key Milestones:
 - Form workgroup and develop approach
 - Acquire and install equipment
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

Discussion of Risk:

The implementation of technology has risk associated with the potential to become obsolete as the industry innovates. The technology may become obsolete, and retrofitting may be required to update installed equipment or software. This potential for obsolescence should be considered by the workgroup during the selection of solutions.

Installation of new equipment or systems will require training and O&M. These costs should be offset through improved operation efficiencies and savings.

Assumptions and Calculations:

The mitigation concept-level cost estimate includes the following assumptions:

- WTD would procure and install the new equipment using internal staff working over multiple years and through new projects.
- Costs are primarily associated with procurement of communication and sensor equipment which is estimated by WDT staff to be around 1 million dollars* in total. Cross-reference the Task 600 *Resiliency Recommendations* report concept (Project ID SP-4 Evaluate Seismic Monitoring Technologies in Appendix C, Attachment D-1) for discussion of research enabling selection of the proper technologies.
- Condition assessments and asset management documentation would be addressed through in-house staff over a multiple-year process. This may require additional staff in the WTD Asset Management program to support this ongoing and reoccurring activity. Ideally, this increased asset management staffing costs would be offset through operational cost saving associated with improve work efficiencies.

**No separate Concept-Level Cost Estimate was prepared for this general estimation by WTD staff.*

MITIGATION CONCEPT SUMMARY

Issue No. E-6	Issue Title Fiscal Risks of a Large-Scale Event	Priority Rating C
Idea Code E-6	Concept Title Financial Risk Management	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below) South Treatment Plant	<input checked="" type="checkbox"/> MEP <input checked="" type="checkbox"/> SCADA <input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Public Health <input checked="" type="checkbox"/> Consequent Damages <input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume <input checked="" type="checkbox"/> Equity and Social Justice <input checked="" type="checkbox"/> System Downtime <input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input checked="" type="checkbox"/> < \$1M
	<input type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

WTD may not have appropriate fiscal mitigation strategies and tools in place to address risks associated with large-scale disaster.

The cash flow associated with a large federally-declared disaster event is immense, and may require several hundred million to over a billion dollars to get through the recovery process. Federal grants take time and require WTD to first spend funds to receive reimbursement, placing stress on cash reserves. Generally, costs must be incurred, or at least obligated, prior to eligibility under FEMA guidelines. It takes a substantial amount of time for county, state, and federal agencies to validate and process FEMA project worksheets, further delaying reimbursement. A simple error can cause months of delay to resolve. During large events, FEMA simply does not have the resources to quickly process requests, as evident in the delays associated with recent hurricanes and flooding.

Risk if not Addressed:

WTD may not have appropriate fiscal mitigation strategies and tools in place to address risks associated with a large-scale disaster.

MITIGATION CONCEPT SUMMARY

Description of Mitigation Concept:

Reimbursement payments, whether associated with an insurance claim or a federal grant program, are directly related to the ability to provide the appropriate documentation and evidence to justify the release of funds. This includes documentation of eligibility and compliance with policy and/or grant program requirements. Leveraging industry expertise to support claims management and reimbursement is prudent when dealing with large and/or complex situations.

It is suggested that a work group be formed to analyze the potential cash obligations associated with an event and understand reimbursement timelines. A model event may help this analysis, combined with looking back at historical claims to gain insights. Inclusion of outside experts to support the session may be required to identify and analyze various financial instruments, risk management strategies and policies WTD may consider through this process. Clear processes and policy should be in place to guide activities in a manner that enables federal reimbursement.

King County Strategy Steward/Leader: Project Management, Finance, Project Control

Advantages:

- Clear analysis and inventory of available fiscal resources in the face of a disaster
- Increased understanding of reimbursement timelines
- Ability to implement strategies that insure adequate resources are available to support response and recovery activities

Disadvantages:

- Potential highlighting of several areas of concern where risks are difficult to mitigate or manage

Main Benefit:

- Improved organizational Resiliency and ability to drive timely recovery activities

Discussion of Schedule:

- Key Milestones:
 - Develop workgroup and conduct workshops
 - Implement workshop recommendations
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

Discussion of Risk:

Not Applicable

Assumptions and Calculations:

The cost associated with mitigation are limited to task one in the schedule which is focused on conduct of a workshop and development of mitigation strategies. The mitigation concept-level cost estimate includes the following assumptions:

Direct Costs:

- Implementation Work Group – Workshop; 2 days for 10 COOP Managers
- Costs are primary associated with the need for some external consulting around calculation of risks, cash flow analysis, mitigation strategies and fiscal instruments or insurance products.

MITIGATION CONCEPT SUMMARY

Indirect Costs:

- Project Contingency – Assume 10%
- Misc. Service and Materials – Assume 0.3%

Concept-Level Cost Estimate (E-6)

Estimate - AACEI Class 5					
Concept Title:	Financial Risk Management			Date:	2/22/2018
Location:	Multiple Locations			Estimator:	Eric Benton, CPE
Description:				Idea Code:	E-6
DIRECT: SUBTOTAL COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1	Implementation Work Group	160	HRS	\$ 150	\$ 24,000
2	Coaching/Mentoring (Consultant)	240	HRS	\$ 210	\$ 50,400
3					
4					
5					
6					
7					
8					
Subtotal Costs					\$ 70,000
INDIRECT COSTS					
Design and Construction Consulting					n/a
Other Consulting Services					n/a
Permitting & Other Agency Support					n/a
Right-of-Way					n/a
Misc. Service & Materials					\$ 210
Non-WTD Support					n/a
WTD Staff Labor					n/a
Subtotal Indirect Costs					\$ 70,210
Project Contingency					\$ 7,021
Initiatives					n/a
TOTAL INDIRECT COSTS					\$ 77,000
TOTAL PROJECT COST					\$ 77,000

Notes:

Given the highly conceptual nature of the mitigation concepts, the estimating team used an AFI of 40%.

The costs represented in this document are Opinions of Probable Cost provided by the Engineering Team. The accuracy of the associated cost estimate is dependent upon the various underlying assumptions, inclusions, available information, and exclusions described herein.

Actual project costs may differ and can be significantly affected by factors such as changes in the external environment, the manner in which the project is executed and controlled, material labor cost increases, competitive bidding methods, market conditions, and other factors that may impact the estimate basis or otherwise affect the project. Estimate accuracy ranges are only assessments based upon the cost estimating methods and data employed in preparing the estimate and are not a guarantee of actual project costs.

MITIGATION CONCEPT SUMMARY

Issue No. E-7	Issue Title WDT Needs a Mechanism to focus Dedicated Resources to Effectively Manage Recovery Projects Associated with a Large Scale Event	Priority Rating A
Idea Code E-7	Concept Title Emergency Recovery Working Group	Dev. Team 11/1/2017 Meeting

Mitigation Type	Discipline (check as many as apply)	Criticality Concern (check as many as apply)
<input checked="" type="checkbox"/> System-Wide	<input checked="" type="checkbox"/> Structural	<input checked="" type="checkbox"/> Life Safety
<input type="checkbox"/> Site Specific (list site below) South Treatment Plant	<input checked="" type="checkbox"/> MEP <input checked="" type="checkbox"/> SCADA <input checked="" type="checkbox"/> Natural Hazards	<input checked="" type="checkbox"/> Public Health <input checked="" type="checkbox"/> Consequent Damages <input checked="" type="checkbox"/> Environment
		<u>Other:</u> <input type="checkbox"/> Flow Volume <input checked="" type="checkbox"/> Equity and Social Justice <input checked="" type="checkbox"/> System Downtime <input type="checkbox"/> (Describe here)

Estimated Concept-Level Cost:	<input checked="" type="checkbox"/> < \$1M
	<input type="checkbox"/> \$1M to \$5M
	<input type="checkbox"/> \$5M to \$10M
	<input type="checkbox"/> > \$10M

Description of Existing Issue:

WTD does not use a centralized approach to managing a large reconstruction effort following a large-scale disaster.

Management of recovery operations following a large event offers significant challenges to any agency or utility. Recovery and reconstruction activities may take years to complete, with reimbursement extending this timeline depending on the complexities associated with the projects. Even small events can tie up critical staff for extended periods of time managing design, repairs and/or construction aspects of the project. Efficient management of reconstruction activities is critical to returning the system to normal operations, restoration of full services, and controlling recovery costs. The ability to comply with complex grant management guidelines and maintain appropriate documentation is key through project close-out.

The normal demands associated with operating a large complex wastewater treatment system are never-ending. Staff have full-time positions prior to the event and those same demands will return quickly after the event subsides and customers return. To that end, staff working under a focused structure designed to drive restoration projects is a key success factor in meeting anticipated demands. The *Department of Natural Resources and Parks (DNRP) Continuity of Operations Plan (2017 DNRP COOP)*, Phase IV, pages 26–27, provides limited guidance on establishing a structure to address response and recovery activities. The document provides a list of responsibilities, some of which are recovery. Additional

MITIGATION CONCEPT SUMMARY

planning and focused training regarding assigned recovery responsibilities would enable designated staff to meet the identified recovery responsibilities outlined in the *2017 DNRP COOP*.

Risk if not Addressed:

- No centralized mechanism for recovery operations management within WTD
- Reduced organizational efficiency and prolonged reduction of service capabilities
- Loss of cost recovery opportunities and potential compliance risks

Description of Mitigation Concept:

The activation of an Emergency Recovery Working Group represents a strategy for WTD to implement to improve recovery operations following a large-scale event. This Working Group would form the structure that could also be used to manage smaller events at the discretion of the Division Director. Activation of the Emergency Recovery Working Group on smaller, but more frequent events would help build and maintain key reconstruction core skill sets and processes as well as provide a scalable operational structure.

It is recommended that WTD consider the following steps:

- Establish an Emergency Recovery Working Group to manage recovery activities and drive system-wide restoration around the following 3 main areas:
 - Operations & Maintenance
 - Engineering and Technical Support
 - Finance/Administration

Significant effort would be required to align the Emergency Recovery Working Group with existing processes outlined in various documents including the ERPs, COOP, and related operational plans. This type of work requires an implementation team to support the organization, authorization, and activation of this new structure. Consideration would be required around possibilities to activate and operate the Emergency Recovery Working Group, as well as clear mechanisms to assign a WTD leader to manage the operation.

The implementation team would address the guidance provided in the *2017 DNRP COOP*, pages 26--27. The implementation team should focus on developing an Emergency Recovery Working Group that accomplishes the recovery related responsibilities called out in the document. Ideally the responsibilities associated with Phases I through III of the COOP should be addressed through other mechanisms, documents and processes.

The Emergency Recovery Working Group is further detailed in Appendix B: Emergency Recovery Working Group Concept of Operations of this Task 500 *Preparedness and Recovery Recommendations* report.

King County Strategy Steward/Leader: (Name TBD by WTD), Operations, Project Management, WTD Management, Directors Office

Advantages:

- Improved resiliency and recovery schedule
- Ability to scale a recovery based on impacts and needs
- Improved compliance and reimbursement associated with grants and insurance claims
- Centralized management to insure resources are focused on WTD priorities and realization of efficiencies

MITIGATION CONCEPT SUMMARY

Disadvantages:

- Staff pulled away from other duties
- Advanced planning required

Main Benefit:

- Primary strategy to improving WTD recovery capacity and capabilities to reconstruct severely damaged facilities and/or address the influx of numerous smaller project that overwhelm WTD resources

Discussion of Schedule:

- Key Milestones:
 - Form implementation team and develop management plan
 - Appoint staff to the Emergency Recovery Working Group
 - Conduct training and exercises
- Approximate Schedule for Discrete Subtasks: to be determined by WTD after evaluation of resource availability

Discussion of Risk:

Not Applicable

Assumptions and Calculations:

The mitigation concept-level cost estimate addresses task one of the schedule and includes the following assumptions:

Direct Costs:

- Implementation Team – Capital Project Group; assume 10% of workload
- Coaching/Mentoring (Consultant) – Assume 10% of workload, 3 consultants

Indirect Costs:

- Project Contingency – Assume 10%
- Misc. Service and Materials – Assume 0.3%

MITIGATION CONCEPT SUMMARY
Concept-Level Cost Estimate (E-7)

Estimate - AACEI Class 5					
Concept Title:	Office of Recovery	Date:	2/22/2018		
Location:	Multiple Locations	Estimator:	Eric Benton, CPE		
Description:		Idea Code:	E-7		
DIRECT: SUBTOTAL COSTS					
Item No.	Item Description	Quantity	Units	Unit Cost	Item Cost
1	Implementation Team	520	HRS	\$ 150	\$ 78,000
2	Coaching/Mentoring (Consultant)	312	HRS	\$ 210	\$ 65,520
3					
4					
5					
6					
7					
8					
Subtotal Costs					\$ 140,000
INDIRECT COSTS					
	Design and Construction Consulting				n/a
	Other Consulting Services				n/a
	Permitting & Other Agency Support				n/a
	Right-of-Way				n/a
	Misc. Service & Materials			\$	420
	Non-WTD Support				n/a
	WTD Staff Labor				n/a
	Subtotal Non-Construction Costs			\$	140,420
	Project Contingency			\$	14,042
	Initiatives				n/a
TOTAL INDIRECT COSTS					\$ 154,000
TOTAL PROJECT COST					\$ 154,000

Notes:

Given the highly conceptual nature of the mitigation concepts, the estimating team used an AFI of 40%.

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Actual project costs may differ and can be significantly affected by factors such as changes in the external environment, the manner in which the project is executed and controlled, material labor cost increases, competitive bidding methods, market conditions, and other factors that may impact the estimate basis or otherwise affect the project. Estimate accuracy ranges are only assessments based upon the cost estimating methods and data employed in preparing the estimate and are not a guarantee of actual project costs.