RESOLUTION 23-06

A RESOLUTION OF THE SOUTH WEBER CITY COUNCIL ADOPTING A MULTI-HAZARD MITIGATION PLAN

WHEREAS, Council sought after and was awarded a Building Resilient Infrastructure and Communities (BRIC) grant from the Federal Emergency Management Agency (FEMA) to aid in creation of a multi-hazard mitigation plan; and

WHEREAS, Elwell Consulting Group was hired to assist the city in developing the plan; and

WHEREAS, for the past year staff has worked through planning, risk assessment, and mitigation strategy to create a Multi-Hazard Mitigation Plan; and

WHEREAS, the draft plan was submitted to the state of Utah and after their review, the plan was then revised to address a few comments into the Final Multi-Hazard Mitigation Plan contained in Exhibit 1 which satisfied the state on meeting local hazard mitigation plan requirements; and

WHEREAS, the final step is acceptance and adoption of the finalized Multi-Hazard Mitigation Plan by Council to then be given to FEMA for their final review and approval;

NOW THEREFORE BE IT RESOLVED by the Council of South Weber City, Davis County, State of Utah, as follows:

Section 1. Adoption: The Multi-Hazard Mitigation Plan contained in Exhibit 1 is hereby adopted subject to FEMA's approval allowing for minor changes as needed.

Section 2: Repealer Clause: All ordinances or resolutions or parts thereof, which are in conflict herewith, are hereby repealed.

PASSED AND ADOPTED by the City Council of South Weber, Davis County, on the 28th day of February 2023.

Roll call vote is as follows:		
Council Member Halverson	FOR	AGAINST
Council Member Petty	FOR	AGAINST
Council Member Soderquist	FOR	AGAINST
Council Member Alberts	FOR	AGAINST
Council Member Dills	FOR	AGAINST

DAVIS COUNTY, UTAH * SEAL * OFFICIAL * 1961 * SOUTH WEBER CITY *

Rod Westbroek, Mayor

Attest: Lisa Smith, Recorder

EXHIBIT 1

MULTI-HAZARD MITIGATION PLAN

FINAL
Multi-Hazard Mitigation Plan

Prepared for

South Weber City

1600 E. South Weber Dr.

South Weber, Utah 84405

February 13, 2023

Prepared by:
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(801) 870-9709

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Section 1 Introduction

South Weber City (SWC) is a local government jurisdiction of the State of Utah located in northern Davis County near the mouth of Weber Canyon in the foothills of the Wasatch Front Mountains. SWC was initially settled in 1851 and was incorporated in 1938, and on 16 March 1971, with the population of 1,073, became a third-class city (see https://southwebercity.com/city-history/). The estimated population as of July 1, 2021, is 8125 (see https://www.census.gov/quickfacts/southwebercityutah).

Excerpts from the SWC General Plan Update 2020 provide the following information:

SWC's geographic location buffers the community from surrounding urban areas. Nestled in the Weber River drainage basin, the community is separated from neighboring cities by I-84 and the Weber River to the north, high bluffs to the south, the Wasatch Mountains to the east and a narrow band of land between the freeway and the bluff to the west. This geography gives the community a distinct advantage in maintaining a clear identity….

LAND USE: Historically an agricultural area, SWC has transformed into a predominantly residential community. Agricultural land that once provided the rural small-town character is being developed, primarily into housing. The community is shifting away from preserving agricultural land to ensuring there is enough open space for adequate recreational opportunities. Additionally, there is a focus to promote SWC as a gateway to many outdoor recreational opportunities, with specific attention given to Weber Canyon and the Weber River.

POPULATION: One of the major factors contributing to changes in the community is increased population. As population rises so does the amount of land devoted to residential use. The demand for municipal services, i.e., police, fire, water, sewer, etc. increases, thus creating a strain on city resources. It is impossible to predict changes in the population, but we can get an idea of the final buildout population through making some reasonable projections by analyzing past growth…and arrive at a potential build-out dwelling unit count of 3,316. The most recent persons per household number for SWC is 3.89…. Multiply that by the build-out dwelling unit count and you arrive at a build-out population of 12,900. At an average growth rate of 3 percent per year, build out will take approximately 20 years.

ENVIRONMENTAL CONDITIONS: There are several known natural and human caused environmental hazards in SWC. Natural hazards include earthquakes, fire, high wind, flooding, and landslides. Human caused hazards are associated with the two gravel pits, the Davis and Weber Counties Canal that runs the entire length of SWC from the east end to the west end with potential for flooding….

The SWC mission and vision are to:

- Mission - SWC's mission is to facilitate neighborhood connection, honor our heritage, ensure a safe haven for families, provide sustainable municipal services, and develop a community with a heart.
- Vision - A family-focused community, driven by heritage, safety, and charm at its heart.

SWC's mission and vision were used during the Multi-hazard Mitigation Plan (MMP) planning process to develop the following four mission criteria with definitions for use in prioritizing and ranking SWC's key critical assets (See Section 3.4.1Pair Wise Comparison):

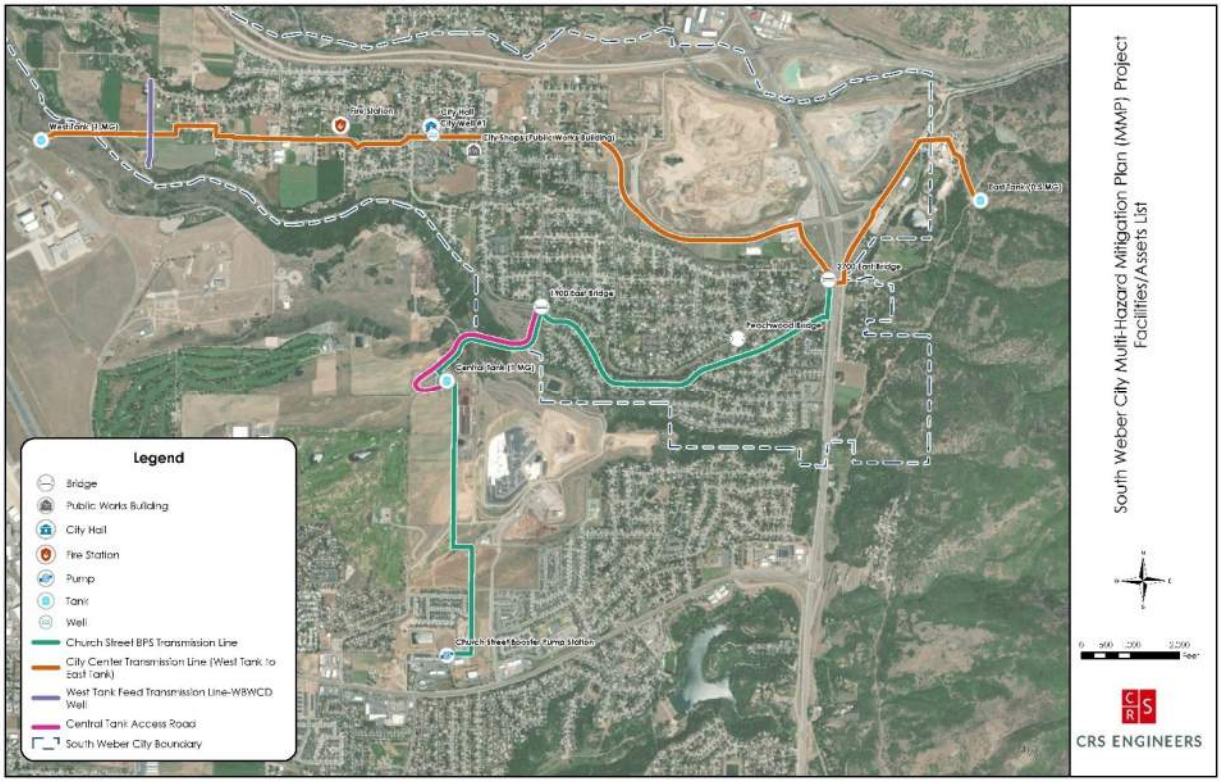
1. Reliability—Provide reliable and sustainable municipal services to our community.
2. Quality of Life—Maintain local natural environment and landscape to promote heritage, neighborhood connection, and heart for our community.
3. Safety—Ensure employee and public safety from injury/illness/deaths.

4. Stewardship—Efficient and cost-effective management of municipal/public assets (i.e., costs, property, value, employees, customers, etc.).

1.1 SWC's Key Assets

SWC's key critical assets consist of several different types of assets that were grouped into the following five facility groups: 1) city buildings, 2) water system, 3) stormwater/flood control facilities and parks, 4) sanitary sewer system, and 5) roads (main arterial and city access roads/highways). A map of SWC with the top 15 SWC key assets is shown in Figure 1-1.

Figure 1-1 SWC Key Assets and City Boundaries



SWC's primary types of facility groups with their key critical assets inventory that will be identified for potential assessment in this MMP are shown in Table 1-1.

Table 1-1 Facility/Asset Types

Facility Groups	Assets Inventory
City Buildings	City Hall City Shops (Public Works Building) Family Activity Center Fire Station
Water System	East Tank – concrete water tank (0.5 million gallons (MG)) West Tank – concrete water tank (1.0 MG) Central Tank – concrete water tank (1.0 MG) City Well #1 Church Street Booster Pump Station (BPS) Water Transmission Lines Water Distribution Lines
Stormwater/Flood Control Facilities and Parks	Memorial Park/Detention Basin Old Maple Farms Detention Basin Cherry Farms Park/2020 East Detention Basin Canyon Meadows Park/Detention Basin
Sanitary Sewer System	Collection system sewer mains Sewer interceptor to Central Weber Sewer Improvement District (CWSID) Sewer Lift Station (Cottonwood Drive)
Roads – Main Arterial	South Weber Drive (Utah Department of Transportation (UDOT) jurisdiction) 475 East 1900 East/Deer Run Drive 2100 East Old Fort Road 2700 East
Roads – City access roads/highways	Interstate 84 (UDOT jurisdiction) U.S. 89 (UDOT jurisdiction)

Next, an overview of some of SWC's facility group assets is presented in the following paragraphs.

City Buildings

There are four primary city buildings in SWC's inventory:

1. City Hall: The City Hall building is a structure consisting of several different material types. Some walls are concrete, some are block, and some are wood framed. The building serves to house the city administration as well as serve as a court. It has previously been used for several different commercial enterprises. SWC began using the building in 1984.
2. City Shops (Public Works Building): Multiple buildings serve as the public works shop. There is a large steel framed building serving as a shop as well as a smaller shed roof style steel building used as storage. The smaller building has been partitioned into multiple wood framed sections with shelves for storing materials. The main public works shop was constructed in the first half of the 20th century by Job Corps employees.
3. Family Activity Center: This is a resource shared jointly with the Davis School District. It is a block building with a large gymnasium and several small meeting rooms located at 1183 East Lester Drive.

4. Fire Station: Located at 7365 S. 1375 E. and built in 2004, the structure is a masonry wall building with wood framing for the roof system. There are three drive-through bays. An upgrade to the driveway and other site improvements was completed in 2022.

Water System

The SWC water system consists of three water storage tanks, one well, one booster pump station (BPS), and miles of water transmission and distribution lines for providing culinary water service to the citizens of SWC. SWC's primary water supply is purchased from Weber Basin Water Conservancy District (WBWCD), with SWC's one well providing limited backup to the WBWCD water supply.

5. The East Tank is a concrete tank having a capacity of 500,000 gallons. The tank stores culinary water. There are no known existing plans for the tank, but the 2017 water conservation plan by Jones and Associates states it was approximately 35 years old meaning it would have been built in the early 1980s.
6. The West Tank is a concrete structure having a 1 MG capacity and is used to store culinary water. The tank diameter is 105 feet on the interior. The roof is supported by 24 interior concrete columns. The tank is understood to have been built in the 1950s (see Jones & Associates Condition Assessment of Existing Reservoir Westside Water Reservoir Project dated October 5, 2016). Repairs to wall/floor joint were made circa 2014.
7. The Central Tank access road is an un-paved road gated off to the public. The road was constructed as part of a waterline project circa 2010. There is a 12-inch diameter ductile iron pipe (DIP) drinking waterline and a 15-inch diameter reinforced concrete pipe (RCP) drain line located in the roadway. The road is cut into the hillside and runs on a 14% grade. The road surface is untreated base course.
8. City Well #1 - Backup well is seldom used since nearly all SWC's water supply is purchased from WBWCD. The facility is a block structure, is supported by a water right for 0.55 cfs and 398.19 acre feet per year, is 350 feet deep, has an 8-inch diameter casing, and includes pumping equipment.
9. Church Street BPS is a block structure that pumps 700 gallons per minute (gpm) that is used to fill the Central Tank. The primary source of water for the BPS is WBWCD's nearby reservoir,
10. Water transmission lines.
11. Water distribution lines.

Stormwater/Flood Control Facilities & Parks

12. Memorial Park/Detention Basin can store up to 7-acre feet and is located at 1900 E. South Weber Drive.
13. Old Maple Farms Detention Basin can store up to 6.4-acre feet and is located at 285 Kingston Drive.
14. Cherry Farms Park/2020 East Detention Basin can store up to 2.59-acre feet and is located at 2100 E 8100 S.
15. Canyon Meadows Park/Detention Basin can store up to 1.64-acre feet and is located at 6650 S. 475 E.

Sanitary Sewer System

SWC provides operation and maintenance (O&M) for the sanitary sewer collection system and Central Weber Sewer Improvement District (CWSID) provides treatment of wastewater.

16. Sanitary sewer collection system mains.

17. Sanitary sewer interceptor to CWSID
18. Sanitary sewer lift station at Cottonwood Drive serves 7 homes.

Roads

19. Main arterial roads:
    a. South Weber Drive (Utah Department of Transportation (UDOT) jurisdiction)
    b. 475 East
    c. 1900 East
    d. 2100 East
    e. Deer Run Drive
    f. Old Fort Road
    g. 2700 East
20. City access roads/highways:
    a. Interstate 84 (UDOT jurisdiction)
    b. U.S. 89 (UDOT jurisdiction)

During the planning process, SWC selected the top 15 assets for risk assessment. These 15 key assets are shown on the asset location and hazard maps in Appendix A.

1.2 Past Development

SWC is largely built out on the eastern portion of the city, with the majority of the development potential existing on the western region. SWC has developed primarily as a single family "bedroom" community, converting agricultural land into single family subdivisions with substantial growth occurring in the 1990s into the 2000s.

SWC lies at the mouth of Weber Canyon along the Wasatch Mountain range. Because of its location, SWC's primary commercial tenants mine and distribute gravel and sand for the production of cement. The result of these operations has created large geologic depressions which limit future development potential in those areas. Other commercial development has occurred in SWC but is not a primary use identified within the SWC's General Plan Land Use Map. These areas have developed mainly near the Utah State Highway 89 interchange located in the eastern portion of SWC.

1.3 Future Development

The remnant agricultural lands have been identified in SWC's General Plan to be developed primarily as single family residential. SWC's population as of the 2020 census estimates 8,125 people. The projected buildout population is estimated to be 12,900 based upon the current projected land use map. Commercial growth within SWC is not projected to increase substantially.

SWC's General Plan has identified numerous environmental conditions that pose a threat to future development. Areas in which hazards exist are indicated on SWC's Sensitive Lands Map (see Appendix A). Areas that are identified within the map are subject to special provisions that are found within SWC's Land Use code. This code provides specific mitigation efforts and development standards to follow to minimize the impact of these hazards on new construction.

Geologic features in SWC's unique geographic location, provide various challenges to future growth. The southern border of SWC runs along the ridge of a plateau that has been created through natural

erosion of the sediment from historic Lake Bonneville. These areas have proven to be somewhat unstable resulting in numerous landslides throughout the years. Because of these hazards, the projected land use map indicates a large percentage of these areas to be designated as commercial recreational lands. Projects that are to be located on or near the hillsides are required to conduct and provide in-depth geotechnical reports to the land-use authority.

Because SWC is built in a river basin, high ground water tables and flood zones are present throughout the area. SWC has identified those areas as potential hazards. New construction within the area is subject to SWC code in dealing within potential flood zones. SWC's Flood Zone Manager actively monitors these requirements and developments that are proposed in those areas. Areas marked as wetlands are governed by the United States Army Corps of Engineers. As SWC continuously updates the capital facilities plan for storm water, a large emphasis is the effective containment of storm water surge.

The SWC Council created sensitive lands development regulations. The standards, guidelines, and criteria to be achieved by the overlay zone shall include, but not be limited to, the following: the protection of the public from natural and manmade hazards; the minimizing of the threat and consequential damages of fire in foothill areas by establishing fire protection measures; the preservation of natural features, wildlife habitat, and open space; the preservation of public access to mountain areas and the preservation of natural drainage channels; the preservation and enhancement of visual and environmental quality by use of natural vegetation and the prohibition of excessive excavation, terracing, and removal of natural vegetation; the establishment of traffic circulation facilities that ensure ingress and egress for vehicles including emergency vehicles into all developed areas at any time of the year with minimal cuts, fills, or visible scars; the encouragement of a variety of development designs and concepts that are compatible with the natural terrain of the foothill areas, that will preserve open space and natural landscape; the establishment of land use management criteria that will encourage protection of natural elements while allowing a harmonious and satisfying residential environment; the encouragement of regard for the view of the foothills, as well as the view from the foothills; and the determination of areas in SWC that, due to geologic hazards, may not be suitable for development, or may require engineering measures to reduce the hazards to an acceptable level.

Section 2 Planning Process

Preparation of this MMP was accomplished using a four-phase approach, which included:

Phase A Planning Process

Phase B Natural Hazard Risk Assessment

Phase C Mitigation Strategy Development

Phase D Plan Update and Adoption

Phase A, Planning Process, was used to define the planning process for the MMP and included several meetings (kickoff, planning team meeting #1, and asset prioritization) with SWC's planning team to complete the major elements of this phase. The planning process was reviewed, and the stakeholders list and outreach strategy were prepared for the public involvement program along with plan maintenance procedures.

During this phase, other existing plans and resources were also reviewed for use in the MMP's development. This includes, but is not limited to, the Utah Division of Emergency Management 2019 Utah State Hazard Mitigation Plan; the Davis County, Utah Pre-Disaster Mitigation Plan 2021 Update; the SWC General Plan Update 2020; and the SWC Corporation Water Conservation Plan (November 2017). These were reviewed to aid in the development of the MMP so that it meets the Federal Emergency Management Agency's (FEMA's) local hazard mitigation plan requirements.

The MMP also includes new facilities/assets not reviewed and assessed previously by SWC during development of the Davis County Pre-Disaster Mitigation Plan 2021 Update. Also, during the planning process, SWC's top 15 key assets were identified and prioritized based on SWC's mission specific criteria to determine their criticality.

A planning team meeting was held with SWC at the end of this phase to review all the Phase A tasks, followed by the stakeholder meeting #1 to solicit input, present the scope of work, and outline the schedule for the remaining phases of the development of the MMP.

Phase B, Natural Hazard Risk Assessment, included hazard identification and risk/vulnerability assessment. This was accomplished through tasks of identifying and profiling hazards, assessing vulnerabilities, and assessing consequences.

The assets identified and prioritized during Phase A were first screened at a risk screening workshop and then SWC selected 15 asset-hazard pairs during Phase B. Descriptions of the natural hazards affecting SWC's key assets are documented in Section 3 of the MMP including an analysis of how hazards vary across assets, location, and extent (severity) of each natural hazard affecting the facilities.

Previous hazard occurrences were also reviewed and documented. A two-step screening process was used to limit the assets assessed to only those with high risk of hazard, in order to limit the number of asset-hazard pairs receiving the risk assessment due to limited SWC resources.

The vulnerability assessment task included research, document reviews, and interviews of SWC staff for critical SWC assets. The assessment also included a review of other plans, existing hazard studies, reports and other information gathered during Phase A. A summary was documented for each of the 15 selected asset-hazard pairs for the asset's vulnerability to each hazard. This included rating of the impact of each hazard.

The consequence assessment task included determining the system loss of service and cost of infrastructure repair/replacement for each of the top 5 assets for their selected asset-hazard pairs. Towards the end of this phase, a planning team meeting #2 was held to review the results of Phase

B. A stakeholder meeting #2 was then held to present the results of Phase B to stakeholders, receive stakeholder input, and provide a scope and schedule update for the MMP.

Phase C, Mitigation Strategy Development, the mitigation strategy was developed for the MMP. The mitigation strategy included identification of mitigation goals and actions, and development of general and specific mitigation actions based on Phase B assessment results to lower the natural hazard risk and consequence of failure of SWC assets. This was accomplished by conducting the following tasks: identify and develop specific mitigation actions, prioritize action items, and develop an implementation plan.

The mitigation actions for the top 5 assets were further developed with planning level rough order of magnitude cost estimates. A basic benefit-cost analysis was performed for each mitigation project using the benefits estimated during Phase B of the planning process and using the results of the consequence assessment. A mitigation implementation plan was developed for the specific hazard mitigation projects (i.e., mitigation actions of top 5 assets) and included project prioritization, potential funding source identification, and proposed implementation schedule.

A risk assessment workshop was held with the planning team to review the results of Phase C. Next, a stakeholder meeting #3 was held to present the results of Phase C to the stakeholders, receive stakeholder input, and provide a scope and schedule update for completion of the MMP.

Phase D, Plan Update and Adoption, a draft version of the MMP was prepared with results from work performed during Phases A-C. The draft MMP was reviewed by SWC, presented to stakeholders, then revised and submitted to the State of Utah Division of Emergency Management (DEM) for review.

After addressing DEM comments, the final draft MMP was tentatively adopted by SWC City Council prior to submitting to FEMA for review and approval. After receiving comments from FEMA, addressing FEMA comments, and confirming approval of the final draft MMP from FEMA, the MMP was finalized for publication. Finally, the signed adoption resolution was submitted to FEMA for final approval.

2.1 Planning Team

The MMP was prepared by the Elwell Consulting Group (ECG) Team under contract and the direction of SWC. The planning team was made up of SWC management staff, department directors (e.g., fire chief, public works director), and contract municipal engineer, as well as the consultant team providing civil, facilities, structural, drainage, geotechnical, geological, and geographic information system (GIS) expertise. Team members were chosen based on their knowledge of SWC and its key assets, as well as their expertise in the area of natural hazards, risk management, and mitigation planning. SWC managers and other key personnel, and ECG's project manager, facilities engineer, and geotechnical engineering lead, who served as the key planners for the project, are listed in Table 2-1. The remainder of the planning team members provided technical contributions throughout the planning process and are listed in Table 2-2 below.

Table 2-1 Planning Team-Key Planners

Team Member	Organization, Position Title
Hiram Alba	GeoStrata (ECG subconsultant), Geotechnical Engineering Lead
Trevor Cahoon	SWC Community Services Director
Bryon Elwell	Elwell Consulting Group, Project Manager/MMP Lead
Mark Johnson	SWC Water and Sewer Manager
Brandon Jones	SWC City Engineer (Jones and Associates)
Mark Larsen	SWC Public Works Director
David Larson	SWC City Manager and Project Manager
Mark McRae	SWC Finance Director/Office Manager
Derek Tolman	SWC Fire Chief/Emergency Manager
Bryan Wageman	SWC Assistant Public Works Director
Mike Wilson	CRS Engineers (ECG subconsultant), Senior Project Manager

Table 2-2 Planning Team-Technical Contributors

Team Member	Organization, Position Title
Sofia Agopian	GeoStrata (ECG subconsultant), Project Geologist/GIS
Mandy Hettich	CRS Engineers (ECG subconsultant), Administration
Craig Nebeker	CRS Engineers (ECG subconsultant), Structural Engineer
Daniel Reynolds	CRS Engineers (ECG subconsultant), GIS
Tim Thompson	GeoStrata (ECG subconsultant), Engineering Geologist

2.2 Stakeholder Involvement

This section documents the involvement of federal, state, regional, and local stakeholders in the development of the MMP. The MMP affects many jurisdictions, agencies, and organizations including local agencies, neighboring local jurisdictions, regional and county organizations, and state and federal agencies. Public involvement was attained throughout the planning process by holding periodic meetings with stakeholders during all four phases of mitigation planning. The meetings were provided to inform the stakeholders about the planning process, provide progress updates, brief them on evaluation results, and solicit comments and feedback. Table 2-3 identifies the stakeholder jurisdictions/agencies and organizations, and their participation in the planning process. Comments from the various public meetings were documented by SWC's mitigation planning consultant (ECG) and were incorporated into the MMP, as appropriate.

SWC solicited public/stakeholder participation in the planning process by sending out stakeholder meeting invitation letters to all potential interested parties. A copy of the invitation list, invitation letters, and attendance records for each stakeholder meeting held during the planning process are provided in Appendix B along with stakeholder comment sheets and survey forms completed during the planning process.

Table 2-3 Stakeholder Planning Participants

	Stakeholder Meeting Attendance			
Stakeholder	Phase A Mtg #1:	Phase B Mtg #2:	Phase C Mtg #3:	Phase D Mtg #4:
Local Agencies – (e.g., Water/Utility Companies)				
Local Flood Plain Manager				
Local Emergency Planning Committee (LEPC) – see Davis County Sheriff's Office, and others	✓		✓	✓
SWC Community Emergency Response Team (CERT)	✓			✓
South Weber Water Improvement District				
South Weber Irrigation Company	✓			
Davis and Weber Counties Canal Company		✓	✓	
Weber Basin Water Conservancy District (WBWCD)				
Central Weber Sewer Improvement District (CWSID)				
Wasatch Integrated Waste Management	✓		✓	
South Weber Elementary				
High Mark Charter School				
Neighboring Local Jurisdictions				
Layton City				
City of Washington Terrace				
Riverdale City				
South Ogden City	✓			
Uintah City				

Stakeholder	Stakeholder Meeting Attendance			
	Phase A Mtg #1:	Phase B Mtg #2:	Phase C Mtg #3:	Phase D Mtg #4:
County or Regional Agency				
Davis County Sheriff's Office	✓			
Davis County Emergency Manager	✓		✓	✓
Davis County Environmental Health Services Division				
Davis County Animal Control	✓	✓	✓	✓
Wasatch Front Regional Council				
Weber County Emergency Manager				
State Agency				
Utah Division of Emergency Management	✓		✓	
Utah Department of Transportation (Region One Office)				✓
Utah Division of Drinking Water				
Utah Division of Water Quality				
Utah Division of Water Rights				
Utah Geological Survey				
Utah Division of Forestry, Fire and State Lands				
Federal Agency				
FEMA Region 8	✓		✓	✓
U.S. Bureau of Land Management – Utah State Office				
U.S. Bureau of Reclamation				
U.S. Forest Service - Intermountain Region				
U.S. Geological Survey				
Other				
Job Corps				
Robinson Waste		✓		✓

The planning process for the recent update included a thorough engagement with key stakeholders through dedicated stakeholder meetings. All stakeholder meetings were open to the public. During these meetings, representatives from community organizations and local businesses were able to provide feedback, ask questions, and discuss the plan's key components. While we did not conduct direct outreach to the general public at this time, we relied on our stakeholders to help spread the word and engage with their networks, provided public updates during open and public city council meetings, have a public comment email established where public comments could be sent at any time, and had meeting minutes posted online for the public to review and comment on at any time. This approach allowed us to gather valuable insights and perspectives that helped inform the final plan.

2.3 Planning Timeline

The MMP project began on March 30, 2022, with approximately a 14-month planned project duration. The key milestones and their corresponding completion dates are shown in Table 2-4 below. The project was divided into four phases. Phase A, Planning Process, started with the kickoff meeting on March 30, 2022, and ended with the stakeholder meeting #1 on May 26, 2022. Phase B, Risk Assessment, began in May 2022 and ended on September 29, 2022, with the stakeholder meeting #2. Phase C, Mitigation Strategy, began in September 2022 and ended on November 30, 2022, with the stakeholder meeting #3. Phase D, Plan Review and Adoption, started in December 2022 and was completed upon SWC City Council adoption of the Plan and FEMA's approval in February 2023 and April 2023, respectively.

A review meeting to discuss the draft MMP was held on January 18, 2023, with the planning team, after which SWC provided comments for incorporation into the draft MMP. The final stakeholder meeting (#4) was held on January 25, 2023. The draft MMP was then prepared and submitted to the DEM for review. After making DEM-requested changes, the MMP was presented to and tentatively adopted by the SWC City Council on February 28, 2023 subject to FEMA approval. The MMP was submitted to FEMA for review in March 2023. FEMA completed review of the Plan in April 2023 and granted conditional approval of the Plan pending incorporation of FEMA-requested changes. The SWC City Council plan adoption resolution was submitted to FEMA, and it is anticipated FEMA will then issue a letter of approval.

Table 2-4 Planning Process Timeline

Date	Action	Description
March 30, 2022	Kickoff Meeting	Kickoff meeting with City personnel lead by planning consultant to begin MMP project
May 11, 2022	Phase A Planning Team Meeting #1 and Asset Prioritization	Planning process results reviewed with City and Phase B asset prioritization (collaborative pairwise comparison; asset criticality ranking) completed with City
May 26, 2022	Phase A Stakeholder Meeting #1	Stakeholders briefed on Phase A results and feedback/comments solicited with Stakeholder Survey #1
July 14, 2022	Phase B Planning Team Meeting #2 – Risk Screening	City personnel participated in a workshop discussing consequences of identified hazard vulnerabilities of top 15 assets and selected highest 15 asset-hazard pairs for risk assessment
September 14, 2022	Phase B – Risk Assessment Workshop	Risk assessment results reviewed with City and Top 5 assets ranked for mitigation actions during Phase C
September 29, 2022	Phase B Stakeholders Meeting #2	Stakeholders briefed on hazard evaluation and risk assessment results and feedback/comments solicited with stakeholder survey #2
November 11, 2022	Phase C Planning Team Meeting #3	Hazard mitigation actions and plan for implementation reviewed with City
November 30, 2022	Phase C Stakeholders Meeting #3	Stakeholders briefed on hazard mitigation strategy and stakeholder survey #2 results reviewed and feedback/comments solicited
January 13-25, 2023	City review of draft MMP	City reviewed the draft MMP and provided comments
January 18, 2023	Phase D Planning Team Meeting #4 – Draft MMP Review	City personnel briefed on MMP and review comments discussed
January 25, 2023	Phase D Final Stakeholders Briefing	MMP briefing held
January 27-February 6, 2023	State of Utah review of MMP	State of Utah reviewed MMP and provided comments
February 28, 2023	SWC City Council Meeting	SWC City Council passed a resolution to tentatively adopt the MMP pending FEMA review and comment
March 1-April 15, 2023	FEMA review of MMP	FEMA reviewed the MMP, provided comments, and provided conditional approval
April 18, 2023	FEMA approval	FEMA issued final approval of the MMP
May 24, 2023	Final MMP	Final MMP issued

2.4 Plan Adoption

The SWC City Council passed a resolution adopting the MMP during a City Council meeting held on February 28, 2023. The SWC City Council approval is conditional upon FEMA review and approval of the MMP. Next, SWC submitted the adopted MMP including signed resolution adopting the MMP to FEMA for their review and approval. A copy of the signed SWC City Council resolution is provided in Appendix J. It is anticipated that FEMA will provide conditional approval of the SWC MMP with some minor items that need to be addressed in the MMP or provide an approval letter prior to April 18, 2023.

Section 3 Hazard Identification

3.1 Natural Hazards

The natural hazards that present potential risk to SWC key assets were identified from the comprehensive list included in the FEMA Local Mitigation Planning Handbook dated March 2013. This FEMA guidance document lists the potential natural hazards as: avalanche, dam failure, drought, earthquake, erosion, expansive soils, extreme cold, extreme heat, flood, hail, hurricane, landslide, lightning, sea level rise, severe wind, severe winter weather, storm surge, subsidence, tornado, tsunami, and wildfire. Of this all-inclusive list, the natural hazards to which the SWC system is susceptible, based on climate and location, are:

avalanche	flood	severe wind
dam failure	landslide N(LS)	severe winter weather
debris flow[1]	lightning	subsidence
drought	problem soils[1]	tornado
earthquake N(E) & N(E-WF)	Rockfall[1]	wildfire N(W)

Note 1: The City added a few specific natural hazards that were not listed in FEMA's guidance document specifically but have been known to exist for their critical assets: Problem soils (collapsible soils and undocumented fill were added to Expansive Soils in FEMA's list), and debris flow. The landslide hazard also included rockfall.

The nomenclature used for each of the above natural hazards (i.e., N(E), N(E-WF), N(LS), N(W)) will be used in presenting the Section 4 Risk Assessment and Section 5 Mitigation Strategy information, where the N stands for natural hazard and the letter in parenthesis stands for the specific hazard type. The second code used for the earthquake hazard of N(E-WF) is used to define the earthquake hazard along the Wasatch Front part of the SWC assets (applied to all 15 key assets) which has a higher likelihood than the N(E) hazard based on a regional study performed on the Wasatch Front faults in 2016. It is also important to note that only the three hazards (earthquake, landslide, and wildfire) are shown above with the naming convention (e.g., N(LS)) following them because they were the only hazards advanced forward through the risk screening process and are part of the asset-hazard pairs that received the full risk assessment. For additional details on the Risk Assessment process, see Section 4. The following is a description of each of the potential natural hazards that the SWC assets are susceptible to.

3.1.1 Avalanche

Avalanches are typically rapid down-slope movement of snow, ice, and debris. They are the result of snow accumulation on a steep slope and can be triggered by ground shaking, sound, wind, animal or a person. The two main factors affecting avalanche activity include weather and terrain – large frequent storms combined with steep slopes result in avalanche danger. Slope angles between 30 to 45 degrees are optimum for avalanches. Additional factors contributing to slope stability are amount of snow, rate of accumulation, moisture content, snow crystal types, and the wind speed and direction. In Utah, the months of January through April have the highest avalanche risk.

3.1.2 Dam Failure

Dams are structures that store water and divert and impound water upstream. Most dams have a spillway where the flow of water from the reservoir is controlled. Dam failures result from the breach or overtopping of a manmade water impoundment structure, which often results in catastrophic down grade flooding. Dams owned by SWC are all off stream structures and will never likely be

overtopped. Failure of these structures would likely be associated with cracking of the embankment through either settlement or ground shaking associated with an earthquake.

3.1.3 Debris Flow

Debris flows are water-laden masses of soil and fragmented rock often called mudslides, mudflows, or debris avalanches and are usually associated with flooding types of rainfall events or rapidly melting snowmelt. The debris within a debris flow is typically comprised of soil, rock fragments, and organic material such as trees and other vegetation that are picked up by scouring of rapidly moving water as the flow moves down a confining channel. Debris flow deposits are categorized based on the water to sediment ratio and viscosity of the debris flow. Debris flows may also be generated when a landslide deposit becomes rapidly saturated with water and flows into a channel.

Intense rainfall and rapid snowmelt are generally events that may trigger debris flow movement. Debris flows and floods also occur when heavy rains on recently burned slopes result in higher-than-normal runoff and in turn channel scour. Repeated debris flows and/or flood events deposit sediment at the mouth of canyons, forming an alluvial fan. Flows may travel farther down the fan from the mouth of the canyon if the channel becomes entrenched and the flow is confined.

Debris flows can be viscous and can transport extremely large boulders (greater than 6-feet diameter); debris flows may eventually become muddy flood waters as they deposit their debris. Debris flows tend to move in pulses. Early pulses or previous debris flows can form levees that channel the flow until the levees are breached. The presence of older levees indicates the recurrence and characteristics of debris flows in a particular canyon.

3.1.4 Drought

Drought is a normal recurrent but temporary feature of climate, which results from prolonged periods of below normal precipitation. The severity and frequency of droughts is expected to increase from adverse climate change impacts. Droughts affect the availability of water for municipal and industrial (M&I), agricultural, recreational, and environmental uses alike. Drought accompanied by higher temperatures also increases the occurrence of algal blooms that have the potential to produce harmful cyanotoxins that render secondary sources unusable. Droughts also heighten the risk of wildfire.

3.1.5 Earthquake

An earthquake is the abrupt shaking of the earth caused by the sudden breaking of rocks when they can no longer withstand the stresses that build up deep beneath the earth's surface. The rocks tend to rupture along weak zones referred to as faults. This sudden release of seismic energy can cause ground shaking, surface fault rupture, and liquefaction.

Ground shaking causes the most impacts during an earthquake because it affects large areas and is the origin of many secondary effects associated with earthquakes. Ground shaking, which generally lasts 10 to 30 seconds in large earthquakes, is caused by the passage of seismic waves generated by earthquakes. Earthquake waves vary in both frequency and amplitude. High frequency low amplitude waves can cause more damage to short stiff structures, whereas low frequency high amplitude waves have a greater effect on tall (high-rise) structures. Ground shaking is measured using Peak Ground Acceleration (PGA). Local geologic conditions such as depth of sediment and sediment type affect earthquake waves. Deep valley sediments increase the frequency of seismic waves relative to bedrock.

During a large earthquake, fault movement may propagate along a fault plane to the surface, resulting in surface rupture along the fault. Anything built on top of or crossing a fault has a high

potential of major damage of fault rupture displacement. Examples of damage include cracked foundations, building structures torn apart, broken up roads, and breaks or ruptures in utility lines, pipelines, or any other utilities. Surface fault rupture does not occur on a single distinct plane; instead, it occurs over a zone often several hundred feet wide known as the zone of deformation.

Soil liquefaction occurs when water-saturated cohesion-less sandy soils are subject to ground shaking. When liquefaction occurs, soils behave more like a viscous liquid (quicksand) and lose their bearing capacity and shear strength. For soils to liquefy, they must be sandy, loose, water-saturated soils typically between 0 and 30 feet below the ground surface and the ground shaking must be strong enough to cause soil to liquefy. The loss of shear strength and bearing capacity due to liquefaction causes buildings to settle or tip and light buoyant structures such as buried storage tanks and empty swimming pools to float upward. Liquefaction can also cause damage through lateral spreading, which is soil displacement of three or more feet accompanied by ground cracking and vertical displacement. Lateral spreading can cause roads, buildings, buried utilities, and other structures to be pulled apart.

3.1.6 Expansive Soils (i.e., Problem Soils)

Problem soils include collapsible, expansive, and undocumented fill soils. Collapsible soils are low density and typically dry soils that decrease in volume when exposed to water. This type of problem soils typically occurs in alluvial fan deposits, dry loess or eolian deposits or unconsolidated colluvium deposits. Undocumented fill soils underlying facilities could have the potential for settlement which could result in differential settlement below these facilities. Expansive soils are often associated with high plasticity clays and shale bedrock.

3.1.7 Flood

Flooding is a temporary overflow of water onto lands not normally inundated by water. Often, mud/sediment/debris flows happen concurrently with flooding, causing damages sometimes more severe than what flooding alone may have caused. Factors that determine the severity of floods include rainfall intensity, duration of a storm, and rapid snowmelt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having impermeable surfaces such as large parking lots, paved roadways, or post-burned areas. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Frequency of flood inundation depends on the climate, soil, and channel slope. Conditions which may exacerbate floods include steeply sloped watersheds, constrictions, obstructions, debris contamination, soil saturation, and velocity.

3.1.8 Landslide (including rockfall)

Landslides are the downslope movement of rock, debris, or soil. Landslides occur because of either an increase in the driving forces (weight of slope and slope gradient) or a decrease in the resisting forces (friction, or the strength of the material making up a slope). Geology, topography, water content, vegetative cover, and slope aspect are key factors of slope stability. Rockfall is considered a form of landslide. Rockfalls are the fastest moving type of mass movement hazard and predominantly occur in mountains where a rock source exists along and above steep slopes and cliffs that slope greater than 35 degrees. Rockfalls are a result of a loss of support from beneath the rock mass that can be caused by freeze/thaw action, rainfall, weathering and erosion, and/or strong ground shaking resulting from seismic activity. Rockfalls result in the collection of rock fall material, referred to as talus, either on or at the base of the slope. The presence of talus indicates that a rockfall has occurred and the hazard is present at the site.

3.1.9 Lightning

Lightning is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. During the development of a thunderstorm, rapidly rising air combined with movement of precipitation within a cloud causes electrical charges to build. As negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud become positively charged. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

3.1.10 Severe Wind

Severe wind is most likely the result of a downburst, which is a severe localized wind blasting from a thunderstorm. Downbursts fall into two categories by size – micro-bursts and macro-bursts. Micro-bursts cover an area less than 2.5 miles in diameter. Macro-bursts cover an area with a diameter larger than 2.5 miles.

3.1.11 Severe Winter Weather

Severe winter weather comes in the form of snow and cold temperatures. A severe winter snowstorm deposits at least four inches of snow during a 12-hour period or six inches of snow during a 24-hour period and has winds in excess of 35 mph and temperatures at or below 20° F. A blizzard is a snowstorm with sustained winds of 40 mph or more or gusting winds of at least 50 mph with heavy falling or blowing snow persisting for one hour or more at temperatures of 10° F or colder.

3.1.12 Subsidence

Subsidence is the settling or collapse of the ground. Causes of subsidence include limestone and karst terrain, gypsiferous soil, piping, peat, and mine collapse.

Karst terrain is characterized by closed depressions, caverns, and streams that abruptly disappear underground. Limestone is susceptible to dissolution by ground water and surface water thus forming karst terrain, which can result in a collapse of the ground surface.

Gypsiferous deposits, when wetted, are subject to settlement, causing sinkholes similar to those found in karst terrains.

Piping is a type of subsurface erosion caused by the movement of ground water that removes fine-grained particles creating subsurface voids or channels. These channels increase in size as more and more water is collected until the walls and roof can no longer support the weight above and collapse occurs.

Peat consists of partially decomposed plant remains that usually accumulate in areas of shallow ground water and near standing water. When water is removed, peat can subside, compress, and settle under pressure.

Mining removes rock and leaves underground voids that, if not supported, can collapse and cause ground subsidence and sinkholes.

3.1.13 Tornado

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornadoes have high wind speeds and cover large areas. Tornadoes are classified by wind damage using the Fujita Scale, which ranges from F0 at the low end (40-72 mph winds) to F5 at the high end (261-318 mph winds). The damage associated with a tornado can comparatively range from light or

minor (tree limbs broken) to devastating damage that destroys structures and carries away large objects.

3.1.14 Wildfire

A wildfire is an uncontrolled fire spreading through vegetative fuel. Wildfires are placed into two classifications – wildland and urban-wildland interface fires. Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. An urban-wildland interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. Major ignition sources for wildfires are lightning and human causes such as arson, recreational activities, burning debris, and carelessness with fireworks. Vegetation, topography, and weather are all conditions having an effect on wildfire behavior.

3.2 Previous Hazard Occurrences

Previous natural hazard events affecting SWC are discussed below. Information about past occurrences was obtained from interviews with SWC staff and other existing plans and resources.

SWC's experience with natural hazards includes incidents related to debris flow/landslide, drought, flood, severe wind, and wildfire. Although some maintenance measures were employed where necessary to mitigate the effects of these occurrences, there were some previous hazard events that resulted in major damage. The previous specific hazard occurrences identified by SWC staff personnel are summarized in Table 3-1.

SWC actively participates in the NFIP. SWC recently adopted a revised Flood Control Ordinance in August 2022. This new ordinance regulates all new construction in or near the Special Flood Hazard Areas (SFHAs). All applications for new development must meet the requirements in this ordinance. When a new development application is received by SWC, if the project area is located in or near the SFHAs, review and/or approval by the Floodplain Administrator is required.

SFHAs within SWC are located along the Weber River plus a few water impoundments east of US 89. Revised Federal Insurance Rate Maps (FIRMs) became effective September 15, 2022. Any local requests for map updates, including requests for Letters of Map Change, must first receive acknowledgement from SWC via the Floodplain Development Permit process.

Having a relatively small amount of SFHA, most of which is easily visible from the street, allows SWC to easily monitor any activity occurring in the SFHA. Any and all permitted modifications receive inspection from SWC personnel.

Note, while SWC has experienced some past flooding occurrences at some of its assets located in or crossing waterways, there are no known repetitive loss structures owned and/or operated by SWC.

Table 3-1 Previous Hazard Occurrences near or in SWC

Hazard	Approx. Year	Occurrence Description
Debris flow	2005	A manmade pond of water was created at the top of the hill and saturated the hillside. The hillside sloped off and brought debris down into a home and injured a child in the home. The pond was relocated to farther away from the hillside.
Drought	2000-current	A historic mega-drought has affected much of the western United States straining water supplies and enhancing dangerous wildfire conditions.
Flood	1987	SWC experienced a backup of the Weber River.
	June 2011	Water from the Weber River began seeping into the north slope of the Staker/Parson gravel pit. Immediate work was done to shore up the side of the pit and stop the water from filling the pit.
Severe Wind	2011/2012	Major windstorm event. Major damage.
	March 2020	Major windstorm event. Minimal damage
Wildfire	September 2017	Uintah Fire. A major wildfire event that began in Uintah and traveled west down I-84 and into South Weber.

3.3 Hazard Significance

Each of these potential natural hazards were evaluated to determine the overall risk they individually pose to SWC. This evaluation used Worksheet 5.1 from FEMA's Local Mitigation Planning Handbook (2013) as its basis and took into account the geographic extent of the hazard within the SWC planning area, the probable magnitude of the hazard, and the likelihood of a hazard event.

The **Geographic Area Affected** was estimated for each hazard using the following metrics:

Negligible: affects less than 10% of planning area or isolated single-point occurrence

Limited: affects 10-25% of planning area or limited single-point occurrences

Significant: affects 25-75% of planning area or frequent single-point occurrences

Extensive: affects 75-100% of planning area or consistent single-point occurrences

The **Probable Strength/Magnitude** of each hazard event was estimated based on the following metrics:

Weak: Limited classification on the scientific scale, low speed of onset or short duration of event, resulting in little to no damage

Moderate: Moderate classification on the scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of service for days

Severe: Severe classification on the scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months

Extreme: Extreme classification on the scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions

To estimate the **Probability of a Future Event** for each hazard, the following metrics were used:

Unlikely: less than 1% probability of occurrence in the next year or a recurrence interval of greater than 100 years

Occasional: 1 to 10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years

Likely: 10 to 90% probability of occurrence in the next year or a recurrence interval of 1 to 10 years

Highly Likely: 90 to 100% probability of occurrence in the next year or a recurrence interval of less than 1 year

The summary results of this overall hazard significance rating are presented in Table 3-2. The Overall Significance Rating of each hazard to SWC was determined by qualitatively combining the three rating criteria as follows:

Low: Two or more criteria fall in lower classifications, or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.

High: The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

Table 3-2 Hazard Significance Summary

Hazard	Rating Criteria			Overall Significance Rating
	Geographic Area Affected	Probable Strength/Magnitude	Probability of a Future Event	
Avalanche	Negligible	Weak	Unlikely	**Low**
Dam Failure	Limited	Severe	Unlikely	**Medium**
Debris Flow	Limited	Moderate	Occasional	**Medium**
Drought	Extensive	Moderate	Likely	**Medium**
Earthquake	Extensive	Severe	Unlikely	**Medium**
Expansive Soils	Negligible	Weak	Unlikely	**Low**
Flood	Limited	Moderate	Occasional	**Medium**
Landslide *including Rockfall*	Significant	Moderate	Occasional	**Medium**
Lightning	Limited	Moderate	Occasional	**Low**
Severe Wind	Extensive	Moderate	Highly likely	**Medium**
Severe Winter Weather	Extensive	Moderate	Highly likely	**Medium**
Subsidence	Limited	Moderate	Unlikely	**Low**
Tornado	Negligible	Severe	Unlikely	**Low**
Wildfire	Significant	Moderate	Likely	**Medium**

As can be seen in Table 3-2, all the potential hazards were determined to pose medium risk to SWC except for avalanche, expansive soils, lightning, subsidence, and tornado, which have low significance ratings. Therefore, these five hazards rated with low significance were not evaluated further; however, the other 9 natural hazards were evaluated for risk on an asset-by-asset basis. To facilitate the asset-based hazard evaluation assessment of the SWC system, the 15 key assets were prioritized based on their criticality to the function of SWC, rated based on their vulnerability to each of the 9 hazards, and classified to establish those assets which would be explicitly evaluated against each hazard (asset-hazard pairs). This asset prioritization process is described in Section 3.4 below. This process combined with the Section 3.5 (Hazard Rating) resulted in the determination of which assets and hazards would be combined into asset-hazard pairs for assessment during the Phase B risk assessments (see Section 4.1 and Table 4-1).

3.4 Asset Criticality Ranking

In May 2022, a workshop to determine the criticality ranking of SWC's 15 key assets was held using a virtual meeting. Attendees included key SWC managers and engineers, as well as key ECG Team personnel. The major objective of the workshop was to determine the criticality ranking for the top 15 SWC key assets shown in Table 3-3 in the order they were assessed but not by their criticality ranking which is shown in Section 3.4.2 Table 3-5.

Table 3-3 SWC Key Critical Assets

Asset #	Asset Name	Asset #	Asset Name
1	City Hall	9	City Center transmission line (West to East Tank)
2	City Shops (Public Works Building)	10	West Tank Feed Transmission Line- WBWCD Well
3	Fire Station	11	City Well #1
4	West Tank - Concrete Water Tank (1 MG)	12	1900 E. Bridge
5	Central Tank - Concrete Water Tank (1 MG)	13	Peach Wood Bridge
6	East Tank - Concrete Water Tank (0.5 MG)	14	2700 E. Bridge
7	Church Street Booster Pump Station (BPS)	15	Central Tank access road
8	Central Tank Transmission Line (Booster to 2700 E.)		

3.4.1 Pair Wise Comparison

A pair wise comparison method was used to perform the facility ranking. First, the SWC mission and vision (see Section 1) were used to determine facility comparison criteria, as follow:

Reliability: Provide reliable and sustainable municipal services to our community.

Quality of Life: Maintain local natural environment and landscape to promote heritage, neighborhood connection, and heart for our community.

Safety: Ensure employee and public safety from injury/illness/deaths.

Stewardship: Efficient & cost-effective management of municipal/public assets (i.e., costs, property, value, employees, customers, etc.).

Pair-wise comparison of the criteria against one another resulted in criteria weighting factors shown in Table 3-4 and the complete asset pair-wise matrix spreadsheets are provided in Appendix C.

Table 3-4 Criteria Weighting Factors

Criteria	Weighting Factor
Safety	14
Reliability	11
Stewardship	6
Quality of Life	5

3.4.2 Asset Criticality Tier Ranking Results

Second, the 15 SWC assets were compared against each other using the pair-wise comparison approach based on input from the various SWC representatives in attendance at the workshop. This comparison resulted in a total weighted sum (overall asset score) based on the scores for each of the four ranking criteria. The individual asset total scores were then normalized (divided) by the total maximum score possible from the pair-wise comparison. The individual assets were then grouped into three tiers of five assets per tier based on their overall asset priority score. The assets with the highest scores were grouped into criticality tier 1, followed by the second highest scoring individual assets grouped into tier 2, and so forth. The results of the asset ranking, including overall asset score, priority rank, and tier grouping for each of assets, are shown in Table 3-5. The complete set of asset pair-wise matrix spreadsheets is provided in Appendix C.

Table 3-5 Asset Criticality Ranking

Asset	Overall Asset Score	Rank
Tier 1 Assets		
5. Central Tank – Concrete Water Tank (1 MG)	1975	1
9. City Center Transmission Line (West to East Tank)	1903	2
8. Center Tank Transmission Line (Booster to 2700 E.)	1897	3
7. Church Street Booster Pump Station (BPS)	1841	4
4. West Tank – Concrete Water Tank (1 MG)	1797	5
Tier 2 Assets		
10. West Tank Feed Transmission Line – WBWCD Well	1662	6
3. Fire Station)	1620	7
2. City Shops (Public Works Building	1485	8
11. City Well #1	1371	9
14. 2700 E. Bridge	1346	10
Tier 3 Assets		
6. East Tank – Concrete Water Tank (0.5 MG)	1332	11
12. 1900 E. Bridge	1279	12
1. City Hall	1131	13
13. Peach Wood Bridge	1026	14
15. Center Tank Access Road	1015	15

3.5 Hazard Rating

To prioritize the natural hazard risks, each SWC key asset was rated based on its potential risk for each type of natural hazard.

A hazard evaluation for each of the medium-risk (there were not any high-risk hazards) identified in Section 3.3 was performed on the 15 key assets. The assets were scored by the project team based on the following scoring definitions:

High (H): asset completely disabled; SWC's mission fully or nearly defeated; deaths, injuries, or other high costs.

Medium (M): asset partially disabled; SWC's mission moderately impacted; moderate amount of other costs.

Low (L): asset not or only slightly disabled; SWC's mission only slightly impacted; low amount of other costs.

Not Applicable (N/A): given hazard does not affect asset, or otherwise does not apply.

Each applicable hazard was assessed based on that hazard's impact to the asset. There were 15 assets that were assessed for 11 natural hazards (11 natural hazards when accounting for the 3 different types of earthquake hazards plus 8 other natural hazards) resulting in a total of 165 asset-hazard pairs (i.e., 11 natural hazards multiplied by 15 assets is 165 pairs). The results of the ECG Team's preliminary hazard assessment scoring found the following number of asset-hazard pairs for the 15 Assets for each of the four scoring criteria of H, M, L, and not applicable (N/A); results are summarized in Table 3-6.

Table 3-6 Preliminary Hazard Assessment-Scoring

Natural Hazard	High(H)	Medium (M)	Low(L)	N/A	Total # of Assets by Hazard
Dam Failure	0	0	15	0	**15**
Debris Flow	3	0	12	0	**15**
Drought	0	0	15	0	**15**
Earthquake - Ground Shaking (2PE50 & 10PE50)	15	0	0	0	**15**
Earthquake – Liquefaction	0	2	13	0	**15**
Earthquake - Surface Fault Rupture/Fault Crossings	1	1	13	0	**15**
Flood	0	0	15	0	**15**
Landslide including Rockfall	6	0	9	0	**15**
Severe Wind	0	5	10	0	**15**
Severe Winter Weather	0	5	10	0	**15**
Wildfire	5	10	0	0	**15**
Total # of Assets by Scoring Criteria	**30**	**23**	**112**	**0**	**165**

This preliminary hazard assessment which found 30 High (H) consequence asset-hazard pairs as shown in the second column of Table 3-6 was reviewed with SWC's planning team at the Phase B

planning risk screening workshop to screen and select up to 15 asset-hazard pairs for risk assessment. This is covered in greater detail in Section 4.1 Risk Screening under the next Section 4, Risk Assessment.

Section 4 Risk Assessment

This section covers risk screening, risk analysis, and risk assessment results for the Hazards and Assets defined in Sections 3.1 and 3.4, respectively.

A hazard evaluation of each of the SWC selected 15 asset-hazard pairs from the risk screening conducted during the Phase B planning team meeting #2 for the 15 critical assets was performed. The results of the assessments of the 15 asset-hazard pairs are discussed below by hazard type.

4.1 Risk Screening

The Phase B risk assessment began with a risk screening workshop conducted during the Phase B planning team meeting #2 to review with SWC's planning team the preliminary hazards assessment performed by the ECG Team discussed in Section 3.5 by reviewing the asset-hazard pair screening worksheet (see Appendix D). The purpose of the workshop was to verify consequence ratings in the asset-hazard pair screening worksheet and thereby screen all the applicable hazards against the 15 assets. This screening of the asset-hazard pairs was done by scoring each of the 15 assets against each of the 11 hazards (includes 3 Earthquake hazard types plus 8 other natural hazards) using the same scoring criteria presented in Section 3.5, with the addition of the "Not Selected" criterion:

High (H): asset completely disabled; SWC's mission fully or nearly defeated; deaths, injuries, or other high costs.

Medium (M): asset partially disabled; SWC's mission moderately impacted; moderate costs.

Low (L): asset not or only slightly disabled; SWC's mission only slightly impacted; low costs.

Not Applicable (N/A): given hazard does not affect asset, or otherwise does not apply.

Not Selected (N/S): asset initial scoring of H, but not selected by SWC for further assessment due to limited resources.

Scores were assigned based on SWC's qualitative assessment of the level of consequence that would occur assuming the hazard does occur. The hazard likelihood and vulnerability of the asset are not considered during this screening exercise. These other two risk variables are applied later after the asset-hazard pairs has been selected by SWC during the next step in the risk assessment process covered in Section 4.2 below. SWC reviewed and adjusted several of the asset-hazard scores as discussed below with the complete details provided in the planning team meeting #2 risk screening minutes found in Appendix D. In addition, see Appendix G Geohazards Tech Memo for risk screening which specifically addresses the geohazards of earthquake, landslide, and debris flow.

For comparison purposes Table 4-1 shows the Asset-Hazard Screening and Selection Summary from the risk screening workshop, which when compared to Table 3-6 Preliminary Hazard Assessment Scoring shows that the number of High (H) consequence asset-hazard pairs was reduced from 30 to 15 pairs, which is the number of pairs that the risk assessment was performed on for the SWC assets in the next section. There were 30 pairs determined to have High (H) consequence scoring for the risk screening, but SWC's planning team was able to determine 15 High (H) consequence asset-hazard pairs to not select (N/S) for the debris flow, earthquake (ground shaking), earthquake (fault rupture/fault crossing), landslide (including rockfall), and wildfire hazards shown in Table 4-1.

Table 4-1 Asset-Hazard Screening and Selection Summary

Natural Hazard	High (H)	N/S	Medium (M)	Low (L)	N/A	Total # of Assets by Hazard
Dam Failure	0	0	0	15	0	15
Debris Flow	0	3	0	12	0	15
Drought	0	0	0	15	0	15
Earthquake - Ground Shaking (2PE50 & 10PE50)	9	6	0	0	0	15
Earthquake – Liquefaction	0	0	2	13	0	15
Earthquake - Surface Fault Rupture/Fault Crossings	0	1	1	13	0	15
Flood	0	0	0	15	0	15
Landslide including Rockfall	2	4	0	9	0	15
Severe Wind	0	0	5	10	0	15
Severe Winter Weather	0	0	5	10	0	15
Wildfire	4	1	10	0	0	15
Total # of Assets by Scoring Criteria	**15**	**15**	**23**	**112**	**0**	**165**

The 15 High (H) ranking asset-hazard pairs include 10 of the 15 critical assets and 3 of the hazards (earthquake (ground shaking), landslide (including rockfall), and wildfire hazards) that advanced from the hazard significance evaluation.

4.2 Risk Analysis

The risk analysis was performed on the 15 selected asset-hazard pairs from the risk screening workshop at planning team meeting #2.

The ECG Team used a Generic Risk Assessment Tool (GRAT) for the risk analysis that assesses the Risk (R) by considering the likelihood of the hazard (T) also referred to as threat likelihood, vulnerability (V) of each segment to the hazard, and the consequence (C) of the hazard to each segment if the hazard were to occur. This can be expressed in the following equation:

R = T*V*C

where: R=Risk, T=Likelihood of Hazard (Threat), V=Vulnerability, C= Consequence

The variables in the risk equation were determined as described as follows for each of the 15 asset–hazard pairs:

The likelihood of hazard or threat was determined for natural hazards using historical records from National Oceanic and Atmospheric Administration/National Weather Service (NOAA/NWS), FEMA flood maps, seismic report for the Wasatch Front faults, etc. The vulnerability against natural hazards was assessed by analyzing each asset's age, material type, condition, etc. against the current International Building Code (IBC) codes (i.e., seismic, wind, snow load, etc.). The consequence that would be incurred for each asset if the hazard were to occur was assessed by

applying consequence metrics established with SWC during the risk assessment planning workshop. A summary of the results for the 10 assets analyzed for the various hazards is presented in Table 4-2 with asset name, hazard type, and the relative risk rating. There were five possible relative risk ratings of L = Low, ML = Medium Low, M = Medium, MH = Medium High, and H = High.

Table 4-2 Risk Analysis Summary of Results

Asset	Hazard Type	Relative Risk Rating
1 - City Hall	N(E-WF)*, N(W)	M, L
2 - City Shops (Public Works Building)	N(E-WF)*, N(W)	MH, ML
3 - Fire Station	N(W)	L
4 - West Tank - Concrete Water Tank (1 MG)	N(E-WF)*, N(LS)	MH, ML
6 - East Tank - Concrete Water Tank (0.5 MG)	N(E-WF)*	MH
11 - City Well #1	N(E-WF)*, N(W)	ML, L
12 - 1900 E. Bridge	N(E-WF)*	ML
13 - Peach Wood Bridge	N(E-WF)*	ML
14 - 2700 E. Bridge	N(E-WF)*	ML
15 - Central Tank Access Road	N(E-WF)*, N(LS)	ML
** Earthquake - N(E-WF) - ground shaking.*		

A preliminary review of the relative risk ratings received by each asset reveals that the highest relative risk rating received by any asset was Medium High (MH). This is below the highest possible rating of High (H) but is still a concern for SWC that should be addressed to lower the risks of the various hazards with Medium (M) or in some cases even those with Medium Low (ML) ratings. The complete risk analysis table with all risk equation variables and their scores in addition to the overall relative risk shown in Table 4-2 is provided in Appendix E. In the next Section 4.3, the risk assessment results are further analyzed including performing a sensitivity analysis to determine those assets with highest relative risk.

4.3 Risk Assessment Results

Next, a consequence workshop was held with the SWC planning team to review the risk assessment results from Section 4.2 (Risk Analysis) and confirm asset rankings using a sensitivity analysis. This was used to establish the risk tolerance of SWC for selecting the cutoff point for addressing the highest risk assets based on scoring of their asset-hazard pairs. The sensitivity analysis was performed by assigning scores of 1 to 5 for each of the five relative risk ratings of L, ML, M, MH, and H for each of the assets that were assessed during the risk analysis described in Section 4.2 above. The scores for each asset were normalized on a relative risk scoring scale with a maximum of 5.0 points. No projects with High (H) risk were identified that needed to proceed immediately to “In Progress”. The 10 assets assessed scored between 2.0 and 4.0; a score between 4.0 and 5.0 would require immediate attention, so scores between 3.0 and 4.0 are still quite high and should be addressed as soon as practicable depending on SWC resources.

Scoring for the 10 assets is shown in Table 4-3 where the top 5 cluster of highest risk assets from the final risk analysis have been identified with yellow highlight as Assets 1, 2, 4, 6, and 15 with scores of 3.0, 3.0, 3.0, 4.0, and 2.0, respectively. Figure 4-1 is also presented below to show the relative risk of the 10 Assets analyzed. For additional details on the consequence workshop and risk assessment results see the workshop summary notes in Appendix E. In addition, see Appendix G Geohazards Tech Memo for risk results specifically addressing the geohazards of earthquake, landslide, and debris flow.

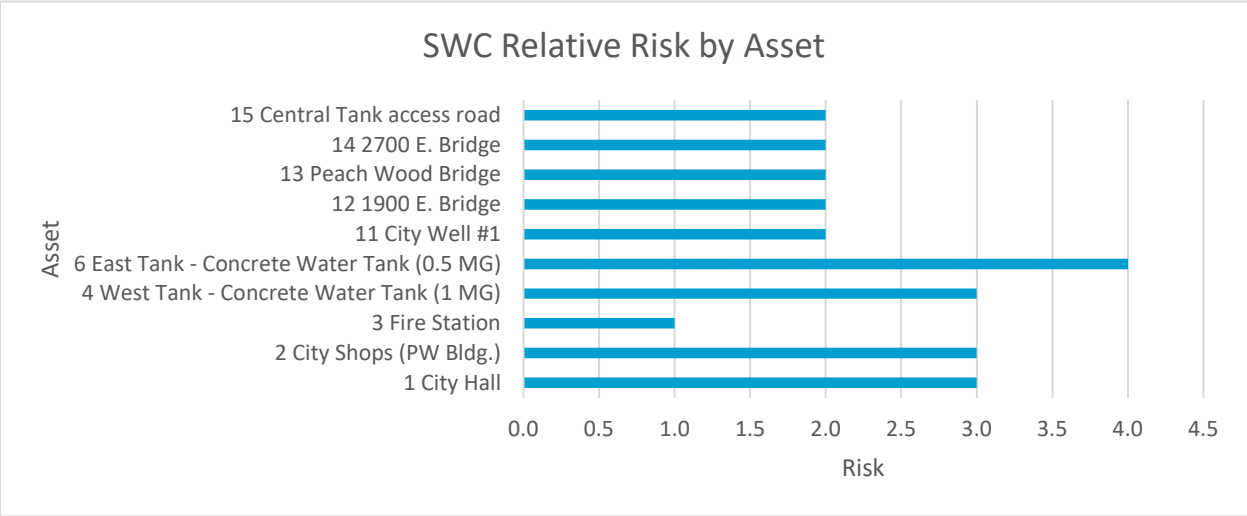
Note that the initial risk assessment effort from the consequence workshop scored had five assets (#11-15) that had the same relative risk score. The planning team ranked the tied assets using a qualitative analysis with input from SWC staff. The Central Tank access road was selected by the planning team since none of the 3 bridges are owned by SWC and it would be difficult to develop mitigation action/project for them and the City Well #1 is seldom used with WBWCD water acting as SWC's primary water supply, while the Central Tank access road could sustain damage to not only the road but to the buried pipeline that supports the Central Tank. The top 5 now reflects the assets with the highest risk scores, and the Central Tank Access Road as prioritized above.

Table 4-3 Asset Risk Analysis Summary

Asset	Relative Risk Score
1 - City Hall	3.0
2 - City Shops (PW Bldg.)	3.0
3 - Fire Station	1.0
4 - West Tank - Concrete Water Tank (1 MG)	3.0
6 - East Tank - Concrete Water Tank (0.5 MG)	4.0
11 - City Well #1	2.0
12 - 1900 E. Bridge	2.0
13 - Peach Wood Bridge	2.0
14 - 2700 E. Bridge	2.0
15 - Central Tank Access Road	2.0

The complete details of GRAT top 5 sensitivity analysis discussed above are included in Appendix E. The mitigation strategies and recommendations for addressing the top 5 highest risk assets will be presented next in Section 5, Mitigation Strategies.

Figure 4-1 Relative Risk by Asset



Section 5 Mitigation Strategies

5.1 City Authorities

SWC is the only jurisdiction covered by this MMP. SWC operates under a council-manager form of government, with an elected Mayor and five Council Members. The day-to-day operations and the majority of executive authorities are delegated to a City Manager, who works hand-in-hand with the Mayor to ensure all SWC operations are well-run. SWC operations include a municipal court, water, streets, storm water, sanitary sewer, snow removal, community development, parks and recreation programming, and Fire Department. SWC contracts for garbage services, animal control services, and law enforcement services. SWC is a political subdivision of the State of Utah and is generally governed by the Utah Municipal Code Title 10.

5.2 Mitigation Goals

The mitigation goals established in this plan are based upon the mission of SWC to facilitate neighborhood connection, honor our heritage, ensure a safe haven for families, provide sustainable municipal services, and develop a community with a heart. Mitigation measures were prioritized to both avoid and mitigate the anticipated post-hazard event damage or deficiencies identified in Section 5.3. Mitigation measures listed below are expected to enable SWC to achieve a reduction in the risks to hazards that are present for the highest-risk SWC critical assets.

5.3 Mitigation Actions/Measures

The Mitigation Actions/Measures recommended for SWC are presented in the next two subsections on General Mitigation Measures and Critical Asset Specific Mitigation Measures.

5.3.1 General Mitigation Measures

The following are general mitigation measures applicable to SWC with the type of hazard risk specified:

5.3.1.1 Earthquake risk:

Improve earthquake public education via credible science and government resources.

a. Action A: Promote the Utah Seismic Safety Commission via social media outlets.
b. Action B: Organize a field visit from the Utah Geologic Survey to identify and discuss earthquake hazards.
c. Action C: Provide education on preparation activities throughout the year but emphasizing them close to the annual “Great Shakeout” drill.

Educate property owners of seismic threats.

d. Action A: Provide online maps of earthquake faults and damage zones to residents.
e. Action B: Educate homeowners on structural safety techniques to follow during and after an
f. earthquake.
g. Action C: Educate homeowners about structural and non-structural retrofitting of vulnerable homes and encouraging retrofit.

For water utility systems:

h. Action A: Stockpile representative sizes of repair sleeves, pipe replacement segments, valves, and other spare parts/materials for immediate access after a seismic event.

i. Action B: Pipe Supply Contract – SWC should develop priority supply contract(s) with pipe suppliers such that replacement segments can be procured expeditiously after a damaging seismic event.

j. Action C: Training – SWC should incorporate response to seismic events, including pipeline repair and restoration, as part of its emergency training for employees.

A SWC goal with specific mitigation strategy in the Davis County 2021 Plan is to protect the SWC water system where feasible from threat of earthquake. The action identified in the Davis County 2021 Plan was as follows:

> Replace the waterline at the East Bench Reservoir to Cornia Dr. This line is cast iron and more susceptible to rupture than other lines in the system.

It is anticipated that this project will be bid in January 2023 with construction completed by Fall 2023.

5.3.1.2 Flooding risk:

Minimize injury, and loss of life and property from flooding through public education and government involvement in the NFIP.

k. Action A: Create floodplain awareness campaign in collaboration with the state, Davis County cities, National Weather Service, and various Davis County departments. Campaign will include floodplain information dissemination via presentations, seminars, social media, and Davis County presence at public events.

l. Action B: Create a floodplain committee that includes Davis County Public Works, Davis County Emergency Management, Davis County Economic and Community Development, cities within Davis County, and private sector partners affiliated with property selling/buying that meets annually to discuss best collaborative efforts to bring awareness to floodplain properties.

m. Action C: Work with Davis County and SWC staff to continually enforce floodplain management ordinances that meet the minimum NFIP requirements.

n. Implement and/or continue proper flood control measures to minimize injury and loss of life and property from flooding.

   i. Action A: Develop and/or update community-wide stormwater management plan.

   ii. Action B: Complete a stormwater drainage study for known problem areas.

   iii. Action C: Install/upgrade stormwater pumping stations.

   iv. Action D: Perform regular drainage system maintenance including sediment and debris clearance; and detection and prevention of discharges into stormwater and sewer systems from home footing drains, downspouts, or sewer pumps.

A SWC goal with specific mitigation strategy in the Davis County 2021 Plan is to reduce the threat of flooding damage in the city, which could also be caused by dam failure upstream of the city. The action identified in the Davis County 2021 Plan was as follows:

> Build a berm around the Staker & Parsons Co. gravel pit at an elevation higher than the banks of the river adjacent to the Weber River in that area.

SWC completed a stormwater management plan in September 2021 and has recently completed a stormwater system rate study.

5.3.1.3 Landslide risk:

For water utility systems:

o. Like earthquake risk, the suggestions below are temporary measures until utility systems can be hardened.
   i. Action A: Onsite Inventory – SWC should stockpile representative sizes of repair sleeves, pipe replacement segments, valves, and other spare parts/materials for immediate access after a landslide event.
   ii. Action B: Pipe Supply Contract – SWC should develop priority supply contract(s) with pipe suppliers such that replacement segments can be procured expeditiously after a damaging landslide event.
   iii. Action C: Training – SWC should incorporate response to landslide events, including pipeline repair and restoration, as part of its emergency training for employees.

A SWC goal with specific mitigation strategy in the Davis County 2021 Plan is to mitigate the effects of landslides. The actions identified in the Davis County 2021 Plan was as follows: Creating a plan to study areas where landslides may occur. Discuss using GIS Mapping or other means to determine where landslides may occur.

5.3.1.4 Severe weather risk

Increase public awareness of severe weather information and best mitigation and preparedness strategies.

p. Action A: Work with the Davis County School District to include safety strategies for severe weather in driver education classes and materials.
q. Action B: Utilize awareness weeks for lightning, severe weather, winter weather, etc.
r. Action C: Promote community outreach to vulnerable populations that may need assistance if heating and power are impacted by severe weather.
s. Action D: Educate homeowners on the benefits of retrofitting homes.

Retrofit public buildings and critical infrastructures to better withstand severe weather events.

t. Action A: Anchor roof-mounted heating, ventilation, and air conditioning units.
u. Action B: Ensure critical facilities, public buildings, and high occupancy buildings have back-up generators.
v. Action C: Work with utility companies to inspect utility poles to ensure they meet specifications and are wind resistant.
w. Action D: Direct promotion towards utility companies to upgrade overhead utility lines and/or bury power lines to provide uninterrupted power after severe winds, considering both maintenance and repair issues.

A SWC goal with specific mitigation strategy in the Davis County 2021 Plan is to reduce the threat of severe weather damage in the city. The actions identified in the Davis County 2021 Plan were as follows: 1) Put an emergency backup generator at Church Street booster pump station. 2) Work in tandem with homeowners to trim or remove tall trees that are susceptible to falling over and causing damage to homes, other facilities or across streets.

A backup generator is in place at the Church Street booster pump station.

5.3.1.5 Wildfire risk:

Further SWC residents' knowledge of wildland fire mitigation and preparedness.

x. Action A: Sponsor Firewise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations.

y. Action B: Work with Davis County fire agencies/departments to organize local fire department tours.

z. Action C: Work with Davis County cities to inform residents about proper evacuation procedures.

aa. Action D: Link wildfire safety with environmental protection strategies.

bb. Action E: Sponsor local "slash and clean-up days" to reduce fuel loads along the wildland-urban interface.

Mitigate injury and the loss of life and property by performing wildland fire mitigation activities.

cc. Action A: Create defensible zones around power lines, oil and gas lines, and other infrastructure systems.

dd. Action B: Enhance and develop new water sources in wildfire-prone areas.

ee. Action C: Work with Davis County fire departments/agencies to routinely inspect the functionality of fire hydrants.

ff. Action D: Develop a vegetation management plan.

gg. Action E: Continue the development and maintenance of firebreak road on the east bench in coordination with cities. The firebreak road in SWC would be a good project to consider for FEMA funding.

Increase consistent information amongst all fire agencies/departments and the county.

hh. Action A: Continue the development of the Community Wildland Protection Plan (CWPP) in coordination with the Utah Division of Forestry Fire & State Lands. SWC participates in education efforts as part of the CWPP.

ii. Action B: Meet with all fire agencies/departments bi-monthly during wildland fire season to share information on hazards, fireworks restrictions, and county and state ordinances and restrictions.

jj. Action C: Work with all fire agencies/departments and the Utah Division of Forestry Fire & State Lands to create an up-to-date centralized MOU/MOA file.

Ensure that County Fire Warden is experienced in wildland fire mitigation and response.

kk. Action A: Create position (volunteer or paid) within the Davis County Emergency Management program to serve as County Fire Warden and require experience relating to wildland fires.

ll. Action B: If Action A cannot be completed, send the current County Fire Warden to extensive training to further their knowledge of wildland fires.

A SWC goal with specific mitigation strategy in the Davis County 2021 Plan is to reduce the threat of wildfire damage in SWC. The action identified in the Davis County 2021 Plan was as follows: Work in tandem with homeowners to remove fuels and create fire breaks.

5.3.2 Critical Asset Specific Mitigation Actions/Measures

The risk assessment of the 15 threat-asset pairs resulted in an analysis which identified the following 5 highest risk assets:

2. East Tank
3. City Hall

4. City Shops (Public Works Building)
5. West Tank
6. Central Tank access road

The following sections contain additional information for the recommended mitigation actions for each of the top 5 highest risk assets.

5.3.2.1 Mitigations Strategies

The top 5 highest risk assets are presented with a description of each asset including features, hazards, and primary threat(s) that elevated the risk for each asset and their corresponding recommended mitigation measure (projects) descriptions to reduce their overall risk to SWC. The specific mitigation projects which have been developed and additional detail is provided below for those assets.

5.3.2.2 East Tank

Description

The East Tank is a concrete tank having a capacity of 500,000 gallons. The tank stores culinary water. There are no known existing plans for the tank, but the 2017 water conservation plan by Jones and Associates states it was approximately 35 years old meaning it would have been built in the early 1980s.

Deficiency

The tank is aging and will need to have more serious maintenance measures as it ages. Historically, concrete water tanks have a design life of 50 years, and it would be expected that this tank would reach its design life in approximately 10 years or less.

Maintenance measures may be taken to extend the design life of the tank. SWC will need to assess the financial aspect of making repairs to the existing tank to extend the life a little longer and then compare those costs to the construction of a replacement tank. Potential maintenance measures could include lining of the interior of tank to extend the life of exposed concrete, lining of the interior of the tank to improve structural performance, or other similar measure.

Damage Scenario

In the event of a major earthquake, this tank and related piping may lose their ability to contain water. It is unknown how construction materials were used to resist seismic loading during construction, but the design technology of the early 1980's did not account for seismic loading in the same way more modern structure designs do. Potential damages could be cracks or failure of the concrete or connection pipes due to ground shaking or surface fault rupture. The tank appears to lie just outside mapped surface fault rupture areas but may be affected if the rupture zone were to expand in areal extent. Repairs to remedy this type of damage would be costly and time consuming.

Mitigation Measure

A study is recommended to analyze earthquake (e.g., ground shaking, surface fault rupture) and problem soils impacts on the East Tank for preparation of a detailed plan to harden or replace the tank. As part of the seismic assessment, structural performance of the tank will be analyzed to determine the tank condition and ability to resist seismic forces. When the analysis is complete, it is recommended that SWC further analyze the structural repair options and costs against the cost of constructing a new concrete tank.

Some features that may be suggested for mitigation are to check the tank overflow height and set it such that the slosh during an earthquake will not allow the water to contact the underneath side of the lid. Additionally flexible pipe fittings where the inlet and outlet enter the tank will help keep the tank plumbing intact during a seismic event. Finally, walls, columns and footings can be checked for structural integrity and connections reviewed to see how they are likely to react in a seismic event.

5.3.2.3 City Hall

Description

The City Hall building is a structure consisting of several different material types. Some walls are concrete, some are concrete masonry unity (CMU) block, and some are wood framed. The building serves to house SWC administration as well as serve as a court. It has previously been used for several different commercial enterprises. SWC began using the building in 1984.

Deficiency

There is no known record of the original building, but it is aging. The additions are of several different material types.

Much of the building is of CMU walls. Based on the visible cracks on the north side of the building where the CMU wall is exposed, the CMU walls appear to be deficient in steel reinforcement based on current building codes.

A concrete wall addition was added to create a vault room for SWC. It is anticipated the reinforcement, footings and other structural items are sound. A structural evaluation of the connection to the existing building would be required to give a more detailed account of deficiency for this portion of the building.

The west side of the building is of wood construction. As this construction is more recent than other building portions, standard studs, insulation and structural panels would likely have been utilized in construction. A structural evaluation of exposed connection points would be necessary to provide a more detailed account of deficiency for this portion of the building.

Damage Scenario

A major earthquake could cause damage or collapse to the building due to the variation in construction materials and seismic resistance properties. Additionally, fire could potentially cause damage to the building and the resources stored there. Damage could include significant structural damage and non-structural damage such as ceiling tile displacement, waterline rupture, electrical system damage, etc.

Mitigation Measure

A detailed structural evaluation will determine additional measures to be taken to protect the building from both earthquake and fire. Some things that can be done based on what is known already are as follows:

- Carbon fiber straps could be added to the CMU walls in both vertical and horizontal directions to supply reinforcement to areas that are deficient.
- Nailing patterns on wood sheathing could be evaluated and adjusted as necessary to resist lateral loads on the wood framed walls.
- Ties and hold downs for wood framed roof and walls could be evaluated structurally for capacity to resist vertical and lateral loading during a seismic event.

- Interior, non-structural items such as light fixtures, duct work, shelves, cabinets, etc. could be anchored to structural members to ensure security from more severe damages and/or injury to occupants during an earthquake.
- The International Building Code has several options available to reinforce this building against fire. Fire resistant construction methods could be used to replace the most susceptible structural components. Fire sprinkler systems could be included in the existing building.

Once a detailed structural evaluation is completed, a cost benefit ratio or alternatives analysis could be conducted to evaluate the financial feasibility of repairing the existing building against the cost of a new building.

5.3.2.4 City Shops (Public Works Building)

Description

Multiple buildings serve as the Public Works shop. There is a large steel framed building serving as a shop as well as a smaller shed style steel building used as storage. The smaller building has been partitioned into multiple wood framed sections with shelves for storing materials. The main public works shop is reported to have been constructed in the first half of the 20th century by Job Corp employees.

Deficiency

These buildings are in quite serious disrepair due to age and corrosion. Soil has been in contact with the base of the buildings. Drainage away from the buildings has not been possible under these conditions. The steel skin of the buildings is corroded through. Some of the main framing members have been damaged.

Damage Scenario

These buildings are at risk of severe or catastrophic failure due to earthquake and fire. The age of the buildings suggest they are not designed to withstand lateral loads. The foundations would not have been constructed according to modern seismic standards and are likely to fail. The buildings, being of steel shells, are not combustible, but would still suffer damage in the event of a fire.

Mitigation Measure

The mitigation for these buildings would be to de-construct and salvage the building materials. A new shop building designed to withstand seismic and fire dangers is recommended.

5.3.2.5 West Tank

Description

The West Tank is a concrete structure having a 1 MG capacity and is used to store culinary water. The tank diameter is 105 feet on the interior. The roof is supported by 24 interior concrete columns. The tank is understood to have been built in the 1950s (see Jones & Associates Condition Assessment of Existing Reservoir Westside Water Reservoir Project dated October 5, 2016). Repairs were made to wall/floor joint circa 2014.

Deficiency

This tank has experienced leaking in the past and projects have been completed to mitigate the leaks. The tank still has a remaining life expectancy of 10-15 years. The tank, piping, and site conditions need to be monitored to maintain a water-tight, contaminate free system.

Damage Scenario

The tank is susceptible to damage due to an earthquake and landslide. Both scenarios could cause loss of essential water service to parts of SWC.

Mitigation Measure

This site has been analyzed in a study by Jones & Associates dated July 19, 2017, entitled Westside Water Reservoir Project Phases 2 and 4-Remediation Design (Existing Reservoir) and Alternative Site Selection (Replacement Reservoir Siting). We suggest the City review the prior recommendations to determine status of mitigation measures proposed in the study and of SWC acquisition of 1.5 acres of neighboring property for construction of a new tank.

5.3.2.6 Central Tank Access Road

Description

The central tank access road is an un-paved road gated off to the public. The road was constructed as part of a waterline project in about 2010. There is a 12-inch diameter ductile iron pipe (DIP) drinking waterline and a 15-inch diameter reinforced concrete pipe (RCP) drain line located in the roadway. The road is cut into the hillside and runs on a 14% grade. The road surface is un-treated base course.

Deficiency

During construction of the waterline and associated pipelines, groundwater was observed in a 100-200 feet long section of the roadway. It is unclear if any measures were identified and implemented to remedy the groundwater and its potential for affecting the pipelines and the roadway. In addition, the roadway is quite steep and may be difficult to use during inclement weather due to grade and surface.

Damage Scenario

The roadway may experience damage due to earthquake and landslide. In the event of an earthquake, the roadway and pipelines may become damaged due to subgrade liquefaction causing soils failure. A landslide could cover or dislodge the roadway and pipelines.

Mitigation Measure

It is recommended that SWC keep equipment and stockpiles of road building and pipeline materials on hand to repair damages caused by either an earthquake or a landslide. This will make the repairs happen quickly. Roadway drainage is critical in making sure the road can be used as an all-weather road. A hard surface will also help to mitigate the roadway deficiencies.

5.4 Mitigation Implementation

To facilitate development of an implementation plan for the mitigation measures identified in Section 5.3 above, the measures were combined into projects, cost estimates were prepared for each project, and the projects were prioritized and scheduled. This implementation development process is described in corresponding subsections below.

5.4.1 Mitigation Projects – Opinion of Probable Construction Costs

The various mitigation projects are listed in Table 5-1 along with their estimated project costs. The projects and their cost estimates are shown by asset with the hazard(s) mitigated and mitigation objective. The Mitigation Projects Implementation Plan is shown in Appendix F. Detailed breakdown of the cost estimates by asset is shown in Appendix H.

Costs shown in this report are Class 5 estimates in accordance with the Association for the Advancement of Cost Engineering International (AACE). A Class 5 estimate is defined as a Conceptual Level or Project Viability Estimate where engineering is from 0 to 2 percent complete. Class 5 estimates are used to prepare planning level cost scopes or evaluation of alternative schemes, long range capital outlay planning, and can also form the basis of a Class 4 Planning Level or Design Technical Feasibility Estimate. Expected accuracy for Class 5 estimates typically ranges from -50 to +100 percent, depending on the technological complexity of the project, appropriate reference information and the inclusion of an appropriate contingency. To remain effective, Class 5 estimates should be reviewed periodically for accuracy and changing conditions and/or project scope.

Costs are planning level estimates which reflect approximate construction costs in 2022 dollars. The estimates include fees directly related to labor and materials for physical implementation of mitigation measures (including contractor overhead & profit), consultant planning, design and/or analysis fees, engineering (bidding & construction management), administration, and legal fees, as well as estimated allowances for contractor overhead and profit. Additional design and in-depth analysis work are required to fully quantify the cost associated with implementing the mitigation measures. The intent of this estimate is to provide a basis from which future work may begin.

Table 5-1 Mitigation Project Estimated Costs

Mitigation Project	Hazard(s) Mitigated	Mitigation Objective	Costs
East Tank Study	Seismic	Withstand a seismic event with minimal damage and return to service within 3 days	$209,000
East Tank Mitigation Project	Seismic	Withstand a seismic event with minimal damage and return to service within 3 days	$0.81M ($0.5-1.3M)
City Hall Study	Seismic, Wildfire	Withstand a seismic event with minimal damage and return to service within 3 days; protect against wildfire	$137,500
City Hall Mitigation Project	Seismic, Wildfire	Withstand a seismic event with minimal damage and return to service within 3 days; protect against wildfire	$1.9 ($1.2-3.0M)
City Shops (Public Works Building)	Seismic, Wildfire	Withstand a seismic event with minimal damage and return to service within 3 days; protect against wildfire	$14.8
West Tank	Seismic	Withstand a seismic event with minimal damage and return to service within 3 days	$2.6M ($1.7-4.3M)
Central Tank Access Road	Seismic, Landslide	Withstand a seismic and/or landslide event with minimal damage and return to service within 3 days	$1.3M ($0.8-1.3M)

Items that are not in the planning level cost estimates include, but are not limited to:

Hazard abatement or remediation

Plumbing, mechanical, or electrical equipment or systems upgrade/modifications

Items that my change the estimated costs include, but are not limited to:

Modifications to conceptual scope of work in estimate

Special phasing requirements

5.4.2 Benefit Cost Evaluation

A benefit cost analysis (BCA) was performed for the mitigation projects identified above which consist of physical retrofit measures. FEMA's BCA Reference Guide (2009) and *What is a Benefit?*

(2001) documents were used as the basis of the benefit cost evaluation. The benefit cost evaluation performed is in accordance with the basics of the FEMA BCA methodology used in the federal disaster grant funding application process (now BRIC grant funding) to determine the cost-effectiveness of utility improvement measures. It should be noted, however, that the FEMA BCA modules were not run for any of the mitigation projects, and therefore benefit-cost ratios shown herein may not be equivalent to those obtained from the modules. A BCA using the appropriate BCA modules will need to be completed when submitting a FEMA grant application in accordance with current funding program requirements.

Three categories of "Avoided Damage" were used to determine the benefits portion of the BCA: 1) avoided physical damages, 2) avoided loss-of-function impacts (i.e., economic impact of loss of water services), and 3) avoided casualties and injuries. The benefits were calculated based on the estimated system performance following a hazard event for baseline conditions and upgraded conditions.

Avoided physical damage was determined based on the expected performance of the assets and the estimated structure, pipeline segment, nonstructural item, or equipment replacement value. Based on the assessment results for each hazard event, an estimate of the damage state (e.g., severe, moderate, light, etc.) was defined for each deficient asset's baseline and upgraded condition, as described in Section 4.3. The physical loss estimate was then expressed as a percent of the replacement value, which was linked to each estimated damage level. The avoided physical damage benefit was calculated in dollars as the difference in the expected baseline damage and the anticipated damage after upgrades have been implemented.

Avoided loss-of-function impacts (i.e., economic impacts of loss of water service) were determined in accordance with the FEMA BCA standard utility loss of service values and Sections 6.3 and 6.4.2 of FEMA's *What is a Benefit?* document. The economic impacts of loss of water service are estimated based on three levels of loss of service: 1) complete loss of potable water service, 2) potable water service that is 'unsafe for drinking', and 3) complete loss of secondary water service. Based on the hazard assessment results, scenario damage descriptions were defined for individual assets. Using these damage descriptions, SWC estimated the functional downtime of the SWC water system facilities/assets (in days of complete loss of service and water service that is 'unsafe for drinking') both for the baseline condition and the upgraded condition assuming only the individual asset under consideration is damaged. SWC also determined the number of customers served by each asset in terms of population. Then using the FEMA standard economic impact valued for loss of water service, the total economic impact of the loss of service was determined for the baseline and upgraded conditions. The FEMA standard value accounts for the effects of reduced regional economic activity, direct impacts on customers, and disruptions of customer's normal activities. The avoided loss-of-function benefit was calculated in dollars as the difference in the expected baseline impacts and the upgraded impacts.

Avoided casualties and injuries were determined in accordance with FEMA standard values as follows: $11.6 Million per death (fatality), $3.728 Million per hospitalization, $290,000 per treat and release, and $35,000 per self-treat. The avoided casualties and injuries are applicable for hurricane, seismic, tornado, and wildfire hazards, Therefore, the benefits due to avoided casualties and injuries were applied to the applicable mitigation project(s) with the applicable hazards.

The total hazard scenario benefits for each asset are the sum of the avoided damage benefit and the avoided loss-of-function benefit. To account for the differing frequency of each type of hazard, the scenario benefits are converted to "expected annual benefits" by multiplying by the annual probability of exceedance for the scenario hazard event. To account for the useful project lifetime of the mitigation work and the time value of money, the "expected annual benefits" are converted to a

"present value of annual benefits" using the FEMA-mandated discount rate of 7% and a standard project useful lifetime value of 50 years for utility projects. The benefit-cost ratio is determined by dividing this "present value of annual benefits" by the estimated project mitigation cost.

The benefit cost ratios for each mitigation project were determined using a sum of the avoided physical damage benefits for each asset included in the project and a system-wide determination of the avoided loss-of-function benefits considering the combined contribution of each individual asset within that project. A summary of the benefit cost results for each mitigation project is presented in Table 5-2.

Table 5-2 Benefit Cost Summary

	Mitigation Project	Total Annualized Present Value Benefits	Total Mitigation Costs	Benefit Cost Ratio
1	East Tank – Project Scoping	N/A	$209,000	N/A
2	City Hall – Project Scoping	N/A	$137,500	N/A
3	City Shops (Public Works Building)	$7.75M	$14.8M	0.5
4	West Tank	$2.1M	$2.6M	0.8
5	Central Tank Access Road	N/A	$1.3M	N/A

N/A = not applicable since studies and analyses precede the mitigation project that has benefits

5.4.3 Mitigation Project Prioritization, Funding, and Scheduling

The final step in preparing an implementation plan for the mitigation measures was to identify the priority, potential funding, and proposed implementation schedule for the mitigation projects described in Section 5.3.2. Potential funding was determined based on discussions with SWC Planning Team concerning available funding and on eligibility requirements for FEMA grants. The results of the mitigation project prioritization, funding, and scheduling is shown in tabular form in Appendix F.

Implementation by Fiscal Year ignores other SWC assets; the actual implementation year will depend on the needs of all SWC assets and SWC's overall budget once the SWC MMP is complete. Assets were sorted by risk score to create the top 5 and then mitigation projects developed for those assets.

A summary of each of the 7 mitigation projects for the five highest risk assets is presented by mitigation action priority below and is also found in Appendix F, Table F-1. The mitigation action number corresponds to the mitigation project's priority with 1 being the highest priority and 5 the lowest. Most of these mitigation actions are considered either High or Medium priority since they pertain to SWC's top 5 highest ranked critical assets for the combined hazard risk and consequence of failure. The summary of each mitigation action includes the hazard to be mitigated, mitigation objective, priority of the action, estimated cost, estimated implementation time frame, and potential funding source(s). SWC is the sole responsible jurisdiction.

Mitigation Action 1A – East Tank (Project Scoping)

Hazard: Earthquake (ground shaking, problem soils)

Objective: Study earthquake (ground shaking) and problem soil impacts on East Tank for preparation of detailed plan to harden or replace the water tank

Priority: HIGH

Time Frame: Based on funding, estimated in Year 1

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 1B – East Tank (**Mitigation Project**)

Hazard: Earthquake (ground shaking, problem soils)

Objective: Replace with modern structure designed to current seismic code

Priority: HIGH

Time Frame: Based on funding, estimated in Year 1

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 2A – City Hall (**Project Scoping**)

Hazard: Earthquake (ground shaking); Wildfire

Objective: Study earthquake (ground shaking) and wildfire impacts on City Hall for preparation of detailed plan to harden or replace the building

Priority: HIGH

Time Frame: Based on funding, estimated in Year 1

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 2B – City Hall (**Mitigation Project**)

Hazard: Earthquake (ground shaking); Wildfire

Objective: Upgrade structure to be seismically resilient and protected from wildfire

Priority: HIGH

Time Frame: Based on funding, estimated in Year 1

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 3 – City Shops (Public Works Building)

Hazard : Earthquake (ground shaking, problem soils); Wildfire

Objective: Replace with a modern structure designed to current seismic, wind, and snow loads/code; protect from wildfire

Priority: HIGH

Time Frame: Based on funding, estimated in Year 2

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 4 – West Tank

Hazard : Earthquake (ground shaking, problem soils)

Objective: Replace with a modern structure designed to current seismic code

Priority: HIGH

Time Frame: Based on funding, estimated in Year 2

Funding: Local and Federal

Jurisdiction: SWC

Mitigation Action 5 – Central Tank Access Road

Hazard : Earthquake (ground shaking, problem soils); Landslide

Objective: Upgrade to protect against seismic and/or landslide risk(s)

Priority: MEDIUM

Time Frame: Based on funding, estimated in Year 2

Funding: Local and Federal

Jurisdiction: SWC

Section 6 Plan Maintenance

SWC plans on monitoring and evaluating the MMP yearly as it correlates to SWC's General Plan and annual Capital Facilities Plans updates. In addition, SWC plans on monitoring and evaluating the MMP in conjunction with updates to the State of Utah Plan that currently includes SWC in Davis County. SWC is also included in the 2021 Davis County Pre-Disaster Mitigation Plan. SWC is considering submitting portions of their MMP to Davis County, for inclusion in their regional plan for future updates. SWC intends on updating their MMP at least once every five years, either through State and/or regional plan updates or through an actual update to their MMP. SWC will continue to provide its stakeholders and the public with updates to the SWC MMP and encompassing State/regional plans to solicit public involvement and comments.

Now that SWC has established a MMP, SWC is excited to incorporate its contents in the other important, long-range planning documents used for community development and budgeting such as the SWC's General Plan and various Capital Facilities Plans. The General Plan is updated every 5 years, followed by individual updates for each Capital Facilities Plan in turn. The current cycle for these updates is as follows: General Plan 2020, Storm Drain 2021, Transportation 2023, Water 2023, and Sewer 2023. Although these documents are updated every 5 years, they are reviewed annually to ensure proper budgeting is in place to complete the projects identified within each respective plan. The MMP projects will now be incorporated into the annual process of project reviews and budgeting, with applicable projects included in the applicable Capital Facilities Plans when they are updated.

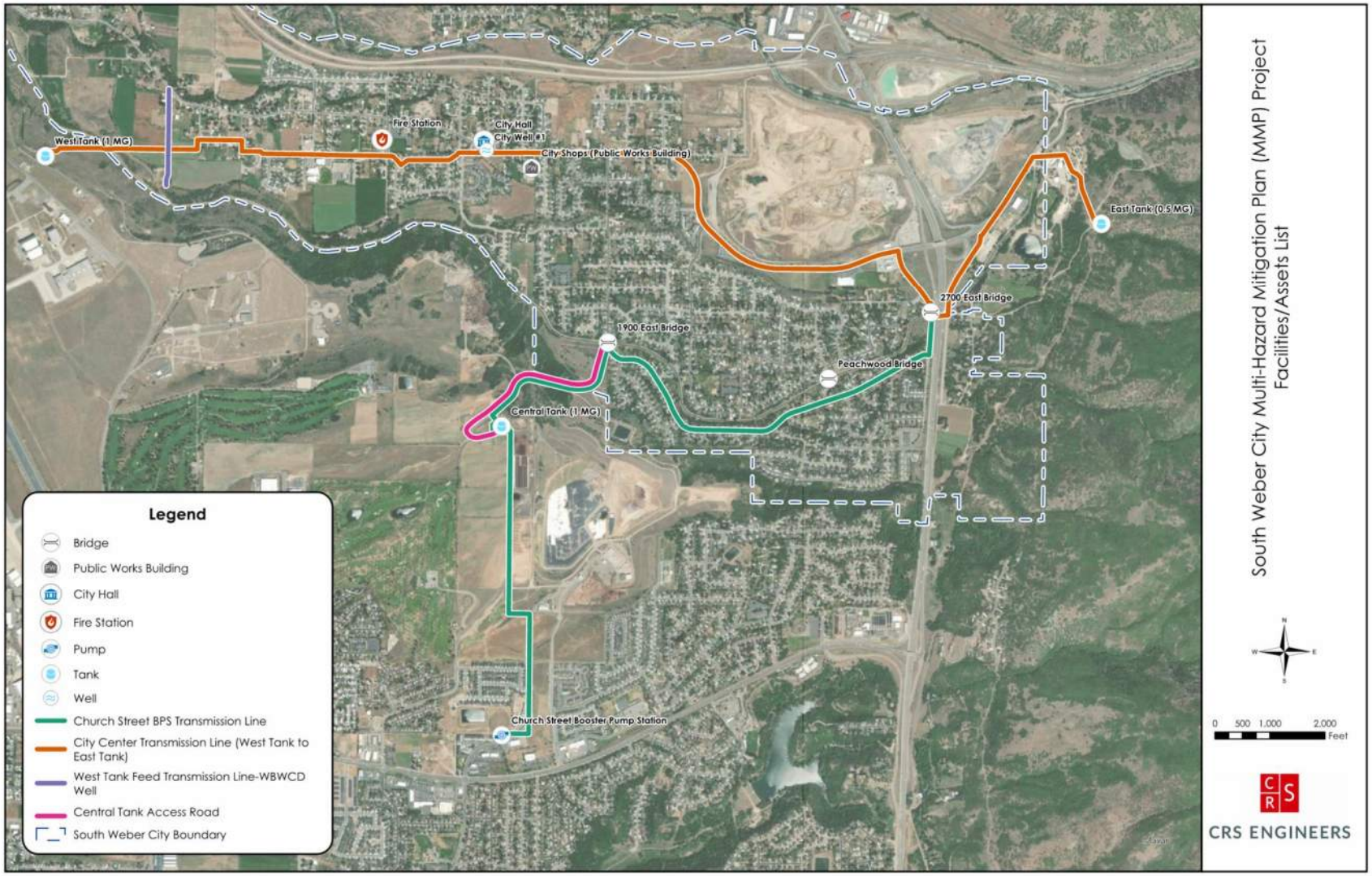
In addition to the stakeholder engagement conducted during the planning process (see Section 2.2), SWC is committed to ongoing communication with the public during the maintenance phase. SWC will be utilizing multiple channels to keep the public informed, including social media, meetings, and SWC's website. These channels will provide opportunities for the public to ask questions, provide feedback, and stay up-to-date on any developments related to the plan's implementation. SWC believes that this ongoing engagement will help ensure that the plan remains responsive to the needs and values of the community it serves.

Facebook and TikTok will be SWC's primary platforms for communicating with the public during the maintenance phase of the MMP for SWC's infrastructure. These platforms will allow SWC to share updates, answer questions, and gather feedback from a wide audience. Utilizing social media also provides an opportunity for real-time interaction and enables SWC to respond quickly to any concerns that may arise.

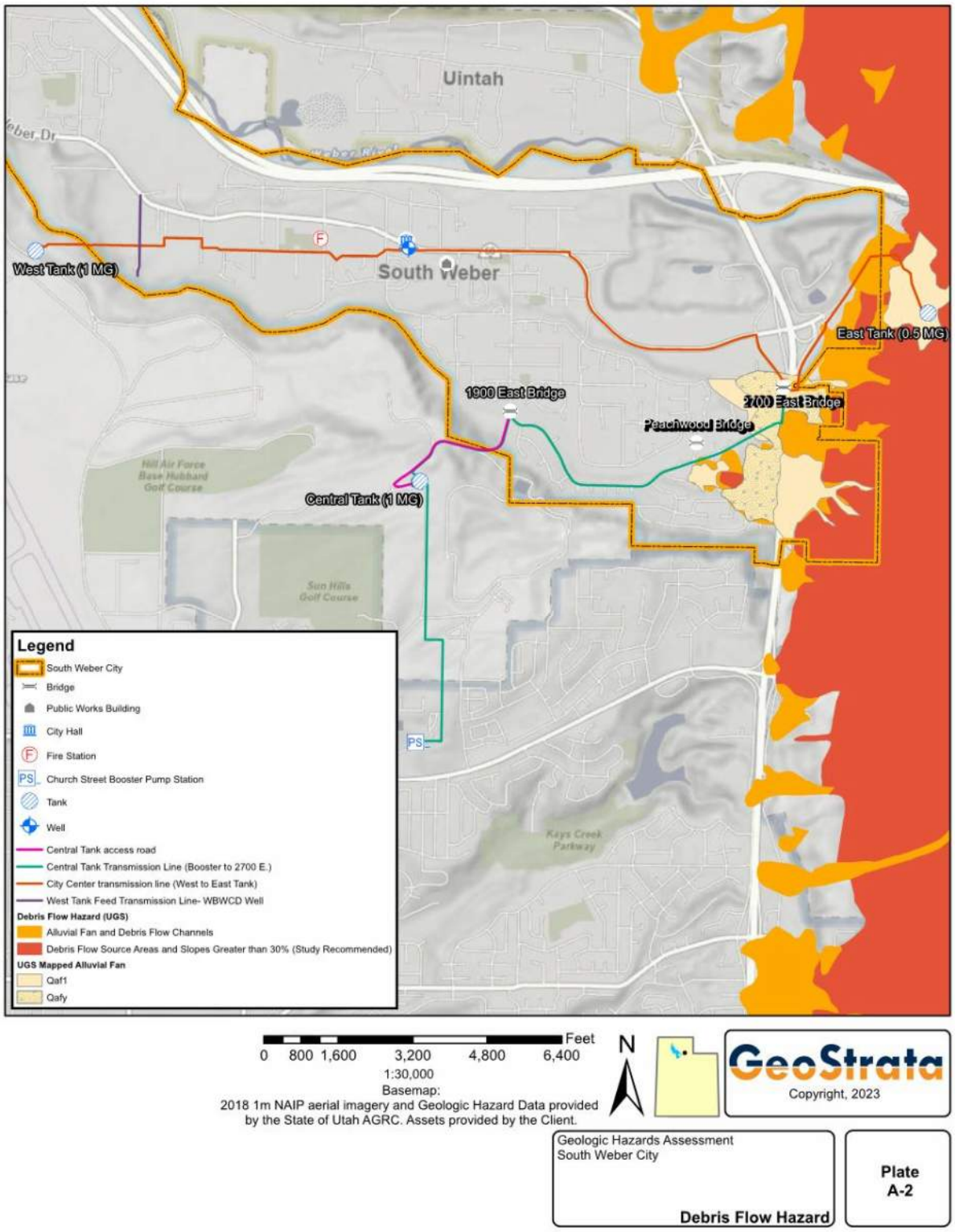
In addition to utilizing social media, public meetings held in-person or virtually (not on social media) will also play an important role in our ongoing communication with the public. These meetings will provide an opportunity for people to come together, ask questions, and share their thoughts on the plan's implementation. They can also be used to provide updates on progress and address any challenges that may arise. By holding regular public meetings, SWC aims to maintain an open and transparent dialogue with the community and ensure that their voices are heard throughout the maintenance phase.

Appendix A: Asset Location and Hazard Maps

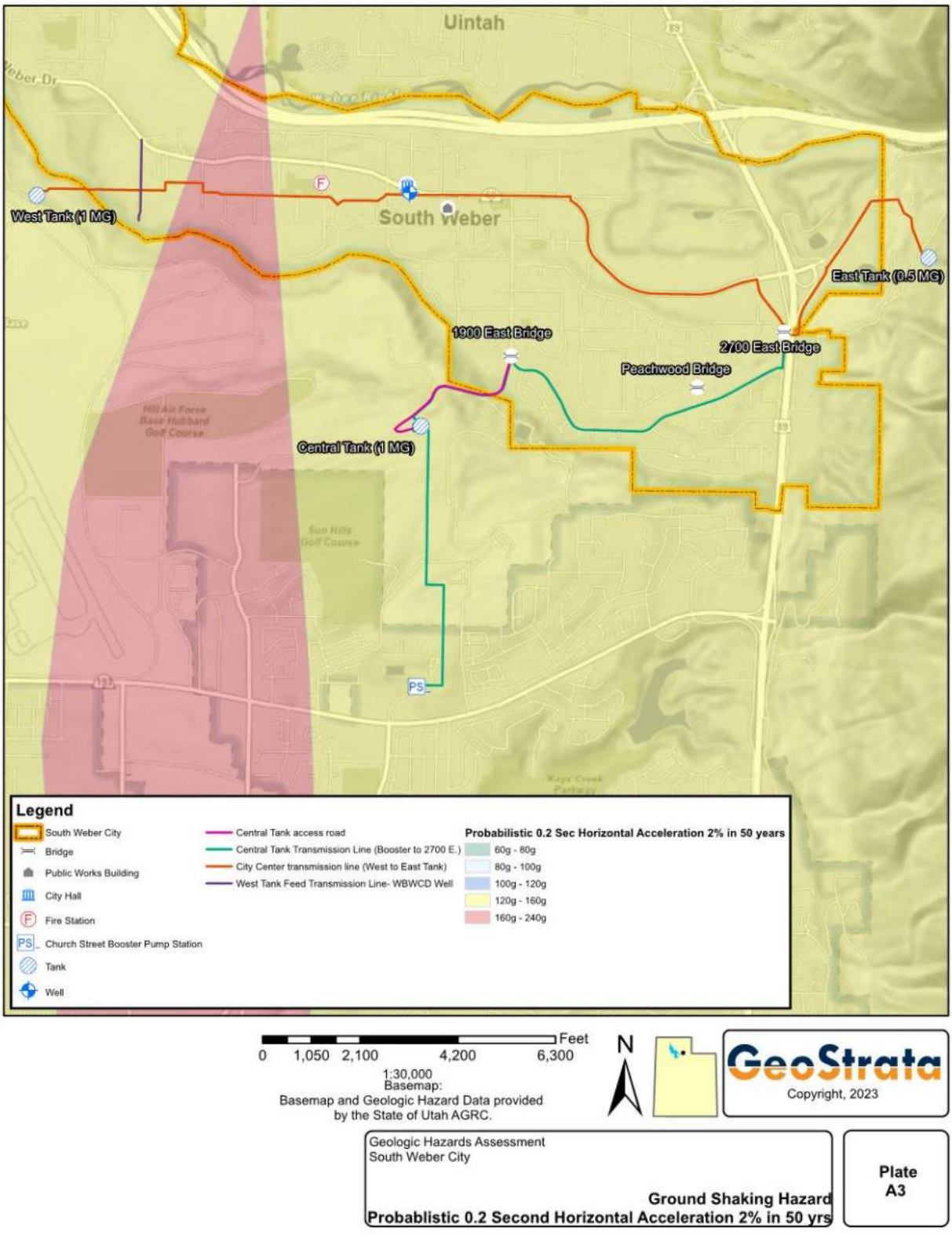
1. Facilities/Assets List and Map
2. Debris Flow Hazards Map (Plate A-2)
3. Earthquake Hazard - Ground Shaking (Plate A-3)
4. Earthquake Hazard - Liquefaction Potential (Plate A-4)
5. Earthquake Hazard – Surface Fault Rupture (Plate A-5)
6. Problem Soil Hazard – Expansive Soil and Subsidence (Plate A-8)
7. Flood Hazard Areas
8. Landslide Hazard (Plate A-7)
9. Severe Wind (Average Speed) Hazard
10. Wildfire (Threat Index) Hazard
11. Sensitive Lands Map



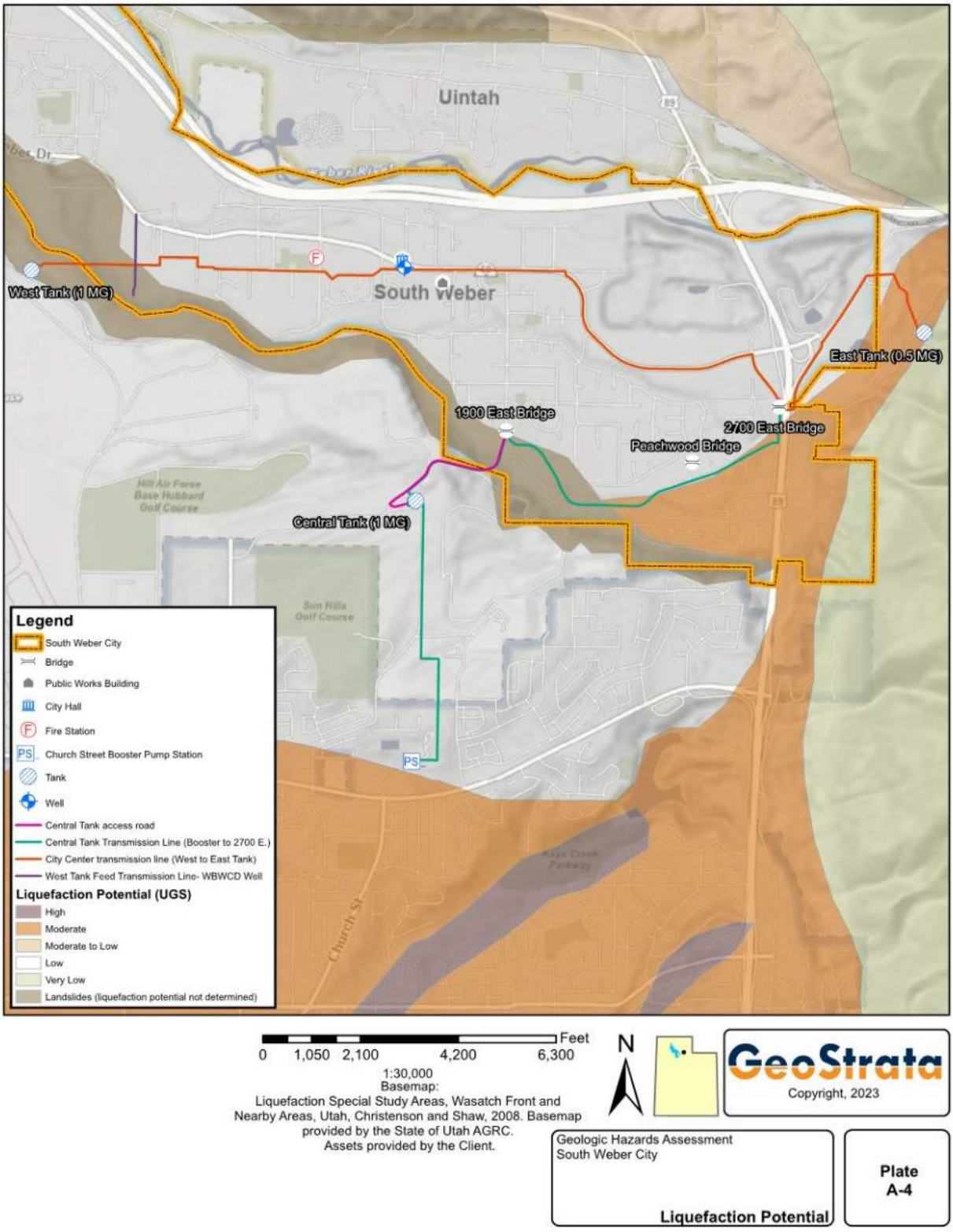
Map 1 Facilities/Assets List and Map



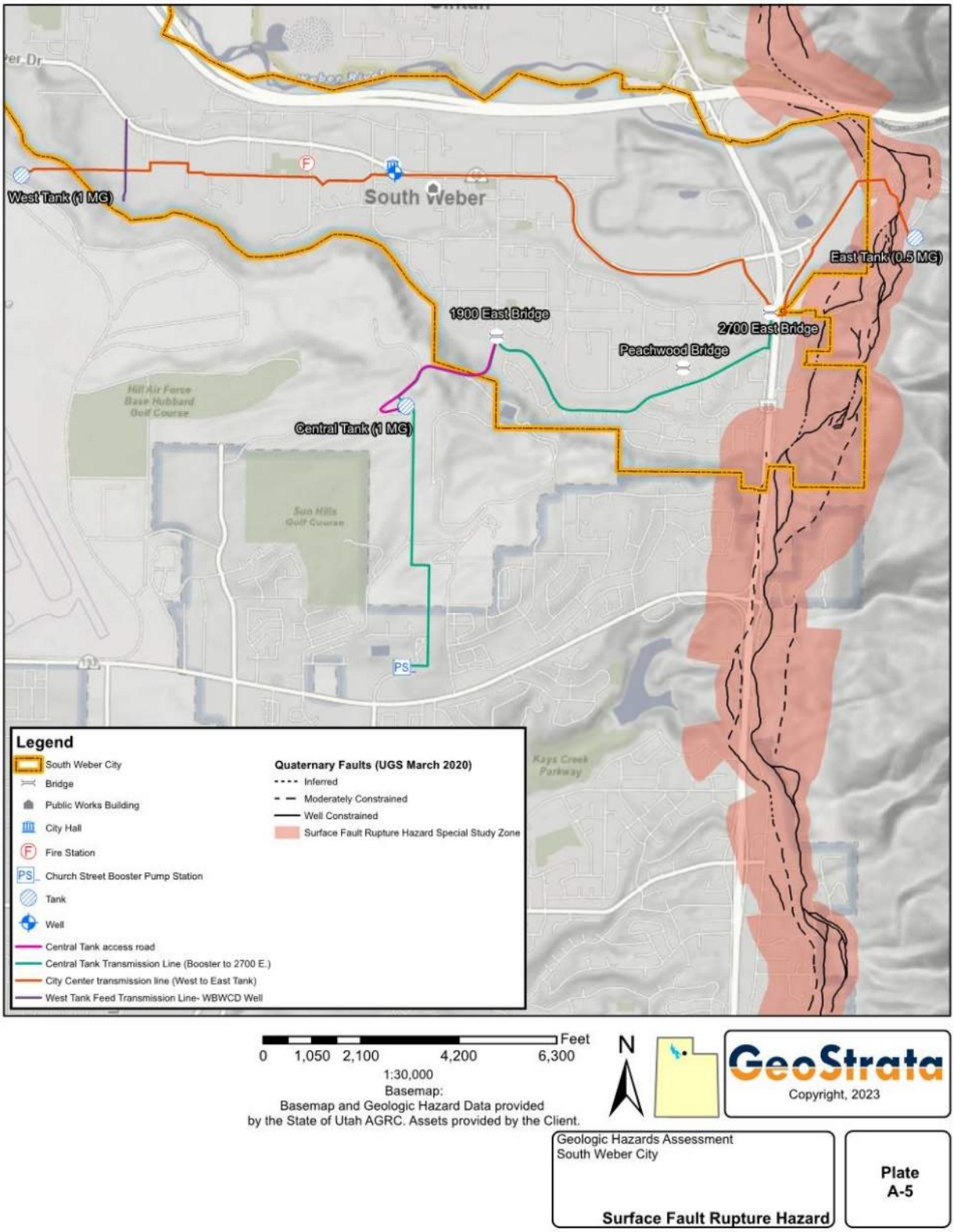
Map 2 Debris Flow Hazards Map (Plate A-2)



Map 3 Earthquake Hazard - Ground Shaking (Plate A-3)



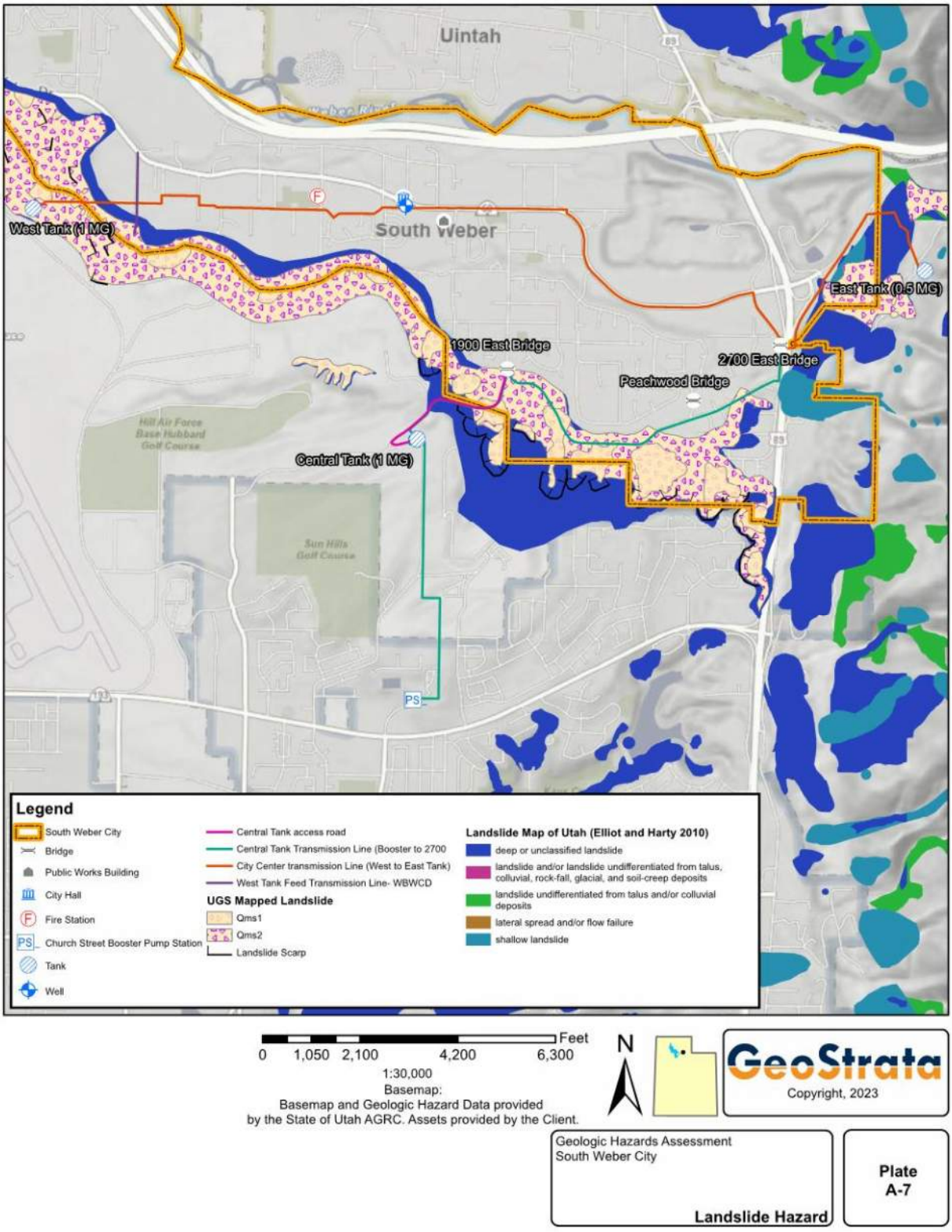
Map 4 Earthquake Hazard - Liquefaction Potential (Plate A-4)



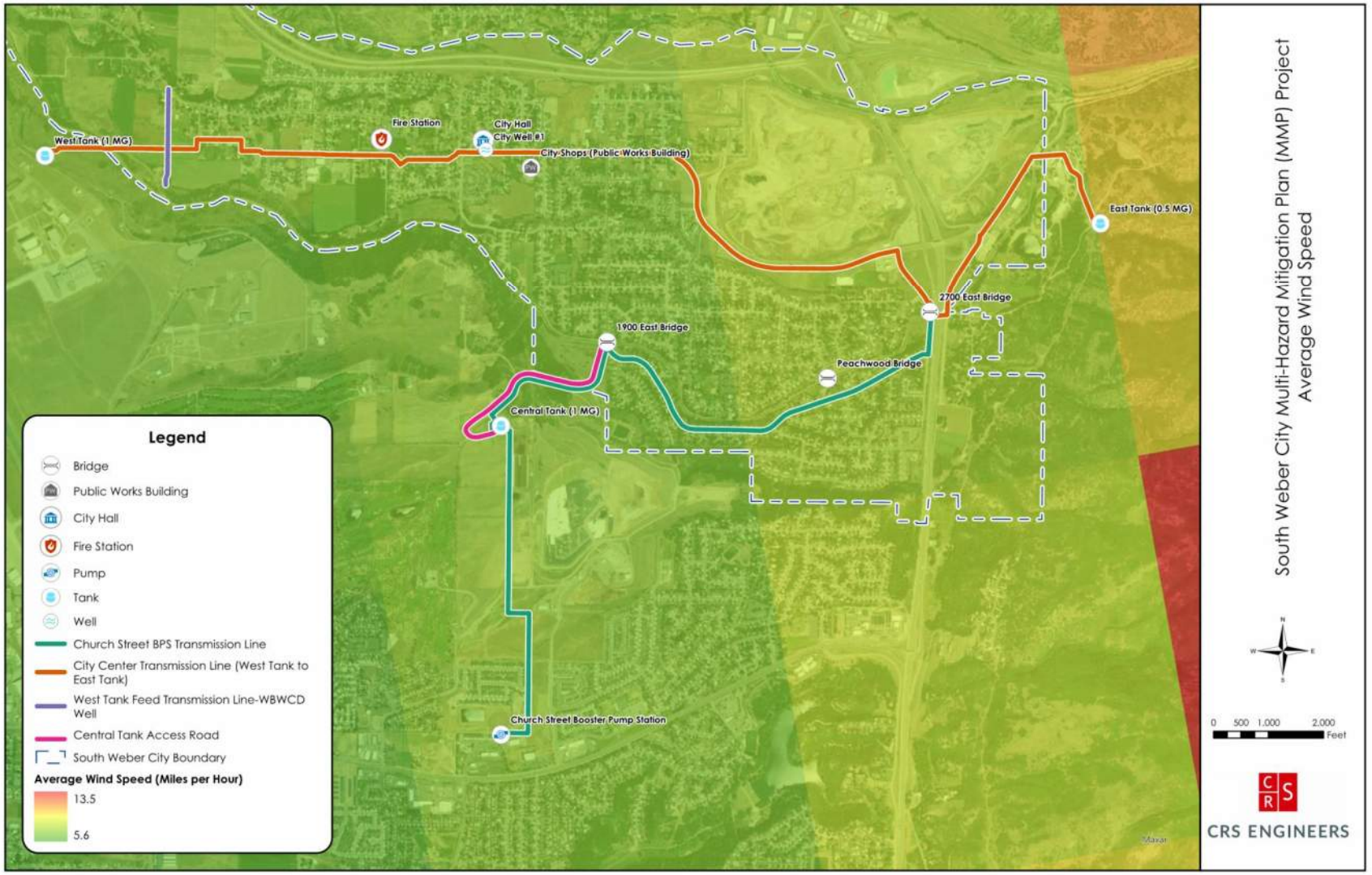
Map 5 Earthquake Hazard – Surface Fault Rupture (Plate A-5)

Map 6 Problem Soil Hazard – Expansive Soil and Subsidence (Plate A-8)

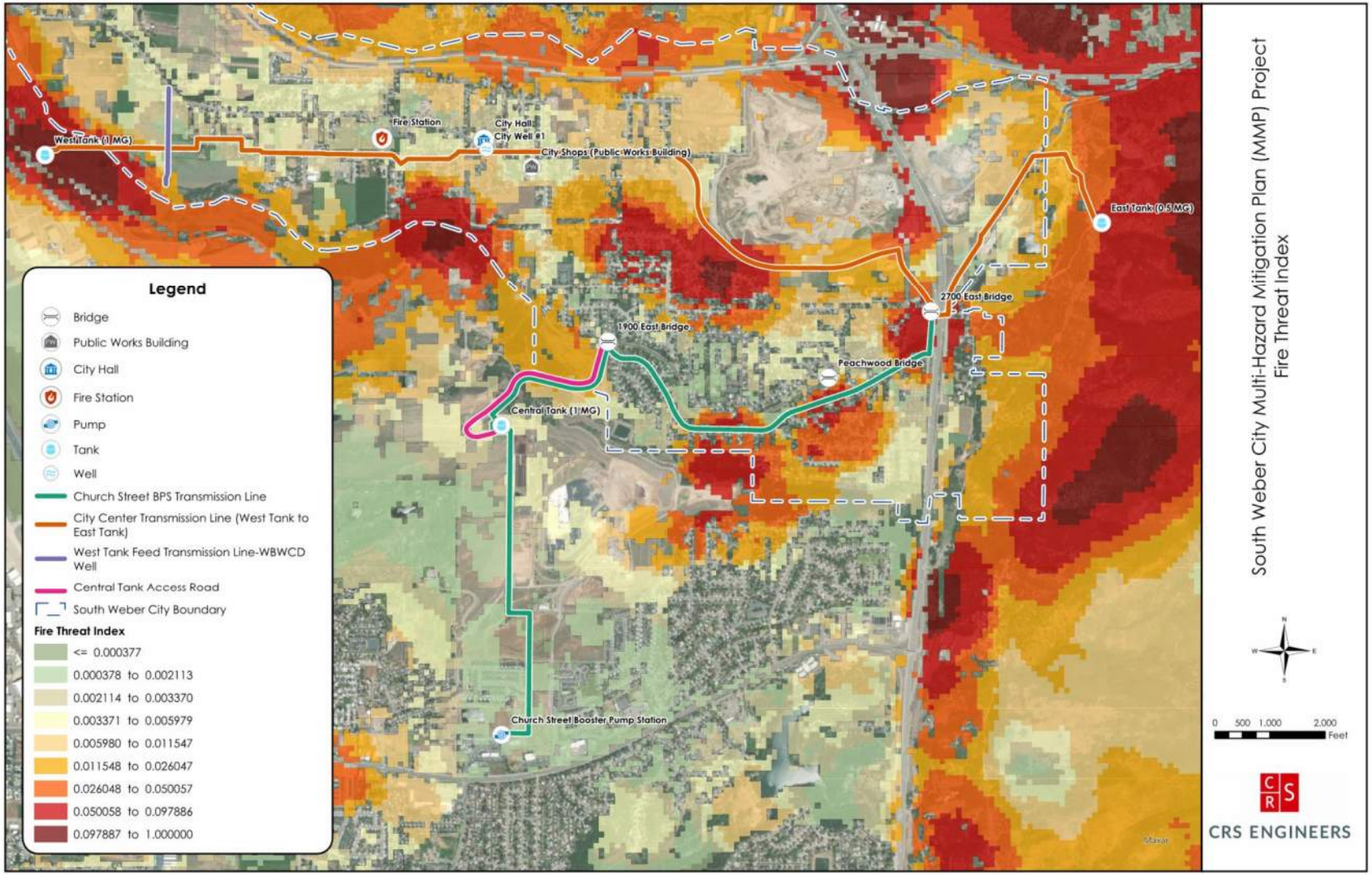
Map 7 Flood Hazard Areas



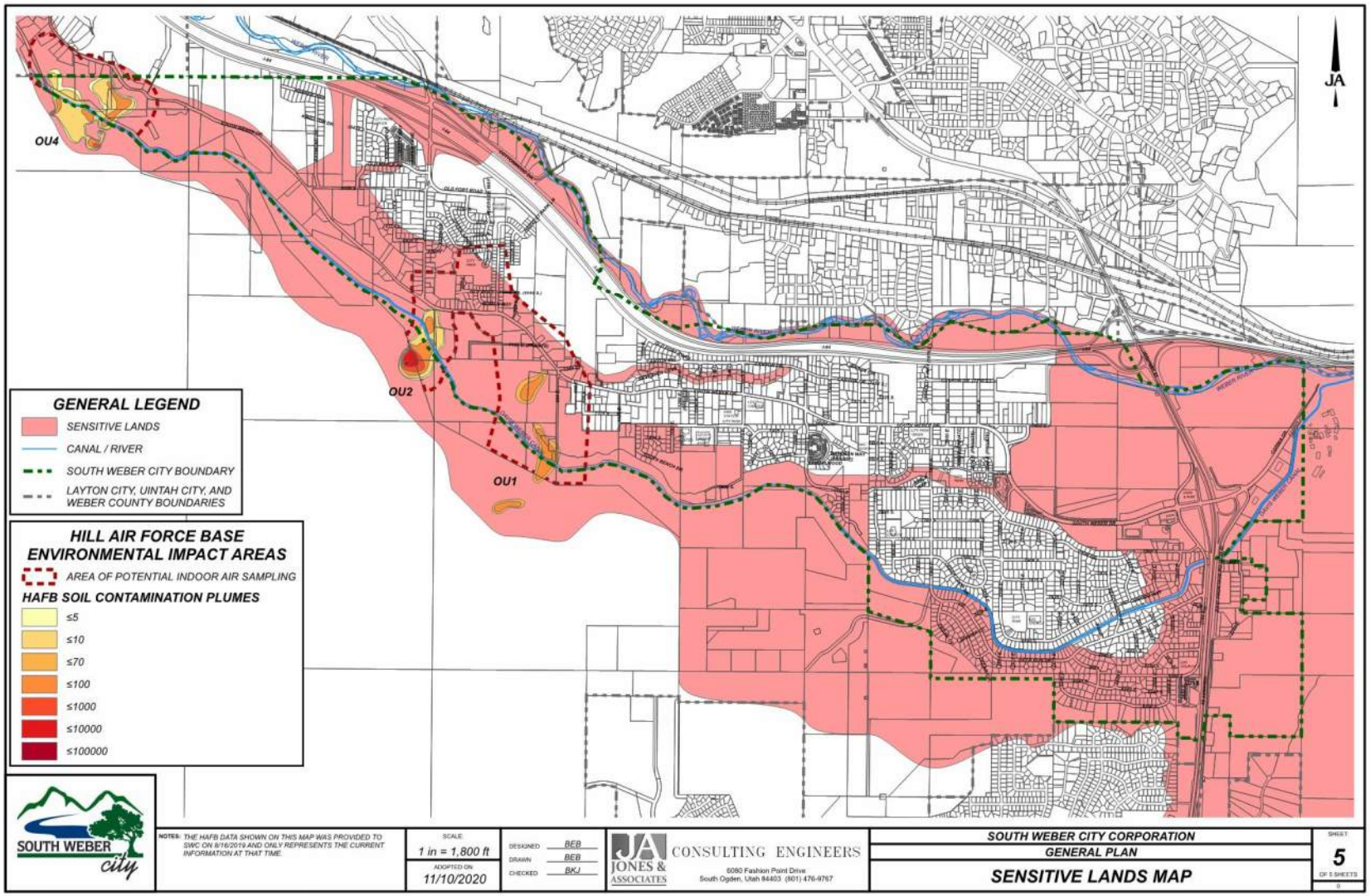
Map 8 Landslide Hazard (Plate A-7)



Map 9 Severe Wind (Average Speed) Hazard



Map 10 Wildfire (Threat Index) Hazard



Map 11 South Weber City Sensitive Lands Map

Appendix B: Stakeholder Participation Documentation

1. Stakeholder email list
2. Stakeholder Meeting #1 May 25, 2022
    a. Invitation
    b. In-person sign in sheet
    c. Virtual (online) attendee list
    d. Meeting agenda
    e. Questionnaire link email
    f. Questionnaire link for virtual attendees
    g. Questionnaire-Comment sheet blank
    h. Questionnaire-Davis County Animal Control
    i. Questionnaire-Wasatch Integrated Waste District
3. Stakeholder Meeting #2 September 29, 2022
    a. Invitation
    b. In-person sign in sheet
    c. Virtual (online) attendee list
    d. Meeting agenda
    e. Questionnaire link for virtual attendees
    f. Questionnaire-Comment sheet blank
4. Stakeholder Meeting #3 November 30, 2022
    a. Invitation
    b. In-person sign in sheet
    c. Virtual (online) attendee list
    d. Meeting agenda
5. Stakeholder Meeting #4 January 25, 2023
    a. Invitation
    b. In-person sign in sheet
    c. Virtual (online) attendee list
    d. Meeting agenda

South Weber City MMP Project - Stakeholders List

Stakeholder Organization	Name/Position Title	Email	Phone Number
Local Agencies – (e.g., Water/Utility Companies)			
Local Flood Plain Manager	Dana Shuler	dana@jonescivil.com	801.476.9767
Local Emergency Planning Committee (LEPC) – see Davis County Sheriff's Office, and others?	Chad Monroe/Emergency Manager	cmonroe@co.davis.ut.us	801-451-4129
South Weber City CERT	Trevor Cahoon/Community Services Director	TCahoon@southwebercity.com	801.479.3177 ext. 2221
S.W. Water Improvement District	Darren Hess	dhess@weberbasin.com	801.475.4749
South Weber Irrigation Company	Blair Halverson	bhalverson@ctrol.com	801.381.4093
Davis & Weber Counties Canal Company	Rick Smith	ricks@davisweber.org	801.774.6373
Weber Basin Water Conservancy District (WBWCD)	Darren Hess/Assistant General Manager/COO	dhess@weberbasin.com	801.771.1677
Central Weber Sewer Improvement District (CWSID)	Kevin Hall	kevinh@centralweber.com	801.731.3011
Wasatch Integrated Waste Management	Nathan Rich	nathanr@wiwmd.org	801.614.5601
South Weber Elementary	Brook Paras	bparas@dsdmail.net	801.402.3750
High Mark Charter School	Shawn Miehlke	smiehlke@hmcharterschool.org	801.476.4627

Stakeholder Organization	Name/Position Title	Email	Phone Number
Neighboring Local Jurisdictions			
Layton City	Alex Jensen/City Manager	ajensen@laytoncity.org	
City of Washington Terrace	Tom Hanson/City Manager	Tomh@washingtonterracecity.org	
Riverdale	Steve Brooks/City Administrator	SBrooks@riverdalecity.com	
South Ogden City	Matt Dixon/City Manager	mdixon@southogdencity.gov	
Uintah City	Jolene	uintahcity@uintahcity.com	
County or Regional Agencies			
Davis County Sheriff's Office	Sheriff Kelly Sparks	ksparks@co.davis.ut.us	801.451.4100
Davis County Emergency Manager	Chad Monroe	cmonroe@co.davis.ut.us	801-451-4129
Davis County Environmental Health Services Division	Brian Hatch	brianl@co.davis.ut.us	801.525.5100
Davis County Animal Control	Ashleigh Young	ayoung@co.davis.ut.us	801.444.2200
Wasatch Front Regional Council	Andrew Gruber	agruber@wfrc.org	801.824.0055
Weber County Emergency Manager	Lisa Schwartz	lschwartz@co.weber.ut.us	801.778.6682

Stakeholder Organization	Name/Position Title	Email	Phone Number
State Agencies			
Utah Division of Emergency Management	Kathy Holder/State Hazard Mitigation Officer Eric Martineau/Mitigation Planner	kcholder@utah.gov emartineau@utah.gov	385-315-3566 Cell 801-946-4002
Utah Department of Transportation (Region One Office)	Rob Wight/Region 1 Director	rwight@utah.gov	801.620.1600
Utah Division of Drinking Water	Pete Keers/Environmental Scientist and ESF#3 State EOC	pkeers@utah.gov	385-271-7045
Utah Division of Water Quality	Emily Canton/Assistant Director	ercanton@utah.gov	385.262.1911
Utah Division of Water Rights	Dave Marble/Assistant Utah State Engineer	DaveMarble@utah.gov	801-538-7376
Utah Geological Survey	Steve Bowman/Geologic Hazard Program Manager[1] Rich Giraud/Senior Geologist[2]	SteveBowman@utah.gov RichardGiraud@utah.gov	801-537-3304 801-573-3351
Utah Division of Forestry, Fire & State Lands	Julie Murphy/Wildfire Risk Reduction Coordinator Laura Ault/Utah Shared Stewardship Coordinator	JulieMurphy@utah.gov lauraault@utah.gov	385-228-6439 801.550.7754

Stakeholder Organization	Name/Position Title	Email	Phone Number
Federal Agencies			
FEMA Region 8	Emily Alvarez/Community Planner	Emily.Alvarez@FEMA.DHS.gov	720-292-8702
U.S. Bureau of Land Management – Utah State Office	Greg Sheehan/Director	Blm_ut_state_director@blm.gov	801-539-4001
U.S. Bureau of Reclamation	Wayne Pullan/Regional Director for the Upper Colorado Regional Basin Office	ucbpao@usbr.gov	801-524-3600
U.S. Forest Service - Intermountain Region	Tyler Ashcroft/ Shared Stewardship Coordinator Quincy Barr/ Utah State Liaison Forest Service Intermountain Region	tyler.ashcroft@usda.gov quincy.bahr@usda.gov	801-625-5354 office 801-698-3857 cell 801-518-1479 cell
U.S. Geological Survey		sigerner@usgs.gov	801-908-5000
Other			
Job Corps	Jason Talbot	Jason.l.talbot@usda.gov	801.479.9806
Robinson Waste	Lance Allen	lance@robinsonwasteservices.com	801.825.3800

Notes:

1. Wrote majority of Geological Hazards Chapter in State of Utah HMP (2019)
2. State's Landslide expert.

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Invitation: Stakeholder Meeting for South Weber City Multi-Hazard Mitigation Plan

David J. Larson <dlarson@southwebercity.com> Mon, May 16, 2022 at 10:24 AM

Hi Friend,

South Weber City is in process of creating a Multi-Hazard Mitigation Plan for emergency management purposes. We are excited to hold a series of Stakeholder Meetings for local, regional, and state agencies; neighboring cities and jurisdictions; and other interested and potentially effected stakeholders. You and your organization has been identified as a potential stakeholder. If you feel like you've been included in error, please reply to this email and let me know.

I'd like to invite you to attend our first stakeholder meeting on Wednesday, May 25 from 9:30-11:00am at South Weber City Hall or virtually via zoom (see attached flyer and below for zoom details).

Attached is the agenda for the meeting. We look forward to providing information about our project and what has been accomplished so far, then receiving feedback and comment from you as stakeholders to the City's plan.

Please don't hesitate to contact me if you have any questions.

Thanks.

David

Virtual Online Option: Zoom Meeting (see link & phone info below)

Join Zoom Meeting: (Phone: 669 900 6833)

https://us02web.zoom.us/j/85166217465?pwd=bDl2eUw4WmI3UnlWcE9xZEE4RCtxdz09

Meeting ID: 851 6621 7465 Passcode: 322689

David J. Larson

City Manager | South Weber City

o 801-479-3177 x207 | f 801-479-0066

dlarson@southwebercity.com

2 attachments

SWC MMP Ph A Stakeholder Mtg Agenda 05-11-22_PT Mtg#1 Results_R1.pdf
98K

Stakeholder Mtg #1.pdf
863K

Stakeholder Meeting #1 Sign-In Sheet

In Attendance	Project:	South Weber City (SWC) Multi-Hazard Mitigation Plan (MMP) Project		Meeting Date:	May 25, 2022
	Facilitator:	Bryon Elwell		Place/Room:	SWC City Council Chambers
	Name	**Title/Project Role**	**Organization**	**Phone**	**E-Mail**
✓	Bryon Elwell	President/Project Manager	Elwell Consulting Group	801-870-9709 Cell	Bryonelwellsr@gmail.com
✓	David Larson	City Manager/Project Manager	South Weber City	801-479-3177 ext. 2207 Office 801-361-0637 Cell	dlarson@southwebercity.com
✓	Trevor Cahoon	Community & Planning Director	South Weber City	801-479-3177 ext. 2221 Office	tcahoon@southwebercity.com
✓	Mark McRae	Finance Director/Office Manager	South Weber City	801-479-3177 ext. 2212 Office	mmcrae@southwebercity.com
	Mark Larson	Public Works Director	South Weber City	801-458-4839	mlarson@southwebercity.com
	Bryan Wageman	Asst. Public Works Director	South Weber City	801-791-5765	bwageman@southwebericty.com
	Mark Johnson	Water & Sewer Manager	South Weber City	435-770-6098	mjohnson@southwebercity.com
	Brandon Jones	City Engineer	Jones and Associates	801-391-9621	brandonj@jonescivil.com
	Ashleigh Young	AC Director	Davis County	801-444-2220	aywing@co.davis.ut.us
	Dan Ramos	Safety Superintendent	Wasatch Int. Waste Man.	801-614-5608	dan@wiwmd.org
	Preston Lee	Cp Manager	Wasatch Integrated	8016383849	preston@wiwmd.org
	Stockton Truvillo	Emergency planner	DCEM	801-448-4986	Struvillo@co.davis.ut.us
	A. J. Cox	Lt. Davis County	DCSO	801 451-4124	Jaxgyle@co.davis.ut.us
	Teri Halverson	SWIC	SWIC		Teriswic6525@gmail

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Zoom Attendees List

David J. Larson <dlarson@southwebercity.com> Wed, May 25, 2022 at 11:13 AM
To: Bryon Elwell <bryonelwellsr@gmail.com>

Hi Bryon,

Here are the individuals that were attending the stakeholder meeting online:

- Eric Martineau
- Parker Crowe
- Emily Alvarez
- Cameron
- Matt Dixon
- Miranda Miller

Thanks.

David

David J. Larson

City Manager | South Weber City

o 801-479-3177 x207 | f 801-479-0066

dlarson@southwebercity.com

AGENDA

South Weber City (SWC)

Multi-Hazard Mitigation Plan (MMP) Project

Phase A Stakeholders Meeting #1

May 25, 2022
9:30 a.m. – 11:00 a.m.
In Person at South Weber City Hall: 1600 E South Weber Drive

Virtual Online Option: Zoom Meeting (see link & phone info below)
Join Zoom Meeting: (Phone: 669 900 6833)
https://us02web.zoom.us/j/85166217465?pwd=bDl2eUw4Wml3UnlWcE9xZEE4RCtxdz09

Meeting ID: 851 6621 7465
Passcode: 322689

1. **Introductions**
2. **Project Overview - MMP**
3. **Phase A - Planning Process - Results**
4. **Project Schedule**
5. **Next Steps – Phase B Risk Assessment**
6. **Stakeholder Input**
7. **Adjourn**

ECG Project No. 2022-002 1 of 1 May 13, 2022

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Invitation: Stakeholder Meeting for South Weber City Multi-Hazard Mitigation Plan

David J. Larson <dlarson@southwebercity.com> Thu, May 26, 2022 at 12:45 PM

Hi All,

Thank you to all those who participated with us yesterday in our first stakeholder meeting. We anticipate the next meeting in the Fall.

If you were unable to attend, please click on this link to fill out a quick stakeholder questionnaire – https://forms.office.com/r/56tCvzYVSW. This is the same questionnaire that was used in the meeting yesterday.

Please don't hesitate to contact me if you have any questions.

Thanks.

David

[Quoted text hidden]

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Digital Stakeholder Comment Sheet

David J. Larson <dlarson@southwebercity.com> Wed, May 25, 2022 at 9:03 AM
To: Bryon Elwell <bryonelwellsr@gmail.com>

Hi Bryon,

Here's the link to fill out the digital stakeholder "Questionnaire/Comment Sheet" so we can put it in the zoom meeting chat box: https://forms.office.com/r/56tCvzYVSW

David J. Larson

City Manager | South Weber City

o 801-479-3177 x207 | f 801-479-0066

dlarson@southwebercity.com

Questionnaire/Comment Sheet

South Weber City Multi-Hazard Mitigation Plan
Stakeholders Meeting #1
May 25, 2022

Stakeholder Agency: _____

Representative Name: _____ Email: _____

1. Natural Hazard History
   Past Occurrences (Hazard type, Year, Damages, Repair/Restore Costs):

2. Natural Hazard types and areas of concern within South Weber City (i.e., Drought, Earthquake, Landslide, Lightning, Wildfire, etc.):

3. Other relevant hazard mitigation plans/information:

4. Other Input/Comments:

Questionnaire/Comment Sheet

South Weber City Multi-Hazard Mitigation Plan
Stakeholders Meeting #1
May 25, 2022

Stakeholder Agency: Davis County Animal Care

Representative Name: Ashleigh Young Email: aayoung@co.Davis.ut.us

1. Natural Hazard History
   Past Occurrences (Hazard type, Year, Damages, Repair/Restore Costs):
   Wind Storms - 2021 + previous years
   Wildfire(s) - 2020 in Fruit Heights / 2018 S. Weber
   Drought - ongoing

2. Natural Hazard types and areas of concern within South Weber City (i.e., Drought, Earthquake, Landslide, Lightning, Wildfire, etc.):
   What about disease/chemical spills or outbreaks?

3. Other relevant hazard mitigation plans/information:

4. Other Input/Comments:
   Animal Care is currently developing a MHM plan for Davis County.

Questionnaire/Comment Sheet

South Weber City Multi-Hazard Mitigation Plan
Stakeholders Meeting #1
May 25, 2022

Stakeholder Agency: Wasatch Integrated Waste Managment District

Representative Name: Preston Lee Email: preston@wiwmd.org

1. Natural Hazard History
   Past Occurrences (Hazard type, Year, Damages, Repair/Restore Costs):
   Dec 2011 Windstorm Damage to structures. But Davis Landfill was overwhelmed with debris Weeks of clean up.

2. Natural Hazard types and areas of concern within South Weber City (i.e., Drought, Earthquake, Landslide, Lightning, Wildfire, etc.):
   Landslides; Fires; Storms

3. Other relevant hazard mitigation plans/information:

4. Other Input/Comments:
   Wasatch Integrated Plans on being the support for clean up after ~~disaster~~ Disaster clean up.

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Invitation: Stakeholder Meeting #2 for South Weber City Multi-Hazard Mitigation Plan

David J. Larson <dlarson@southwebercity.com> Wed, Sep 14, 2022 at 12:20 PM

Hi Friend,

Thank you to those who attended our first stakeholder meeting in May. We are excited to invite you to our second stakeholder meeting on Thursday, September 29 from 1:00-2:00pm at South Weber City Hall or virtually via zoom (see attached flyer and below for zoom details).

Attached is the agenda for the meeting. We look forward to providing information and a status update about our project, then receiving feedback and comment from you as stakeholders to the City's plan.

As a reminder of the meeting's purpose, South Weber City is in process of creating a Multi-Hazard Mitigation Plan for emergency management purposes. We are excited to hold a series of Stakeholder Meetings for local, regional, and state agencies; neighboring cities and jurisdictions; and other interested and potentially effected stakeholders. You and your organization has been identified as a potential stakeholder. If you feel like you've been included in error, please reply to this email and let me know.

Please don't hesitate to contact me if you have any questions.

Thanks.

David

David J. Larson

City Manager | South Weber City

o 801-479-3177 x207 | f 801-479-0066

dlarson@southwebercity.com

2 attachments

Stakeholder Mtg #2 (1).png
1286K

SWC MMP Ph B Stakeholder Mtg Agenda 09-29-22.pdf
289K

Stakeholder Meeting #2 Sign-In Sheet

In Attendance	Project:	South Weber City (SWC) Multi-Hazard Mitigation Plan (MMP) Project		Meeting Date:	September 29, 2022
	Facilitator:	Bryon Elwell		Place/Room:	SWC City Council Chambers
	Name	**Title/Project Role**	**Organization**	**Phone**	**E-Mail**
✓	Bryon Elwell	President/Project Manager	Elwell Consulting Group	801-870-9709 Cell	Bryonelwellsr@gmail.com
✓	David Larson	City Manager/Project Manager	South Weber City	801-479-3177 ext. 2207 Office 801-361-0637 Cell	dlarson@southwebercity.com
	Trevor Cahoon	Community & Planning Director	South Weber City	801-479-3177 ext. 2221 Office	tcahoon@southwebercity.com
	Mark McRae	Finance Director/Office Manager	South Weber City	801-479-3177 ext. 2212 Office	mmcrae@southwebercity.com
✓	Mark Larson	Public Works Director	South Weber City	801-458-4839	mlarson@southwebercity.com
	Bryan Wageman	Asst. Public Works Director	South Weber City	801-791-5765	bwageman@southwebericty.com
	Mark Johnson	Water & Sewer Manager	South Weber City	435-770-6098	mjohnson@southwebercity.com
	Brandon Jones	City Engineer	Jones and Associates	801-391-9621	brandonj@jonescivil.com
✓	Andrew Lyday	Canal operations lead	Davis + Weber Canal	801-745-5814	andrewl@davisweber.org
✓	Ashleigh Young	Director Animal Care	Animal Care	801-444-2220	

Attended via Zoom online

	Lance Allen		Robinson Waste Services		Lance@Robinsonwasteservices.com

Page 2 of 3

AGENDA

SWC Multi-Hazard Mitigation Plan (MMP) Project

Phase B Stakeholders Meeting #2

September 29, 2022
1:00 p.m. – 2:30 p.m.
Virtual Zoom Meeting (see link & phone info below)

Join Zoom Meeting: (Phone: 669 900 6833)
https://us02web.zoom.us/j/85028155585?pwd=WHhMZ01QSXJxakRFSXFmMXIzOUpqQT09
Meeting ID: 850 2815 5585
Passcode: 057684

1. **Introductions**
2. **Project Overview**
3. **Phase B Risk Assessment - Results**
4. **Next Steps – Phase C Mitigation Strategy**
5. **Stakeholder Input**
6. **Project Schedule**
7. **Adjourn**

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Stakeholder Survey #2

David J. Larson <dlarson@southwebercity.com> Thu, Sep 29, 2022 at 12:41 PM
To: Bryon Elwell <bryonelwellsr@gmail.com>

Hi Bryon,

Here's the link to the digital version of the survey – https://forms.office.com/r/5LXAmV8xnx

Thanks.

David

David J. Larson

City Manager | South Weber City

o 801-479-3177 x2207 | f 801-479-0066

dlarson@southwebercity.com

Questionnaire/Comment Sheet

South Weber City Multi-Hazard Mitigation Plan
Stakeholders Meeting #2
September 29, 2022

Stakeholder Agency: _____

Representative Name: _____ Email: _____

1. Other relevant hazard mitigation plans/information applicable to South Weber City?

   _____

   _____

2. Do you have your own or do you participate in a FEMA-approved Regional or Local Hazard Mitigation Plan?

   ☐ Yes ☐ No

   Plan Name:

   _____

   Year Approved by FEMA:

   _____

3. Mitigation Action Ideas for Hazards Assessed (i.e., Earthquake – anchor & brace nonstructural equipment)
   Hazard Mitigation Action

   _____ _____

   _____ _____

4. Stakeholder Experience with Mitigation Actions
   a. Mitigation Action: _____
   b. Effectiveness of Mitigation Action: _____
   c. Year Implemented: _____
   d. Approximate Cost: _____

   _____

5. Other Stakeholder Input/Comments:

   _____

   _____

   _____

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Invitation: Stakeholder Meeting #3 for South Weber City Multi-Hazard Mitigation Plan

David J. Larson <dlarson@southwebercity.com> Fri, Nov 18, 2022 at 9:39 AM

Hi Friend,

Thank you to those who attended our first and/or second stakeholder meetings in May & September. We are excited to invite you to our third stakeholder meeting on Wednesday, November 30 from 1:00-2:30pm at South Weber City Hall or virtually via zoom (see attached flyer and below for zoom details).

Attached is the agenda for the meeting. We look forward to providing information and a status update about our project, then receiving feedback and comment from you as stakeholders to the City's plan.

As a reminder of the meeting's purpose, South Weber City is in process of creating a Multi-Hazard Mitigation Plan for emergency management purposes. We are excited to hold a series of Stakeholder Meetings for local, regional, and state agencies; neighboring cities and jurisdictions; and other interested and potentially effected stakeholders. You and your organization has been identified as a potential stakeholder. We appreciate your time and consideration of our planning process.

Please don't hesitate to contact me if you have any questions.

Thanks.

David

David J. Larson

City Manager | South Weber City

o 801-479-3177 x2207 | f 801-479-0066

dlarson@southwebercity.com

2 attachments

Stakeholder Mtg #3.png
1290K

SWC MMP Ph C Stakeholder Mtg#3 Agenda 11-30-22.pdf
193K

Stakeholder Meeting #3 Sign-In Sheet

In Attendance	Project:	South Weber City (SWC) Multi-Hazard Mitigation Plan (MMP) Project		Meeting Date:	November 30, 2022
	Facilitator:	Bryon Elwell		Place/Room:	SWC City Council Chambers
	Name	**Title/Project Role**	**Organization**	**Phone**	**E-Mail**
✓	Bryon Elwell	President/Project Manager	Elwell Consulting Group	801-870-9709 Cell	Bryonelwellsr@gmail.com
✓	David Larson	City Manager/Project Manager	South Weber City	801-479-3177 ext. 2207 Office 801-361-0637 Cell	dlarson@southwebercity.com
	Trevor Cahoon	Community & Planning Director	South Weber City	801-479-3177 ext. 2221 Office	tcahoon@southwebercity.com
	Mark McRae	Finance Director/Office Manager	South Weber City	801-479-3177 ext. 2212 Office	mmcrae@southwebercity.com
	Mark Larson	Public Works Director	South Weber City	801-458-4839	mlarson@southwebercity.com
	Bryan Wageman	Asst. Public Works Director	South Weber City	801-791-5765	bwageman@southwebericty.com
	Mark Johnson	Water & Sewer Manager	South Weber City	435-770-6098	mjohnson@southwebercity.com
	Brandon Jones	City Engineer	Jones and Associates	801-391-9621	brandonj@jonescivil.com
	Derek Tolman	Fire Chief	South Weber City	801-941-5961	dtolman@southwebercity.com
✓	Chad Monroe	Emergency Manager	Davis County	801-451-4129	cmonroe@co.davis.ut.us
✓	Preston Lee	Ops Manager	Wasatch Integrated	801-638-3849	Preston.lee@wiwmd.org
✓	Rick Smith	General Manager	DWCCC	801-774-6373	ricks@davisweber.org

ELWELL
CONSULTING GROUP

Attended via Zoom online

	Kathy Holder	Utah DEM			
	Morowda Miller	Utah DEM			
	Parker Crowe	FEMA Region 8			
	Dan Ramos	WIWMD			
	Ashleigh Young	Davis County Animal Control			

AGENDA

SWC Multi-Hazard Mitigation Plan (MMP) Project

Phase C Stakeholder Meeting #3

November 30, 2022
1:00 p.m. – 2:30 p.m.
Virtual Zoom Meeting (see link & phone info below)

Join Zoom Meeting: (Phone: 669 900 6833)
https://us02web.zoom.us/j/87003241335?pwd=TjBtaWs0alpmT0JnRWtQQnpLZUk0Zz09
Meeting ID: 870 0324 1335
Passcode: 462003

1. **Introductions**
2. **Project Overview – Multi-Hazard Mitigation Plan (MMP)**
3. **Phase C Risk Assessment - Results**
4. **Next Steps – Phase D Plan Review & Adoption**
5. **Stakeholder Input**
6. **Project Schedule**
7. **Adjourn**

Gmail

Bryon Elwell <bryonelwellsr@gmail.com>

Invitation: Stakeholder Meeting #4 for South Weber City Multi-Hazard Mitigation Plan

David J. Larson <dlarson@southwebercity.com> Thu, Jan 12, 2023 at 3:37 PM

Hi Friend,

Thank you to those who attended any of our previous 3 stakeholder meetings in May, September, and November. We are excited to invite you to our fourth and final stakeholder meeting on Wednesday, January 25 from 1:00-2:30pm at South Weber City Hall or virtually via zoom (see attached flyer and below for zoom details).

This is the last leg of the journey!

Attached is the agenda for the meeting. We look forward to previewing our draft plan and receiving feedback and comment from you as stakeholders to the City's plan. We appreciate your time and consideration of our planning process and those who have remained with us for the duration 😊

Please don't hesitate to contact me if you have any questions.

Thanks.

David

David J. Larson

City Manager | South Weber City

o 801-479-3177 x2207 | f 801-479-0066

dlarson@southwebercity.com

2 attachments

Stakeholder Mtg #4.png
1289K

SWC MMP Stakeholder Mtg #4 1-25-23 Agenda.pdf
249K

Stakeholder Meeting #4 Sign-In Sheet

In Attendance	Project:	South Weber City (SWC) Multi-Hazard Mitigation Plan (MMP) Project		Meeting Date:	January 25, 2023
	Facilitator:	Bryon Elwell		Place/Room:	SWC City Hall
	Name	**Title/Project Role**	**Organization**	**Phone**	**E-Mail**
✓	Bryon Elwell	President/Project Manager	Elwell Consulting Group	801-870-9709 Cell	Bryonelwellsr@gmail.com
✓	David Larson	City Manager/Project Manager	South Weber City	801-479-3177 ext. 2207 Office 801-361-0637 Cell	dlarson@southwebercity.com
✓	Trevor Cahoon	Community & Planning Director	South Weber City	801-479-3177 ext. 2221 Office	tcahoon@southwebercity.com
	Mark McRae	Finance Director/Office Manager	South Weber City	801-479-3177 ext. 2212 Office	mmcrae@southwebercity.com
	Mark Larson	Public Works Director	South Weber City	801-458-4839	mlarson@southwebercity.com
	Bryan Wageman	Asst. Public Works Director	South Weber City	801-791-5765	bwageman@southwebericty.com
	Mark Johnson	Water & Sewer Manager	South Weber City	435-770-6098	mjohnson@southwebercity.com
	Brandon Jones	City Engineer	Jones and Associates	801-391-9621	brandonj@jonescivil.com
✓	Derek Tolman	Fire Chief	South Weber City	801-941-5961	dtolman@southwebercity.com
✓	CHAD MONROE	DAVIS CO. EM	DAVIS COUNTY	801-451-4129	CMONROE@CO.DAVIS.UT.US
✓	Stockton Trusillo	Davis CO. EM	Davis CO.	801-451-4702	strusillo@co.davis.ut.us

ELWELL CONSULTING GROUP

SWC MMP Project Stakeholder Meeting #4

Online Attendees 1/25/2023

	Name	Title	Org	Phone	Email
	Lance Allen		Robinson Waste		
	Ashleigh Young		Davis County		
	Rob Pressly		FEMA Reg 8		
	Rob Wight		UDOT		

AGENDA

SWC Multi-Hazard Mitigation Plan (MMP) Project

Phase D Stakeholder Meeting #4

January 25, 2023
1:00 p.m. – 2:30 p.m.
Virtual Zoom Meeting (see link & phone info below)

Join Zoom Meeting: (Phone: 669 900 6833)
https://us02web.zoom.us/j/87655764869?pwd=R0N2N1ZhellZc2dBU2hJUklHdzZJdz09
Meeting ID: 876 5576 4869
Passcode: 338993

1. **Introductions**
2. **Project Overview – Multi-Hazard Mitigation Plan (MMP)**
3. **Phase D Plan Review & Adoption – Results – Draft Plan**
4. **Next Steps - State & FEMA Review, Plan Adoption & FEMA Plan Approval**
5. **Stakeholder Final Input / Discussion**
6. **Project Schedule**
7. **Adjourn**

ECG Project No. 2022-002 1 of 1 January 11, 2023

Appendix C: Asset Pair-Wise Comparison Matrices

Asset Prioritization

1. Mission Criteria
2. Criteria 1 – Reliability
3. Criteria 2 – Quality of Life
4. Criteria 3 – Safety
5. Criteria 4 – Stewardship
6. Summary

Mission Criteria	Reliability	Quality of Life	Safety	Stewardship	Criteria Weighting Factors	**Rank**
Reliability		5	2	4	11	**2**
Quality of Life	1		1	3	5	**4**
Safety	4	5		5	14	**1**
Stewardship	2	3	1		6	**3**

South Weber City (SWC) Vision:

A family-focused community, driven by heritage, safety, and charm at its heart

SWC Primary Mission:

South Weber City's mission is to facilitate *neighborhood connection, honor our heritage, ensure a safe haven* for families, *provide sustainable municipal services*, and develop a *community with a heart*

Mission Criteria Definitions:

Reliability: Provide reliable and sustainable municipal services to our community

Quality of Life: Maintain local natural environment and landscape to promote heritage, neighborhood connection and heart for our community

Safety: Ensure employee and public safety from injury/illness/deaths

Stewardship: Efficient & cost effective management of municipal/public assets (i.e., costs, property, value, employees, customers, etc)

Reliability	City Hall	City Shops (PW Bldg.)	Fire Station	West Tank - Concrete Water Tank (1 MG)	Central Tank - Concrete Water Tank (1 MG)	East Tank - Concrete Water Tank (0.5 MG)	Church Street Booster Pump Station (BPS)	Central Tank Transmission Line (Booster to 2700 E.)	City Center transmission line (West to East Tank)	West Tank Feed Transmission Line- WBWCD Well	City Well #1	1900 E. Bridge	Peach Wood Bridge	2700 E. Bridge	Central Tank access road	Sum
City Hall		2	1	1	1	3	1	1	1	1	2	2	3	2	4	25
City Shops (PW Bldg.)	4		3	1	1	2	1	1	1	1	3	4	4	3	4	33
Fire Station	5	3		2	2	3	2	2	2	2	3	4	5	4	5	44
West Tank - Concrete Water Tank (1 MG)	5	5	4		3	4	3	3	3	3	4	4	5	4	5	55
Central Tank - Concrete Water Tank (1 MG)	5	5	4	3		4	3	4	4	4	5	5	5	5	5	61
East Tank - Concrete Water Tank (0.5 MG)	3	4	3	2	2		2	2	2	2	3	3	3	3	4	38
Church Street Booster Pump Station (BPS)	5	5	4	3	3	4		4	4	4	5	5	5	5	5	61
Central Tank Transmission Line (Booster to 2700 E.)	5	5	4	3	2	4	2		4	3	5	5	5	5	5	57
City Center transmission line (West to East Tank)	5	5	4	3	2	4	2	2		3	5	5	5	5	5	55
West Tank Feed Transmission Line- WBWCD Well	5	5	4	3	2	4	2	3	3		5	5	5	5	5	56
City Well #1	4	3	3	2	1	3	1	1	1	1		5	4	5	5	39
1900 E. Bridge	4	2	2	2	1	3	1	1	1	1	1		5	3	4	31
Peach Wood Bridge	3	2	1	1	1	3	1	1	1	1	2	1		1	3	22
2700 E. Bridge	4	3	2	2	1	3	1	1	1	1	1	3	5		4	32
Central Tank access road	2	2	1	1	1	2	1	1	1	1	1	2	3	2		21

Reliability Definition:

Reliability: Provide reliable and sustainable municipal services to our community

Quality of Life	City Hall	City Shops (PW Bldg.)	Fire Station	West Tank - Concrete Water Tank (1 MG)	Central Tank - Concrete Water Tank (1 MG)	East Tank - Concrete Water Tank (0.5 MG)	Church Street Booster Pump Station (BPS)	Central Tank Transmission Line (Booster to 2700 E.)	City Center transmission line (West to East Tank)	West Tank Feed Transmission Line- WBWCD Well	City Well #1	1900 E. Bridge	Peach Wood Bridge	2700 E. Bridge	Central Tank access road	Sum
City Hall		3	3	3	3	3	3	3	3	3	3	3	3	3	3	42
City Shops (PW Bldg.)	3		3	3	3	3	3	3	3	3	3	3	3	3	3	42
Fire Station	3	3		3	3	3	3	3	3	3	3	3	3	3	3	42
West Tank - Concrete Water Tank (1 MG)	3	3	3		3	3	3	3	3	3	3	3	3	3	3	42
Central Tank - Concrete Water Tank (1 MG)	3	3	3	3		3	3	3	3	3	3	3	3	3	3	42
East Tank - Concrete Water Tank (0.5 MG)	3	3	3	3	3		3	3	3	3	3	3	3	3	3	42
Church Street Booster Pump Station (BPS)	3	3	3	3	3	3		3	3	3	3	3	3	3	3	42
Central Tank Transmission Line (Booster to 2700 E.)	3	3	3	3	3	3	3		3	3	3	3	3	3	3	42
City Center transmission line (West to East Tank)	3	3	3	3	3	3	3	3		3	3	3	3	3	3	42
West Tank Feed Transmission Line- WBWCD Well	3	3	3	3	3	3	3	3	3		3	3	3	3	3	42
City Well #1	3	3	3	3	3	3	3	3	3	3		3	3	3	3	42
1900 E. Bridge	3	3	3	3	3	3	3	3	3	3	3		3	3	3	42
Peach Wood Bridge	3	3	3	3	3	3	3	3	3	3	3	3		3	3	42
2700 E. Bridge	3	3	3	3	3	3	3	3	3	3	3	3	3		3	42
Central Tank access road	3	3	3	3	3	3	3	3	3	3	3	3	3	3		42

Quality Definition:

Quality of Life: Maintain local natural environment and landscape to promote heritage, neighborhood connection and heart for our community

Safety	City Hall	City Shops (PW Bldg.)	Fire Station	West Tank - Concrete Water Tank (1 MG)	Central Tank - Concrete Water Tank (1 MG)	East Tank - Concrete Water Tank (0.5 MG)	Church Street Booster Pump Station (BPS)	Central Tank Transmission Line (Booster to 2700 E.)	City Center transmission line (West to East Tank)	West Tank Feed Transmission Line- WBWCD Well	City Well #1	1900 E. Bridge	Peach Wood Bridge	2700 E. Bridge	Central Tank access road	Sum
City Hall		2	1	1	1	1	1	1	1	1	1	2	3	2	2	20
City Shops (PW Bldg.)	4		3	2	2	2	2	2	2	2	3	3	3	3	3	36
Fire Station	5	3		2	2	4	2	2	2	2	3	3	4	3	3	40
West Tank - Concrete Water Tank (1 MG)	5	4	4		3	4	2	2	2	2	4	4	5	4	5	50
Central Tank - Concrete Water Tank (1 MG)	5	4	4	3		5	3	3	4	4	5	4	5	4	5	58
East Tank - Concrete Water Tank (0.5 MG)	5	4	2	2	1		2	1	1	1	3	3	3	3	3	34
Church Street Booster Pump Station (BPS)	5	4	4	4	3	4		4	3	4	4	4	5	4	5	57
Central Tank Transmission Line (Booster to 2700 E.)	5	4	4	4	3	5	2		3	4	4	4	5	4	5	56
City Center transmission line (West to East Tank)	5	4	4	4	2	5	3	3		3	4	4	5	4	5	55
West Tank Feed Transmission Line- WBWCD Well	5	4	4	4	2	5	2	2	3		3	3	3	3	3	46
City Well #1	5	3	3	2	1	3	2	2	2	3		2	3	2	3	36
1900 E. Bridge	4	3	3	2	2	3	2	2	2	3	4		4	2	4	40
Peach Wood Bridge	3	3	2	1	1	3	1	1	1	3	3	2		1	4	29
2700 E. Bridge	4	3	3	2	2	3	2	2	2	3	4	4	5		5	44
Central Tank access road	4	3	3	1	1	3	1	1	1	3	3	2	2	1		29

Safety Definition:

Safety: Ensure employee and public safety from injury/illness/deaths

Stewardship	City Hall	City Shops (PW Bldg.)	Fire Station	West Tank - Concrete Water Tank (1 MG)	Central Tank - Concrete Water Tank (1 MG)	East Tank - Concrete Water Tank (0.5 MG)	Church Street Booster Pump Station (BPS)	Central Tank Transmission Line (Booster to 2700 E.)	City Center transmission line (West to East Tank)	West Tank Feed Transmission Line- WBWCD Well	City Well #1	1900 E. Bridge	Peach Wood Bridge	2700 E. Bridge	Central Tank access road	Sum	Insurance/Replacement Values
City Hall		2	3	4	4	5	5	4	4	5	5	5	5	5	5	61	$6M to $10M
City Shops (PW Bldg.)	4		4	5	5	5	5	5	5	5	5	5	5	5	5	68	$17M
Fire Station	3	2		4	4	5	5	4	4	5	5	5	5	5	5	61	$6M
West Tank - Concrete Water Tank (1 MG)	2	1	2		3	4	5	3	3	5	3	4	4	4	4	47	$3M
Central Tank - Concrete Water Tank (1 MG)	2	1	2	3		4	5	3	3	5	3	4	4	4	4	47	$3M
East Tank - Concrete Water Tank (0.5 MG)	1	1	1	2	2		4	2	1	5	3	4	4	4	4	38	$2M
Church Street Booster Pump Station (BPS)	1	1	1	1	1	2		2	1	3	2	3	3	3	3	27	$800K
Central Tank Transmission Line (Booster to 2700 E.)	2	1	2	3	3	4	4		3	5	3	4	4	4	4	46	$3M
City Center transmission line (West to East Tank)	2	1	2	3	3	5	5	3		5	4	5	5	5	5	53	$4M
West Tank Feed Transmission Line- WBWCD Well	1	1	1	1	1	1	3	1	1		5	4	4	4	4	32	$500K
City Well #1	1	1	1	3	3	3	4	3	2	1		4	4	4	4	38	$2.5M
1900 E. Bridge	1	1	1	2	2	2	3	2	1	2	2		3	3	3	28	$1M
Peach Wood Bridge	1	1	1	2	2	2	3	2	1	2	2	3		3	3	28	$1M
2700 E. Bridge	1	1	1	2	2	2	3	2	1	2	2	3	3		3	28	$1M
Central Tank access road	1	1	1	2	2	2	3	2	1	2	2	3	3	3		28	$1M

Value:

Stewardship: Efficient & cost effective management of municipal/public assets (i.e., costs, property, value, employees, customers, etc)

Summary Sheet	Reliability			Quality of Life			Safety			Stewardship			Total Weighted Sum	Normalized Asset Score	Rank	1.00
	Sum (Reliability)	Pairwise Criteria Evaluation	Weighted Sum	Sum (Quality of Life)	Pairwise Criteria Evaluation	Weighted Sum	Sum (Safety)	Pairwise Criteria Evaluation	Weighted Sum	Sum (Stewardship)	Pairwise Criteria Evaluation	Weighted Sum				Overall Asset Score
City Hall	25	11	275	42	5	210	20	14	280	61	6	366	1131	0.45	13	0.45
City Shops (PW Bldg.)	33	11	363	42	5	210	36	14	504	68	6	408	1485	0.59	8	0.59
Fire Station	44	11	484	42	5	210	40	14	560	61	6	366	1620	0.64	7	0.64
West Tank - Concrete Water Tank (1 MG)	55	11	605	42	5	210	50	14	700	47	6	282	1797	0.71	5	0.71
Central Tank - Concrete Water Tank (1 MG)	61	11	671	42	5	210	58	14	812	47	6	282	1975	0.78	1	0.78
East Tank - Concrete Water Tank (0.5 MG)	38	11	418	42	5	210	34	14	476	38	6	228	1332	0.53	11	0.53
Church Street Booster Pump Station (BPS)	61	11	671	42	5	210	57	14	798	27	6	162	1841	0.73	4	0.73
Central Tank Transmission Line (Booster to 2700 E.)	57	11	627	42	5	210	56	14	784	46	6	276	1897	0.75	3	0.75
City Center transmission line (West to East Tank)	55	11	605	42	5	210	55	14	770	53	6	318	1903	0.76	2	0.76
West Tank Feed Transmission Line- WBWCD Well	56	11	616	42	5	210	46	14	644	32	6	192	1662	0.66	6	0.66
City Well #1	39	11	429	42	5	210	36	14	504	38	6	228	1371	0.54	9	0.54
1900 E. Bridge	31	11	341	42	5	210	40	14	560	28	6	168	1279	0.51	12	0.51
Peach Wood Bridge	22	11	242	42	5	210	29	14	406	28	6	168	1026	0.41	14	0.41
2700 E. Bridge	32	11	352	42	5	210	44	14	616	28	6	168	1346	0.53	10	0.53
Central Tank access road	21	11	231	42	5	210	29	14	406	28	6	168	1015	0.40	15	0.40

Tier 1		1-5
Tier 2		6-10
Tier 3		11-15

Highest Possible Score = 2520

Appendix D: Risk Screening & Selection

1. Final Risk Screening and Selection Table_7-14-22
2. Risk Screening and Selection Workshop (Project Planning Meeting #2) Summary Notes_7-14-22

Asset-Hazard Pair and Estimated Consequence Matrix	CRS / ECG	CRS / ECG	GS / CRS	GS / CRS	GS / CRS	GS /CRS	CRS / ECG	GS / CRS	CRS / ECG	CRS / ECG	CRS / ECG								
	Natural Hazards																		
Risk Screening Table	Dam Failure	Drought	Debris Flow	Earthquake - Ground Shaking	Earthquake – Liquefaction	Earthquake - Surface Fault Rupture/Fault Crossings	Flood	Landslide including Rockfall	Severe Wind	Severe Winter Weather	Wildfire								Notes
Assets - SWC MMP												**H**	**N/S**	**M**	**L**	**N/A**			
1 City Hall	L	L	L	H	L	L	L	L	M	M	H	2	0	2	7	0			Older Bldg. so concerns with EQ hazard, but need year constructed & as-built drwgs. Also located in High wildfire hazard area.
2 City Shops (PW Bldg.)	L	L	L	H	L	L	L	L	M	M	H	2	0	2	7	0			Older Bldg. so concerns with EQ hazard, but need year constructed & as-built drwgs. Also located in High wildfire hazard area.
3 Fire Station	L	L	L	N/S	L	L	L	L	M	M	H	1	1	2	7	0			Constructed 2004/2005 so designed for current EQ standards, but need to address wildfire (manage fuels for wildfire, fire break roads, etc.)
4 West Tank - Concrete Water Tank (1 MG)	L	L	L	H	L	L	L	H	L	L	M	2	0	1	8	0			Older than East Tank and built in 1930s. Some rehab for leaking, but nothing for major earthquake - Replacement would be primary mitigation
5 Central Tank - Concrete Water Tank (1 MG)	L	L	L	N/S	L	L	L	L	L	L	M	0	1	1	9	0			(Constructed 2010, designed for Earthquake - changed from Lead to DI pipe)
6 East Tank - Concrete Water Tank (0.5 MG)	L	L	L	H	M	M	L	L	L	L	M	1	0	3	7	0			Old Tank constructed? Approx. 1970s estimated by Bryan Wageman. Need to locate as-built drwgs.
7 Church Street Booster Pump Station (BPS)	L	L	L	N/S	L	L	L	L	M	M	N/S	0	2	2	7	0			Built same time as Central Tank in 2010 and designed for Earthquake
8 Central Tank Transmission Line (Booster to 2700 E.)	L	L	N/S	N/S	L	L	L	N/S	L	L	M	0	3	1	7	0			Replaced entire line in 2010 and upgrade to DI pipe from Lead joint & Cast Iron pipe. N/S since 2010 construction addressed EQ and not that close to Wildfire area.
9 City Center transmission line (West to East Tank)	L	L	N/S	N/S	M	N/S	L	N/S	L	L	M	0	4	2	5	0			Already changed from Lead to Ductil Iron pipe. Going to replace line w/Fused pipe East Tank to East Frontage Road 2022/23.
10 West Tank Feed Transmission Line- WBWCD Well	L	L	L	N/S	L	L	L	N/S	L	L	M	0	2	1	8	0			2010 changed from Lead to Ductil Iron pipe
11 City Well #1	L	L	L	H	L	L	L	L	M	M	H	2	0	2	7	0			Could put in a new well casing
12 1900 E. Bridge	L	L	L	H	L	L	L	N/S	L	L	M	1	1	1	8	0			EQ for all 3 bridges should be selected per Planning Team. Not select Landslide hazard for bridge. Can access 2 different ways if only this bridge damaged.
13 Peach Wood Bridge	L	L	L	H	L	L	L	L	L	L	M	1	0	1	9	0			EQ for all 3 bridges should be selected per Planning Team. Two other routes if only this Bridge damaged/out of service. Could use Canal as a road if it were covered.
14 2700 E. Bridge	L	L	N/S	H	L	L	L	L	L	L	M	1	1	1	8	0			EQ for all 3 bridges should be selected per Planning Team. Not select Debris Flow hazard for bridge. Could take down fence to use Hwy 89 to exit City.
15 Central Tank access road	L	L	L	H	L	L	L	H	L	L	M	2	0	1	8	0			Emergency access out of town and EQ & Landslide hazards to mitigate
												15	**15**	**23**	**112**	**0**	**165**	**Totals**	
Number of Highs	0	0	0	9	0	0	0	2	0	0	4	**15**		**City to Select up to Top 15 Asset-Hazard Pairs**					
Number of N/Ss	0	0	3	6	0	1	0	4	0	0	1	**15**							
Number of Mediums	0	0	0	0	2	1	0	0	5	5	10	**23**							
Number of Lows	15	15	12	0	13	13	15	9	10	10	0	**112**							
Number of N/As	0	0	0	0	0	0	0	0	0	0	0	**0**							
												165							
												Totals							

Estimated Consequence Scores

H	**High (H):** asset completely disabled; City's mission fully or nearly defeated; deaths, injuries, or other
N/S	**Not Selected (N/S):** initial scoring of H, but not selected by City for further assessment due to
M	**Medium (M):** asset partially disabled; City's mission moderately impacted; moderate amount of other
L	**Low (L):** asset not or only slightly disabled; City's mission only slightly impacted; low amount of other
N/A	**Not Applicable (N/A):** given hazard cannot impact asset, or otherwise does not apply to, the given

Risk Screening & Selection Workshop Summary

South Weber City (SWC)
Multi-Hazard Mitigation Plan (MMP) Project

Risk Screening & Selection Workshop

July 14, 2022
1:00 p.m. – 3:00 p.m.

Attendees: SWC: David Larson, Trevor Cahoon, Mark McRae, Bryan Wageman, Derek Tolman, and Brandon Jones; Elwell Consulting Group (ECG) Team: Bryon Elwell

Sign-in Sheet/Attendance Record, Meeting Objectives

David Larson started the Risk Screening & Selection Workshop at around 1:00 pm in the City Hall conference room and turned the time over to Bryon Elwell to conduct the meeting. Bryon passed around a sign-in sheet for the meeting that was filled out or their prefilled box was checked off by all attendees resulting in the sign-in record (*see attachment*) for the Risk Screening & Selection Workshop. Mark McRae attended the meeting by Webcam with a phone connection, Bryan Wageman was able to join the meeting about 15 minutes after it started, and Fire Chief Tolman was able to join the meeting in person around 2:15 pm. Bryon also briefly reviewed the meeting objectives at the beginning of the workshop as follows:

- Review hazard profile table and prioritized asset list used to prepare hazard-asset pair screening worksheet, verify consequence ratings, select hazard-asset pairs
- Review & finalize scoring for hazard-asset pair screening worksheet, then SWC selects hazard-asset pairs for risk assessment
- Review next steps for risk analysis including review of document request list & project schedule

Phase B Risk Assessment: Review Tasks 4, 5, & 6 (Preface)

Bryon reviewed the Task 4 prioritized asset list, Task 5 hazard profile table, and Task 6 hazard-asset pair worksheet and example consequence metrics for risk assessment with the following noted discussions.

Task 4 Prioritized Asset List

The 15 SWC selected assets for assessment were prioritized at the Planning Team Mtg#1 on 5/11/22 and put into three tiers with Tier 1 including Assets #1-5, Tier 2 includes Assets #6-10, and Tier 3 includes Assets #11-15 as shown on the handout provided both before the meeting by email and again at the workshop for those in attendance. The Summary Sheet from the prioritization of the City's top 15 assets has also been color coded by Tier to make it easier to locate each Tier as follows: Tier 1 green, Tier 2 orange, and Tier 3 yellow highlighted as shown in the list below. This table with the prioritized City assets will be used during the selection of the 15 asset-hazard pairs for risk assessment and will also be one of criteria used for the implementation plan that will be developed during Phase C Mitigation Strategy.

1. City Hall
2. City Shops (PW Bldg.)
3. Fire Station
4. West Tank - Concrete Water Tank (1 MG)

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5. Central Tank - Concrete Water Tank (1 MG)
6. East Tank - Concrete Water Tank (0.5 MG)
7. Church Street Booster Pump Station (BPS)
8. Central Tank Transmission Line (Booster to 2700 E.)
9. City Center transmission line (West to East Tank)
10. West Tank Feed Transmission Line- WBWCD Well
11. City Well #1
12. 1900 E. Bridge
13. Peach Wood Bridge
14. 2700 E. Bridge
15. Central Tank access road

Finally, the 2700 East Bridge was confirmed by the SWC Planning Team as the correct name for this asset, since there was some confusion on the use of 2400 East vs. 2700 East Bridge when the ECG Team was preparing the asset and hazard maps.

Task 5 Hazard Profile Table

Brandon asked about considering hazards and their potential impacts outside of SWC's ownership and control/responsibility with potential impacts to citizens of the city rather than limiting the City's focus to their selected and prioritized top 15 assets. Bryon indicated the Plan could include information and write-ups about past incidents and potential natural hazards/impacts outside of the City's top 15 assets and that is something that has already been requested from the city to provide previous hazard incidents information (e.g., Reports/ descriptions with dates of previous natural hazard incidents that affected SWC and details of any previous mitigation actions/projects) The Plan will also look at mitigation goals and strategies in order to develop mitigation actions for SWC to include in their Plan and these could include items outside of City limits but may not result in projects that the city would be responsible for implementing. Mitigation actions are also not exclusively developed for mitigation projects rather they can include educational mitigation actions to educate the Citizens of SWC about different hazard and how to prepare and respond to various natural hazards (i.e., earthquake, wildfire, flood, etc.). Following are some of the past natural hazard incidents and areas of concern outside of city limits and/or not included in the City's top 15 assets that were identified and discussed during the workshop by the SWC Planning Team:

South Bench – retention basin at edge of property in 2005 had a mudslide that took out a canal and home. The pond that caused the incident has since been moved, but the bench still has no drainage outlet to prevent future mudslides and damages. Potential mitigation would be to provide a drain outfall line for the property to help protect city residents located below the south bench area.

Cedar Bench Drive – Landslide area that State is monitoring above the Landfill, which is private property and not under SWC's authority or responsibility but could impact city residents.

Flood – When the CRS flood hazard map was reviewed with the Planning Team, Brandon indicated that he has a flood inundation map that he prepared for the city that shows additional flooding that covers more of the gravel pit and the Weber River channel flooding into the Canyon Drive area from East to West. Brandon will provide the ECG Team with this flood map layer for use in the MMP.

Drought – current drought situation is not impacting SWC, since WBWCD's water is provided primarily from Smith & Morehouse Reservoir which is currently almost full. There could be issues in the future with drought hazard, but SWC Planning Team agrees with Low consequence scoring for all assets in the Risk Screening Table for use in the current MMP.

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Task 6 Hazard-Asset Pair Worksheet & Example Consequence Metrics for Risk Assessment
Bryon reviewed the layout of the Hazard-Asset Pair Worksheet including how the consequence scoring was performed by the ECG Team for the preliminary Worksheet being reviewed and finalized with the SWC Planning Team at today's workshop. In addition, Bryon reviewed an Example Consequence Metrics Table for use in the risk assessment that will follow for the 15 asset-hazard pairs that the SWC Planning Team selects at today's workshop. The example consequence metrics table is from a city of similar size to SWC for a risk assessment performed by ECG in 2021 and covers three measures of consequence for Health Effects, Economic Loss, and Duration of Loss of Service and will need to be adjusted for SWC's risk assessment.

Phase B Risk Assessment: Task 6 Risk Screening
Next Bryon reviewed with the Planning Team the scoring of all the asset-hazard pairs in the Risk Screen Table prepared by the ECG Team. Bryon stepped the Planning Team through each hazard for all the assets and showed the Planning Team each of the hazard maps prepared by Geo Strata (i.e., Debris flow, EQ – ground shaking, EQ-liquefaction, EQ-fault rupture, Landslide) and CRS (i.e., Flood, Severe Wind, and Wildfire). For those hazards without hazard maps (i.e., dam failure, drought and severe winter weather) the hazards were discussed with the Planning Team and rationale for scoring provided by Bryon. During the review of all the asset-hazard pair scores there was only one pair that was adjusted. The "6. East Tank – EQ Fault Crossing" pair was adjusted from Low to Medium consequence score based on the Planning Team's concern of how close the Tank is to the fault, but realizes it is not within the fault rupture zone indicated on the hazard map which would have resulted in a High consequence score. This one adjustment in the Risk Screen Table did not affect the total number of High consequence pairs which remained at 30 pairs.

Phase B Risk Assessment: Hazard-Asset Pair Selection
Once scoring of the top 15 Assets against the 11 natural hazards had been confirmed with the SWC Planning Team, there were 30 asset-hazard pairs with High consequence scores that needed to be reduced to the City's top 15 pairs to be selected for risk assessment. It was suggested initially that High consequence pairs not be selected based on whether it was believed that there could be a mitigation project developed for that pair. It was later decided by the Planning Team to re-evaluate elimination of the bridges from the top 15 pairs being selected and they were in fact added back in for the earthquake hazard. Those pairs not selected by the Planning Team due to limited city resources and needing to go from 30 High consequence pairs down to the 15 pairs selected were determined and are shown in the "Risk Screening Table 7-14 Mtg Results" (*see attachment*) with "N/S" and are red highlighted in the table. The top 15 pairs selected are shown in the Risk Screening Table with an "H" and are red highlighted. A notes column was added to the far-right side of the Table to include notes about the Assets (i.e., year constructed, upgrades/replacements made including year, and other important attributes and information) to help decide which Pairs to select and those to not select. Therefore, the SWC Planning Team has now selected their 15 pairs for risk assessment, which include 10 of the City's top 15 assets and the three hazards of earthquake, landslide, and wildfire. No asset has more than 2 hazards to be assessed. As previously noted above, the final SWC Planning Team selection results of the 15 asset-hazard pairs for risk assessment are shown in the "Risk Screening Table 7-14 Mtg Results" (*see attachment*).

Phase B Risk Assessment: Next Steps, Info/Doc Request List & Schedule
Bryon started by reviewing the project schedule and noted that we were completing the Task 6 Vulnerability Assessment Hazard Screen & Select Workshop and confirmed that the two upcoming Phase B Risk Assessment meetings were still good dates and times for the SWC Planning Team. Those two meetings: Task 7 Planning Team Mtg#2 Risk Workshop 9/14/22 (1-3 pm) and Stakeholder Mtg#2 9/29/22 (1-2:30 pm) will remain without any changes. The Phase C Mitigation Strategy meetings are currently shown as tentative with Planning Team Mtg#3 scheduled for 11/16/22 (1-3 pm) and Stakeholder Mtg#3 11/30/22 (1-3 pm). These two meeting dates & times will be confirmed when they get closer at the Planning Team Mtg#2 Risk Workshop. It should also be noted that the Stakeholder meetings have all been shortened from up to 2 hours to up to 1½ hours which will be

adjusted on the project schedule at the next update after the 9/14/22 meeting. Therefore, there are no changes to the current Schedule (Rev2, 5/11/22).

Bryon reviewed the Information & Document Request List (Version 2, 5/11/22 Plan Team Mtg#1 Results) with the Planning Team. The list was updated with those items that have been completed since the 5/11/22 Planning Team Mtg#1 through today's 7/14/22 Risk Screening & Selection Workshop. Therefore, an updated Information & Document Request List (Version 3, 7/14/22 Risk Screen & Selection Workshop Results) was started at the workshop and finalized by Bryon after the workshop (*see attachment*). City Assignments are identified below in the Meeting Summary/Recap and notes in the attached latest version of the SWC MMP Info Request List (v3, 7/14/22). Now that the 15 asset-hazard pairs have been selected, SWC will need to provide the information requested for those assets and hazards previously requested and the ECG Team may need to request additional information and documents once the risk assessment of those pairs' progresses. The City will need to provide the majority of the outstanding requested information within the next 7 to 10 days to the ECG Team for the risk assessment of the 15 pairs.

Meeting Summary/Recap – Assignments

Bryon briefly summarized the meeting and the following assignments:

- Bryon to prepare and issue Risk Screening & Selection Workshop summary to SWC and the following results from the meeting:
  - Risk Screening & Selection Workshop sign-in record 7-14-22 (*see attachment*)
  - Finalized Risk Screening Table from 7/14/22 Workshop (*see attachment*)
  - SWC MMP Info Request List (V3, 7/14/22 Risk Screen & Selection Workshop Results) (*see attachment*)

- SWC assignments that will be led by David and supported by other City Planning Team members as identified:
  - Provide outstanding items from the initial Information and Document Request List (V3, 7/14/22 Risk Screen & Selection Workshop Results) within next 7 to 10 calendar days

Adjourn

Risk Screen & Selection Workshop ended at 3:15 pm

July 17, 2022

Appendix E: Risk Analysis & GRAT Top 5

1. Risk Analysis
2. Risk Chart
3. Risk Analysis Metrics
4. SWC MMP - Risk Assessment Workshop Summary Notes_9-14-22

South Weber City
Multi-Hazard Mitigation Plan Project
Risk Analysis

~~September 14, 2022~~

South Weber City MMP Risk Analysis Summary

			Consequence				Vulnerability			
A	B	C	D	E	F	G	N	Q	R	S
Asset	**Hazard Scenario Description (Baseline Assessment)**	**Threat Type**	**Public Health & Safety Effects (deaths, injuries, sicknesses)**	**Economic Loss of Physical Assets** (replacement cost)	**Loss of Service** (service outage duration)	**CONSEQUENCE (C)**	**Threat #5 - Natural Hazard**	**Conditional Risk (R = C x V x 1)**	**RELATIVE LIKELIHOOD (P_A)**	**RELATIVE RISK (R = C x V x P_A)**
1 City Hall	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to City Hall Bldgs and non-structural to equipment & furnishing due to ground shaking	N(E-WF)	M	VH	H	**VH**	H	**H**	M	**M**
	Wildfire in wildland urban interface causes damages to City Hall and requires evacuation of personnel	N(W)	L	MH	ML	**MH**	L	**L**	H	**L**
2 City Shops (PW Bldg.)	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to City Shops - PW Bldg. due to ground shaking	N(E-WF)	M	VH	H	**VH**	VH	**H**	M	**MH**
	Wildfire in wildland urban interface causes damages to PW Bldg., vehicles and equipment	N(W)	L	MH	VH	**VH**	L	**ML**	H	**ML**
3 Fire Station	Wildfire in wildland urban interface causes damages to Fire Station and requires evacuation of personnel	N(W)	L	L	L	**L**	L	**L**	H	**L**
4 West Tank - Concrete Water Tank (1 MG)	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to tank structure & piping connections due to ground shaking	N(E-WF)	L	VH	VH	**VH**	VH	**H**	M	**MH**
	Landslide movement that damages tank structure, piping & appurtenants	N(LS)	L	M	M	**M**	H	**M**	MH	**ML**
6 East Tank - Concrete Water Tank (0.5 MG)	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to tank structure & piping connections due to ground shaking, and some liquefaction & fault rupture/fault crossing	N(E-WF)	L	VH	VH	**VH**	VH	**H**	M	**MH**
11 City Well #1	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to City Well's Bldg. structure, well & appurtenants due to ground shaking	N(E-WF)	L	M	L	**M**	H	**M**	M	**ML**
	Wildfire in wildland urban interface causes damages to Well house, well equipment & appurtenants	N(W)	L	L	L	**L**	L	**L**	H	**L**
12 1900 E. Bridge	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to bridge structure & temporary closure due to ground shaking	N(E-WF)	L	M	M	**M**	VH	**M**	M	**ML**
13 Peach Wood Bridge	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to bridge structure & temporary closure due to ground shaking	N(E-WF)	L	M	M	**M**	H	**M**	M	**ML**
14 2700 E. Bridge	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to bridge structure & temporary closure due to ground shaking	N(E-WF)	L	M	M	**M**	H	**M**	M	**ML**
15 Central Tank access road	2,500-yr earthquake event occurs on the Wasatch Fault causing damages to access road resulting in temporary closure due to ground shaking	N(E-WF)	L	M	M	**M**	H	**M**	M	**ML**
	Landslide movement that damages access road resulting in temporary closure	N(LS)	L	M	M	**M**	H	**M**	MH	**ML**

Consequence Metrics

Measure of Consequence	Very High 1	High 0.9	Med High 0.7	Medium 0.5	Med Low 0.3	Low 0.1
Public Health & Safety Effects	>1 death or >50 injuries	1 death and 21 to 50 injuries	0 deaths and 11 to 20 injuries	0 deaths and 6 to 10 injuries	0 deaths and 2 to 5 injuries	0 deaths and 0 to 1 injury
Economic Loss of Physical Assets (replacement $)	>$1.5M	>$750K to $1.5M	$425K to <$750K	$100K to <$425K	$25K to <$100K	<$25K
Loss of Service	Service outage of >48 hours	Service outage of 36 to <48 hours	Service outage of 24 to <36 hours	Service outage of 12 to <24 hours	Service outage of 4 to 12 hours	<4 hrs.

System Effectiveness

VH	0.9
H	0.8
HM	0.7
MH	0.6
M	0.5
ML	0.4
LM	0.3
L	0.2
VL	0.1

Vulnerability

0.1	VL
0.2	L
0.3	LM
0.4	ML
0.5	M
0.6	MH
0.7	HM
0.8	H
0.9	VH

Relative Likelihood of Attack/Hazard

	1.0	*e.g., Vandalism*	*Petty Theft*									
VH	0.9	T(PI): Phys insider	N(L): Lightning									VH
H	0.8	D(U): Utilities	T(PU): Phys outsider	N(SW): Severe Weather	N(W): Wildfire							H
HM	0.7	T(CU): Cyber outsider	N(I): Ice Storm									HM
MH	0.6	T(CI): Cyber insider	A5: Drone	N(LS): Landslide	D(T): Transportation	N(D) Drought	N(DF): Debris Flow					MH
M	0.5	D(S): Suppliers	N(F): Flood	N(G): Erodible Soils	N(A): Avalanche	N(E-WF): EQ-Wasatch	AT1: 1 Assailant					M
ML	0.4	D(E): Employees	V1: Car	V2: Van	C(C): Chemical	S(PI): Phys insider	S(CI): Cyber insider	AT2: 2-4 Assailants	N(T): Tornado			ML
LM	0.3	D(P): Proximity	V3: Midsize truck	M1: Small boat	S(PU): Phys outsider	S(CU): Cyber outsider	C(P): Pathogen					LM
L	0.2	N(E): Earthquake	V4: 18-wheeler	M2: Fast boat	AT3: 5-8 Assailants	C(B): Biotoxin						L
VL	0.1	D(C): Customers	A1: Helicopter	A2: Small plane	A3: Regional jet	A4: Large jet	M3: Barge	M(4): Ocean Ship	AT4: 9-16 Assailants	C(R): Radionuclide	C(W): Weaponization	VL
	0.0	*e.g., Nuclear bomb*	*N(H): Hurricane*									

Hazards selected by SWC for risk assessment

Risk Assessment Workshop Summary Notes

South Weber City (SWC)
Multi-Hazard Mitigation Plan (MMP) Project

Risk Assessment Workshop

September 14, 2022
1:00 p.m. – 3:00 p.m.

Attendees: SWC: David Larson, Trevor Cahoon, Mark McRae, Mark Larsen, Bryan Wageman, Derek Tolman, and Brandon Jones; Elwell Consulting Group (ECG) Team: Bryon Elwell

Sign-in Sheet/Attendance Record, Meeting Objectives

David Larson started the Risk Assessment Workshop at around 1:00 pm in the City Hall conference room and turned the time over to Bryon Elwell to conduct the meeting. Bryon took the roll call and updated the electronic sign-in sheet for the meeting (*see attachment*) for the Risk Assessment Workshop. Derek Tolman was able to join the meeting about 15 minutes after it started. Bryon also briefly reviewed the meeting objectives at the beginning of the workshop as follows:

- Review risk analysis worksheet including hazard scenarios, Consequence/Vulnerability/Hazard Likelihood
- Adjust Risk Analysis Scores in risk analysis worksheet based on SWC Planning Team's input
- Identify Top hazard-asset pairs (Relative risk scores) to advance to Phase C Mitigation Strategy
- Review next steps: Stakeholder Mtg#2 & Phase C Mitigation Strategy including review of document request list & project schedule

Risk Analysis Worksheet (Preface)

Bryon reviewed the Risk Analysis Worksheet by going through each of the tabs including Risk Analysis tab, Risk Chart tab, Lookup tables tab, and Tables – Print Version. The Consequence Metrics that David and Bryon finalized on 8/22/22 were reviewed with SWC Planning Team for use during the confirmation of Consequence scoring of the Risk Analysis table's 15 hazard-asset pairs. The Vulnerability scoring was reviewed which consists of vulnerability ratings of very low (VL) to very high (VH) in increments of 0.1 starting at 0.1 for VL with 9 different vulnerability levels going up to VH at 0.9. Next, the relative Likelihood of the hazard was reviewed for the three natural hazards included in the 15 hazard-asset pairs being analyzed. Those hazards are N(W)-Wildfire, N(LS)-Landslide, and N(E)- Earthquake. However, the earthquake hazard has a more specific hazard likelihood for earthquakes that occur along the Wasatch Faults, so it is designated as N(E-WF)-EQ Wasatch. The corresponding relative likelihoods for the three hazards being assessed are N(W) = 0.8, N(LS) = 0.6, and N(E-WF) = 0.5. After each of the risk equation variables and their scoring methods were reviewed, Bryon then reviewed how the Risk Analysis tab worked for the first hazard-asset pair of earthquake along Wasatch fault occurring at City Hall. The scenario of 2,500-yr earthquake event occurs on the Wasatch Fault causing damages to City Hall Bldgs. and non-structural to equipment & furnishing due to ground shaking was applied and the Vulnerability scoring by the ECG Team was reviewed. This was followed by review of each of the three Consequence ratings for Public Health & Safety Effects, Economic Loss of Physical Assets, and Loss of Service were reviewed. Finally, the relative likelihood scores were reviewed which resulted in the overall Relative Risk for this hazard-asset pair of Medium (M).

September 22, 2022

Risk Analysis Worksheet: Review & Confirm C, V & T

Next Bryon reviewed with the Planning Team the scoring of all the asset-hazard pairs in the Risk Analysis tab of the Risk Analysis Worksheet prepared by the ECG Team. Bryon stepped the Planning Team through each of the 15 asset-hazard pairs by first reviewing the Vulnerability scores and then reviewing the three Consequence scores. Adjustments were made along the way with notes provided to either support the existing score or to raise or lower the score (*see attachment*). The only Vulnerability score that was adjusted was for the City Hall – Wildfire pair which was lowered from a ML to a L vulnerability due to the distance a wildfire would need to travel in order to reach the City Hall from the higher wildland fire areas. This also made the vulnerability of City Hall the same as for the City Shops (PW Bldg.) and the Fire Station for their wildfire hazard pairs. There were a few Consequence scores that were adjusted by the SWC Planning Team and again for each of those adjustments there were notes to indicate how the scores were changed. None of the Public Health & Safety Effects consequence scores were changed. However, a few of the Economic Loss and Loss of Service consequence scores were changed as follows:

Asset-Hazard Pair	Economic Loss of Physical Assets	Loss of Service
2. City Hall – N(W)	raised from M to MH	No change
4. City Shops – N(W)	raised from ML to MH	raised form L to VH

Risk Analysis Worksheet: ID Top Hazard-Asset Pairs & Assets

Once the scoring of the 15 Assets had been reviewed and adjustments by the SWC Planning Team were completed, Bryon was able to review the Risk Chart tab (*see attachment*) with the Planning Team. This review found the Asset with the highest Risk score for its asset-hazard pairs was the East Tank with a relative Risk score of 4.0. The next three Assets that all scored relative Risk of 3.0 included City Hall, City Shops (PW Bldg.) and West Tank. Finally, there was a tie for the 5th highest relative Risk score of 2.0 which included City Well #1, 1900 E Bridge, Peach Wood Bridge, 2700 E Bridge, and Central Tank access road. The SWC Planning Team discussed which of these five assets should be selected for the top 5 Assets that will move forward during the Phase C Mitigation Strategy to develop a mitigation action/project to address the risk of the hazard(s). The Central Tank access road was selected by the Planning Team, since none of the 3 bridges are owned by the City and it would be difficult to develop mitigation action/project for them and the City Well #1 is seldom used with WBWCD water acting as the City's primary water supply, while the Central Tank access road could sustain damage to not only the road but to the buried pipeline that supports the Central Tank.

Next Steps

Bryon started by reviewing the next step of holding Stakeholder Mtg #2 on 9/29/22 from 1 to 2:30 pm at City Hall and on Zoom. The agenda for the meeting was reviewed with the Planning Team and David Larson indicated he had sent out stakeholder meeting invites earlier that day on 9/14/22, which gives the stakeholders a little over 2 weeks' notice. The level of detail to be provided to the stakeholders in the meeting presentation was discussed and like Stakeholder Mtg #1 this will be a high-level discussion and mainly used to provide the stakeholders with the results of Phase B Risk Assessment. Although the other goal of the stakeholder meeting is to receive stakeholder input and comments, which Bryon will look at promoting with potentially providing another stakeholder questionnaire similar to the first meeting.

Next, the Phase C Mitigation Strategy was discussed which will be used to identify the City's mitigation strategy for both general and specific mitigation actions for the hazards that have been identified and for the top 5 Assets there will be specific mitigation actions/projects developed and prioritized into an implementation plan.

Next the project schedule was reviewed, and the Phase C Mitigation Strategy meetings were changed from tentative to confirmed dates and times. The Planning Team Mtg#3 was changed from 11/16/22 to 11/17/22 from 1 to 3 pm, and Stakeholder Mtg #3 had no change and was kept on 11/29/22 from 1 to 2:30 pm. It was

also discussed that there will be a need to adjust the Phase D Draft Plan Review Mtg and Stakeholder Mtg #4 dated in order to meet the State/FEMA deadlines for Plan Approval under the old policy for preparing Hazard Mitigation Plans rather than the new policy which will take effect on 4/19/23. The 8/8/22 email from Maranda Miller, Utah DEM was reviewed, and it indicates SWC's Plan needs to be submitted by 1/15/23 to the State in order to ensure the draft Plan is submitted to FEMA by 3/3/23, which should achieve FEMA approval by the 4/19/23 deadline. Therefore, the above changes to the two, Phase C Meetings were made to the Schedule (Rev3, 9/14/22) (*see attachment*).

Bryon reviewed the Information & Document Request List (Version 3, 7/14/22 Risk Screen & Selection Workshop Results) with the Planning Team. The list was updated with those items that have been completed since the 7/14/22 Risk Screening & Selection Workshop through today's 9/14/22 Risk Assessment Workshop. Therefore, an updated Information & Document Request List (Version 4, 7/14/22 Risk Assessment Workshop Results) was started at the workshop and finalized by Bryon after the workshop (*see attachment*). City Assignments are identified below in the Meeting Summary/Recap and notes in the attached latest version of the SWC MMP Info Request List (v4, 9/14/22). These remaining documents and information are needed to prepare the draft MMP, so the ECG Team would like to receive the outstanding requested information within the next 7 to 10 days.

Meeting Summary/Recap – Assignments

Bryon briefly summarized the meeting and the following assignments:

- Bryon to prepare and issue Risk Assessment Workshop summary to SWC and the following results from the meeting:
  - Risk Assessment Workshop sign-in record 9-14-22 (*see attachment*)
  - Finalized Risk Analysis Table tabs from 9/14/22 Workshop (*see attachments*)
  - SWC MMP Info Request List (V4, 9/14/22 Risk Assessment Workshop Results) (*see attachment*)
  - Project Schedule (Rev3, 9/14/22) (*see attachment*)

- SWC assignments that will be led by David and supported by other City Planning Team members as identified in the following:
  - Provide outstanding items from the Information and Document Request List (V4, 9/14/22 Risk Assessment Workshop Results) within next 7 to 10 calendar days

Adjourn

Risk Assessment Workshop ended at 2:50 pm

September 22, 2022

Appendix F: Mitigation Implementation Plan

Table F-1: SWC MMP Mitigation Actions Implementation Plan

South Weber City MMP Mitigation Actions Implementation Plan

	MITIGATION			Risk Scores Asset/T-A	Asset Priority Tier / #	B/C	Risk Implement Priority	Potential FUNDING SOURCES				IMPLEMENTATION per FISCAL YEAR					
	Mitigation Action # / Asset Project Name	Hazard	Mitigation Action					General Fund	CIP	FEMA Grant	Other	2024	2025	2026	2027	2028	Project Subtotal
1	#1A / East Tank Seismic & Problem Soils Project Scoping	Earthquake, Problem Soils	Study earthquake (ground shaking) and problem soils impacts on East Tank for preparation of detailed plan to harden or replace the water tank	4.0	Tier 3 / Asset #11	N/A	High		X	X		$0.1M	$0.11M				**$0.21M**
2	#2A / City Hall Seismic & Wildfire Project Scoping	Earthquake, Wildfire	Study earthquake (ground shaking) and wildfire impacts on City Hall for preparation of detailed plan to harden or replace the building	3.0	Tier 3 / Asset #13	N/A	High	X		X			$0.07M	$0.07M			**$0.14M**
3	#3 / City Shops (PW Building) Replacement Project	Earthquake, Problem Soils, and Wildfire	Design and administer the construction contract for a seismic upgrade of the two, original floc/sed basins to mitigate ground shaking hazard and improve process resilience against water quality degradation from drought and fires.	3.0	Tier 2 / Asset #8	0.5	High	X	X	X			$3.7M	$5M	$5M		**$13.7M**
4	#4 / West Tank Replacement Project	Earthquake, Problem Soils	Design and construct new tank that addresses earthquake and problem soils at current location and acquire 1.5 additional acres	3.0	Tier 1 / Asset #5	0.8	High		X	X					$1.3M	$1.3M	**$2.6M**
5	#1B / East Tank Mitigation Project (s)	Earthquake, Problem Soils	Design and construct recommended mitigation measures for either retrofitting existing tank or constructing a new tank (based on results of Mitigation Action 1, once completed)	4.0	Tier 3 / Asset #11	TBD	High		X	X				TBD	TBD		**TBD**
6	#5 / Central Tank Access stockpile road building materials	Earthquake, Problem Soils, Landslide	Stockpiling of road building materials and equipment on hand to repair damages to existing road in event of seismic, problem soils, and/or landslide hazards.	2.0	Tier 3 / Asset #15	N/A	Medium		X			$0.26 M	$0.26M	$0.26M	$0.26 M	$0.26 M	**$1.3M**
7	#2B / City Hall Seismic & Wildfire Resiliency Project	Earthquake, Wildfire	Design and administer the construction contract to upgrade City Hall structure that is seismically resilient and protected from wildfire	3.0	Tier 3 / Asset #13	TBD	High		X	X					TBD	TBD	**TBD**
											Totals	**$0.36 M**	**$4.14M**	**$5.33M**	**$6.56 M**	**$1.56 M**	**$17.95M**

TBD = To Be Determined
CIP contains both Capital Facilities Plan and O&M for each Enterprise funds (i.e., water, sewer, sanitation, storm water)
General Fund contains Streets and Parks

Appendix G: SWC Geohazards Technical Memorandum

SWC Geohazards Technical Memorandum

SWC GEOHAZARDS TECHNICAL MEMORANDUM

Introduction

GeoStrata as a part of the Elwell Consulting Team was asked to provide geohazard assessments for all of the selected South Weber City (SWC) facilities. The purpose for the assessment was to gain a better understanding of the impacts that the geohazards may have on the facilities. The hazards assessed as a part of this study included earthquake, landslides, and debris flows. GeoStrata used available reports and maps provided by the Utah Geological Survey (UGS) and the United States Geological Survey (USGS). All references used in this study are presented in the references section at the end of this technical memorandum.

The following sections discuss the earthquake hazards, landslide hazards and debris flow hazards. Earthquake hazards included ground shaking, fault rupture and liquefaction. Tables are presented in each of the sections that provide our teams assessment of each hazard with respect to each SWC facility.

Debris Flow

Debris flows are water-laden masses of soil and fragmented rock often called mudslides, mudflows, or debris avalanches and usually associated with flooding types of rainfall events or rapidly melting snowmelt. The debris within a debris flow is typically comprised of soil, rock fragments, and organic material such as trees and other vegetation that are picked up by scouring of rapidly moving water as the flow moves down a confining channel. Debris flow deposits are categorized based on the water to sediment ratio and viscosity of the debris flow. Debris flows may also be generated when a landslide deposit becomes rapidly saturated with water and flows into a channel.

Intense rainfall and rapid snowmelt are generally events that may trigger debris flow movement. Debris flows and floods also occur when heavy rains on recently burned slopes results in higher-than-normal runoff and in turn channel scour. Repeated debris flows and/or flood events deposit sediment at the mouth of canyons, forming an alluvial fan. Flows may travel farther down the fan from the mouth of the canyon if the channel becomes entrenched and the flow is confined.

Debris flows can be viscous and can transport extremely large boulders (greater than 6-foot diameter); debris flows may eventually become muddy flood waters as they deposit their debris. Debris flows tend to move in pulses. Early pulses or previous debris flows form levees that channel the flow until the levees are breached. The presence of older levees indicates the recurrence and characteristics of debris flows in a particular canyon.

A debris flow hazard map for the SWC planning area, presented in Appendix A Plate A-2 and Table 1, identifies the SWC facilities which were specifically evaluated for the debris flow hazard.

Debris Flow Hazard Potential is defined as follows:
High – Facility is located on a Holocene age mapped alluvial fan
Moderate – Facility is located within ½ mile of a mapped modern debris flow
Low – Site does not exist near a known debris flow hazard

Table 1 Facilities Assessed for Debris Flow

Asset	Near Slopes > 30%	Mapped Debris Flow Deposit	Debris Flow Hazard	Notes
1 - City Hall	No	No	Low	
2 - City Shops (PW Bldg.)	No	No	Low	
3 - Fire Station	No	No	Low	
4 - West Tank - Concrete Water Tank (1 MG)	No	No	Low	
6 - East Tank - Concrete Water Tank (0.5 MG)	Yes	Yes	Low[1]	
11 - City Well #1	No	No	Low	
12 - 1900 E. Bridge	No	No	Low	
13 - Peach Wood Bridge	No	No	Low[2]	
14 - 2700 E. Bridge	No	Yes	High	Initial scoring of High, but not selected by City for further assessment due to limited resources.
15 - Central Tank Access Road	No	No	Low	

1 – This facility is located within a debris flow deposit; however, it sits above the canyon channel and would likely not be impacted during a debris flow event.
2 – This facility is located within ½ mile of a mapped debris flow deposit, however, there is development between the canyon that sources the material of the debris flow deposit.

Earthquake

Key SWC facilities are distributed adjacent to the Wasatch fault along the benches of the Wasatch Front and near the mouths of canyons. The earthquake assessment of key SWC facilities addressed the three types of seismic threats: ground shaking, surface fault rupture, and liquefaction.

Ground Shaking is associated with seismic accelerations. The seismic ground motion hazard is highest for facilities near the Wasatch fault due to the fault's potential for high-magnitude earthquakes, as well as the higher occurrence frequency of smaller earthquakes in the vicinity of the fault noted.

The nearest active fault that would likely be the source of ground shaking in the SWC service area include the Weber segment of the Wasatch Fault Zone (WFZ). Table 2 lists the ground motion parameters for this fault in relation to the maximum credible seismic event that would affect the SWC service area.

Table 2 Ground Motion Parameters of Active Fault Near SWC facilities

Fault	Length of fault (kilometers)	Slip rate (mm/year)	Age of most recent event (years)	Potential Magnitude (Moment Magnitude scale)
Weber Segment	56	1.0 – 5.0	< 15,000	7.2[1]

[1] DuRoss, C.B., Personius, S.F., Crone, A.J., McDonald, G.N., and Lidke, D.J., 2009, Paleoseismic Investigation of the Northern Weber Segment of the Wasatch Fault Zone at the Rice Creek Trench Site, North Ogden, Utah: Utah Geological Survey Special Study 130, Paleoseismology of Utah, Volume 18, p. 25.

The ground shaking potential due to an earthquake on this and other faults in the Wasatch region is best represented by U.S. Geological Survey (USGS) determined peak ground acceleration (PGA) values. Table 2 includes the facilities assessed for ground shaking hazard and Plate A-3 in Appendix A shows the PGA contours for the SWC service area for the 475-year seismic event and the 2,475-year event, respectively. These seismic events correspond to 10 percent probability of occurrence in 50 years and 2 percent probability of occurrent in 50 years. The maps illustrate how for both return periods, PGA amplitudes (i.e., intensity of ground shaking) are the highest in close proximity to the Weber segment of the WFZ. The PGAs noted will be used by the structural engineer in their assessment of the impact to the SWC facility.

Areas of potential surface fault rupture and liquefaction are described below and were considered as a group of permanent ground displacement hazards that serve to modify and intensify the seismic ground motion hazard at each site.

Liquefaction is the loss of bearing capacity in loose, saturated, granular soil deposits during a ground shaking event. Among other effects, liquefaction can result in densification of such deposits causing settlement of overlying layers as excess pore water pressures are dissipated after an earthquake. Liquefaction may also cause slope movement on relatively flat slopes; this phenomenon is known as lateral spread. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions, (2) soil type and consistency, and (3) depth to groundwater. This type of environment is typical of low-lying areas in proximity

to bodies of water, such as valley floors and floodplains. Appendix G of the SWC HMP Plate G-3 Liquefaction Map shows the liquefaction hazard potential for the SWC planning area

Liquefaction is produced by intense seismic shaking which causes a buildup of pore pressure in loosely deposited granular soils within areas of shallow groundwater. This causes the soil deposits to lose their bearing capacity and excessive settlements can occur. Other liquefaction concerns include the floating of pipelines and buried tanks due to the presence of high pore pressures. A liquefaction hazard map for the SWC service area during the 2,475-year earthquake is presented in Appendix A Plate A-4. This hazard map was used to assist in the assessment of each city asset for liquefaction potential.

Surface Fault Rupture is the surface manifestation of an active fault. Surface fault rupture refers to permanent displacement of the ground surface along an active fault that is caused by tectonic slip on the fault plane at depth. Surface fault rupture accompanies major earthquakes, generally of moment magnitude M 5.0 and greater for the Great Basin region of Nevada and Utah. In the SWC planning area, the Weber segment of the WFZ is the most active fault system in the area.

Based on fault studies compiled by the United States Geological Survey (USGS), the Weber segment is the second largest segment of the WFZ and extends north to south 56 km from the Salt Lake Salient, through a ridge of Paleozoic and Tertiary bedrock that extends west of the Wasatch Front, to the Pleasant View Salient which marks the boundary between the Weber segment and the Brigham City segment (DuRoss and others, 2009). The geometry of linkage between the main rupture zones in the Weber segment and faults in the interior of the Salt Lake salient is not clear. Surface scarps at the southern margin of the salient are discontinuous but apparently extend into the large normal fault along the eastern boundary of the segment. There is no reported evidence for Quaternary movement on this fault in the interior of the salient, so presumably the Quaternary ruptures have not reactivated most of this fault. Prior paleoseismic studies report that the Weber segment of the WFZ is thought to have experienced four surface faulting seismic events since the middle Holocene. Nelson and others (2006) report four surface faulting seismic events since the middle Holocene with the most recent event being a partial segment rupture which occurred approximately 500 years ago resulting in a 1.6 feet surface rupture displacement. DuRoss and others (2009) report evidence from the 2007 Rice Creek trench site of as many as six surface faulting seismic events during the Holocene with four surface faulting events in approximately the past 5,400 years. This data from DuRoss and others (2009) supports the partial segment surface rupture timing reported by Nelson and others (2006). A location near Kaysville, Utah indicated that the Weber Segment has a measurable offset of 1.4 to 3.4 meters per event (McCalpin and others, 1994). The Weber Segment may be capable of producing earthquakes as large as magnitude 7.5 (Ms). The consensus preferred recurrence interval for the Weber segment, determined by the Utah Quaternary Fault Working Group, is approximately 1,400 years for the past four surface fault rupture earthquakes (Lund, 2005).

Surface rupture displacement is commonly distributed across a zone of deformation that can be several meters to tens of meters wide as measured perpendicular to the fault. Normal faults, such as the Wasatch fault that dips at a steep angle towards the west, can produce zones of surface deformation tens of meters wide or more on the down-thrown side of the fault. Additionally, the full width of the active fault zone, including associated splays, can only be determined from detailed geological investigations that involves careful geological mapping and exploratory fault trenching. Such detailed investigations are commonly performed at critical facility sites but are rarely performed along the entire length of an active fault. Consequently, uncertainty exists as to the actual fault width at any location where such investigations have not been performed. This

uncertainty extends to the plotted map location of the faults relative to the mapped location of each SWC facility site. Recommendations for additional studies and estimated costs for these studies have been prepared and are presented in the Mitigation Project Cost Estimates, Section 4.5 of the SWC Hazard Mitigation Plan (HMP).

Facilities located within a UGS defined Special Study Zone, as defined in Table 3, are considered to have a potential for fault rupture impacts. No facilities are located within the special study zones. The distance of the facilities to the special study zones is listed in Table 6 and illustrated in Appendix A of the SWC HMP, Plate A-5.

Table 3 UGS Defined Special Study Zone

Fault Type	Upthrown Distance (ft)	Downthrown Distance (ft)
Well Located (solid)	250	500
Approximately Located (dashed)	1000	1000
Inferred (dotted)	1000	1000

Many SWC assets are located in relatively high seismic areas. Table 4 identifies the SWC facilities which were evaluated for the ground shaking potential, Table 5 provides the liquefaction potential for SWC facilities, and Table 6 presents the surface fault rupture hazard for SWC facilities.

Table 4 Facilities Assessed for Ground Shaking Hazard

Facility	Nearest Fault	MCA-PGA Associated with a 2% Probability of Exceedance in 50 years (%g)
1 - City Hall	Weber	120-160
2 - City Shops (PW Bldg.)	Weber	120-160
3 - Fire Station	Weber	120-160
4 - West Tank - Concrete Water Tank (1 MG)	Weber	120-160
6 - East Tank - Concrete Water Tank (0.5 MG)	Weber	120-160
11 - City Well #1	Weber	120-160
12 - 1900 E. Bridge	Weber	120-160
13 - Peach Wood Bridge	Weber	120-160
14 - 2700 E. Bridge	Weber	120-160
15 - Central Tank Access Road	Weber	120-160

Table 5 Facilities Assessed for Liquefaction

Facility	Liquefaction Hazard
1 - City Hall	Low
2 - City Shops (PW Bldg.)	Low
3 - Fire Station	Low
4 - West Tank - Concrete Water Tank (1 MG)	Low
6 - East Tank - Concrete Water Tank (0.5 MG)	Moderate
11 - City Well #1	Low
12 - 1900 E. Bridge	Low
13 - Peach Wood Bridge	Low
14 - 2700 E. Bridge	Low
15 - Central Tank Access Road	Low

Table 6 Facilities Assessed for Earthquake Fault Rupture

Facility	Nearest Fault	Approximate Distance to Special Study Zone (mi)
1 - City Hall	Weber	1.45
2 - City Shops (PW Bldg.)	Weber	1.30
3 - Fire Station	Weber	1.75
4 - West Tank - Concrete Water Tank (1 MG)	Weber	3.00
6 - East Tank - Concrete Water Tank (0.5 MG)	Weber	0.04
11 - City Well #1	Weber	1.45
12 - 1900 E. Bridge	Weber	1.00
13 - Peach Wood Bridge	Weber	0.29
14 - 2700 E. Bridge	Weber	0.12
15 - Central Tank Access Road	Weber	1.00

Landslide

Landslides are defined as all slope failures including slump, slide, debris/earth flow, and rock fall that may be induced by ground shaking or other failure mechanisms. It is noted, however, that not all slopes represent a landslide hazard. Slopes that contain layers of weak material (especially landslide deposits), are overly steep for the strength of the materials that comprise the slope, and/or are impacted by groundwater are susceptible to landslide failure. Movement can occur at the top of a slope where the slope has been loaded by fill placement, at the base of a slope that has been undercut, or where local groundwater rises resulting in increased pore pressures within the slope. Furthermore, landslide hazards are specifically increased in areas where previous slope failures have occurred, and landslide deposits are present. Previous slope failures leave landslide deposits that are in a state of residual strength and are more susceptible to slope failure than a slope with no landslide deposits. A landslide hazard map for the SWC planning area is presented in Appendix A of the SWC HMP Plate A-7, and Table 7 identifies the SWC facilities which were specifically evaluated for the landslide hazard.

Table 7 Facilities Assessed for Landslide

Facility	Hazard Rating	Notes
1 - City Hall	Low	
2 - City Shops (PW Bldg.)	Low	
3 - Fire Station	Low	
4 - West Tank - Concrete Water Tank (1 MG)	High	
6 - East Tank - Concrete Water Tank (0.5 MG)	Low	
11 - City Well #1	Low	
12 - 1900 E. Bridge	High	Initial scoring of High, but not selected by City for further assessment due to limited resources.
13 - Peach Wood Bridge	Low	
14 - 2700 E. Bridge	Very Low	
15 - Central Tank Access Road	High	

We recommend that special landslide hazard studies be completed for those facilities that have been identified as having a High potential for impact from a landslide. These studies would include trenching the limits of mapped landslide deposits, performing drilling into or near the apex of each landslide deposit, and generating a geologic cross section of the landslide deposit. Additionally, an engineering study of the stability of the landslide deposit would need to be completed. All detailed description of all work completed as part of the landslide hazard studies and engineering studies and the results and associated recommendations of the studies would be presented in a final report. Costs for these studies have been prepared and are presented in the Mitigation Project Cost Estimate Section of the SWC HMP (Section 4.5).

References

Bowman, S.D., and Lund, W.R., 2020, Guidelines for Investigating Geologic Hazards and Preparing Engineering-Geology Reports, with a Suggested Approach to Geologic-Hazard Ordinances in Utah, Second Edition, UGS Circular 128.

Christenson, G.E., Shaw, L.M., 2008, Geographic Information System Database Showing Geologic-Hazards Special Study Areas, Wasatch Front, Utah, UGS Circular 106.

DuRoss, C.B., Personius, S.F., Crone, A.J., McDonald, G.N., and Lidke, D.J., 2009, Paleoseismic Investigation of the Northern Weber Segment of the Wasatch Fault Zone at the Rice Creek Trench Site, North Ogden, Utah: Utah Geological Survey Special Study 130, Paleoseismology of Utah, Volume 18, p. 25.

Elliot, A.H., Harty, K.M., 2010, Landslide Maps of Utah, UGS Map 246DM.

McDonald, G. N., Kleber, E.J., Hiscock, A.I., Bennet, S.E., and Bowman, S.D., 2020, Fault Trace Mapping and Surface-Fault-Rupture Special Study Zone Delineation of the Wasatch Fault Zone, Utah and Idaho, UGS Report of Investigation 280.

Wong, I., Lund, W., DuRoss, C., Thomas, P., Arabasz, W., Crone, A., Hylland, M., Luco, N., Olig, S., Pechman, J., Personius, S., Peterson, M., Schwartz, D., Smith, R., and Bowman, S., 2016, Earthquake Probabilities for the Wasatch Front Region in Utah, Idaho, and Wyoming, UGS Miscellaneous Publication 16-3.

Yonkee, A., Lowe, M., 2004, Geologic Map of the Ogden 7.5-Minute Quadrangle, Weber and Davis Counties, Utah: Utah Geological Survey Map 200.

Appendix H: Mitigation Cost Estimates

Detailed Cost Estimates

1. City Shops (Public Works Building) Replacement Project
2. Mitigation Project #1A – East Tank Seismic & Problem Soils Project Scoping
3. Mitigation Project #1B – East Tank Mitigation Project (s)
4. Mitigation Project #2A – City Hall Seismic & Wildfire Project Scoping
5. Mitigation Project #2B – City Hall Seismic & Wildfire Resiliency Project
6. Mitigation Project #4 – West Tank Replacement Project
7. Mitigation Project #5 – Central Tank Access stockpile road building materials

Department/Description	GSF	$/SF	Total $
PROJECT COST ESTIMATE DETAIL			
BUILDING			
Office Area			**$ 1,281,010**
Office	4,036	$ 317	$ 1,281,010
Shop Area			**$ 3,403,050**
Office	1,856	$ 300	$ 556,800
Shop/Storage	9,000	$ 250	$ 2,250,000
Wash Bay	2,250	$ 265	$ 596,250
Building Construction Cost Sub-Total			**$ 4,684,060**
SITE STRUCTURES			**$ 2,382,412**
Vehicles & Equipment Storage			$ 1,080,245
Material Storage (Raw)			$ 399,215
Material Storage (Items)			$ 380,858
Loading Ramps			$ 39,570
Pre-Wash Station			$ 30,936
Wash Station			$ 365,681
Vac-Truck Waste Decanting Station			$ 29,542
Fuel Station			$ 56,366
Site Structures Construction Cost Sub-Total			**$ 2,382,412**
SITE DEVELOPMENT			
Site Work			**$ 1,246,020**
Site Preparation			$ 564,000
Asphalt			$ 480,000
Gravel			$ 11,200
Landscaping			$ 43,000
Fencing/Signage/Misc			$ 147,820
Utilities			**$ 511,675**
Culinary Water			$ 131,750
Pressure Irrigation			$ 28,300
Sewer			$ 47,850
Storm Drain			$ 252,525
Power			$ 35,000
Gas			$ 16,250
Site Development Construction Cost Sub-Total			**$ 1,757,695**
CONSTRUCTION MARK-UP			
Overhead/Profit			8.00%
General Conditions			12.00%
Contingency			20.00%
Escalation to 3/2023			7.50%
		sub-total (%)	*47.50%*
Building Mark-Up			**$ 2,224,930**
Site Structures Mark-Up			**$ 1,131,650**
Site Development Mark-Up			**$ 834,910**
Project Mark-Up			**$ 4,191,490**
PROJECT TOTAL CONSTRUCTION COST			
Building Construction Cost Sub-Total			$ 4,684,060
Building Mark-Up			$ 2,224,930
Building Total Construction Construction Cost			**$ 6,908,990**
Site Structures Construction Cost Sub-Total			$ 2,382,412
Site Structures Mark-Up			$ 1,131,650
Site Structures Total Construction Cost			**$ 3,514,062**
Site Development Construction Cost Sub-Total			$ 1,757,695
Site Development Mark-Up			$ 834,910
Site Development Total Construction Cost			**$ 2,592,605**
Project Total Construction Cost			**$ 13,015,657**
PROJECT SOFT COST			
Design			$ 1,041,250
Furniture, Fixtures & Equipment (FF&E)			$ 226,050
Information Technology			$ 195,230
Testing & Inspection			$ 130,160
Moving/Occupancy			$ 10,000
Builder's Risk Insurance(0.15% of Construction Budget)			$ 19,520
Commissioning			$ -
Design Contingency			$ 130,160
Total Project Soft Costs			**$ 1,752,370**
Soft Cost % of Estimated Project Total			12%
ESTIMATED PROJECT TOTAL			**$ 14,768,027**

1A East Tank Project Scoping
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	Study earthquake (ground shaking) and problem soils impacts on East Tank for preparation of detailed plan to harden or replace the water tank	1	LS	$ 150,000.00	$ 150,000
1.02	Geotechnical field work	1	LS	$ 40,000.00	$ 40,000
				Total	$ 190,000
				10% Contigency	$ 19,000
				Grand Total	**$ 209,000**
Note: Cost figures stated above are the engineer's opinion of probable costs this year. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

1B East Tank Mitigation Project
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	Mobilization	1	LS	$ 63,750.00	$ 63,750
1.02	Erosion Control	1	LS	$ 12,500.00	$ 12,500
1.03	Replace Tank	500,000	Gallon	$ 1.25	$ 625,000
				Total	$ 701,250
				10% Construction Contigency	$ 70,125
				5% Construction Management	$ 35,063
				Grand Total	**$ 806,438**
				Class 5 estimate (high +30% to +100%; used +65%) (review estimate periodically and update as needed)	$ 1,331,000
				Class 5 estimate (low -20% to -50%; used -35%) (review estimate periodically and update as needed)	$ 525,000
Note: Cost figures stated above are the engineer's opinion of probable costs this year. These costs have been obtained from reviewing bid tabulations on projects designed by the engineer over the past 2 years, talking with contractors in the applicable fields of construction, and from reviewing construction cost publications. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change pending survey, final design, and approval by jurisdictional agencies.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

2A City Hall Project Scoping
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	Study earthquake (ground shaking) and wildfire impacts on City Hall for preparation of detailed plan to harden or replace the building	1	LS	$ 100,000.00	$ 100,000
1.02	Structural investigation field work	1	LS	$ 25,000.00	$ 25,000
				Total	$ 125,000
				10% Contigency	$ 12,500
				Grand Total	**$ 137,500**
Note: Cost figures stated above are the engineer's opinion of probable costs this year. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

2B City Hall Mitiation Project
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	Mobilization	1	LS	$ 145,898.91	$ 145,899
1.02	Erosion Control	1	LS	$ 28,607.63	$ 28,608
1.03	Addition/renovation City Hall	4,600	SF	$ 310.95	$ 1,430,382
				Total	$ 1,604,888
				10% Construction Contigency	$ 160,489
				5% Construction Management	$ 80,244
				Grand Total	**$ 1,845,621**
				Class 5 estimate (high +30% to +100%; used +65%) (review estimate periodically and update as needed)	$ 3,046,000
				Class 5 estimate (low -20% to -50%; used -35%) (review estimate periodically and update as needed)	$ 1,200,000
Note: Cost figures stated above are the engineer's opinion of probable costs this year. These costs have been obtained from reviewing bid tabulations on projects designed by the engineer over the past 2 years, talking with contractors in the applicable fields of construction, and from reviewing construction cost publications. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change pending survey, final design, and approval by jurisdictional agencies.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

4 West Tank Mitigation Project
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	West Tank Replacement Project	1	LS	$ 1,953,838.91	$ 1,953,839
1.02	West Tank additional property acquisition	1.5	Acre	$ 195,383.89	$ 293,076
				Total	$ 2,246,915
				10% Construction Contigency	$ 224,691
				5% Construction Management	$ 112,346
				Grand Total	**$ 2,583,952**
				Class 5 estimate (high +30% to +100%; used +65%) (review estimate periodically and update as needed)	$ 4,264,000
				Class 5 estimate (low -20% to -50%; used -35%) (review estimate periodically and update as needed)	$ 1,680,000
Note: Cost figures stated above are the engineer's opinion of probable costs this year. These costs have been obtained from reviewing bid tabulations on projects designed by the engineer over the past 2 years, talking with contractors in the applicable fields of construction, and from reviewing construction cost publications. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change pending survey, final design, and approval by jurisdictional agencies.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

5 Central Tank Mitigation Project
South Weber City Multi-hazard Mitigation Plan
Preliminary Estimate of Probable Costs
Prepared By: CRS Engineers
Reviewed By: Elwell Consulting Group
Date: 11/15/2022
(CRS Project #: 2022-0090)

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Cost
1.00	Section Name				
1.01	Stockpile roadbase	370	CY	$ 13.50	$ 5,000
1.02	Stockpile 15" reinforced concrete pipe	250	LF	$ 24.25	$ 6,063
1.03	Stockpile 12" ductile iron pipe	250	LF	$ 54.00	$ 13,500
1.04	Miscellaneous fittings, manholes, etc (50% of pipe cost)	1.0	LS	$ 5,600.00	$ 5,600
1.05	Asphalt pavement	45,000	SY	$ 23.75	$ 1,068,750
				Total	$ 1,098,913
				10% Construction Contigency	$ 109,891
				5% Construction Management	$ 54,946
				Grand Total	**$ 1,263,749**
				Class 5 estimate (high +30% to +100%; used +65%) (review estimate periodically and update as needed)	$ 2,086,000
				Class 5 estimate (low -20% to -50%; used -35%) (review estimate periodically and update as needed)	$ 822,000
Note: Cost figures stated above are the engineer's opinion of probable costs this year. These costs have been obtained from reviewing bid tabulations on projects designed by the engineer over the past 2 years, talking with contractors in the applicable fields of construction, and from reviewing construction cost publications. Costs stated above are not guaranteed. They are an opinion and not a warranty. It is recommended that the Owner have a contingency fund for unexpected costs. All quantities shown are preliminary and subject to change pending survey, final design, and approval by jurisdictional agencies.					
	Engineering News Record Construction Cost Index	Nov-22		13,174.98	

Appendix I: Mitigation Benefits

Mitigation Benefits Table

Draft January 2023

South Weber City
Multi-hazard Mitigation Plan

Hazard	Asset	Deficiency Type	Deficiency	Building/Structure and Nonstructural Item(s) Replacement Value or Pipeline Per Repair Section Replacement Value	Estimated *BASELINE* Building/Structure or Nonstructural Items Damage State after Scenario Hazard Event			Population Serviced by Asset (potable & ag water users)	If *BASELINE* Damage State Occurs, Estimated Baseline System Functional Downtime			Mitigation Measure	Estimated *UPGRADED* Building/Structure or Nonstructural Items Damage State after Scenario Hazard Event			If *UPGRADED* Damage State Occurs, Estimated Upgraded System Functional Downtime			Total Present Value Benefits (Net) without hazard likelihood
					Damage Level	Damage Scenario Description	Estimated Damage ($)		Potable Water: # Days of Complete Loss of Water Service	Potable Water: # Days of Water that is "Unsafe for Drinking"	Secondary Water: # Days of Complete Loss of Water Service		Damage Level	Damage Scenario Description	Estimated Damage ($)	Potable Water: # Days of Complete Loss of Water Service	Potable Water: # Days of Water that is "Unsafe for Drinking"	Secondary Water: # Days of Complete Loss of Water Service	
Earthquake & Problem Soils	City Shops (PW Bldg.)	S	These buildings are in quite serious disrepair due to age and corrosion. Soil has been in contact with the base of the buildings. Drainage away from the buildings has not been possible under these conditions. The steel skin of the buildings is corroded through. Some of the main framing members have been damaged.	$14,800,000	Complete Repair	These buildings are at risk of severe or catastrophic failure due to earthquake and fire. The age of the buildings suggest they are not designed to withstand lateral loads. The foundations would not have been constructed according to modern seismic standards and are likely to fail. The buildings, being of steel shells, are not combustible, but would still suffer damage in the event of a fire.	$14,800,000	0	6			The mitigation for these buildings would be to de-construct and salvage the building materials. A new shop building designed to withstand seismic and fire dangers is recommended.	Light		$740,000	0			$106,886,000
Earthquake	West Tank - 1 MG Reservoir	S	This tank has experienced leaking in the past and projects have been completed to mitigate the leaks. The tank still has a remaining life expectancy of 10-15 years. The tank, piping, and site conditions need to be monitored to maintain a water-tight, contaminate free system.	$2,600,000	Complete Repair	The tank is susceptible to damage due to an earthquake and landslide. Both scenarios could cause loss of essential water service to parts of the City.	$2,600,000	8,000	30			Replacement of existing tank with new concrete reservoir at same site with acquisition of additional 1.5 acres.	Light-Moderate		$390,000	1			$29,122,000

Legend:
G – Geologic
NS – Nonstructural
S – Structural
P– Pipeline

P=Benefits –> Annualized

Appendix J: Addendum #1 – SWC Plan Adoption and FEMA Approval

SWC Plan Adoption Resolution

FEMA Approval Letter

RESOLUTION 23-07

A RESOLUTION OF THE SOUTH WEBER CITY COUNCIL ADOPTING A MULTI-HAZARD MITIGATION PLAN

WHEREAS, Council sought after and was awarded a Building Resilient Infrastructure and Communities (BRIC) grant from the Federal Emergency Management Agency (FEMA) to aid in creation of a multi-hazard mitigation plan; and

WHEREAS, Elwell Consulting Group was hired to assist the city in developing the plan; and

WHEREAS, for the past year staff has worked through planning, risk assessment, and mitigation strategy to create a Multi-Hazard Mitigation Plan; and

WHEREAS, the draft plan was submitted to the state of Utah and after their review, the plan was then revised to address a few comments into the Final Multi-Hazard Mitigation Plan contained in Exhibit 1 which satisfied the state on meeting local hazard mitigation plan requirements; and

WHEREAS, the final step is acceptance and adoption of the finalized Multi-Hazard Mitigation Plan by Council to then be given to FEMA for their final review and approval;

NOW THEREFORE BE IT RESOLVED by the Council of South Weber City, Davis County, State of Utah, as follows:

Section 1. Adoption: The Multi-Hazard Mitigation Plan contained in Exhibit 1 is hereby adopted subject to FEMA's approval allowing for minor changes as needed.

Section 2: **REPEALER CLAUSE:** All ordinances or resolutions or parts thereof, which are in conflict herewith, are hereby repealed.

PASSED AND ADOPTED by the City Council of South Weber, Davis County, on the 28th day of February 2023.

Roll call vote is as follows:		
Council Member Halverson	FOR	AGAINST
Council Member Petty	FOR	AGAINST
Council Member Soderquist	FOR	AGAINST
Council Member Alberts	FOR	AGAINST

Rod Westbroek, Mayor

Attest: Lisa Smith, Recorder

EXHIBIT 1

MULTI-HAZARD MITIGATION PLAN

[exhibit of South Weber City resolution 23-07; MMP not duplicated here]